Warkworth Continuation 2014

6

Environmental Impact Statement

Prepared for Warkworth Mining Limited | June 2014

VOLUME 6 — Appendices O to R













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Appendix O

Traffic and transport study

Appendix O — Traffic and transport study

O

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Warkworth Continuation 2014 and Mount Thorley Operations 2014

Traffic and transport study

Prepared for Warkworth Mining Limited and Mt Thorley Operations Pty Limited | 2 June 2014

Planning + Environment + Acoustics

Warkworth Continuation 2014 and Mount Thorley Operations 2014

Traffic and transport study

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Warkworth Continuation 2014 and Mount Thorley Operations 2014

Final

Report J14013RP1 | Prepared for Warkworth Mining Limited and Mt Thorley Operations Pty Limited | 2 June 2014

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1 Introduction

1.1 Overview

EMGA Mitchell McLennan Pty Limited (EMM) was engaged by Coal & Allied Operations Pty Limited (Coal & Allied) to undertake an assessment of traffic and transport impacts due to the Mount Thorley Operations (MTO) 2014 and Warkworth Continuation 2014 mining proposals.

Warkworth Mine and MTO function as an integrated operation and share the use of a number of resources and infrastructure. This includes a joint workforce and management team. This traffic and transport impact assessment has therefore been based on the combined projects (the proposal). This assessment forms part of the environmental impact statement (EIS) for each project.

It is important to note that the employee traffic generated by Warkworth Mine and MTO on external public roads will not change under the proposal as there will be no changes to the combined project workforces. Truck traffic generated will also generally remain at similar levels. All product coal is either transported by rail or conveyor currently from the two mine Coal Handling and Preparation (CHPP) plants. The volumes and methods of product coal transported from the mines will remain as per the current operations.

1.2 Mount Thorley Operations EIS

1.2.1 Background

MTO is an open cut coal mine approximately 10.5 kilometres (km) south-west of Singleton in the Hunter Valley, NSW, and is shown in Figure 1.1. The mine is operated by Coal & Allied on behalf of Mount Thorley Joint Venture (MTJV). The site currently operates under Development Consent No. DA 34/95 (the MTO development consent) issued by the then Minister for Planning on 22 June 1996 under Part 4 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act).

Immediately to the north is Warkworth Mine. Since 2004, the two mines have integrated at an operational level and are known as Mount Thorley Warkworth (MTW), with a single management team responsible for all the operations. Equipment, personnel, water, rejects and coal preparation are all shared between the mines. The MTW operations involve an existing operation of approximately 1,300 persons, which includes full-time personnel and a small number of short-term contractors. Ownership of the two mines remains separate.

Mining activities approved under DA 34/95 have mostly been completed with the exception of Loders Pit and Abbey Green North Pit (AGN) with rehabilitation well-progressed on the east of the site. Run-of-mine (ROM) coal from MTO is transported to either the MTO or Warkworth Mine coal preparation plant (CPP) for processing. Extraction of coal from other pits has been completed; overburden emplacement is ongoing. Product coal from the CPPs is transported via conveyor or haul road to the Mount Thorley Coal Loader (MTCL). Coal loaded onto trains at the MTCL is transported to the Port of Newcastle for export.

The proposal at MTO seeks an approval under Part 4, Division 4.1 of the EP&A Act to complete mining and rehabilitation activities within the current limits of approval.

1.2.2 Proposal description

MTO has approval to mine until 22 June 2017 under its development consent. The proposal seeks a 21 year development consent period from the date of any approval. If approval is granted in 2015, operations at MTO are forecast to continue to the end of 2035, an 18 year extension over the current approval. The proposal seeks a continuation of all aspects of MTO as it presently operates and extends or alters them, including:

- mining in Loders Pit and AGN Pit. Mining in Loders Pit is expected to be completed in approximately 2020. Mining in AGN Pit is yet to commence; however, it is anticipated to take approximately two years and be completed before 2022;
- transfer of overburden between MTO and Warkworth Mine to assist in rehabilitation and development of the final landform;
- maintain existing extraction rate of 10 million tonnes per year (Mtpa) of ROM coal;
- maintain and upgrade to the integrated MTW water management system (WMS), including:
  - upgrade to the approved discharge point and rate of discharge into Loders Creek from 100Ml/d to 300Ml/d via the Hunter River Salinity Trading Scheme (HRSTS);
  - ability to transfer and accept mine water from neighbouring operations (ie Bulga Coal Complex, Wambo Mine, Warkworth Mine and Hunter Valley Operations); and
  - increase in the storage capacity of the southern out-of-pit (SOOP) dam from 1.6 giga litres (GL) to 2.2GL;
- maintain and upgrade to the integrated MTW tailings management:
  - including use of the northern part of Loders Pit as a TSF after completion of mining; and
  - Wall lift to Centre Ramp Tailings Facility to approximately RL150;
- upgrade to the MTO CPP to facilitate an increase in maximum throughput to 18Mtpa with the ability to receive this coal from Warkworth Mine;
- acknowledge all approved interactions with Bulga Coal Complex; and
- continuation of coal transfer between Warkworth Mine and MTO and transportation of coal via the MTCL to Port of Newcastle.

All activities, including coal extraction will be within disturbance areas approved under the existing development consent. The proposal is shown in Figure 1.2.

1.3 Warkworth Continuation 2014

1.3.1 Background

Warkworth Mine is an open cut coal mine approximately 8 km south-west of Singleton in the Hunter Valley, NSW, and is shown in Figure 1.1. The mine is operated by Coal & Allied on behalf of Warkworth Mining Limited (WML). The site currently operates under Development Consent No. DA 300-9-2002-i (the Warkworth Mine development consent) issued by the then Minister for Planning in May 2003 under Part 4 of the EP&A Act. The site also operates under two separate Commonwealth approvals (*Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act)): EPBC 2002/629 and EPBC 2009/5081.

Warkworth Mine has been in operation since 1981 and the originally approved operation has been modified several times. Immediately to the south of Warkworth Mine is MTO. As noted in Section 1.2.1, the two mines have integrated at an operational level; however, ownership remains separate.

Warkworth Mine currently operates three integrated open cut mining areas, namely North, West and South pits with West and North pits being the focus of production. ROM coal from Warkworth Mine is transported to either the Warkworth or Mount Thorley CPP for processing. Product coal from the CPPs is transported via conveyor to either the MTCL or to the Redbank Power Station. Coal loaded onto trains at the MTCL is transported to the Port of Newcastle for export.

The proposal at Warkworth Mine seeks an approval under Part 4, Division 4.1 of the EP&A Act to extend mining beyond the current limits.

1.3.2 Proposal description

Warkworth Mine has approval to operate until 19 May 2021 under its development consent. The proposal seeks a 21 year development consent period from the date of any approval. If approval is granted in late 2014, operations at Warkworth Mine are forecast to continue to 2035, a 14 year extension over the current approval. The proposal seeks a continuation of all aspects of Warkworth Mine as it presently operates together with:

- an extension of the approved mining footprint by approximately 698ha to the west of current operations (referred to herein as the proposed 2014 extension area);
- the ability to transfer overburden to MTO to complete MTO's final landform;
- the closure of Wallaby Scrub Road;
- an option to develop an underpass beneath Putty Road for the third bridge crossing yet to be constructed (while retaining the current approval for an overpass);
- minor changes to the design of the Northern out-of-pit (NOOP) dam; and
- the continued use of secondary access gates to the mine site and offsets for activities such as drilling, offset management, equipment shutdown pad access amongst other things.

The proposal is shown in Figure 1.2.

1.4 Road and rail transport implications for the proposal

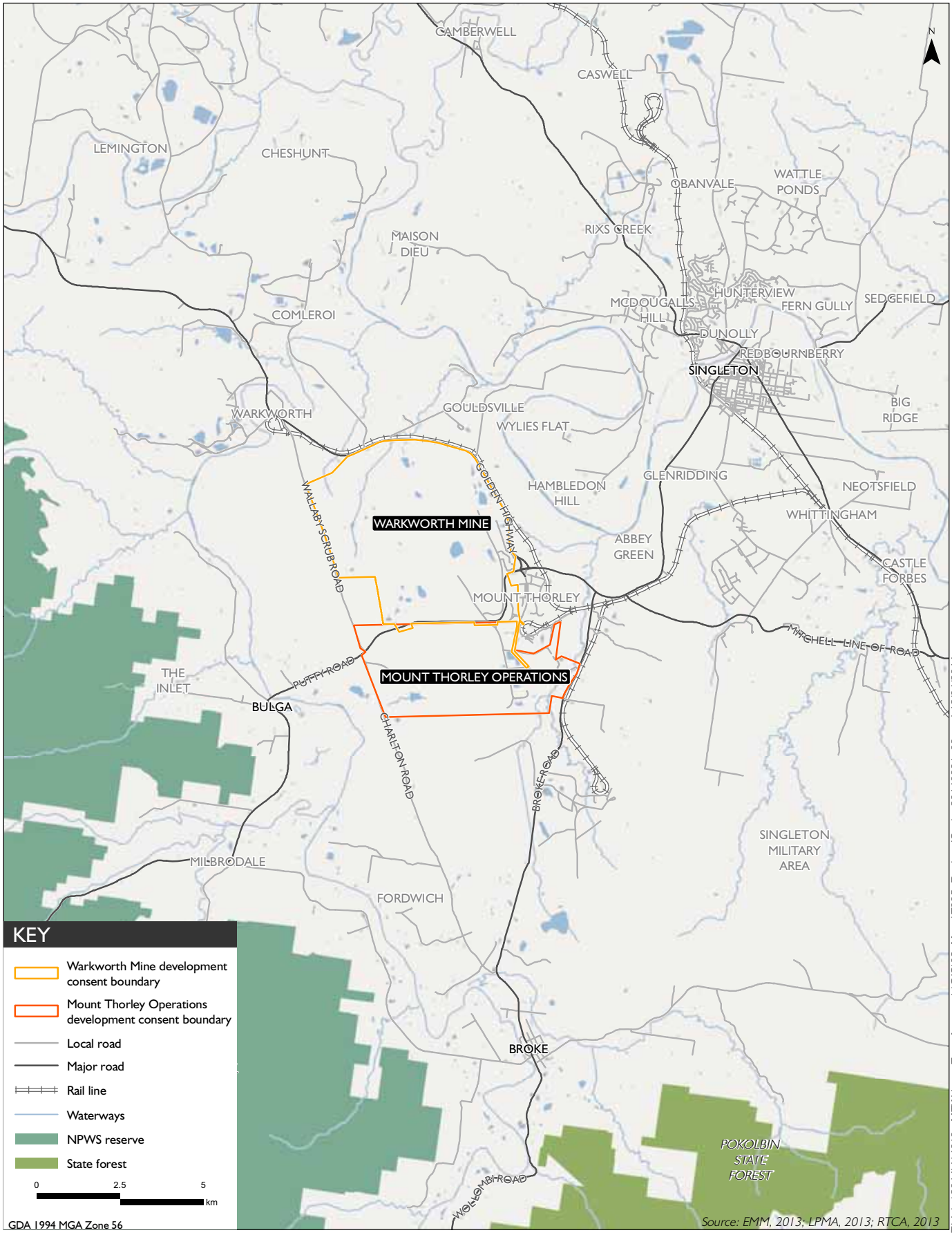
This report assesses the future transport network impacts of the proposal, in accordance with the project Department of Planning and Environment Secretary's requirements for the EIS.

The capacity and performance of the relevant road and rail transport networks are assessed including the effects of the closure of Wallaby Scrub Road, with reference to the most recent road and intersection capacity standards in the *Guide to Road Design* (Austroads 2010) and the Hunter Valley rail network capacity review (ARTC 2013).

Background information reviewed included the previous traffic impact assessments (TIA) and road safety investigations undertaken by Parsons Brinkerhoff in 2010 for the Warkworth Mine Extension Project, and the Bulga Optimisation Project TIA (ARC Traffic + Transport with Transport and Urban Planning 2013). Relevant current information from these documents regarding the road network, intersection operations and traffic safety implications were used to inform this assessment.

The structure of the report is based on the *Guide to Traffic Generating Development* (RTA 2002), which is the standard RMS template for the preparation of traffic impact studies for major projects.

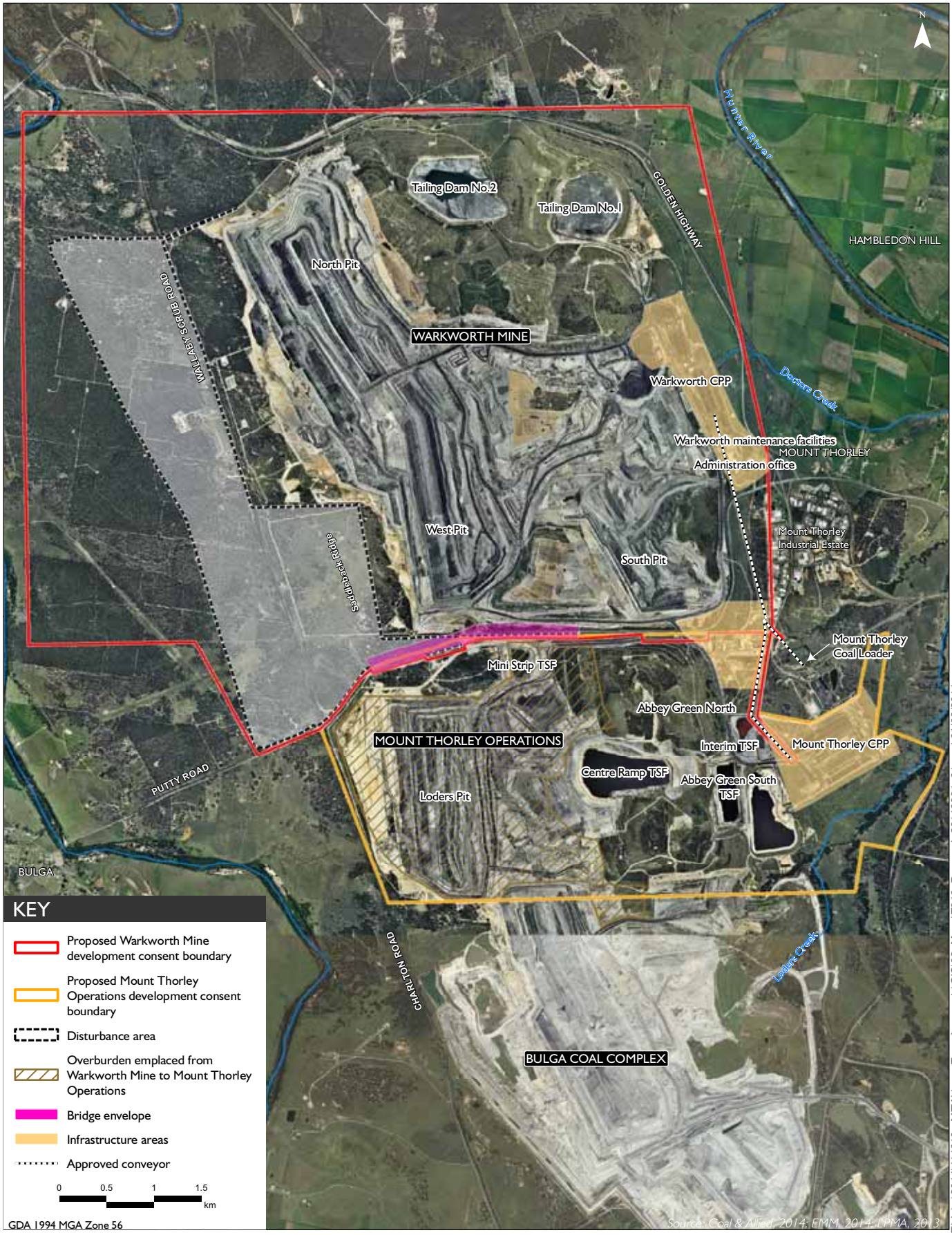
To enable a thorough and detailed assessment, this TIA includes analysis of the current base year traffic conditions in 2014, traffic in the first full year of project operation (2017) following the closure of Wallaby Scrub Road and a cumulative traffic assessment (also in the year 2017) including the closure of Wallaby Scrub Road and forecast mine construction employment at the nearby Bulga Optimisation Project.



Regional location of the proposal

Mount Thorley Warkworth - Continuation of Mining Operations
Traffic Impact Assessment

Figure 1.1



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The proposal

Mount Thorley Warkworth - Continuation of Mining Operations
Traffic Impact Assessment

Figure 1.2

2 Existing road traffic operations

2.1 Site location

The MTW mining operations are on the southern (MTO) and northern (Warkworth) sides of Putty Road, west of Mount Thorley Industrial Estate, and east of the village of Bulga. The locality of the mining operations and the surrounding roads is illustrated in Figure 2.1.

2.2 Road network

2.2.1 Description of roads

The primary access route for most of the MTW project-related traffic in the Mount Thorley area, is the Golden Highway east of Mount Thorley. Approximately 80 percent of the current and proposed MTW traffic movements will be travelling in this direction, either to or from Singleton, or Maitland and the other Hunter Valley townships further to the east.

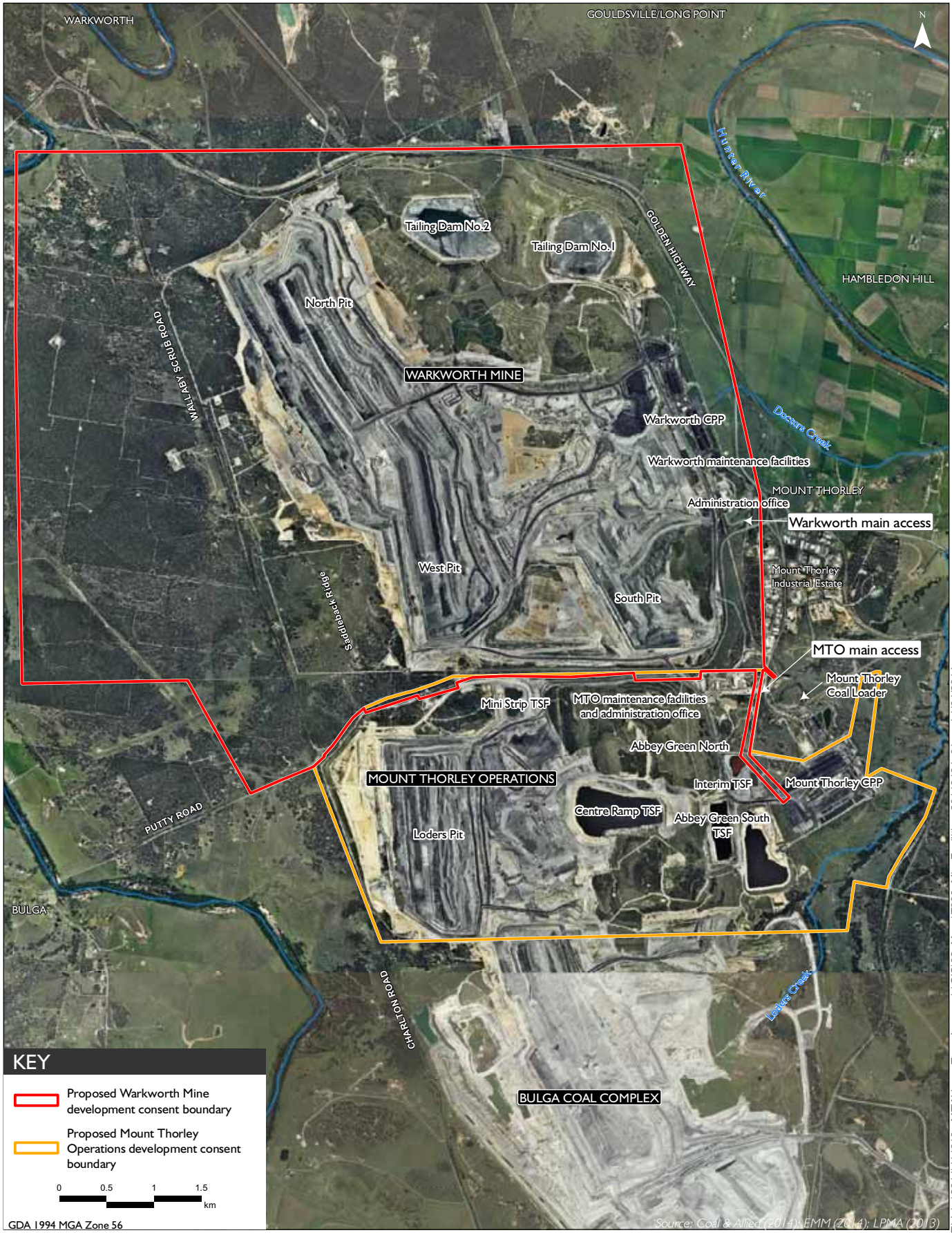
A site inspection and photographic survey of the existing mine access intersections, internal car parking areas and the surrounding local road network, including the Golden Highway, Putty Road and other routes was undertaken by EMM on 20 March 2014. The existing traffic lanes widths and configuration/ traffic controls at all the major intersections on the surrounding road network were observed and existing road pavement surface conditions noted.

The regional and local transport routes in the vicinity of the project area are depicted in Figure 1.1 and Figure 2.1 and described below.

- Golden Highway – A national road freight route linking the Hunter Region with the central inland regions of NSW. The route is generally a two-lane two-way road with a posted speed limit of 100 km/hr, except where horizontal and vertical alignment requires this to be reduced to 80 km/hr. The roadway is generally constructed to a 'major rural highway' design standard, with marked centre and edge lines and sealed shoulders which typically have a minimum width of 1 m or 2 m in many locations.

- Putty Road – Generally an undivided 100 km/hr sealed road which runs between the townships of Singleton in the Hunter Valley and Windsor on the northern outskirts of Sydney. In the vicinity of Mount Thorley, Putty Road shares a section of the route of the Golden Highway, between the intersections with Mitchell Line of Road and Mt Thorley Interchange. To the west Putty Road passes through the village of Bulga, where there is a 60 km/hr speed limit, and continues through generally hilly and mountainous terrain for the remainder of the route towards Windsor.

- Broke Road – An important local road which connects the Golden Highway to the village/settlement of Broke and continues towards the townships of Cessnock and Wollombi via either Broke-Cessnock Road or Wollombi Road. The road also provides the main vehicular access to mining operations at Bulga Coal Mining Complex, where access intersections are a further 3 - 5 km south of the Mount Thorley CPP access intersection. Broke Road is generally a two-lane two-way road with a posted speed limit of 100 km/hr.



Locations of access to the mine facilities from surrounding roads

Mount Thorley Warkworth - Continuation of Mining Operations
Traffic Impact Assessment
Figure 2.1

- Charlton and Wallaby Scrub Roads are both two lane rural roads which link the Golden Highway near Wambo with Broke Road approximately 3 km north of Broke village. The route crosses Putty Road approximately 3 km east of Bulga village. These roads generally have 100 km/hr speed limits and variable road pavement width and conditions, such that the edge and centre lines are not typically marked.

- Mount Thorley Road is an industrial road which provides access to the Mount Thorley Industrial Estate and connects to the Golden Highway and Putty Road as the fourth leg of the Mount Thorley Interchange intersection. The road pavement is generally constructed to a wide 'industrial road' standard. The road has a relatively straight and level alignment and speed limit of 60 km/hr at the northern end and also in the vicinity of MTO and the MTCL access at the southern end.

2.2.2 Site access intersections

The main vehicular access routes to the mine facilities are via three intersections:

- from Putty Road, at Lydes Lane, approximately 200 m west of the Mount Thorley Interchange (west side).

- from Broke Road, approximately 2 km south of the Golden Highway.

- from Mount Thorley Road, at the southern end, near the location of the MTCL rail loop.

The majority (80 percent) of the existing MTW workforce resides in the east and travel via the Golden Highway and Putty Road or Mitchell Line of Road routes which connect to Singleton and other Hunter Valley townships. The remainder of the current MTW workforce generally travels from the west via Putty Road, the north via the Golden Highway, and the south via Broke Road with proportions of approximately 7 percent, 8 percent and 5 percent, respectively.

Morning and afternoon peak hour intersection traffic surveys were undertaken between 6.00 to 9.00 am and 3.00 to 6.00 pm on Tuesday 4 March 2014 at the locations shown in Figure 2.2, which include the two mine access intersections from Putty Road and Broke Road which provide the main vehicular access routes and parking for mining employees currently. Daily traffic volume surveys were also undertaken at two locations on the Golden Highway and on Wallaby Scrub Road as shown in Figure 2.3.

Photographs 2.1 to 2.8 illustrate the existing road network at the major road and mine access intersections. The internal car parking areas and truck movement areas are served by roads connecting to these intersections and the Mount Thorley Road intersection (not shown).

2.2.3 Major road intersections

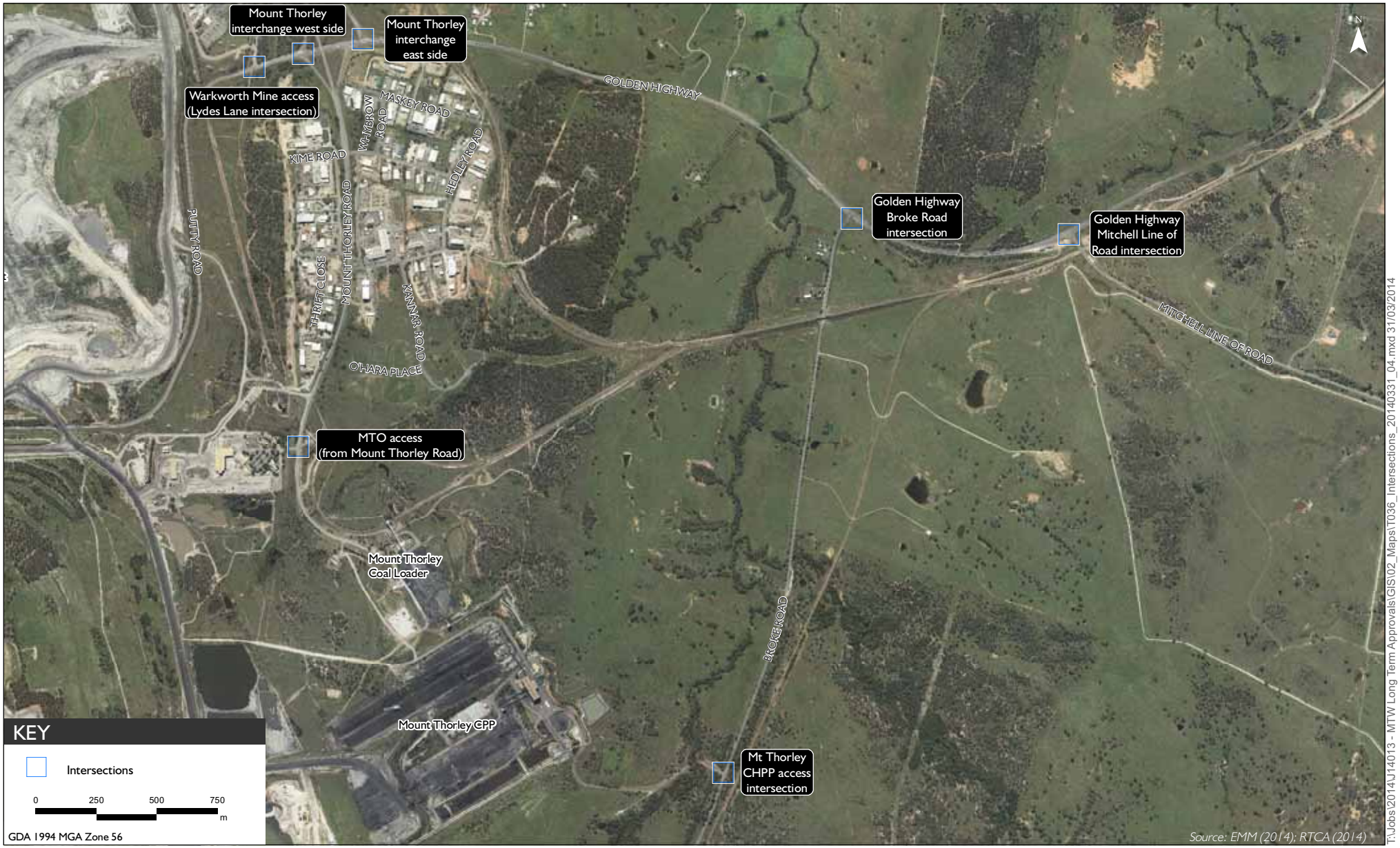
There are four major road intersections potentially affected by traffic generated under the proposal:

- Golden Highway/Mitchell Line Road;

- Golden Highway Mount Thorley Interchange intersection (west side);

- Golden Highway Mount Thorley Interchange Intersection (east side); and

- Golden Highway/Broke Road.



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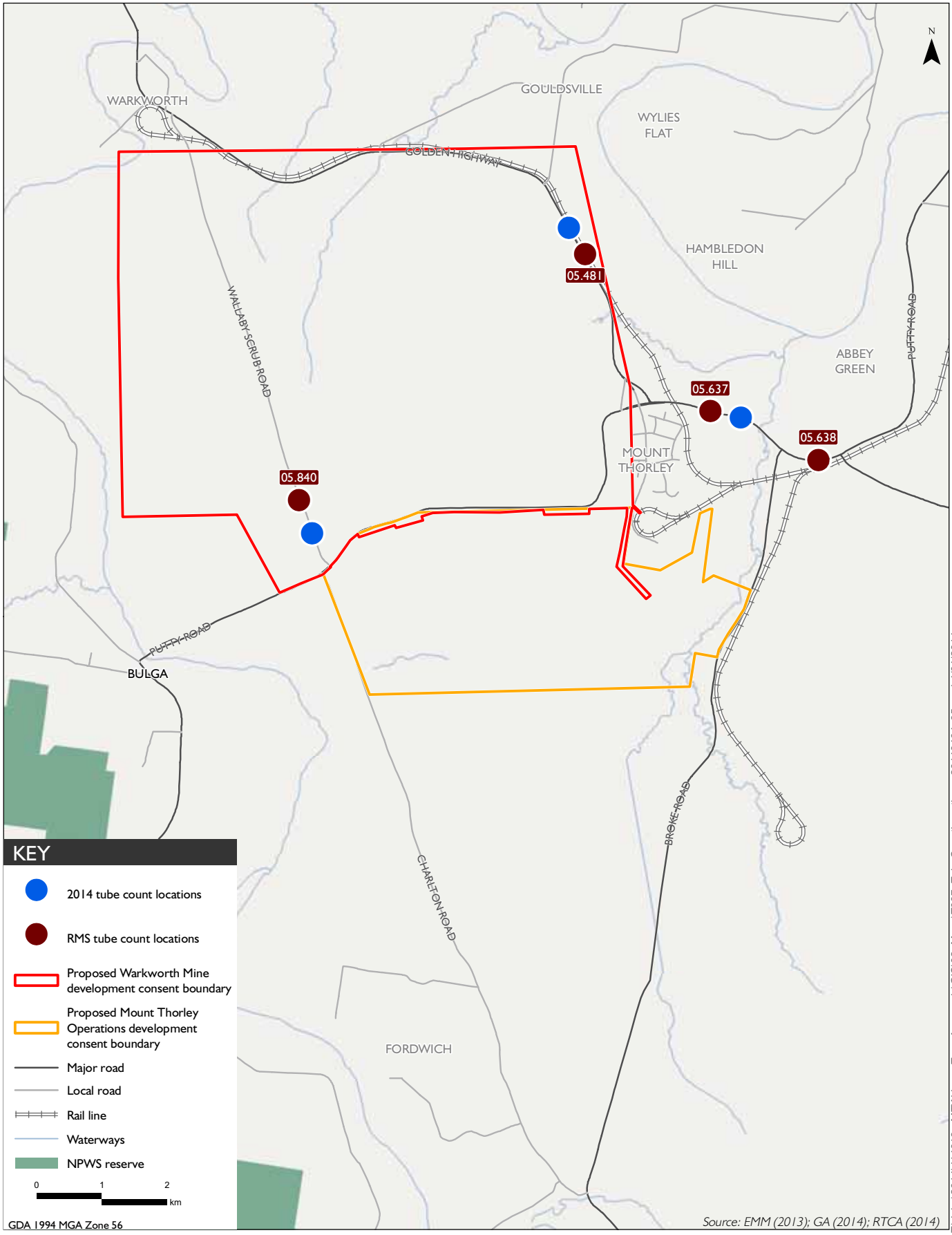
Location of intersections

Mount Thorley Warkworth - Continuation of Mining Operations
Traffic Impact Assessment
Figure 2.2



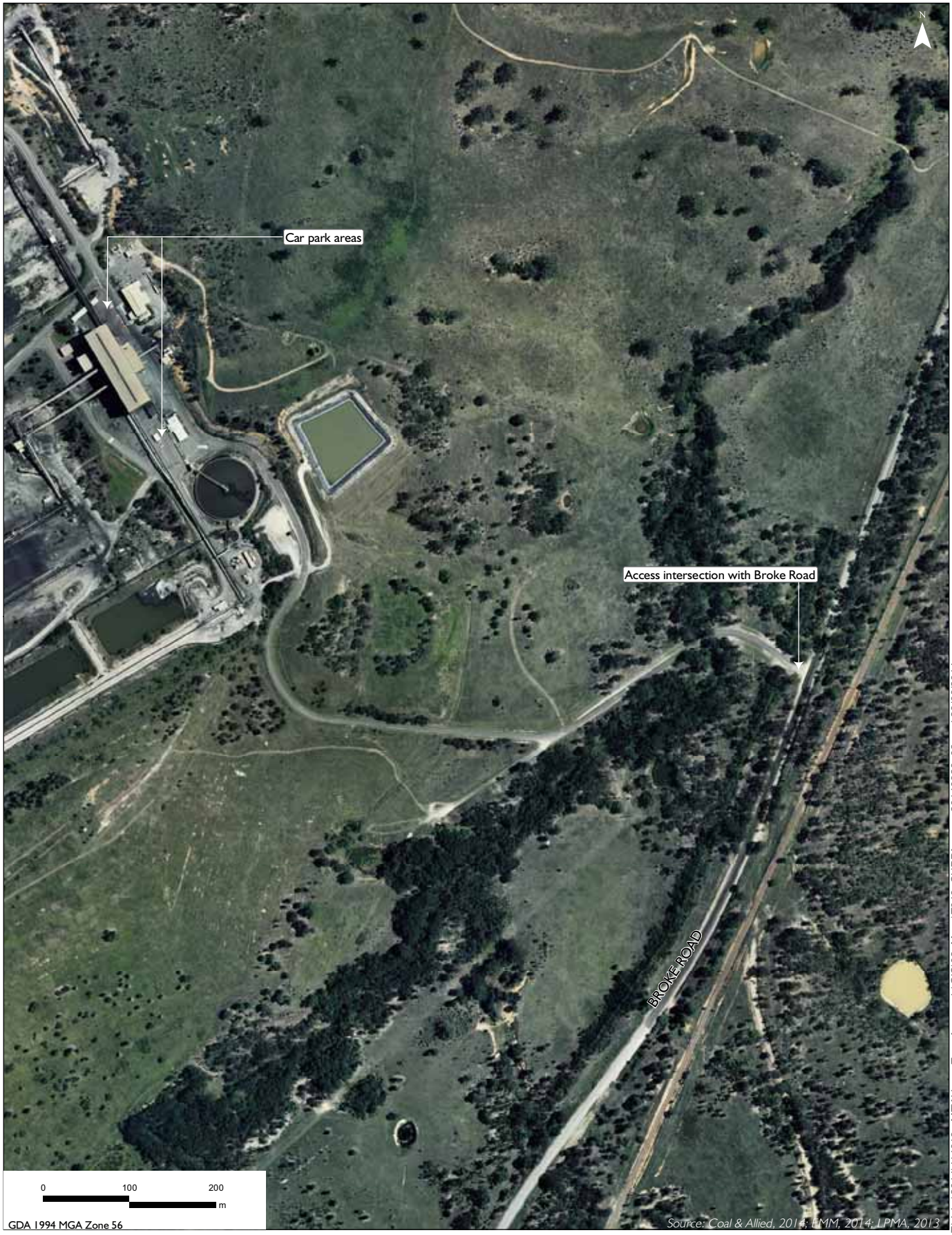
Location of project tube traffic surveys

Mount Thorley Warkworth - Continuation of Mining Operations
Traffic Impact Assessment

Figure 2.3

Access roads to Warkworth mine

Mount Thorley Warkworth - Continuation of Mining Operations
Traffic Impact Assessment
Figure 2.4



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Access road to MTO CHPP area

Mount Thorley Warkworth - Continuation of Mining Operations

Traffic Impact Assessment

Figure 2.5

Access roads to MTO car park and MTCL

Mount Thorley Warkworth - Continuation of Mining Operations

Traffic Impact Assessment

Figure 2.6

Photograph 2.1 **Golden Highway/Mitchell Line Road intersection looking east**

Photograph 2.2 **Golden Highway/Mitchell Line Road intersection looking west**

Photograph 2.3 **Golden Highway/Broke Road intersection looking east**

Photograph 2.4 **Golden Highway/Broke Road intersection looking west**

Photograph 2.5 Putty Road/Warkworth Access (Lydes Lane) intersection looking west

Photograph 2.6 Putty Road/Warkworth Access (Lydes Lane) intersection looking east

Photograph 2.7 **Broke Road/MTO CHPP access intersection looking south**

Photograph 2.8 **Broke Road/MTO CHPP access intersection looking north**

Since 2010, three locality intersections have been upgraded by the RMS, addressing key issues identified by previous traffic studies (Parsons Brinkerhof, 2010).

- At the Golden Highway/Broke Road intersection (Figure 2.2 and Photographs 2.3 and 2.4), a 'seagull' type intersection has been established to provide a dedicated right hand turning lane into Broke Road and a merging lane for traffic turning right from Broke Road.
- At the Mount Thorley interchange west side intersection (Figure 2.2), dedicated turning lanes have been established westbound on Putty Road for through and right turning traffic.
- At the Mount Thorley interchange east side intersection (Figure 2.2), a dedicated through traffic lane has been established eastbound on Putty Road to improve merging with the traffic from the Golden Highway.

At the Golden Highway/Broke Road and Golden Highway/Mitchell Line Road intersections, which are east of Mount Thorley and are constructed to a high design standard, but not grade separated, there are potential future traffic capacity impacts from the proposal which require detailed assessment.

2.3 Traffic volumes

2.3.1 Daily traffic volumes

Daily traffic volume surveys were undertaken for this study between Tuesday 4 March and Tuesday 11 March 2014 at the locations shown in Figure 2.3. The survey results are in Appendix A. The historic Roads and Traffic Authority (RTA), now Roads and Maritime Services (RMS), daily traffic volumes surveyed between the years 1980 and 2004 are also summarised in Appendix A.

The historic growth in the RMS daily traffic volumes from 1984 to 2004 including other recent surveys which were undertaken in 2009 and 2011 for the Warkworth Extension 2010 Project (PB, 2010) and the Bulga Optimisation Project TIA (ARC 2013) and the future base year traffic growth projections for the Golden Highway and other traffic routes for the years 2014 and 2017, are summarised in Table 2.1.

Table 2.1 Summary of base daily traffic volumes from surveys on the regional road network

RTA-RMS location ref	Route and nearest cross street	Year 1984	Year 1998	Year 2001	Year 2002	Year 2004	Year 2009	Year 2011	Year 2014	Percent annual traffic growth from surveys	Future trend volume in Year 2017[1]
05.481	Golden Highway (north of Putty Road at Mount Thorley)	4,200	6,256	7,059	-	5,572	-	-	3,314	-	3,512[2]
05.637	Golden Highway (between Broke Road and Mount Thorley)	5,180	-	-	-	-	-	-	8,346	+1.2%	8,847

Table 2.1 Summary of base daily traffic volumes from surveys on the regional road network

RTA-RMS location ref	Route and nearest cross street	Year 1984	Year 1998	Year 2001	Year 2002	Year 2004	Year 2009	Year 2011	Year 2014	Percent annual traffic growth from surveys	Future trend volume in Year 2017[1]
05.638	Golden Highway (between Broke Road and Mitchell Line of Road)	5,160	7,164	7,966	-	8,143	-	9,355	9,860[3]	+1.7%	10,452
05.840	Wallaby Scrub Road (between Golden Highway and Putty Road)	-	-	-	660	-	777	-	875	+2.0%	928

Note: *1.The traffic growth projections for the current base years 2014 and 2017 are calculated using linear traffic growth projections, including for the period 2014 to 2017, a growth rate of +2 percent annually (the highest rate observed from the traffic surveys in previous years).*

2.The +2 percent per annum future traffic growth projection is still assumed to apply to this route despite negative actual growth in recent years (since 2001).

3. The year 2014 daily traffic volume between Broke Road and Mitchell Line of Road has been estimated from comparison of the Golden Highway peak hourly traffic flows east and west of the Broke Road intersection.

Sources: *RMS, PB (2010), ARC (2013) and EMM (2014).*

Although there has been a gap in the regular sequence of the RTA/RMS traffic surveys between 2004 and the more recent 2009, 2011 and 2014 daily traffic surveys, these surveys can determine the historic traffic growth rates for these roads which are calculated as an annual growth rate projection from the current year 2014 and are also shown in Table 2.1.

The daily traffic volumes on the Golden Highway route north of Putty Road (RTA-RMS location 05.481) have declined in recent years after reaching a peak of over 7,000 vehicles in 2001. Consequently no historic traffic growth rate is calculated for this location in Table 2.1.

The historic traffic growth rates for the three survey locations which are shown in Table 2.1, show a range of traffic growth rates between +1.2 percent and +2.0 percent annually. The higher end of this range of traffic growth rate (+2.0 percent annually) has been used for projecting forward the current base year 2014 daily traffic volumes to 2017 at all the locations shown in Table 2.1. Also, in Chapter 3 of this TIA, the future Year 2017 intersection peak hourly traffic assessments for the Golden Highway and other roads have used this future traffic growth rate, which provides a conservative assumption for the proposal's traffic impact analysis.

The Hunter Expressway opened on 22 March 2014. Over time, the Expressway will influence regional traffic patterns. These effects cannot be quantified at this time. However, the expressway will potentially provide a faster, more direct and safer route linking the M1 Motorway with the Upper Hunter, which will be available to some drivers previously using the Wallaby Scrub Road and Charlton Road route, prior to this date.

2.3.2 Peak hourly traffic volumes

Peak hour intersection traffic counts were undertaken on Tuesday 4 March 2014 at three intersections:

- the Golden Highway/Mitchell Line of Road intersection;
- the Warkworth mine access intersections with Putty Road (Lydes Lane); and
- the MTO mine access intersection with Broke Road.

The locations of these intersections are shown on Figure 2.2. The detailed traffic count results are included in Appendix B.

The peak hourly traffic volumes on the local road network and the proportions of heavy vehicles in traffic which were surveyed by these intersection traffic counts are summarised in Tables 2.2 – 2.4.

The morning and afternoon traffic peak hours at intersections in the vicinity of Mount Thorley occur relatively early (at 6.15 am – 7.15 am and 3.30 pm – 4.30 pm, typically) and are influenced by the shift changes at a number of locality mining operations including MTW, HVO, Wambo and Bulga and the locality industrial employment at Mount Thorley industrial area.

Table 2.2 Summary of peak hourly traffic at Golden Highway and Mitchell Line Road

Road	Direction	Morning peak hour (6.15 am -7.15 am)			Afternoon peak hour (3.30 pm - 4.30 pm)		
		All traffic	Heavy vehicles	Percent heavy*	All traffic	Heavy vehicles	Percent heavy*
Mitchell Line of Road (south of Golden Highway)	N'bound	537	28	5	73	14	8
	S'bound	172	10		338	20	
Golden Highway (west of Mitchell Line Road)	E'bound	328	17	5	704	31	7
	W'bound	944	42		212	32	
Golden Highway (east of Mitchell Line Road)	E'bound	172	7	4	384	11	5
	W'bound	423	14		157	18	

*Note: * % Heavy vehicle traffic is the average proportion based on the traffic flow in both directions.*

Table 2.3 Summary of peak hourly traffic at Broke Road and MTO CPP access

Road	Direction	Morning peak hour (6.15 am -7.15 am)			Afternoon peak hour (3.15 pm - 4.15 pm)		
		All traffic	Heavy vehicles	Percent heavy*	All traffic	Heavy vehicles	Percent heavy*
Mount Thorley CPP access (west of Broke Road)	E'bound	2	0	0	22	0	0
	W'bound	12	0		0	0	
Broke Road (south of CPP access Road)	N'bound	123	5	4	140	5	5
	S'bound	246	11		100	6	
Broke Road (north of CPP access Road)	N'bound	123	5	4	159	5	4
	S'bound	256	11		97	6	

*Note: * percent heavy vehicle traffic is the average proportion based on the traffic flow in both directions.*

Table 2.4 Summary of peak hourly traffic at Putty Road and Warkworth Mine access

Road	Direction	Morning peak hour (6.15 am -7.15 am)			Afternoon peak hour (3.30 pm - 4.30 pm)		
		All traffic	Heavy vehicles	Percent heavy*	All traffic	Heavy vehicles	Percent heavy*
Warkworth Mine access (north of Putty Road)	N'bound	101	4	2	8	0	4
	S'bound	111	0		73	3	
Putty Road (west of Warkworth Mine access)	E'bound	38	2	4	31	1	8
	W'bound	12	0		48	5	
Putty Road (east of Warkworth Mine access)	E'bound	139	1	2	102	4	6
	W'bound	103	3		54	5	

*Note: * percent heavy vehicle traffic is the average proportion based on the traffic flow in both directions.*

2.3.3 Proportions of heavy vehicles in traffic

At the Golden Highway and Mitchell Line Road intersection the proportions of heavy vehicles in traffic during the morning and afternoon peak hourly periods are 4 - 5 percent and 5 – 8 percent, respectively.

At the Mount Thorley CPP access road/Broke Road intersection, the proportions of heavy vehicles on Broke Road are generally 4 - 5% during both the morning and afternoon peak hourly traffic periods.

At the Warkworth Mine access road/Putty Road intersection the proportions of heavy vehicles in traffic during the two peak hourly traffic periods are 2 - 4 percent and 4 - 8 percent, respectively.

2.4 Intersections

The performance of a road network is generally reflected in the performance of key intersections. The Signalised (and Unsignalised) Intersection Design Research Aid (SIDRA) traffic analysis program was used to assess the existing and future traffic capacity at the two mine access intersections and two major road intersections which require detailed traffic assessment for the proposal (ie the Warkworth Mine access (Lydes Lane)/ Putty Road intersection, Mount Thorley CHPP access road/Broke Road, Golden Highway/Broke Road and Golden Highway/Mitchell Line Road).

The peak hour traffic performance of intersections is quantified in terms of 'level of service' and 'degree of saturation'. Level of service is an index of the operation of traffic at an intersection and is based on the average delay per vehicle. The current RMS intersection operation standards for level of service are summarised in Table 2.5. Degree of saturation provides an overall measure of the capability of the intersection to accommodate the traffic levels. A degree of saturation of 1.0 indicates that an intersection is operating at capacity. A satisfactory degree of saturation is considered to be 0.90 or lower at traffic signal controlled intersections and 0.80 or lower at other intersections.

The SIDRA analysis results for the morning and afternoon peak hour base traffic situation for the year 2014, for the four intersections which require assessment under the proposal are summarised in Table 2.6.

Table 2.5 Intersection level of service standards

Level of service	Average delay (seconds per vehicle)	Traffic signals, roundabout	Priority intersection ('Stop' and 'Give Way')
A	Less than 14	Good operation	Good operation
B	15 to 28	Good with acceptable delays and spare capacity	Acceptable delays and spare capacity
C	29 to 42	Satisfactory	Satisfactory, but accident study required
D	43 to 56	Operating near capacity	Near capacity and accident study required
E	57 to 70	At capacity. At signals, incidents will cause excessive delays. Roundabouts require other control mode	At capacity; requires other control mode
F	Greater than 71	Unsatisfactory with excessive queuing	Unsatisfactory with excessive queuing; requires other control mode

Source: Guide to Traffic Generating Development (RTA 2002).

Table 2.6 Peak hour SIDRA performance at key intersections (including current mine traffic)

Intersection	Peak Hour Period	Degree of Saturation	Average Delay (seconds/vehicle)	Level of Service
Golden Highway/Mitchell Line of Road/ Putty Road	Morning peak hour (6.15 am - 7.15 am)	0.700	20.6	B
	Afternoon peak hour (3.30 pm -4.30 pm)	0.270	19.0	B
Golden Highway/Broke Road*	Morning peak hour (6.15 am - 7.15 am)	0.386	31.6	C
	Afternoon peak hour (3.30 pm - 4.30 pm)	0.369	16.5	B
Broke Road/MTO CPP Access	Morning peak hour (6.15 am - 7.15 am)	0.138	12.5	A
	Afternoon peak hour (3.15 pm - 4.15 pm)	0.074	12.5	A
Putty Road/Warkworth Mine access	Morning peak hour (6.15 am - 7.15 am)	0.093	12.9	A
	Afternoon peak hour (3.30 pm - 4.30 pm)	0.063	13.0	A

*Note * The current peak hour intersection traffic volumes have been determined from volumes at the two adjoining intersections.*

The detailed intersection analysis results from the SIDRA analysis, including the existing intersection lane configurations are included in Appendix C.

Three of the four assessed intersections are currently operating at very good conditions (level of service either A or B), with minimal traffic delays. The highest degrees of saturation occur at the Golden Highway/Mitchell Line of Road intersection (0.700) and are associated with the potentially limiting future capacity for the westbound left turn movement from Mitchell Line of Road during the morning peak hour.

This traffic has to merge with a similarly high traffic flow which is travelling from the Singleton direction towards Mount Thorley as a result of the numerous mining and industrial employment locations in the area, including mining projects at Bulga, Wambo, Mount Arthur and further north.

The Golden Highway/Broke Road intersection is currently operating with acceptable traffic delays which are level of service C. The right turn traffic delays are higher than at the Golden Highway/Mitchell Line of Road intersection (over 30 seconds per vehicle) although the maximum intersection degree of saturation is lower.

The RMS intersection operation standards, Table 2.5, indicate that with level of service C intersection operations, an accident study should be undertaken. However as significant intersection upgrading works have only relatively recently been completed by RMS at this intersection (since 2010) a further accident study is not required at the current time.

2.5 Mine traffic generation

2.5.1 Car and other light vehicle traffic

The current maximum mining workforce at MTW is 1,300 persons of whom approximately 25 percent are office/business employees, 65 percent are day or night shift operations workforce and 10 percent are contractors.

The majority of the workforce is currently based at Warkworth Mine where 80 percent of the combined mining workforce facilities and car parking activity is located. The current MTW based workforce numbers are greatest during the daytime when day shift and office/business staff are present. The typical weekday on - site workforce and contractor numbers (FTE) at both sites are summarised in Table 2.7.

Table 2.7 Locations and current shift working arrangements of the project workforce

Location	Day/night shift operations [1] (7.00 am to 7.00 pm and 7.00 pm to 7.00 am)	Office and business (7.00 am to 3-6.00 pm	Contractors (various times)	Total employed workforce
Mount Thorley	169 (approximately 85/day)	65	26	260
Warkworth	676 (approximately 338/day)	260	104	1,040
Total	845 (approximately 423/day)	325	130	1,300

Notes: 1. Approximately half of the shift operations workforce would be on-site, split over two shifts (day and night), in any 24 hour period.

The combined maximum number of employees and contractors who will be travelling to and from work at MTW in any given 24 hour period will be 878 persons (comprised of 423 day/night shift operations staff, 325 office/business staff and 130 contractors). The maximum potential daily car traffic movements which would be generated by this workforce would be a maximum of 1,756 car movements. These traffic movements will generally be travelling either inbound to or outbound from MTW employment locations at different times of the day, as summarised in Table 2.8.

Table 2.8 Summary of current maximum hourly and daily workforce car traffic movements

Time period	Operations in	Office in	Contractors in	Operations out	Office out	Contractors out
5 am - 6 am	-	-	-	-	-	-
6 am - 7 am	212	-	10	-	-	5
7 am - 8 am	-	325	20	211	-	5
8 am - 9 am	-	-	10	-	-	10
9 am - 10 am	-	-	10	-	-	10
10 am - 11 am	-	-	10	-	-	10
11 am - 12 pm	-	-	5	-	-	10
12 pm - 1 pm	-	-	5	-	-	5
1 pm - 2 pm		-	5	-	-	5
2 pm - 3 pm	-	-	5	-	-	10
3 pm - 4 pm	-	-	10	-	130	20
4 pm - 5 pm	-	-	10	-	130	10
5 pm - 6 pm	-	-	10	-	65	10
6 pm -7 pm	211	-	10	-	-	10
7 pm - 8 pm	-	-	5	212	-	5
8 pm - 9 pm	-	-	5	-	-	5
9 pm - 10 am	-	-	-	-	-	-
Total	**423**	**325**	**130**	**423**	**325**	**130**

Although the actual daily site employee car movements would generally be lower than the numbers listed in Table 2.8, due to employee car sharing, site visitors would potentially increase traffic movements, such that the overall total daily and hourly site car traffic movements will still be similar to the numbers listed in Table 2.8.

2.5.2 Truck traffic

i Public roads

The external road transport of mining supplies and other consumables for the mine operations and maintenance activities, usually generates approximately 40 truck and other service vehicle deliveries each weekday (80 movements), mainly via delivery routes using main roads between the mines and either Singleton, Maitland or Newcastle.

ii Private roads

Extensive internal coal haulage is undertaken using the internal private roads within and between the two mines which transport the run of mine coal to CPP facilities and also transfer overburden material within and between Warkworth Mine and MTO.

Two private road crossings of Putty Road already exist for these movements and a third is proposed to be constructed under the proposal.

2.5.3 Construction traffic

Future construction activities at MTW will effectively be part of the continuation of normal mining operations along with ongoing maintenance activities.

These activities include mining equipment upgrades, modifications to existing surface infrastructure and the construction of an underpass or a bridge (already approved) over Putty Road.

Traffic associated with these upgrades, including contractor vehicles and truck traffic, are considered part of MTW's normal operational traffic movements, similar to those which are occurring currently.

2.6 Car parking

The onsite car parking areas are generally located adjacent to the main administration buildings approximately 150 m from Putty Road (for Warkworth Mine) and 200 m from Mount Thorley Road (for MTO). During the peak car parking period (during morning shirt changeover) approximately 240 cars and 80 cars are parked in the main Warkworth Mine and MTO car parks, respectively. These car parks, which are shown on Figures 2.4 – 2.6 have proven to be adequate to meet current peak parking demand.

Other smaller car parking areas are located within MTW for mine employees and contractors who are specifically based at certain infrastructure (eg at the Warkworth and MTO CPPs).

2.7 Public transport

The locality of MTW is remote from regular public transport services. The nearest railway station is Singleton approximately 8 km from MTW.

There are no local public bus services, other than school buses, operating along Putty Road in the locality of Mount Thorley.

Coach services between Newcastle and Dubbo operate via the Golden Highway through this area. However these services are not generally concurrent with the mine shift workforce start and finish times.

Existing public transport services in the locality are considered unlikely to be a suitable commuting option for most MTW employees.

2.8 Pedestrians and cycling

The travel distances between MTW and the nearest residential areas make walking or cycling generally difficult options for commuter travel. Although this type of travel is generally rare in the locality, a small number of MTW employees do occasionally commute by cycling.

2.9 Road safety

Intersection traffic safety and sight distances were observed by EMM during the 20 March 2014 site visit. The Intersection traffic safety and sight distances are considered good at all the intersections potentially affected by the proposal.

The high design standard of the Golden Highway in the locality of Mount Thorley (with marked centre lines and sealed shoulders on all sections) provides a comparatively higher standard of travel safety for traffic using this route in comparison to other roads in the area (eg Wallaby Scrub Road, Charlton Road, Broke Road and Putty Road).

2.10 Coal transport operations

The product coal transport operations for the proposal utilise rail transport for export via the Port of Newcastle using the Mount Thorley (Whittingham) branch line. The location of the Whittingham branch line in relation to the overall Hunter Valley rail network used for coal transport is shown in Figure 2.7.

On the Whittingham branch line there are three coal loading loops which serve the mines at Bulga, MTW, United and Wambo. At MTO there are two coal loading points (MTCL 1 and MTCL 2) which serve the Warkworth CPP and Mount Thorley CPP conveyor loading systems. An additional coal loop on the Whittingham branch line at the Hunter Valley Operations South mine has also been approved but is not yet constructed.

The capacity of the Whittingham branch line (which is single track) is adequate for the current usage (ARTC, 2013). The primary future constraint to this rail line capacity is generally the availability of coal train paths at Whittingham junction where the branch line meets with the Hunter Valley main line, south of Singleton. The railway junction capacity has been improved by the Minimbah Bank Third Rail Project in 2010. The proposed future ARTC coal transport operations for the Whittingham branch line are discussed further in Chapter 4.

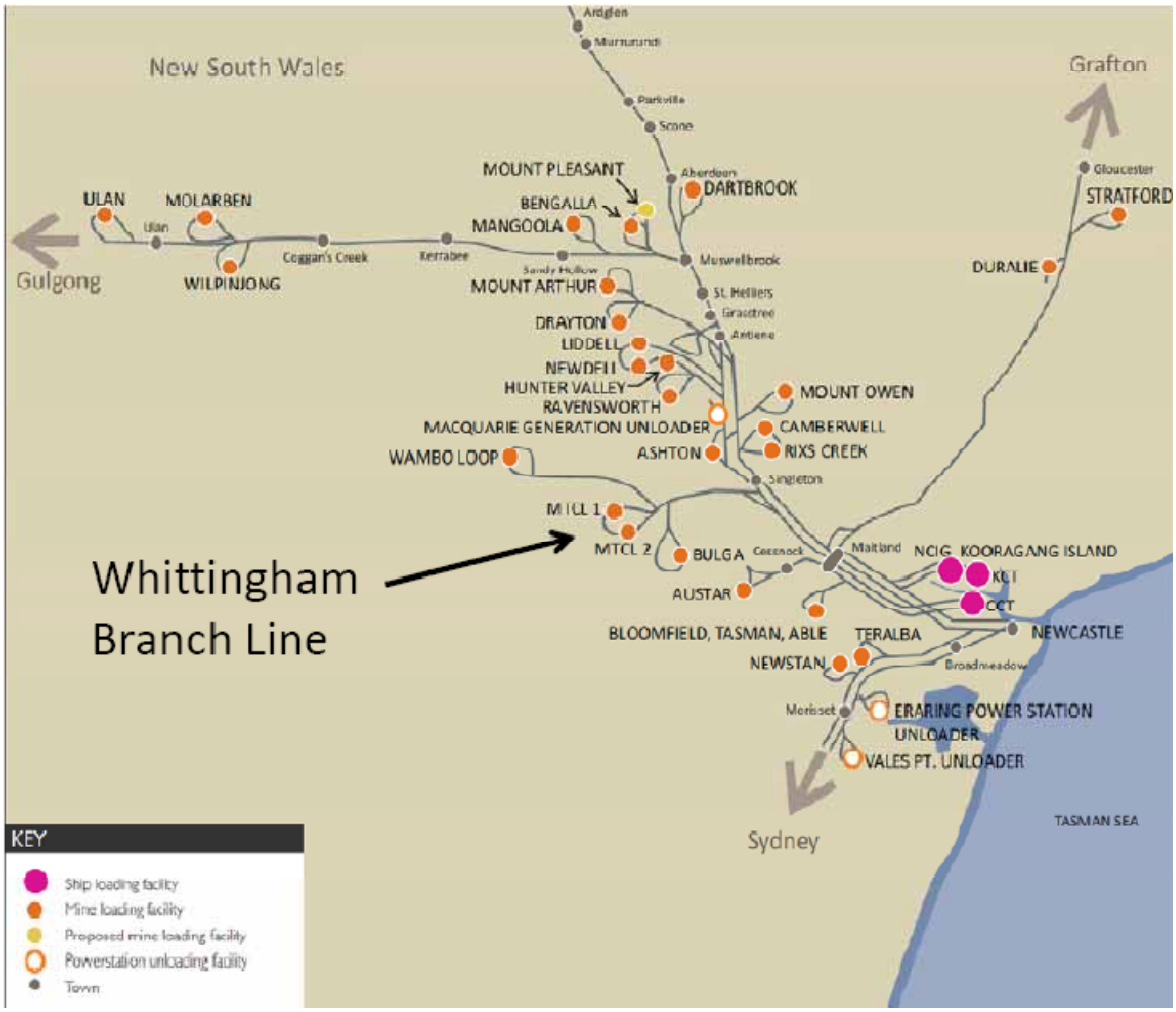


Figure 2.7 Location of MTCL and other coal loading loops on the Hunter Valley Rail Network

3 Road traffic impact assessment

3.1 External traffic movements

Workforce traffic movements for the MTW project on the public road network will not change under the proposal. The current MTW workforce of approximately 1,300 persons, is indicative of future employment levels throughout the proposal period. With the substantial proportion of the workforce employed on a rotating shift basis, the typical maximum number of persons travelling to and from MTW each weekday will remain at approximately 878. The corresponding maximum hourly and daily traffic movements for this workforce over a typical weekday are summarised in Table 2.8.

Approximately 80 daily truck movements are currently generated on public roads by MTW operations (40 truck deliveries each day for maintenance and other activities). This will also not change under the proposal.

Up to 1,756 vehicle movements daily for workforce and site visitor traffic, with up to 80 vehicle movements daily of heavy vehicle traffic, will continue to be generated by MTW operations in future years. This traffic (1,836 daily vehicle movements in total) will be distributed over the surrounding road network in the following general proportions.

- 42 percent total daily vehicle movements to and from the east via Singleton (771 vpd).
- 38 percent total daily vehicle movements to and from the east via other routes (698 vpd).
- 8 percent total daily vehicle movements to and from the west via Putty Road (147 vpd).
- 7 percent total daily vehicle movements to and from the north via Golden Highway (128 vpd).
- 5 percent total daily vehicle movements to and from the south via Broke Road (92 vpd).

3.1.1 Traffic impacts on road networks

The road and intersection traffic surveys for this assessment were undertaken shortly before the Hunter expressway was opened on 22 March 2014. Over time, the expressway will be likely to generate changes to regional traffic patterns. These cannot be quantified currently. However the expressway will provide a faster and safer route for the longer distance traffic travelling between the M1 Motorway and some Upper Hunter locations which will be available to drivers currently using the Wallaby Scrub Road and Charlton Road routes.

The current road network traffic impacts of the proposal are quantified in Table 3.1 in terms of the typical percentage contribution of the MTW generated daily traffic volumes towards the current total daily vehicle traffic movements in early March 2014, at locations on the external roads which correspond to the historic RTA/RMS traffic survey locations shown Figure 2.3 and other locality roads.

The MTW generated daily and hourly car traffic volumes, which are summarised in Table 2.8, will not generally change with the proposal. However other traffic volumes on the surrounding roads will generally change in future years due to either continuing background traffic growth or other changes to the road network such as the closure of Wallaby Scrub Road.

On most major roads in the locality, including sections of the Golden Highway and Putty Road routes, the current MTW daily traffic movements which are shown in Table 3.1 represent between 11 – 22 percent of the total daily traffic movements in March 2014.

On other roads, such as Broke Road and the Golden Highway route north of Mount Thorley, MTW has a lesser contribution to the existing traffic flows, representing only 3 – 4 percent of the total daily traffic movements in March 2014.

Table 3.1 Proportional impact of the mine generated traffic on external roads

RTA-RMS location ref	Road location	Current daily traffic volume (year 2014)	Daily traffic movements generated by MTW	Proportion of current daily traffic volume generated by MTW
05.481	Golden Highway (north of Putty Road at Mount Thorley)	3,314	128	3.8 percent
05.637	Golden Highway (between Broke Road and Mount Thorley)	8,346	1,561	18.7 percent
05.638	Golden Highway (between Broke Road and Mitchell Line of Road)	9,860 (2014 estimate)*	1,469	14.9 percent
N/A	Mitchell Line of Road (south of the Golden Highway and Putty Road	5,958 (2014 estimate)*	698	11.7 percent
N/A	Broke Road (south of the Mount Thorley CHPP access road intersection)	3,240 (2014 estimate)*	92	2.8 percent
N/A	Putty Road (west of the Warkworth Mine access towards Bulga Village)	686 (2014 estimate)*	147	21.4 percent

Notes: **The actual daily traffic volumes in 2014 were surveyed at the two locations shown on the Golden Highway and on Wallaby Scrub Road. The daily traffic volumes for the other routes were determined from comparisons of the peak hourly intersection traffic volumes using these roads and the Golden Highway at the two surveyed locations.*

The effects of the proposal's heavy vehicle traffic movements on the roads shown in Table 3.1 are not currently significant as the MTW generated heavy vehicle traffic movements (which are approximately 80 vehicle movements daily) currently represent between 4 and 5 percent of the total MTW generated daily traffic. These proportions of heavy vehicle traffic are similar to the proportions of heavy vehicles in other traffic which is currently using these roads. There is correspondingly, no disproportionate heavy vehicle generated traffic usage from the MTW activity on surrounding roads. The major roads in the area (eg the Golden Highway) have generally been constructed to carry large volumes of heavy vehicle traffic, so no adverse future heavy vehicle related traffic impacts are anticipated for the MTW related truck traffic using these roads.

3.1.2 Traffic impact at intersections

Detailed traffic impact assessment was undertaken for the intersections potentially affected by the MTW project traffic, which are primarily the two mine access intersections on major roads and two intersections along the Golden Highway route east of Mount Thorley.

The Golden Highway/ Broke Road intersection was previously identified as an intersection likely to require upgrading in the Warkworth Extension 2010 traffic impact assessment (Parsons Brinkerhof 2010). This intersection has been upgraded since 2010 by the construction of the 'seagull type' acceleration lane, which is shown in Photographs 2.3 – 2.4. This improvement has substantially improved the peak hour intersection traffic delays (previously level of service F, now level of service C) and has removed the significant traffic capacity constraint for the major road network in the area which previously existed at this location.

At the two Mount Thorley interchange intersections on the eastern and western sides, dedicated through and right hand turning traffic lanes have also recently been provided for both eastbound and westbound traffic on the Putty Road route to improve the merging and queuing traffic capacity at these intersections.

At the Golden Highway/Mitchell Line Road intersection which is further to the east towards Singleton, the recent traffic impact assessment for the Bulga Optimisation Project (ARC 2013) has identified the intersection as potentially requiring upgrading as a combined result of mining traffic growth and general locality traffic growth on the Golden Highway route through the area. Future potential project traffic impacts (including cumulative traffic impacts) have therefore been considered at this intersection in this assessment.

Three base year and future year traffic scenarios have been defined and evaluated for this traffic impact assessment including the current base year (2014), traffic in the first full year of project operation (2017) following the closure of Wallaby Scrub Road and a cumulative traffic assessment (also in the year 2017) which includes the closure of Wallaby Scrub Road and forecast mine employment at the nearby Bulga Optimisation Project.

These future year traffic impact assessments have also considered the likely additional locality background traffic growth from other sources during the assessment period. However, the effects of the Hunter Expressway, which opened on 22 March 2014, cannot be quantified at this time.

The predicted future background traffic growth which has been included up to the year 2017 in the SIDRA intersection assessments has been +2 percent per annum. This rate corresponds to the higher end of the range of recent recorded traffic growth rates on the major road network shown in Table 2.1. The future (year 2017) peak hour traffic operations at four intersections have been analysed using the SIDRA intersection model for the following future traffic scenarios.

- Scenario 1 – Year 2017 traffic situation including base network traffic growth on the external road network at +2 percent annually.

- Scenario 2 – Year 2017 traffic situation including base network traffic growth on the external road network at +2 percent annually and the detoured traffic from the proposed closure of Wallaby Scrub Road at relevant intersections.

- Scenario 3 – Year 2017 traffic situation including base network traffic growth on the external road network at +2 percent annually at relevant intersections, the detoured traffic from the proposed closure of Wallaby Scrub Road and the additional year 2017 construction traffic movements from a workforce of 25 persons at the Bulga Optimisation Project (eg this traffic does not affect the Warkworth Mine access intersection from Putty Road).

The year 2017 SIDRA intersection analysis results are included in detail in Appendix C and summarised in comparison to the current year 2014 intersection analysis results in Table 3.2.

Table 3.2 Summary of year 2017 peak hour performance at intersections

Intersection	Peak hour period	SIDRA parameter	Base year (2014)	Future traffic scenario 1	Future traffic scenario 2	Future traffic scenario 3
Golden Highway/ Mitchell Line of Road/ Putty Road)	Morning peak hour (6.15 am - 7.15 am)	Dos	0.700	0.766	0.766	0.781
		Delay	20.6	22.5	22.5	23.1
		Los	B	B	B	B
	Afternoon peak hour (3.30 pm - 4.30 pm)	Dos	0.270	0.289	0.289	0.296
		Delay	19.0	19.5	19.5	19.7
		Los	B	B	B	B
Golden Highway/Broke Road (Paynes Crossing Road)	Morning peak hour (6.15 am - 7.15 am)	Dos	0.386	0.409	0.409	0.409
		Delay	31.6	34.1	34.6	34.9
		Los	C	C	C	C
	Afternoon peak hour (3.30 pm - 4.30 pm)	Dos	0.369	0.397	0.412	0.448
		Delay	16.5	17.1	18.2	18.5
		Los	B	B	B	B
Broke Road/Mount Thorley CHPP Access	Morning peak hour (6.15 am - 7.15 am)	Dos	0.138	0.145	0.150	0.156
		Delay	12.5	13.4	13.6	13.6
		Los	A	A	A	A
	Afternoon peak hour (3.15 pm - 4.15 pm)	Dos	0.074	0.078	0.086	0.093
		Delay	12.5	13.2	13.3	13.3
		Los	A	A	A	A
Putty Road/Warkworth Mine Access	Morning peak hour (6.15 am - 7.15 am)	Dos	0.093	0.093	0095	0.095
		Delay	12.9	12.9	12.9	12.9
		Los	A	A	A	A
	Afternoon peak hour (3.30 pm - 4.30 pm)	Dos	0.063	0.063	0.063	0.063
		Delay	13.0	13.0	13.0	13.0
		Los	A	A	A	A

Notes: *Dos = degree of saturation*
Delay = average delay (seconds per vehicle)
Los = level of service

The results in Table 3.2 show the four intersections are currently operating at either very good or acceptable levels of service during both the morning and afternoon peak hours, with the base year (2014) traffic flows.

At the Broke Road/ MTO CHPP access intersection there will be no change with the future (year 2017) intersection operations in terms of the intersection level of service or any other parameter. The peak hour intersection traffic delays at this intersection will increase marginally from 12.5 seconds per vehicle currently (level of service A) to up to 13.6 seconds per vehicle under the future traffic scenarios considered.

At the Putty Road/ Warkworth mine access intersection there will be no change to the future (year 2017) intersection operations in terms of the intersection level of service or any other parameter. The peak hour intersection traffic delays at this intersection will remain at 12.9 to 13.0 seconds per vehicle (level of service A) under all the future traffic scenarios considered.

At the Golden Highway/Mitchell Line of Road intersection, the level of service and the future intersection traffic delays are also not generally affected under the future traffic scenarios considered. In the highest delayed morning peak period traffic scenarios, the average intersection traffic delays will increase from 20.6 seconds per vehicle (level of service B) to 22-23 seconds per vehicles (also level of service B). This is a relatively minor increase in delay. However, the relatively high degree of saturation for the left turn movements from Mitchell Line Road at the intersection will increase to 0.781 in the most delayed future traffic scenario. This degree of saturation is indicative of a developing traffic capacity constraint at this location, but still within acceptable standards, by the year 2017.

At the Golden Highway/Broke Road intersection, the level of service and the future intersection traffic delays are not generally affected under the future traffic scenarios considered. In the highest delayed am peak period traffic scenarios, the average intersection traffic delays will increase from 31.6 seconds per vehicle (level of service C) to 34-35 seconds per vehicle (also level of service C). This is a relatively minor increase in delay. The degree of saturation for the right turn movements at the intersection from Broke Road will remain generally below 0.45 in the most delayed future traffic scenario in Table 3.2, which is indicative of continuing spare traffic capacity at this intersection to accommodate additional future traffic growth in the longer term beyond 2017.

3.2 Impacts of the Wallaby Scrub Road traffic detour

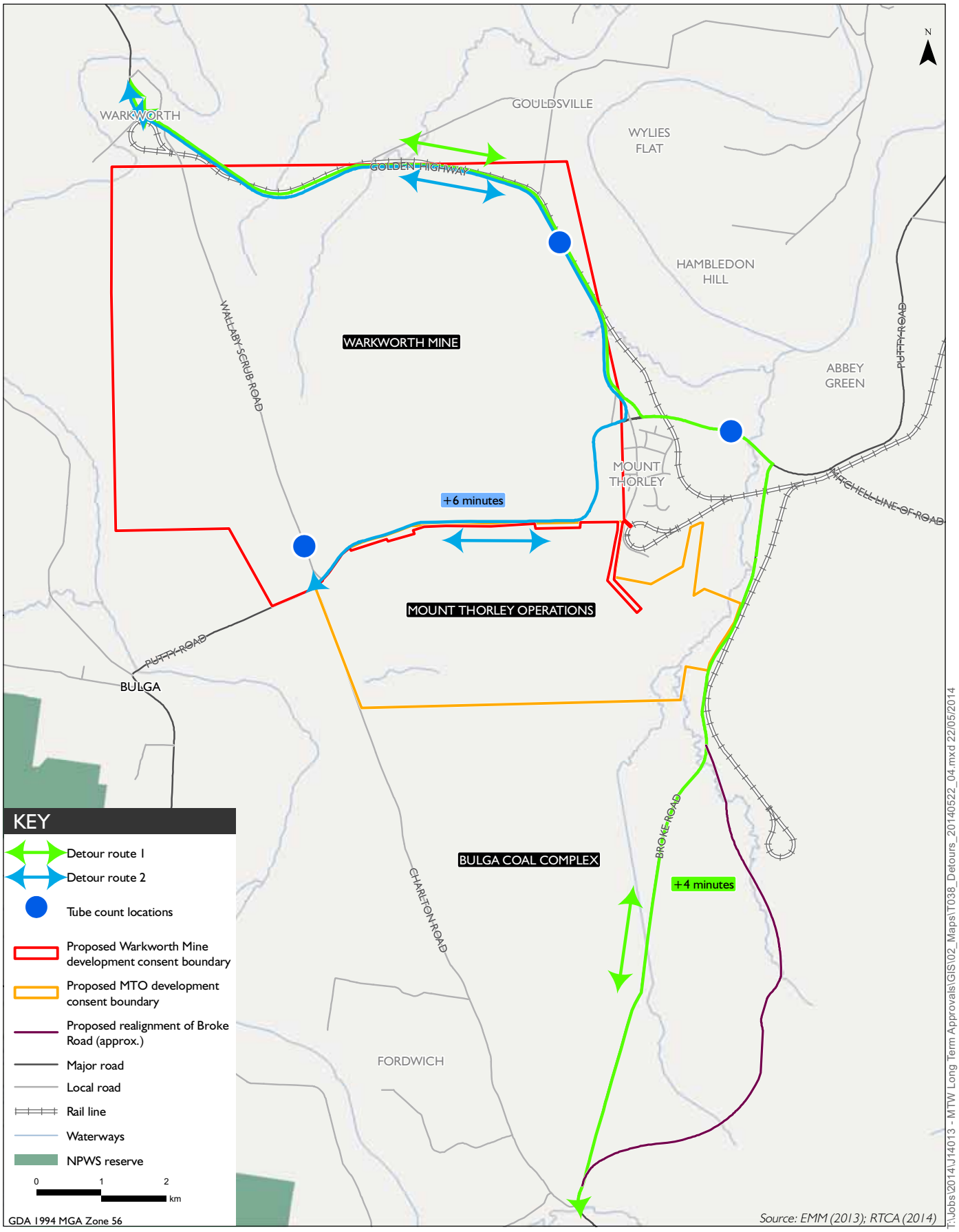
Wallaby Scrub Road is a local road approximately 7 km in length. The proposed closure would divert most traffic to use alternative routes via either the Golden Highway and Putty Road or the Golden Highway and Broke Road, which are shown on Figure 3.1. A replacement fire trail route will be provided to maintain rural fire service emergency access to areas on the western side of the future mine footprint area, between Jerrys Plains, Bulga and Broke. Other emergency vehicles (police and ambulance services) would not generally be affected by the closure as their vehicles are based in Singleton and would not generally travel via Wallaby Scrub Road to access other areas.

The existing traffic movements, which are primarily from the Charlton Road direction, travelling to and from the south, were identified in previous traffic assessments (Parsons Brinkerhof, 2010) as approximately 557 vehicle movements during a 12 hour period and 777 vehicle movements daily, by means of an origin-destination (OD) traffic survey and a tube traffic count. These traffic surveys were repeated for this traffic impact assessment. The latest 2014 traffic surveys returned similar results to the 2010 survey, with 584 vehicle movements recorded during a 12 hour period and 875 vehicle movements daily.

As mentioned previously, the traffic surveys for this assessment were undertaken shortly before the Hunter expressway was opened on 22 March 2014. The expressway provides a faster and safer route for traffic travelling between the M1 Motorway and some Upper Hunter locations. This route will now be available to through traffic which has previously used routes such as Wallaby Scrub Road and Charlton Road, through the Warkworth area.

The March 2014 OD traffic survey included a 24 hour tube traffic counts on Wallaby Scrub Road and at two locations on the Golden Highway to confirm the existing daily traffic volumes on these routes. The locations of these tube traffic count surveys are also shown on Figure 3.1.

The most recent 2014 OD traffic survey results are included in Appendix D. A detailed comparison of the traffic distribution results from the 2014 traffic survey, compared to the previous OD traffic survey (Parsons Brinkerhof 2010) is presented in Table 3.3.



EMM

Wallaby Scrub Road closure traffic detour routes

Mount Thorley Warkworth - Continuation of Mining Operations
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Figure 3.1

As some of the traffic survey locations were different for the two surveys, the results are not directly comparable at all locations. The 2014 survey also determined the proportion of traffic at the northern end of Wallaby Scrub Road, which had an origin or destination along Wallaby Scrub Road and did not travel through to the southern end of Wallaby Scrub Road.

The 2014 survey also determined traffic which had an origin or destination along Charlton Road and did not travel through to the southern end of Charlton Road. However, the 2010 survey looked in more detail at the proportions of traffic which was travelling to and from the west via Bulga Road and how much of this traffic was travelling either to or from Bulga village or from other origins and destinations, south of Bulga. The most recent (2014) survey results generally confirmed the key findings of the earlier OD survey from 2010, which were that:

- The total surveyed traffic volume using Wallaby Scrub Road is less than 1,000 vehicle movements daily.
- The general traffic proportions using Wallaby Scrub Road were approximately 60 – 70 percent coming from Charlton Road (at the south end) and approximately 20 – 25 percent coming from the Putty Road (west) directions.

Table 3.3 Comparison of Wallaby Scrub Road 2010 and 2014 OD traffic survey results

Direction	Route	2010 Survey traffic (vehicles)	2010 Survey traffic (percent)	2014 Survey traffic (vehicles)	2014 Survey traffic (percent)
Southbound	To Charlton Road	223	76.6	168	63.2
	To Wallaby Scrub Road (local)	0	0	36	13.5
	To Putty Road (east)	14	4.8	8[1]	3.0[1]
	To Putty Road (Bulga)	16	5.5	54[2]	20.3[2]
	To Putty Road (south of Bulga)	38	13.1		
	Total Vehicles	291	100.0	266	100.0
Northbound	From Charlton Road	202	75.9	215	67.6
	From Wallaby Scrub Road (local)	0	0	5	1.6
	From Putty Road (east)	0	0	17[1]	5.3[1]
	To Putty Road (Bulga)	29	10.9	81[2]	25.5[2]
	To Putty Road (south of Bulga)	35	13.2		
	Total Vehicles	266	100.0	318	100.0
Combined To/from	Charlton Road	425	76.3	383	65.6
	Wallaby Scrub Road (local)	0	0	41	7.0
	Putty Road (east)	14	2.5	25[1]	4.3[1]
	Putty Road (Bulga)	45	8.1	135[2]	23.1[2]
	Putty Road (south of Bulga)	73	13.1		
	Total Vehicles	557	100.0	584	100.0

Notes: 1.Also Includes traffic travelling on Charlton Road which does not continue to the southern end.

2. Includes traffic travelling from Bulga village and from other locations further to the south.

3.2.1 Traffic impacts to the road network

The daily traffic capacity for a two lane rural highway such as the Golden Highway is determined by the traffic capacity for two way flow which is approximately 2,500 vehicles per hour for level terrain, 2,000 vehicles per hour for rolling terrain and 1,400 vehicles per hour for mountainous terrain (RTA, 2002) for routes carrying 5 percent heavy vehicles during the peak traffic hours. The mid range hourly traffic capacity figure of 2,000 vehicles would be applicable to the Golden Highway in this locality as it traverses generally rolling terrain. As the peak hourly traffic is approximately 10 percent of daily traffic using the Golden Highway in the locality of Mount Thorley, the daily traffic capacity of the route is 20,000 vehicles approximately.

For Putty Road and Broke Road, which have a lower design standard than the Golden Highway and lower sealed shoulder widths, the daily traffic capacity is approximately10 percent lower, at 18,000 vehicles.

The daily traffic increases which will be occurring on the alternative traffic detour routes following the closure of Wallaby Scrub Road are summarised in Table 3.4. Although the current traffic volume of Wallaby Scrub Road is low in comparison to the capacity of the detour routes, there will be proportional daily traffic increases of up to 20 – 30 percent on some of the detour roads.

These increases will however be small in comparison to the actual capacity of the affected roads, which will continue to have considerable spare capacity (in comparison to the daily capacity limits of approximately 18,000 to 20,000 vehicle movements currently) to accommodate the detoured traffic and future improvements will not generally be required to the road widths or the other design standards of these roads.

The potential impacts of the Wallaby Scrub Road traffic detour will affect approximately 93% of the daily traffic movements currently using the route (approximately 863 projected daily vehicle movements) in 2017. However, the affected traffic volume could potentially reduce due to the future effect of the Hunter Expressway route opening, which has yet to be determined.

Table 3.4 Proportional impact of the Wallaby Scrub Road traffic on alternative routes

RTA count reference	Road location	Projected daily traffic volume (year 2017)[1]	Route daily traffic capacity (vehicles)	Daily traffic detoured by Wallaby Scrub Road Closure	Detoured traffic proportion compared to 2017 base daily traffic movements	Detoured traffic proportion compared to route daily traffic capacity
05.481	Golden Highway (north of Putty Road at Mount Thorley)	3,512	20,000	863	24.6 percent	4.3 percent
05.637	Golden Highway (between Broke Road and Mount Thorley)	8,847	20,000	609	6.9 percent	3.0 percent
N/A	Broke Road (south of the Mount Thorley CPP access road intersection)	3,434	18,000	609	17.7 percent	3.4 percent

Table 3.4 Proportional impact of the Wallaby Scrub Road traffic on alternative routes

RTA count reference	Road location	Projected daily traffic volume (year 2017)[1]	Route daily traffic capacity (vehicles)	Daily traffic detoured by Wallaby Scrub Road Closure	Detoured traffic proportion compared to 2017 base daily traffic movements	Detoured traffic proportion compared to route daily traffic capacity
N/A	Putty Road (west of the Warkworth Mine access at Mount Thorley)	727	18,000	254	34.9 percent	1.4 percent

Notes: **The actual daily traffic volumes in 2014 were surveyed at the two locations shown on the Golden Highway. The 2014 daily traffic volumes for Broke Road and Putty Road were determined by comparison of the peak hourly intersection traffic counts on these roads with the surveyed peak hourly and daily volumes using the Golden Highway. A uniform annual traffic growth factor of 2 percent was applied to all routes.*

3.2.2 Traffic detour impacts at intersections

The potential impacts of the Wallaby Scrub Road closure, will affect approximately 77 to 80 peak hourly vehicle movements from the year 2017 onwards, which is conservatively estimated to increase at approximately +2 percent annually in future years, assuming no reduction from traffic using the Hunter Expressway.

The intersection capacity and delay impacts of the detoured traffic in 2017 have been assessed as shown in future traffic analysis Scenarios 2 and 3 in Table 3.2. The assessment shows there will be minimal traffic delay impacts at intersections on these alternative traffic routes from the Wallaby Scrub Road closure as the relevant intersections have sufficient spare capacity to accommodate this traffic.

Since 2010, three intersections in the area have been upgraded by the RMS, which improves their capacity to accommodate the detoured traffic; namely.

- At the Golden Highway/Broke Road intersection a 'seagull' type intersection has been established to provide a dedicated right hand turning lane into Broke Road and a merging lane for traffic turning right from Broke Road.
- At the Mount Thorley interchange west side intersection, dedicated turning lanes have been established westbound on Putty Road for through and right turning traffic.
- At the Mount Thorley interchange east side intersection, a dedicated through traffic lane has been established eastbound on Putty Road to improve merging with the traffic from the Golden Highway.

Following the recent road improvement works (seagull type intersection) which have been implemented by RMS at the Golden Highway/ Broke Road intersection, the peak hour traffic delays and level of service at this intersection have substantially improved (previously level of service F, now level of service C). No further capacity improvements to this intersection or any other intersections on the major road networks in the Mount Thorley area will be required as a result of the generally minimal intersection traffic impacts of the proposal, including the traffic detours from the closure of Wallaby Scrub Road.

At four other intersections, which have not been assessed in detail, at the northern and southern ends respectively of Wallaby Scrub Road and Charlton Road, at the Golden Highway, Putty Road and Broke Road, the detoured traffic will in the future be travelling straight through rather than turning at these intersections. This will generally reduce the turning traffic conflicts and therefore improve the traffic safety and traffic delays at these intersections.

On the Golden Highway section of the traffic detour route, to the north of Putty Road, the existing intersections which provide access to the locality of Gouldsville will have approximately 25% increased daily traffic usage following the Wallaby Scrub Road closure. The existing design standard of these intersections should be reviewed to ensure compliance with the most recent (Austroads 2010) R*oad Design Guide* requirements for rural intersections. This review should be incorporated into the road closure plan required for Wallaby Scrub Road, which will be prepared in consultation with RMS and other organisations.

3.2.3 Increased travel times and distances for detoured traffic

The potential impacts of the Wallaby Scrub Road closure will affect approximately 863 vehicle movements daily from the year 2017 onwards, increasing at approximately +2 percent annually in each future year, which is conservatively estimated assuming no reduction from traffic using the Hunter Expressway.

These vehicle movements will be subject to increased travel distances of approximately 8.8 km and 6.2 km per trip, with additional travel times of 6 and 4 minutes per journey respectively and increased fuel usage, for the Putty Road and Charlton Road originating traffic. The alternative traffic routes for each detour are shown in Figure 3.1.

For the Charlton Road originating traffic, it is also likely that with the Bulga Optimisation Project (which is proposed but not yet approved) an additional traffic detour of approximately 3 additional kilometres and 2 minutes per trip will also be implemented to Broke Road which would generally increase the overall travel detour distances and travel times for this traffic to similar levels as for the Putty Road traffic, ie to approximately 9 kilometres and 6 minutes per trip in total.

The current local property access functions for traffic using Wallaby Scrub Road have also been reviewed in this assessment. All the properties affected on Wallaby Scrub Road, to the south of the railway bridge, are owned by MTW. Emergency vehicle access will be maintained by the construction of an emergency access road between Putty Road and the Golden Highway, prior to the closure of Wallaby Scrub Road. The road would be developed in consultation with the Rural Fire Service (RFS) and constructed to access standards prescribed in *Planning for Bush Fire Protection* (Rural Fire Service 2006).

The economic impact of closing Wallaby Scrub Road is discussed and assessed in more detail in the Economic Impact Assessment for the proposal (BA Economics 2014). The economic assessment includes road user costs, operator costs and non- user costs.

3.3 Road safety

The potential impacts of the Wallaby Scrub Road closure have also been assessed in terms of road safety. Detoured traffic will be subject to increased travel distances as detailed in Section 3.2.3.

Generally there will be safer travelling conditions for detoured traffic (and lower accident rates per kilometre travelled) when travelling via the Golden Highway, due to the improved intersection sight distances and higher road construction standards which are present along this route. These improved traffic safety conditions should generally compensate for the greater travel distances which are likely to be travelled by the detoured traffic while travelling through the MTW area in the future.

A road closure implementation plan for Wallaby Scrub Road, will be prepared in conjunction with relevant stakeholders in the local community including RMS, emergency services Singleton Council and the community.

The road closure implementation plan will include strategies to minimise any potential local traffic access and road safety impacts of the closure, including a review of intersection traffic safety at the existing minor road intersections on the Golden Highway at Gouldsville, where the existing design standard of intersections should be reviewed to ensure compliance with the most recent (Austroads 2010) R*oad Design Guide* requirements for rural intersections.

3.4 Car parking

There are no proposed changes to the MTW car parking areas. The capacity of the existing car parking areas is adequate for the current, and therefore future, workforce and visitor car parking requirements.

3.5 Public transport access

There are no conveniently accessible local bus routes within the area. There is unlikely to be any additional demand on public transport services in the area from the proposal. The nearest train station at Singleton is also not likely to be affected by the proposal.

3.6 Pedestrian and cyclist access

Given the current patterns of predominantly industrial development in the Mount Thorley area, and distance from residential areas, the local and major roads will continue to have only minimal pedestrian and cyclist usage. Improvements to these roads, such as shoulder widening, or the provision of separate pedestrian footpaths and/or cycleways would not generally be warranted as a result of the proposal.

3.7 Cumulative impacts

3.7.1 Traffic impacts to the road network

The potential cumulative traffic impacts from the proposal and the construction work phases for the Bulga Coal Complex (Bulga Optimisation Project) have also been considered for 2017 which is the first year in which cumulative traffic impacts will potentially occur. Although the proposed construction stage workforce for the Bulga Optimisation Project will be up to 300 persons during the early years of construction in 2014 and 2015 (ARC 2013), this workforce will be greatly reduced (to approximately 25 persons) by the year 2017, such that minimal cumulative traffic impacts are anticipated from the two proposals in that and subsequent years. MTW's workforce and other traffic related contributions to cumulative road traffic impacts (with other mining projects) will remain unchanged under the proposal.

There will potentially be a cumulative traffic detour impact for the MTW project with the Bulga Optimisation Project (which is proposed but not yet approved). For the Charlton Road originating traffic, which will be diverted from the Wallaby Scrub Road route, an additional traffic detour of approximately 3 additional kilometres and 2 minutes per trip would also potentially occur along the Broke Road route, which would further increase the overall travel detour distances and travel times for this traffic to similar levels as for the Putty Road originating traffic, ie to approximately 9 kilometres and 6 minutes per trip in total.

3.7.2 Traffic impacts at intersections

In terms of future intersection operations, there will also be minimal impacts from the cumulative traffic impacts of the proposal in combination with the Bulga Optimisation Project, including the effects of the Wallaby Scrub Road closure. The relevant intersection traffic impacts have been considered in the traffic analysis in Table 3.2, and show these intersections will have sufficient spare capacity to accommodate the predicted cumulative traffic increases, with minimal intersection capacity or delay impacts.

The recent RMS intersection improvement works at the Golden Highway/ Broke Road intersection, which were completed during 2011/12, have substantially improved the peak hour traffic delays and level of service at this intersection (previously level of service F, now level of service C) such that this intersection no longer represents a capacity constraint to the major road network in the locality of Mount Thorley.

4 Coal transport impact assessment

4.1 Introduction

The existing Mount Thorley Coal Loader (MTCL) is shown on Figure 2.6 and the schematic plan of the Hunter Valley rail network in Figure 2.7 shows the Whittingham branch line, rail loops and train loading facilities. These facilities will continue to be used for transport of the export coal produced by MTW. MTCL is a separate facility with a separate development consent and is not subject to this proposal.

The MTCL loop is accessed from the Main Northern Railway at Whittingham (near Singleton). Empty trains exit the Main Northern Railway line at Whittingham junction and travel along the Whittingham branch line to the MTCL spur line, in preparation for loading. On completion of loading, trains return along the Whittingham branch to Whittingham junction and proceed to the coal terminals in Newcastle for ship loading. In addition to MTW, other users of the Whittingham branch include Bulga Coal Complex and Wambo Mine.

The future capacity of the Whittingham branch line must accommodate the combined coal transport demand from the MTCL coal loaders and other mines such as Bulga, Wambo and HVO South potentially, which also use the line. The branch line has single track capacity and its capacity is also potentially constrained by the combined operations and the availability of coal train paths at the junction with the Main Northern Railway line at Whittingham.

4.2 Hunter Valley rail transport capacity

Over 150 million tonnes of coal was exported from the Port of Newcastle in 2013 (calendar year), with current expectations of additional growth in throughput across 2014. Installed coal terminal capacity in Newcastle currently exceeds 200 million tonnes; however, the timing of when industry output in the Hunter Valley might align with or exceed coal terminal capacity in Newcastle is uncertain.

The Australian Rail Track Corporation (ARTC) commenced a 60-year lease of the Hunter Valley coal rail network in 2004. ARTC has published several long-term corridor capacity strategies for the Hunter Valley coal network, where the *2013—2022 Hunter Valley Corridor Capacity Strategy* (ARTC 2013) is the seventh version.

This document outlines ARTC's expectations for customer track access over the short, medium and long-term, and the associated rail investment and operating performance requirements to deliver contracted and prospective volume commitments. Excerpts from the 2013-2022 strategy outline ARTC's view on the expected increase in export coal volumes:

> … contracted export coal volumes are... increasing to around 204 mtpa in 2018 and 206 mtpa in 2019. Forward contract volumes are in part conditional on ARTC projects and HVCCC Coal Chain Capacity assessment.

On this basis, it is possible that annual railed coal volumes for export could increase by a further 56 million tonnes by 2019, an almost 40 percent increase on 2013 throughput and a compound annual growth rate (CAGR) of 5.4 percent. The ARTC corridor capacity strategy is based on a combination of contracted volumes (volumes for which contractual arrangements for the transport of coal are already in place) and prospective volumes (volumes from projects which have not progressed to the level at which 'binding' coal transport contracts have been committed to).

The current relationship between contracted volumes, prospective volumes as determined by the Rail Capacity Group of ARTC, and terminal capacity at the Port of Newcastle is shown in Figure 4.1. Further details of the projected contractual and prospective volumes of coal to be transported over each section on the Hunter Valley main line between Newcastle and Muswellbrook are also shown in Figure 4.2.

4.3 Rail transport of product coal

There are no changes proposed by MTW to the MTCL rail loop or spur line as part of the modification. MTCL is a separate facility to MTW and operates to its own development consent.

For the transport of product coal by rail, Coal & Allied (C&A) entered into a rolling 10 year agreement with ARTC in 2012 for track access to provide for the ability to haul coal from MTW to the coal terminals in Newcastle. This agreement was established after the ARTC *Hunter Valley Coal Network Access Undertaking* was approved by the ACCC in June 2011.

A fundamental part of the agreement is the take-or-pay capacity commitment, which provides contracted track access to transport specific monthly and annual coal volumes from MTW for the full 10 year period. All agreements with ARTC are limited to 10 years and RTCA will extend the agreement with ARTC if and when required to accommodate continuing use of the rail network.

ARTC plans and manages network capacity enhancement projects to cater for the track access volumes it has contracted across its customer base and prospective volumes where applicable. The C&A agreement with ARTC for MTW track access is included in ARTC's long-term contractual commitments, and as such, the MTW volumes are considered confirmed for the 10 year period on the basis that ARTC has the available capacity to deliver MTW's contract. The MTW volumes, therefore, are not expected to have any adverse impact on the capacity of the coal rail network because the capacity has been planned and committed for some time.

4.4 Assessment of rail transport

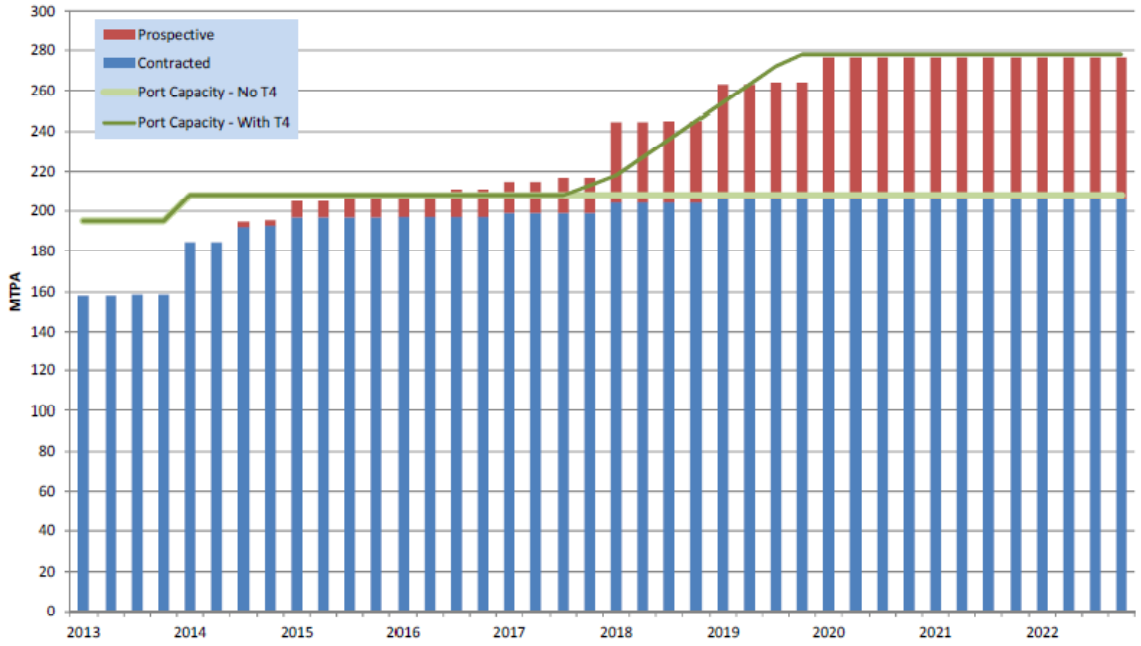
4.4.1 Capacity of the rail line

The daily train movements for MTW coal transport will be consistent with those loaded previously at MTCL and are not anticipated to increase above levels seen historically. As there is no projected increase in annual train movements, the MTW coal transport operations are not expected to cause any increase in delays to other users of the Whittingham branch line.

From the current ARTC strategy, the current contracted and prospective coal transport tonnages for the sections of the Hunter Valley lines shown in Figure 4.2, show there is a planned increase in the total processed export coal transported from existing and proposed mining operations using the Whittingham Branch (eg including the approved HVO South coal loading facility) between the years 2013 and 2022 (the end year of the current ARTC Strategy) from 25 Mt to 40 Mt per annum.

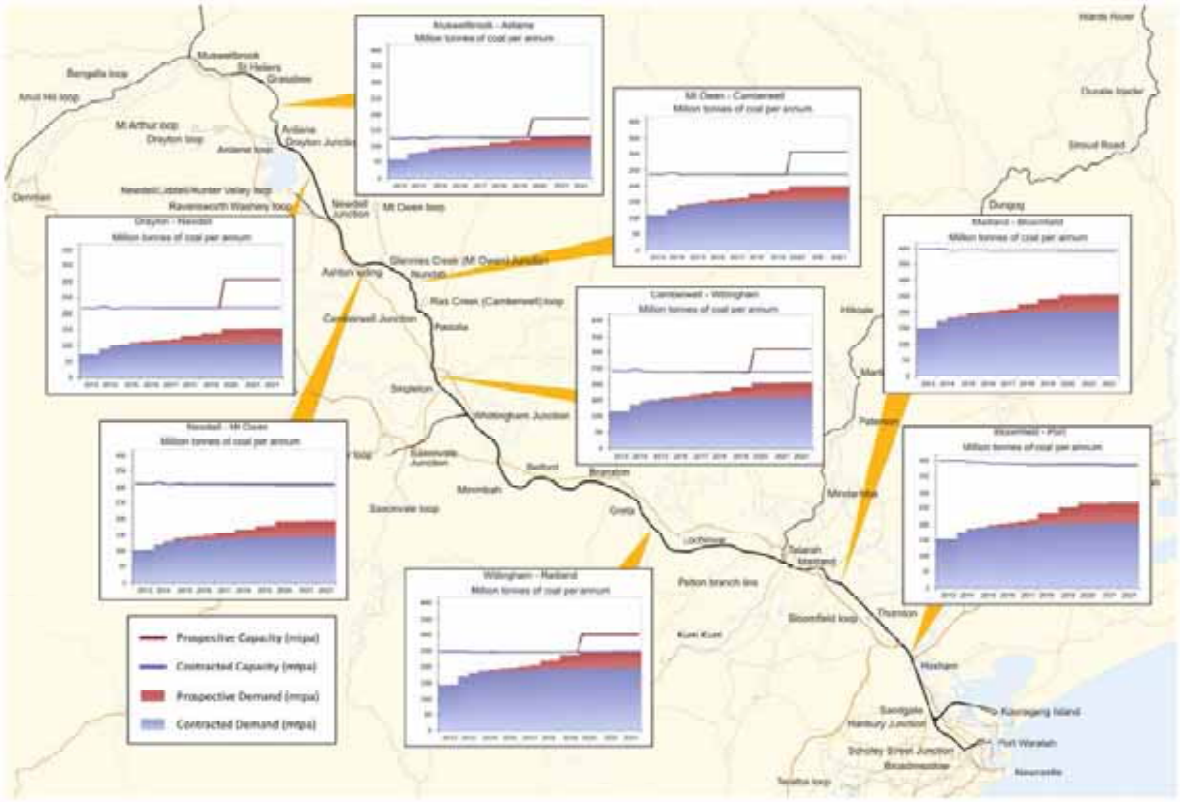
Capacity is incorporated in the ARTC strategy which can accommodate the increased coal transport demand from coal loading facilities using the Whittingham Branch line, notwithstanding that the coal transported from MTW is not anticipated to form part of this demand increase.

The branch line operates with a typical average trainload tonnage of 8,400 tonnes and has potentially 350 days operation per year. The annual average daily number of loaded trains using the Whittingham Branch (from MTW and other mines) will increase from approximately 8.5 in 2013 (to transport approximately 25 Mt of coal) to approximately 13.6 in 2022 (to transport approximately 40 Mt of coal).



Note: *Data Source (ARTC, 2013)*

Figure 4.1 **Forecast growth in rail transport volumes and Newcastle port capacity**



Note: *Data Source (ARTC, 2013)*

Figure 4.2 **Forecast growth in transport volumes on sections of the Hunter Valley main line**

While 40 Mtpa is within the current operating capacity of a single track branch line, which can generally accommodate approximately one train movement hourly in each direction, it is believed that the limiting factor for the branch line capacity is the number of available train paths at the junction with the main line at Whittingham. This capacity will ultimately determine the capacity of the Whittingham branch line to accommodate the projected daily train loads in the years beyond the currently defined ARTC strategy, which continues until 2022.

4.4.2 Assessment of rail safety

i Level crossings

The ARTC network expansion plans include significant expenditure to construct facilities that separate road vehicles from the high volume public level crossings to eliminate interaction. Notable crossings already completed include Range Road (Singleton), Golden Highway (adjacent to New England Highway intersection) and Hermitage Road (Belford). As there will not be an increase in daily train movements beyond those seen historically for MTW, the number of MTW train interactions with users of existing public and private level crossings will not change.

ii Rail safety

MTW train movements will continue to transport coal in a manner consistent with historical operations. Coal will be loaded onto trains provided by approved rail haulage companies who are licensed and approved to operate on the ARTC network. These companies must comply with the requirements of the Independent Transport Safety Regulator whose principal objective is to facilitate the safe operation of railways in NSW. Therefore MTW is not expected to cause an impact on rail safety.

5 Mitigation and management measures

The following project impact mitigation and related monitoring and management measures have been identified to address the identified road and rail transport related aspects of the project.

The primary road transport impact identified for the proposal is the increased travel time and distance costs for the traffic which is currently using Wallaby Scrub Road when the road is closed and the detour is implemented.

MTW propose to prepare a road closure implementation plan for Wallaby Scrub Road, in conjunction with relevant stakeholders in the local community, emergency services, RMS and Singleton Council, which will include strategies to minimise any potential local traffic access and road safety impacts of the closure.

5.1 Road transport mitigation measures

Emergency vehicle access to areas west of Wallaby Scrub Road will be maintained by the construction of an appropriate emergency access road/fire trail between Putty Road and the Golden Highway, prior to the closure of Wallaby Scrub Road. The fire trail route would be constructed in accordance with the NSW Rural Fire Service access standards in *NSW Bushfire Coordinating Committee policy No 2/2007* (Rural Fire Service 2007). Other emergency vehicles (police and ambulance services) would not generally be affected by the closure as their vehicles are based in Singleton and would not generally travel via Wallaby Scrub Road to access other areas.

Some local residents, e.g. in Bulga village and its surrounding areas will experience increased travel times and distances from traffic diversions as a result of the road closure. However the majority of the traffic using the route is regionally based and travels from areas beyond the southern end of Charlton Road. These traffic volumes are anticipated to reduce in the future following the opening of the Hunter Expressway, which should cause some of the affected traffic to use other routes, regardless of whether Wallaby Scrub Road is closed or not.

The recent RMS intersection improvement works at the Golden Highway/ Broke Road intersection and the two Mount Thorley interchange intersections, on the east and west sides, have substantially improved the peak hour traffic delays and level of service at these intersections No further intersection improvement works to these or other intersections on the major road network are specifically required as a result of the predicted road traffic impacts of the proposal.

However, on the Golden Highway section of the Wallaby Scrub Road traffic detour route, to the north of Putty Road, the existing intersections which provide access to the locality of Gouldsville should be reviewed to ensure compliance with the most recent (Austroads 2010) R*oad Design Guide* requirements for rural intersections. This review should be incorporated into the road closure plan required for Wallaby Scrub Road, which will be prepared in consultation with RMS and other organisations.

5.2 Rail transport mitigation measures

No specific rail transport impact mitigation measures are required for the proposal.

6 Summary and conclusion

The contents of this TIA report are based on the Department of Planning and Environment Secretary's requirements, the list of traffic impact assessment requirements published in the RTA/RMS Guide to traffic impact assessment and the most recent ARTC 2013 - 2022 ten year strategy for coal transport on the Hunter Valley rail network.

This TIA identifies that the proposal is currently generating significant daily traffic movements for both car and truck traffic on the Golden Highway and other major roads in the locality of Mount Thorley. The road network currently has spare capacity (including at all the major intersection) and these intersections are currently operating at good or reasonable peak hour levels of service. Based on historic traffic growth patterns at annual growth rates of up to +2 percent, the future background traffic increases for the locality roads, by the year 2017, have also been calculated to determine the future base year traffic situation against which the impact of the proposed closure of Wallaby Scrub Road and the cumulative impact of the MTW traffic with the Bulga Optimisation Project traffic have been assessed.

Employee traffic generated by Warkworth Mine and MTO on external public roads will not generally increase. Truck traffic movements on the external road network would also generally remain at similar levels. The future road and intersection traffic operations in the locality will not generally change due to these factors.

As there is no projected increase in annual production tonnages or train movements, the proposal is not expected to cause any rail transport impacts.

The proposal would also result in minimal traffic impacts to the wider road network and intersections related to the closure of Wallaby Scrub Road. The traffic surveys for this traffic impact assessment included an Origin-Destination traffic survey during a 12 hour period on Tuesday 4 March 2014, which identified the current volumes and proportions of all traffic entering or leaving the area via the northern end of Wallaby Scrub Road. These were:

- The total surveyed traffic volume using Wallaby Scrub Road is less than 1,000 vehicle movements daily.

- The general traffic proportions using Wallaby Scrub Road were approximately 60 – 70 percent coming from Charlton Road (at the south end) and approximately 20 – 25 percent coming from the Putty Road (west) directions.

However, the Hunter Expressway route which opened on 22 March 2014 now provides a faster, safer and more direct travel route for regional traffic movements between the M1 Motorway and the Upper Hunter. This route option is now available to through traffic from the Charlton Road direction which had previously been travelling via Wallaby Scrub Road.

Traffic detoured by the Wallaby Scrub Road closure will be subject to some increases in travel distances and journey times. However, given the improved road construction standard and travelling conditions on the Golden Highway, the closure of Wallaby Scrub Road should not result in an increase in the travel safety risk for the detoured traffic.

MTW propose to prepare a road closure implementation plan, in conjunction with relevant stakeholders in the local community, emergency services, RMS and Singleton Council, to develop strategies to minimise local traffic related impacts of the closure.

Emergency vehicle access to areas west of Wallaby Scrub Road is proposed to be maintained through the development, in conjunction with RFS, of an emergency access/fire trail route between Putty Road and the Golden Highway, close to the western limit of the proposed mining footprint (see Appendix E). The fire trail route would be constructed in accordance with the NSW Rural Fire Service access standards in *NSW Bushfire Coordinating Committee policy No 2/2007* (Rural Fire Service 2007). Other emergency vehicles (police and ambulance services) would not generally be affected by the closure as their vehicles are based in Singleton and would not generally travel via Wallaby Scrub Road to access other areas.

The potential cumulative traffic impacts of the MTW proposal, with the construction work phases for the Bulga Optimisation Project have also been considered in the year 2017. This is the first year in which these cumulative traffic impacts could occur. The proposed construction stage workforce for the Bulga Optimisation Project will be higher in the earlier years of construction, but will have reduced to approximately 25 persons by the year 2017, such that minimal cumulative traffic impacts will occur from the two proposals in that and subsequent years.

There will potentially be a cumulative traffic detour impact from the MTW project with the Bulga Optimisation Project (which is proposed but not yet approved), where the Charlton Road originating traffic diverted from the Wallaby Scrub Road route, will be subject to an additional traffic detour of approximately 3 additional kilometres and 2 minutes per trip along the Broke Road route, as a result of the traffic detours which would occur to that route with the Bulga Optimisation Project.

References

ARC Traffic + Transport with Transport and Urban Planning, 2013 Traffic Impact Assessment for the Bulga Mine Optimisation Project

ARTC 2013, 2013-2022 Hunter Valley Corridor Capacity Strategy, June 2013

Austroads 2010, Guide to Road Design

Parsons Brinkerhoff 2010, Traffic Impact Assessment for the Warkworth Mine Extension project

Roads and Traffic Authority 2002, *Guide to Traffic Generating Developments*.

Rural Fire Service 2007, NSW Bushfire Coordinating Committee policy No 2/2007.

Appendix A

Tube traffic count surveys

Job No	N1299
Client	EMM
Road	Golden Hwy - Between Thornley and Wallaby Scru
Location	Singleton
Site No.	3
Start Date	4-Mar-14
Description	Volume Summary
Direction	Combined

Average Weekday	3,314
7 Day Average	2,978

Time	Day of Week							Ave W'day	7 Day Ave
	Mon	Tue	Wed	Thu	Fri	Sat	Sun		
	10-Mar	4-Mar	5-Mar	6-Mar	7-Mar	8-Mar	9-Mar		
AM Peak	268	234	234	232	247	175	194		
PM Peak	292	238	275	266	324	164	250		
0:00	13	22	20	25	24	15	12	21	19
1:00	9	6	14	9	6	12	8	9	9
2:00	6	6	6	11	7	6	7	7	7
3:00	16	8	17	17	15	15	8	15	14
4:00	47	29	32	36	27	17	9	34	28
5:00	182	157	177	180	183	85	75	176	148
6:00	268	234	234	232	219	81	64	237	190
7:00	230	204	190	179	166	95	66	194	161
8:00	183	161	166	202	172	102	76	177	152
9:00	230	168	158	187	230	120	124	195	174
10:00	200	185	193	187	247	175	120	202	187
11:00	199	179	220	195	239	135	194	206	194
12:00	225	168	199	195	237	164	185	205	196
13:00	292	183	198	222	289	125	231	237	220
14:00	238	188	183	218	324	145	250	230	221
15:00	279	238	257	253	294	104	223	264	235
16:00	257	238	275	266	297	107	194	267	233
17:00	213	231	227	236	274	126	189	236	214
18:00	162	154	142	185	225	127	171	174	167
19:00	82	76	75	103	139	41	91	95	87
20:00	36	49	44	54	63	14	51	49	44
21:00	43	22	36	36	34	20	36	34	32
22:00	27	29	27	32	28	17	17	29	25
23:00	26	22	25	17	19	17	13	22	20
Total	3463	2957	3115	3277	3758	1865	2414	3314	2978

7-19	2708	2297	2408	2525	2994	1525	2023	2586	2354
6-22	3137	2678	2797	2950	3449	1681	2265	3002	2708
6-24	3190	2729	2849	2999	3496	1715	2295	3053	2753
0-24	3463	2957	3115	3277	3758	1865	2414	3314	2978

Job No	N1299
Client	EMM
Road	Golden Hwy - Between Thornley and Wallaby Scru
Location	Singleton
Site No.	3
Start Date	4-Mar-14
Description	Volume Summary
Direction	EB

Average Weekday	1,620
7 Day Average	1,461

Time	Day of Week							Ave W'day	7 Day Ave
	Mon	Tue	Wed	Thu	Fri	Sat	Sun		
	10-Mar	4-Mar	5-Mar	6-Mar	7-Mar	8-Mar	9-Mar		
AM Peak	100	99	106	97	126	92	86		
PM Peak	157	147	164	169	208	86	137		
0:00	5	17	18	20	19	9	6	16	13
1:00	8	4	9	7	4	1	2	6	5
2:00	1	2	1	7	5	3	2	3	3
3:00	0	2	5	6	7	11	2	4	5
4:00	8	10	7	9	7	2	3	8	7
5:00	34	25	31	28	30	22	22	30	27
6:00	90	86	96	74	82	44	35	86	72
7:00	82	92	69	58	65	48	40	73	65
8:00	80	72	79	86	82	49	31	80	68
9:00	91	67	74	97	109	70	39	88	78
10:00	88	73	89	77	126	92	49	91	85
11:00	100	99	106	97	123	68	86	105	97
12:00	114	81	105	95	133	86	98	106	102
13:00	119	85	95	126	163	64	119	118	110
14:00	117	117	96	131	208	70	137	134	125
15:00	157	147	157	162	192	50	113	163	140
16:00	140	144	164	169	193	45	103	162	137
17:00	106	118	118	140	130	57	98	122	110
18:00	87	93	83	109	124	79	92	99	95
19:00	38	41	39	60	97	24	61	55	51
20:00	24	26	29	38	39	4	29	31	27
21:00	11	11	23	24	18	7	22	17	17
22:00	8	10	7	15	13	6	12	11	10
23:00	18	15	14	8	11	6	9	13	12
Total	1526	1437	1514	1643	1980	917	1210	1620	1461
7-19	1281	1188	1235	1347	1648	778	1005	1340	1212
6-22	1444	1352	1422	1543	1884	857	1152	1529	1379
6-24	1470	1377	1443	1566	1908	869	1173	1553	1401
0-24	1526	1437	1514	1643	1980	917	1210	1620	1461

Job No	N1299
Client	EMM
Road	Golden Hwy - Between Thornley and Wallaby Scru
Location	Singleton
Site No.	3
Start Date	4-Mar-14
Description	Volume Summary
Direction	WB

Average Weekday	1,694
7 Day Average	1,517

Time	Day of Week							Ave W'day	7 Day Ave
	Mon	Tue	Wed	Thu	Fri	Sat	Sun		
	10-Mar	4-Mar	5-Mar	6-Mar	7-Mar	8-Mar	9-Mar		
AM Peak	178	148	146	158	153	83	108		
PM Peak	173	113	111	100	144	78	113		
0:00	8	5	2	5	5	6	6	5	5
1:00	1	2	5	2	2	11	6	2	4
2:00	5	4	5	4	2	3	5	4	4
3:00	16	6	12	11	8	4	6	11	9
4:00	39	19	25	27	20	15	6	26	22
5:00	148	132	146	152	153	63	53	146	121
6:00	178	148	138	158	137	37	29	152	118
7:00	148	112	121	121	101	47	26	121	97
8:00	103	89	87	116	90	53	45	97	83
9:00	139	101	84	90	121	50	85	107	96
10:00	112	112	104	110	121	83	71	112	102
11:00	99	80	114	98	116	67	108	101	97
12:00	111	87	94	100	104	78	87	99	94
13:00	173	98	103	96	126	61	112	119	110
14:00	121	71	87	87	116	75	113	96	96
15:00	122	91	100	91	102	54	110	101	96
16:00	117	94	111	97	104	62	91	105	97
17:00	107	113	109	96	144	69	91	114	104
18:00	75	61	59	76	101	48	79	74	71
19:00	44	35	36	43	42	17	30	40	35
20:00	12	23	15	16	24	10	22	18	17
21:00	32	11	13	12	16	13	14	17	16
22:00	19	19	20	17	15	11	5	18	15
23:00	8	7	11	9	8	11	4	9	8
Total	1937	1520	1601	1634	1778	948	1204	1694	1517
7-19	1427	1109	1173	1178	1346	747	1018	1247	1143
6-22	1693	1326	1375	1407	1565	824	1113	1473	1329
6-24	1720	1352	1406	1433	1588	846	1122	1500	1352
0-24	1937	1520	1601	1634	1778	948	1204	1694	1517

Job No	N1299
Client	EMM
Road	Golden Hwy - Between Broke Rd & Mt Thornley
Location	Singleton
Site No.	2
Start Date	4-Mar-14
Description	Volume Summary
Direction	Combined

Average Weekday	9,849
7 Day Average	8,346

Time	Day of Week							Ave W'day	7 Day Ave
	Mon	Tue	Wed	Thu	Fri	Sat	Sun		
	10-Mar	4-Mar	5-Mar	6-Mar	7-Mar	8-Mar	9-Mar		
AM Peak	1165	1083	1148	1214	1048	372	322		
PM Peak	905	819	915	859	904	411	454		
0:00	22	44	46	61	68	58	25	48	46
1:00	16	24	31	13	20	28	22	21	22
2:00	28	22	36	37	31	24	19	31	28
3:00	34	34	48	64	51	61	23	46	45
4:00	149	123	115	138	145	69	30	134	110
5:00	657	701	691	723	711	269	209	697	566
6:00	1165	1083	1148	1214	1048	372	322	1132	907
7:00	745	720	643	646	605	298	229	672	555
8:00	477	449	461	521	467	191	123	475	384
9:00	476	393	417	475	508	250	212	454	390
10:00	419	412	465	441	560	315	204	459	402
11:00	479	429	502	417	565	266	281	478	420
12:00	442	429	497	529	540	290	309	487	434
13:00	560	443	440	531	663	248	326	527	459
14:00	610	525	552	594	732	243	383	603	520
15:00	905	819	704	859	904	209	320	838	674
16:00	771	761	915	766	727	203	299	788	635
17:00	702	726	717	715	676	316	390	707	606
18:00	595	585	600	605	560	411	454	589	544
19:00	285	291	286	341	353	200	255	311	287
20:00	124	143	103	122	155	62	82	129	113
21:00	74	58	90	86	80	41	75	78	72
22:00	85	73	98	96	81	45	49	87	75
23:00	43	62	65	66	54	32	35	58	51
Total	9863	9349	9670	10060	10304	4501	4676	9849	8346
7-19	7181	6691	6913	7099	7507	3240	3530	7078	6023
6-22	8829	8266	8540	8862	9143	3915	4264	8728	7403
6-24	8957	8401	8703	9024	9278	3992	4348	8873	7529
0-24	9863	9349	9670	10060	10304	4501	4676	9849	8346

Job No	N1299
Client	EMM
Road	Golden Hwy - Between Broke Rd & Mt Thornley
Location	Singleton
Site No.	2
Start Date	4-Mar-14
Description	Volume Summary
Direction	EB

Average Weekday	4,649
7 Day Average	3,951

Time	Day of Week							Ave W'day	7 Day Ave
	Mon	Tue	Wed	Thu	Fri	Sat	Sun		
	10-Mar	4-Mar	5-Mar	6-Mar	7-Mar	8-Mar	9-Mar		
AM Peak	294	294	265	256	275	187	172		
PM Peak	628	599	689	650	623	240	246		
0:00	10	36	39	48	42	28	14	35	31
1:00	11	13	16	7	14	10	8	12	11
2:00	6	11	11	11	13	6	3	10	9
3:00	11	17	21	26	25	25	6	20	19
4:00	14	21	19	27	31	15	5	22	19
5:00	53	70	77	75	63	37	31	68	58
6:00	207	237	265	256	230	151	137	239	212
7:00	294	294	229	204	221	187	172	248	229
8:00	176	184	188	183	158	90	49	178	147
9:00	199	186	195	226	247	126	83	211	180
10:00	195	182	176	175	264	165	87	198	178
11:00	232	216	222	204	275	140	113	230	200
12:00	205	210	264	251	298	162	164	246	222
13:00	257	198	202	249	390	109	162	259	224
14:00	300	319	309	361	483	117	178	354	295
15:00	628	599	478	650	623	114	169	596	466
16:00	523	560	689	560	481	96	141	563	436
17:00	390	421	427	420	325	106	155	397	321
18:00	314	352	373	366	313	240	246	344	315
19:00	203	213	196	245	280	159	202	227	214
20:00	55	70	61	66	83	33	47	67	59
21:00	31	28	48	46	36	17	36	38	35
22:00	44	38	58	43	41	17	24	45	38
23:00	38	54	45	47	32	15	14	43	35
Total	4396	4529	4608	4746	4968	2165	2246	4649	3951

7-19	3713	3721	3752	3849	4078	1652	1719	3823	3212
6-22	4209	4269	4322	4462	4707	2012	2141	4394	3732
6-24	4291	4361	4425	4552	4780	2044	2179	4482	3805
0-24	4396	4529	4608	4746	4968	2165	2246	4649	3951

Job No	N1299
Client	EMM
Road	Golden Hwy - Between Broke Rd & Mt Thornley
Location	Singleton
Site No.	2
Start Date	4-Mar-14
Description	Volume Summary
Direction	WB

Average Weekday	5,200
7 Day Average	4,395

Time	Day of Week							Ave W'day	7 Day Ave
	Mon	Tue	Wed	Thu	Fri	Sat	Sun		
	10-Mar	4-Mar	5-Mar	6-Mar	7-Mar	8-Mar	9-Mar		
AM Peak	958	846	883	958	818	232	185		
PM Peak	312	305	290	295	351	210	235		
0:00	12	8	7	13	26	30	11	13	15
1:00	5	11	15	6	6	18	14	9	11
2:00	22	11	25	26	18	18	16	20	19
3:00	23	17	27	38	26	36	17	26	26
4:00	135	102	96	111	114	54	25	112	91
5:00	604	631	614	648	648	232	178	629	508
6:00	958	846	883	958	818	221	185	893	696
7:00	451	426	414	442	384	111	57	423	326
8:00	301	265	273	338	309	101	74	297	237
9:00	277	207	222	249	261	124	129	243	210
10:00	224	230	289	266	296	150	117	261	225
11:00	247	213	280	213	290	126	168	249	220
12:00	237	219	233	278	242	128	145	242	212
13:00	303	245	238	282	273	139	164	268	235
14:00	310	206	243	233	249	126	205	248	225
15:00	277	220	226	209	281	95	151	243	208
16:00	248	201	226	206	246	107	158	225	199
17:00	312	305	290	295	351	210	235	311	285
18:00	281	233	227	239	247	171	208	245	229
19:00	82	78	90	96	73	41	53	84	73
20:00	69	73	42	56	72	29	35	62	54
21:00	43	30	42	40	44	24	39	40	37
22:00	41	35	40	53	40	28	25	42	37
23:00	5	8	20	19	22	17	21	15	16
Total	5467	4820	5062	5314	5336	2336	2430	5200	4395

7-19	3468	2970	3161	3250	3429	1588	1811	3256	2811
6-22	4620	3997	4218	4400	4436	1903	2123	4334	3671
6-24	4666	4040	4278	4472	4498	1948	2169	4391	3724
0-24	5467	4820	5062	5314	5336	2336	2430	5200	4395

Job No	N1299
Client	EMM
Road	Wallaby Scrub Rd - North of Putty Rd
Location	Singleton
Site No.	1
Start Date	4-Mar-14
Description	Volume Summary
Direction	Combined

Average Weekday	921
7 Day Average	875

Time	Day of Week							Ave W'day	7 Day Ave
	Mon	Tue	Wed	Thu	Fri	Sat	Sun		
	10-Mar	4-Mar	5-Mar	6-Mar	7-Mar	8-Mar	9-Mar		
AM Peak	88	89	68	96	74	52	60		
PM Peak	104	81	82	91	115	54	110		
0:00	3	8	9	10	10	5	5	8	7
1:00	2	0	1	1	5	1	3	2	2
2:00	0	1	0	2	4	1	1	1	1
3:00	4	1	4	5	2	2	1	3	3
4:00	17	9	8	8	10	4	6	10	9
5:00	58	64	49	48	59	28	21	56	47
6:00	88	89	68	96	74	36	32	83	69
7:00	68	54	50	48	50	41	34	54	49
8:00	39	45	40	44	48	30	21	43	38
9:00	44	32	39	39	42	52	28	39	39
10:00	54	28	35	48	50	34	43	43	42
11:00	52	24	43	47	57	45	60	45	47
12:00	57	41	33	43	67	54	63	48	51
13:00	48	40	41	38	68	49	74	47	51
14:00	77	53	54	45	87	47	110	63	68
15:00	104	81	82	91	115	40	86	95	86
16:00	71	58	72	87	105	40	71	79	72
17:00	63	49	63	70	99	40	79	69	66
18:00	50	54	54	63	82	41	61	61	58
19:00	39	33	24	36	58	30	47	38	38
20:00	7	8	16	17	28	5	29	15	16
21:00	6	2	1	9	16	5	9	7	7
22:00	8	10	10	11	10	0	2	10	7
23:00	2	5	3	2	1	7	1	3	3
Total	961	789	799	908	1147	637	887	921	875
7-19	727	559	606	663	870	513	730	685	667
6-22	867	691	715	821	1046	589	847	828	797
6-24	877	706	728	834	1057	596	850	840	807
0-24	961	789	799	908	1147	637	887	921	875

Job No	N1299
Client	EMM
Road	Wallaby Scrub Rd - North of Putty Rd
Location	Singleton
Site No.	1
Start Date	4-Mar-14
Description	Volume Summary
Direction	NB

Average Weekday	439
7 Day Average	417

Time	Day of Week							Ave W'day	7 Day Ave
	Mon	Tue	Wed	Thu	Fri	Sat	Sun		
	10-Mar	4-Mar	5-Mar	6-Mar	7-Mar	8-Mar	9-Mar		
AM Peak	72	77	57	80	63	27	26		
PM Peak	35	23	30	27	39	28	45		
0:00	2	0	0	3	0	5	4	1	2
1:00	1	0	1	1	4	1	0	1	1
2:00	0	1	0	0	3	0	0	1	1
3:00	3	1	4	4	1	1	1	3	2
4:00	14	8	7	7	10	3	5	9	8
5:00	53	58	46	43	54	24	21	51	43
6:00	72	77	57	80	63	21	19	70	56
7:00	39	31	31	21	24	13	8	29	24
8:00	22	30	24	21	21	16	11	24	21
9:00	28	17	22	20	20	27	14	21	21
10:00	25	14	13	22	22	19	26	19	20
11:00	21	14	17	12	22	23	22	17	19
12:00	34	23	19	13	26	26	28	23	24
13:00	27	21	22	20	22	28	24	22	23
14:00	28	18	16	9	22	15	45	19	22
15:00	35	13	16	20	26	19	34	22	23
16:00	24	19	20	24	33	18	34	24	25
17:00	30	19	30	27	39	24	43	29	30
18:00	24	10	17	25	38	26	35	23	25
19:00	11	6	11	12	17	4	13	11	11
20:00	4	3	9	9	15	2	10	8	7
21:00	3	2	1	6	8	1	4	4	4
22:00	5	8	7	7	7	0	0	7	5
23:00	0	2	0	0	0	6	1	0	1
Total	505	395	390	406	497	322	402	439	417
7-19	337	229	247	234	315	254	324	272	277
6-22	427	317	325	341	418	282	370	366	354
6-24	432	327	332	348	425	288	371	373	360
0-24	505	395	390	406	497	322	402	439	417

Job No	N1299
Client	EMM
Road	Wallaby Scrub Rd - North of Putty Rd
Location	Singleton
Site No.	1
Start Date	4-Mar-14
Description	Volume Summary
Direction	SB

Average Weekday	482
7 Day Average	459

Time	Day of Week							Ave W'day	7 Day Ave
	Mon	Tue	Wed	Thu	Fri	Sat	Sun		
	10-Mar	4-Mar	5-Mar	6-Mar	7-Mar	8-Mar	9-Mar		
AM Peak	31	23	26	35	35	28	38		
PM Peak	69	68	66	71	89	32	65		
0:00	1	8	9	7	10	0	1	7	5
1:00	1	0	0	0	1	0	3	0	1
2:00	0	0	0	2	1	1	1	1	1
3:00	1	0	0	1	1	1	0	1	1
4:00	3	1	1	1	0	1	1	1	1
5:00	5	6	3	5	5	4	0	5	4
6:00	16	12	11	16	11	15	13	13	13
7:00	29	23	19	27	26	28	26	25	25
8:00	17	15	16	23	27	14	10	20	17
9:00	16	15	17	19	22	25	14	18	18
10:00	29	14	22	26	28	15	17	24	22
11:00	31	10	26	35	35	22	38	27	28
12:00	23	18	14	30	41	28	35	25	27
13:00	21	19	19	18	46	21	50	25	28
14:00	49	35	38	36	65	32	65	45	46
15:00	69	68	66	71	89	21	52	73	62
16:00	47	39	52	63	72	22	37	55	47
17:00	33	30	33	43	60	16	36	40	36
18:00	26	44	37	38	44	15	26	38	33
19:00	28	27	13	24	41	26	34	27	28
20:00	3	5	7	8	13	3	19	7	8
21:00	3	0	0	3	8	4	5	3	3
22:00	3	2	3	4	3	0	2	3	2
23:00	2	3	3	2	1	1	0	2	2
Total	456	394	409	502	650	315	485	482	459
7-19	390	330	359	429	555	259	406	413	390
6-22	440	374	390	480	628	307	477	462	442
6-24	445	379	396	486	632	308	479	468	446
0-24	456	394	409	502	650	315	485	482	459

STATE HIGHWAY NO.23 - CHARLESTOWN-SANDGATE HIGHWAY

LAKE MACQUARIE LGA

STATION	LOCATION	MAP	Km	1980 AADT	1982 AADT	1984 AADT	1986 AADT	1988 AADT	1990 AADT	1992 AADT	1995 AADT	1998 AADT	2001 AADT	2004 AADT
05.304	H'BOROUGH-N OF WARNERS BAY RD,MR325	F	0.0	--	--	--	--	--	--	--	--	--	--	29923

NEWCASTLE LGA

STATION	LOCATION	MAP	Km	1980 AADT	1982 AADT	1984 AADT	1986 AADT	1988 AADT	1990 AADT	1992 AADT	1995 AADT	1998 AADT	2001 AADT	2004 AADT
05.308	KOTARA-0.5KM N OF MYALL RD	B	2.4	17470	21170	23630	23624	--	--	--	--	--	--	38866
05.309	KOTARA-N OF CARNLEY AV	B	3.1	--	17650	19620	19580	19790	--	18833	25993	25489	22013	33279
05.310	CARDIFF HEIGHTS-N OF CARDIFF RD,223	B	3.6	--	24290	25490	25822	25086	--	23993	29774	29515	28014	36859
V05.204	NEW LAMBTON HEIGHTS-N OF RIDGEWAY RD	B	4.1	24850*	26936*	29007*	30359*	30594*	30996V	33737V	35149V	35596V	36907V	--[3]
05.312	NEW LAMBTON HTS-N OF MR223,RUSSELL R	B	0.1	15620	16690	18020	19102	--	--	--	--	--	--	--
05.314	LAMBTON-N OF MR188,HOWE ST	B	1.0	20270	21260	22820	22679	23219	--	25284	22398	29247	28695	33571
05.951	SHORTLAND-SH23 OFF/R NB+SANDGTE ON-S	B	7.6	--	--	--	--	--	--	--	14525	15945	16153	16966
05.321	SANDGATE-S OF SH10,PACIFIC HWY	40	9.4	17990	19540	21310	21424	--	--	--	--	--	--	27062

STATE HIGHWAY NO.27 - GOLDEN HIGHWAY

SINGLETON LGA

STATION	LOCATION	MAP	Km	1980 AADT	1982 AADT	1984 AADT	1986 AADT	1988 AADT	1990 AADT	1992 AADT	1995 AADT	1998 AADT	2001 AADT	2004 AADT
05.841	WHITTINGHAM-W OF SH9,NEW ENGLAND HWY	38	0.0	--	--	2560	--	1682	--	2286	3337	3333	3724	3637
05.638	EAST OF MR181B,BROKE RD	38	0.0	3910	--	5160	--	4759	--	4800	6447	7164	7966	8143
05.637	MT THORLEY-E OF MR503,MILBRODALE RD	38	180.3	3160	--	5180	--	--	--	--	--	--	--	--
05.481	MT THORLEY-N OF MR503,THE PUTTY RD	38	0.1	3120	--	4200	--	4757	--	4508	7997	6256	7059	5572
05.482	WARKWORTH-AT WOLLOMBI BROOK BR	38	11.8	3610	--	3430	--	--	--	--	--	--	--	--

[3] 05204s has many problems through out 2004

Appendix B

Intersection traffic surveys

R.O.A.R. DATA

Reliable, Original & Authentic Results

Ph.88196847, Fax 88196849.
Mobile.0418239019

Client : EMGA
Job No/Name : 5030 MT. THORLEY Mine Access
Day/Date : Tuesday 4th March 2014

PEDS	WEST	SOUTH	EAST	
Time Per	Golden Hwy	Mitchell Line	Putty Rd	TOT
0600 - 0615				0
0615 - 0630		NOT		0
0630 - 0645		REQUIRED		0
0645 - 0700				0
0700 - 0715				0
0715 - 0730				0
0730 - 0745				0
0745 - 0800				0
0800 - 0815				0
0815 - 0830				0
0830 - 0845				0
0845 - 0900				0
Per End	0	0	0	0

PEDS	WEST	SOUTH	EAST	
Peak Per	Golden Hwy	Mitchell Line	Putty Rd	TOT
0600 - 0700	0	0	0	0
0615 - 0715	0	0	0	0
0630 - 0730	0	0	0	0
0645 - 0745	0	0	0	0
0700 - 0800	0	0	0	0
0715 - 0815	0	0	0	0
0730 - 0830	0	0	0	0
0745 - 0845	0	0	0	0
0800 - 0900	0	0	0	0
PEAK HR	0	0	0	0

Lights	WEST		SOUTH		EAST		
	Golden Hwy		Mitchell Line		Putty Rd		
Time Per	T	R	L	R	L	T	TOT
0600 - 0615	26	10	123	1	4	88	252
0615 - 0630	29	16	171	0	4	103	323
0630 - 0645	35	30	146	1	1	114	327
0645 - 0700	39	31	83	1	1	117	272
0700 - 0715	53	78	100	7	1	68	307
0715 - 0730	42	44	56	4	1	58	205
0730 - 0745	30	29	37	2	4	62	164
0745 - 0800	31	23	44	1	2	51	152
0800 - 0815	39	18	29	1	2	52	141
0815 - 0830	42	19	36	0	2	50	149
0830 - 0845	33	13	23	2	2	24	97
0845 - 0900	46	19	34	2	3	37	141
Per End	445	330	882	22	27	824	2530

Heavies	WEST		SOUTH		EAST		
	Golden Hwy		Mitchell Line		Putty Rd		
Time Per	T	R	L	R	L	T	TOT
0600 - 0615	2	2	3	0	4	4	15
0615 - 0630	2	2	8	0	0	4	16
0630 - 0645	2	3	5	0	0	2	12
0645 - 0700	2	4	8	0	0	1	15
0700 - 0715	1	1	7	0	0	7	16
0715 - 0730	1	4	2	0	0	4	11
0730 - 0745	1	1	2	0	1	1	6
0745 - 0800	1	4	8	0	0	4	17
0800 - 0815	4	5	3	0	0	3	15
0815 - 0830	7	8	4	0	1	6	26
0830 - 0845	2	2	5	0	0	1	10
0845 - 0900	2	5	5	0	0	4	16
Per End	27	41	60	0	6	41	175

Combined	WEST		SOUTH		EAST		
	Golden Hwy		Mitchell Line		Putty Rd		
Time Per	T	R	L	R	L	T	TOT
0600 - 0615	28	12	126	1	8	92	267
0615 - 0630	31	18	179	0	4	107	339
0630 - 0645	37	33	151	1	1	116	339
0645 - 0700	41	35	91	1	1	118	287
0700 - 0715	54	79	107	7	1	75	323
0715 - 0730	43	48	58	4	1	62	216
0730 - 0745	31	30	39	2	5	63	170
0745 - 0800	32	27	52	1	2	55	169
0800 - 0815	43	23	32	1	2	55	156
0815 - 0830	49	27	40	0	3	56	175
0830 - 0845	35	15	28	2	2	25	107
0845 - 0900	48	24	39	2	3	41	157
Per End	472	371	942	22	33	865	2705

Lights	WEST		SOUTH		EAST		
	Golden Hwy		Mitchell Line		Putty Rd		
Peak Per	T	R	L	R	L	T	TOT
0600 - 0700	129	87	523	3	10	422	1174
0615 - 0715	156	155	500	9	7	402	1229
0630 - 0730	169	183	385	13	4	357	1111
0645 - 0745	164	182	276	14	7	305	948
0700 - 0800	156	174	237	14	8	239	828
0715 - 0815	142	114	166	8	9	223	662
0730 - 0830	142	89	146	4	10	215	606
0745 - 0845	145	73	132	4	8	177	539
0800 - 0900	160	69	122	5	9	163	528
PEAK HR	156	155	500	9	7	402	1229

Heavies	WEST		SOUTH		EAST		
	Golden Hwy		Mitchell Line		Putty Rd		
Peak Per	T	R	L	R	L	T	TOT
0600 - 0700	8	11	24	0	4	11	58
0615 - 0715	7	10	28	0	0	14	59
0630 - 0730	6	12	22	0	0	14	54
0645 - 0745	5	10	19	0	1	13	48
0700 - 0800	4	10	19	0	1	16	50
0715 - 0815	7	14	15	0	1	12	49
0730 - 0830	13	18	17	0	2	14	64
0745 - 0845	14	19	20	0	1	14	68
0800 - 0900	15	20	17	0	1	14	67
PEAK HR	7	10	28	0	0	14	59

Combined	WEST		SOUTH		EAST		
	Golden Hwy		Mitchell Line		Putty Rd		
Peak Per	T	R	L	R	L	T	TOT
0600 - 0700	137	98	547	3	14	433	1232
0615 - 0715	163	165	528	9	7	416	1288
0630 - 0730	175	195	407	13	4	371	1165
0645 - 0745	169	192	295	14	8	318	996
0700 - 0800	160	184	256	14	9	255	878
0715 - 0815	149	128	181	8	10	235	711
0730 - 0830	155	107	163	4	12	229	670
0745 - 0845	159	92	152	4	9	191	607
0800 - 0900	175	89	139	5	10	177	595
PEAK HR	163	165	528	9	7	416	1288

R.O.A.R. DATA
Reliable, Original & Authentic Results
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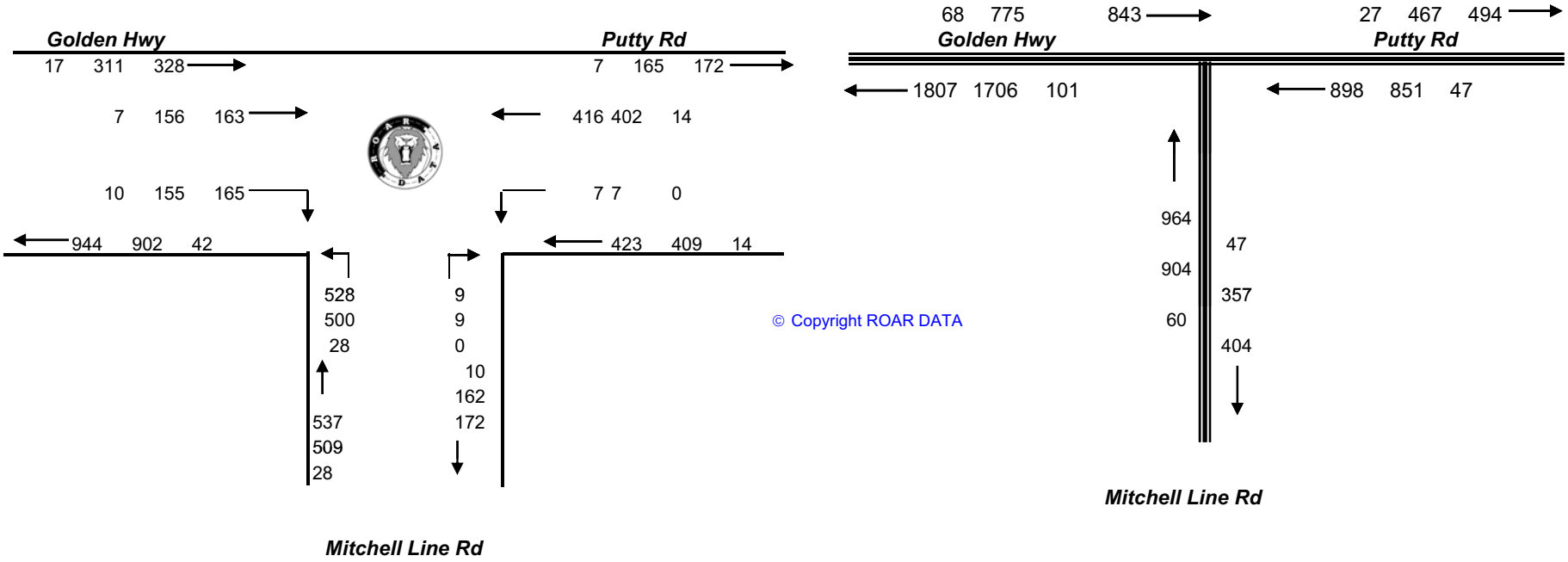
Client : EMGA
Job No/Name : 5030 MT. THORLEY Mine Access
Day/Date : Tuesday 4th March 2014

AM PEAK
0615 - 0715

TOTAL VOLUMES FOR COUNT PERIOD



R.O.A.R. DATA
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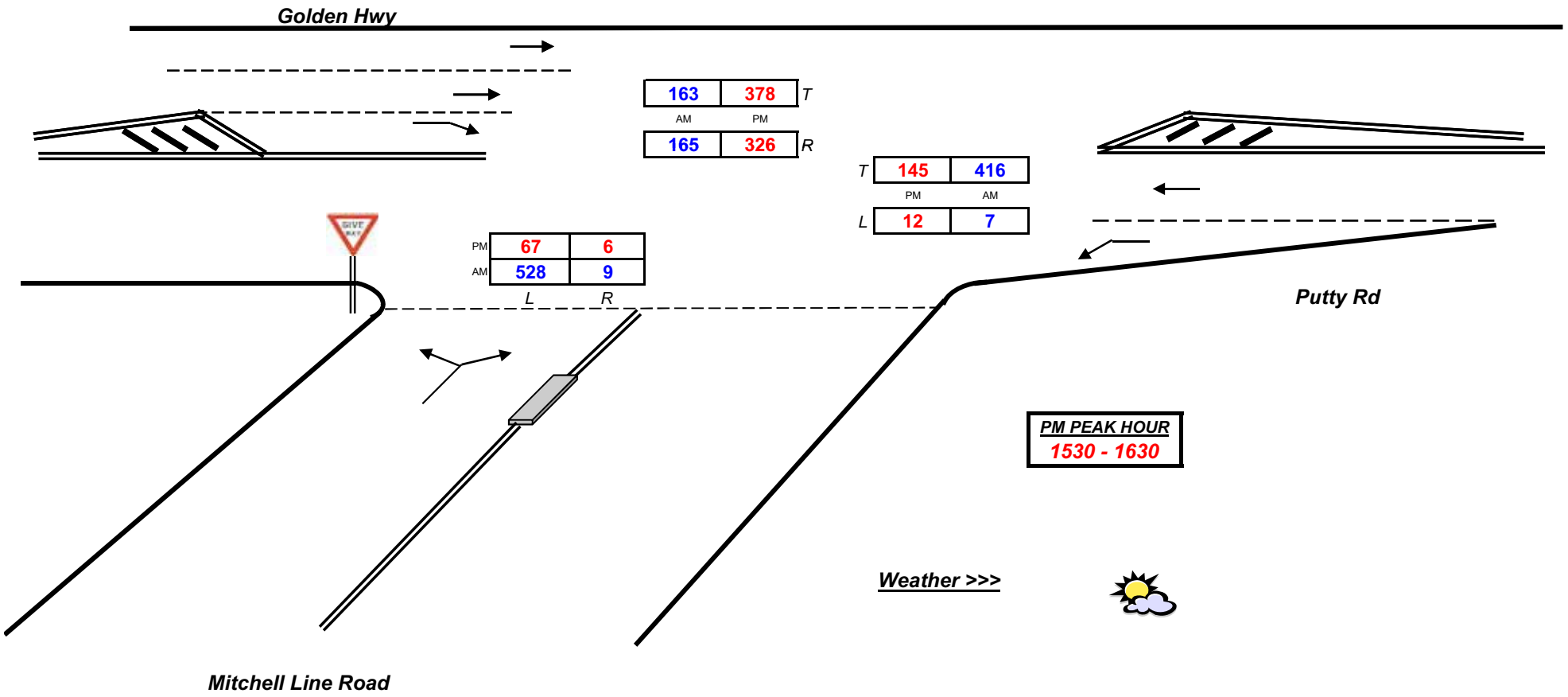
Client : EMGA
Job No/Name : 5030 MT. THORLEY Mine Access
Day/Date : Tuesday 4th March 2014

Intersection Details
Obtained via satellite
May be incorrect

AM PEAK HOUR
0615 - 0715

Combined figures only



PM PEAK HOUR
1530 - 1630

Weather >>>

R.O.A.R. DATA

Reliable, Original & Authentic Results

Ph.88196847, Fax 88196849.
Mobile.0418239019

Client : EMGA
Job No/Name : 5030 MT. THORLEY Mine Access
Day/Date : Tuesday 4th March 2014

PEDS	WEST	SOUTH	EAST	
Time Per	Golden Hwy	Mitchell Line	Putty Rd	TOT
1500 - 1515				0
1515 - 1530		NOT		0
1530 - 1545		REQUIRED		0
1545 - 1600				0
1600 - 1615				0
1615 - 1630				0
1630 - 1645				0
1645 - 1700				0
1700 - 1715				0
1715 - 1730				0
1730 - 1745				0
1745 - 1800				0
Per End	0	0	0	0

PEDS	WEST	SOUTH	EAST	
Peak Per	Golden Hwy	Mitchell Line	Putty Rd	TOT
1500 - 1600	0	0	0	0
1515 - 1615	0	0	0	0
1530 - 1630	0	0	0	0
1545 - 1645	0	0	0	0
1600 - 1700	0	0	0	0
1615 - 1715	0	0	0	0
1630 - 1730	0	0	0	0
1645 - 1745	0	0	0	0
1700 - 1800	0	0	0	0
PEAK HR	0	0	0	0

Lights	WEST		SOUTH		EAST		
	Golden Hwy		Mitchell Line		Putty Rd		
Time Per	T	R	L	R	L	T	TOT
1500 - 1515	74	80	17	8	4	43	226
1515 - 1530	75	73	17	2	3	27	197
1530 - 1545	90	92	10	1	1	30	224
1545 - 1600	89	79	22	1	4	34	229
1600 - 1615	108	71	7	0	4	32	222
1615 - 1630	80	64	14	4	3	31	196
1630 - 1645	87	62	15	1	3	30	198
1645 - 1700	76	67	23	0	6	25	197
1700 - 1715	86	80	27	3	1	38	235
1715 - 1730	60	51	27	3	1	32	174
1730 - 1745	41	34	32	1	2	44	154
1745 - 1800	54	49	49	2	0	45	199
Per End	920	802	260	26	32	411	2451

Heavies	WEST		SOUTH		EAST		
	Golden Hwy		Mitchell Line		Putty Rd		
Time Per	T	R	L	R	L	T	TOT
1500 - 1515	1	5	7	1	0	3	17
1515 - 1530	1	1	5	0	0	1	8
1530 - 1545	4	4	2	0	0	5	15
1545 - 1600	5	4	2	0	0	7	18
1600 - 1615	1	8	5	0	0	2	16
1615 - 1630	1	4	5	0	0	4	14
1630 - 1645	4	2	2	0	0	0	8
1645 - 1700	4	1	2	0	0	0	7
1700 - 1715	2	8	3	0	0	1	14
1715 - 1730	2	3	6	0	0	2	13
1730 - 1745	1	2	4	0	0	2	9
1745 - 1800	1	4	2	0	1	0	8
Per End	27	46	45	1	1	27	147

Combined	WEST		SOUTH		EAST		
	Golden Hwy		Mitchell Line		Putty Rd		
Time Per	T	R	L	R	L	T	TOT
1500 - 1515	75	85	24	9	4	46	243
1515 - 1530	76	74	22	2	3	28	205
1530 - 1545	94	96	12	1	1	35	239
1545 - 1600	94	83	24	1	4	41	247
1600 - 1615	109	79	12	0	4	34	238
1615 - 1630	81	68	19	4	3	35	210
1630 - 1645	91	64	17	1	3	30	206
1645 - 1700	80	68	25	0	6	25	204
1700 - 1715	88	88	30	3	1	39	249
1715 - 1730	62	54	33	3	1	34	187
1730 - 1745	42	36	36	1	2	46	163
1745 - 1800	55	53	51	2	1	45	207
Per End	947	848	305	27	33	438	2598

Lights	WEST		SOUTH		EAST		
	Golden Hwy		Mitchell Line		Putty Rd		
Peak Per	T	R	L	R	L	T	TOT
1500 - 1600	328	324	66	12	12	134	876
1515 - 1615	362	315	56	4	12	123	872
1530 - 1630	367	306	53	6	12	127	871
1545 - 1645	364	276	58	6	14	127	845
1600 - 1700	351	264	59	5	16	118	813
1615 - 1715	329	273	79	8	13	124	826
1630 - 1730	309	260	92	7	11	125	804
1645 - 1745	263	232	109	7	10	139	760
1700 - 1800	241	214	135	9	4	159	762
PEAK HR	367	306	53	6	12	127	871

Heavies	WEST		SOUTH		EAST		
	Golden Hwy		Mitchell Line		Putty Rd		
Peak Per	T	R	L	R	L	T	TOT
1500 - 1600	11	14	16	1	0	16	58
1515 - 1615	11	17	14	0	0	15	57
1530 - 1630	11	20	14	0	0	18	63
1545 - 1645	11	18	14	0	0	13	56
1600 - 1700	10	15	14	0	0	6	45
1615 - 1715	11	15	12	0	0	5	43
1630 - 1730	12	14	13	0	0	3	42
1645 - 1745	9	14	15	0	0	5	43
1700 - 1800	6	17	15	0	1	5	44
PEAK HR	11	20	14	0	0	18	63

Combined	WEST		SOUTH		EAST		
	Golden Hwy		Mitchell Line		Putty Rd		
Peak Per	T	R	L	R	L	T	TOT
1500 - 1600	339	338	82	13	12	150	934
1515 - 1615	373	332	70	4	12	138	929
1530 - 1630	378	326	67	6	12	145	934
1545 - 1645	375	294	72	6	14	140	901
1600 - 1700	361	279	73	5	16	124	858
1615 - 1715	340	288	91	8	13	129	869
1630 - 1730	321	274	105	7	11	128	846
1645 - 1745	272	246	124	7	10	144	803
1700 - 1800	247	231	150	9	5	164	806
PEAK HR	378	326	67	6	12	145	934

R.O.A.R. DATA
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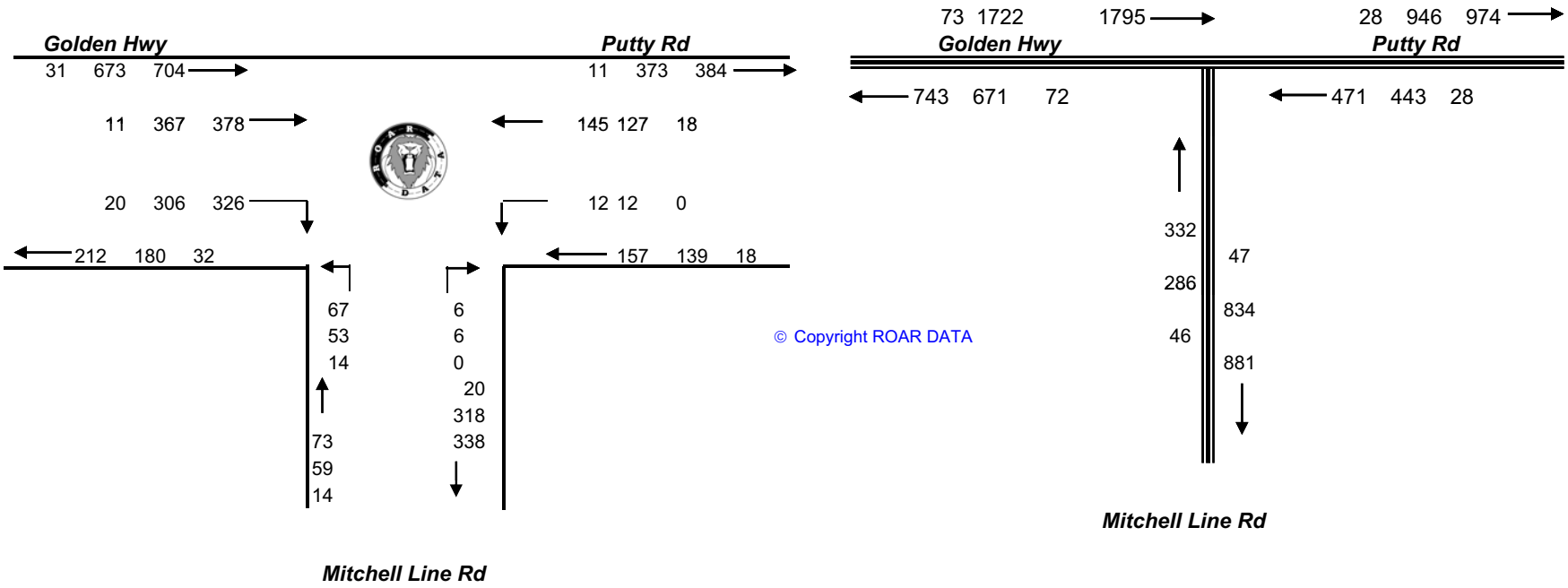
Client : EMGA
Job No/Name : 5030 MT. THORLEY Mine Access
Day/Date : Tuesday 4th March 2014

PM PEAK
1530 - 1630

N

TOTAL VOLUMES FOR COUNT PERIOD



R.O.A.R. DATA

Reliable, Original & Authentic Results

Ph.88196847, Fax 88196849.
Mobile.0418239019

Client : EMGA
Job No/Name : 5030 MT. THORLEY Mine Access
Day/Date : Tuesday 4th March 2014

PEDS	NORTH	WEST	SOUTH	
Time Per	*Broke Rd*	*Mt Thorley*	*Broke Rd*	TOT
0600 - 0615				**0**
0615 - 0630		NOT		**0**
0630 - 0645		REQUIRED		**0**
0645 - 0700				**0**
0700 - 0715				**0**
0715 - 0730				**0**
0730 - 0745				**0**
0745 - 0800				**0**
0800 - 0815				**0**
0815 - 0830				**0**
0830 - 0845				**0**
0845 - 0900				**0**
Per End	**0**	**0**	**0**	**0**

PEDS	NORTH	WEST	SOUTH	
Peak Per	*Broke Rd*	*Mt Thorley*	*Broke Rd*	TOT
0600 - 0700	0	0	0	**0**
0615 - 0715	0	0	0	**0**
0630 - 0730	0	0	0	**0**
0645 - 0745	0	0	0	**0**
0700 - 0800	0	0	0	**0**
0715 - 0815	0	0	0	**0**
0730 - 0830	0	0	0	**0**
0745 - 0845	0	0	0	**0**
0800 - 0900	0	0	0	**0**
PEAK HR	**0**	**0**	**0**	**0**

Lights	NORTH		WEST		SOUTH		
	Broke Rd		*Mt Thorley*		*Broke Rd*		
Time Per	T	R	L	R	L	T	TOT
0600 - 0615	26	5	0	0	0	20	**51**
0615 - 0630	57	3	0	0	1	25	**86**
0630 - 0645	71	4	0	0	0	27	**102**
0645 - 0700	60	4	1	1	0	29	**95**
0700 - 0715	46	0	0	0	0	36	**82**
0715 - 0730	31	3	0	0	0	40	**74**
0730 - 0745	27	2	0	0	0	24	**53**
0745 - 0800	20	1	0	0	0	25	**46**
0800 - 0815	32	2	0	0	0	24	**58**
0815 - 0830	15	5	0	0	0	21	**41**
0830 - 0845	16	0	1	0	0	15	**32**
0845 - 0900	15	0	0	0	0	26	**41**
Per End	**416**	**29**	**2**	**1**	**1**	**312**	**761**

Heavies	NORTH		WEST		SOUTH		
	Broke Rd		*Mt Thorley*		*Broke Rd*		
Time Per	T	R	L	R	L	T	TOT
0600 - 0615	0	0	0	0	0	1	**1**
0615 - 0630	3	0	0	0	0	2	**5**
0630 - 0645	2	0	0	0	0	1	**3**
0645 - 0700	2	0	0	0	0	1	**3**
0700 - 0715	4	0	0	0	0	1	**5**
0715 - 0730	2	0	0	0	0	2	**4**
0730 - 0745	2	0	0	0	0	1	**3**
0745 - 0800	1	0	0	0	0	3	**4**
0800 - 0815	1	0	0	0	0	3	**4**
0815 - 0830	2	0	0	0	0	1	**3**
0830 - 0845	2	0	0	0	0	3	**5**
0845 - 0900	4	0	0	0	0	2	**6**
Per End	**25**	**0**	**0**	**0**	**0**	**21**	**46**

Combined	NORTH		WEST		SOUTH		
	Broke Rd		*Mt Thorley*		*Broke Rd*		
Time Per	T	R	L	R	L	T	TOT
0600 - 0615	26	5	0	0	0	21	**52**
0615 - 0630	60	3	0	0	1	27	**91**
0630 - 0645	73	4	0	0	0	28	**105**
0645 - 0700	62	4	1	1	0	30	**98**
0700 - 0715	50	0	0	0	0	37	**87**
0715 - 0730	33	3	0	0	0	42	**78**
0730 - 0745	29	2	0	0	0	25	**56**
0745 - 0800	21	1	0	0	0	28	**50**
0800 - 0815	33	2	0	0	0	27	**62**
0815 - 0830	17	5	0	0	0	22	**44**
0830 - 0845	18	0	1	0	0	18	**37**
0845 - 0900	19	0	0	0	0	28	**47**
Per End	**441**	**29**	**2**	**1**	**1**	**333**	**807**

Lights	NORTH		WEST		SOUTH		
	Broke Rd		*Mt Thorley*		*Broke Rd*		
Peak Per	T	R	L	R	L	T	TOT
0600 - 0700	214	16	1	1	1	101	**334**
0615 - 0715	234	11	1	1	1	117	**365**
0630 - 0730	208	11	1	1	0	132	**353**
0645 - 0745	164	9	1	1	0	129	**304**
0700 - 0800	124	6	0	0	0	125	**255**
0715 - 0815	110	8	0	0	0	113	**231**
0730 - 0830	94	10	0	0	0	94	**198**
0745 - 0845	83	8	1	0	0	85	**177**
0800 - 0900	78	7	1	0	0	86	**172**
PEAK HR	**234**	**11**	**1**	**1**	**1**	**117**	**365**

Heavies	NORTH		WEST		SOUTH		
	Broke Rd		*Mt Thorley*		*Broke Rd*		
Peak Per	T	R	L	R	L	T	TOT
0600 - 0700	7	0	0	0	0	5	**12**
0615 - 0715	11	0	0	0	0	5	**16**
0630 - 0730	10	0	0	0	0	5	**15**
0645 - 0745	10	0	0	0	0	5	**15**
0700 - 0800	9	0	0	0	0	7	**16**
0715 - 0815	6	0	0	0	0	9	**15**
0730 - 0830	6	0	0	0	0	8	**14**
0745 - 0845	6	0	0	0	0	10	**16**
0800 - 0900	9	0	0	0	0	9	**18**
PEAK HR	**11**	**0**	**0**	**0**	**0**	**5**	**16**

Combined	NORTH		WEST		SOUTH		
	Broke Rd		*Mt Thorley*		*Broke Rd*		
Peak Per	T	R	L	R	L	T	TOT
0600 - 0700	221	16	1	1	1	106	**346**
0615 - 0715	245	11	1	1	1	122	**381**
0630 - 0730	218	11	1	1	0	137	**368**
0645 - 0745	174	9	1	1	0	134	**319**
0700 - 0800	133	6	0	0	0	132	**271**
0715 - 0815	116	8	0	0	0	122	**246**
0730 - 0830	100	10	0	0	0	102	**212**
0745 - 0845	89	8	1	0	0	95	**193**
0800 - 0900	87	7	1	0	0	95	**190**
PEAK HR	**245**	**11**	**1**	**1**	**1**	**122**	**381**

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Client : EMGA
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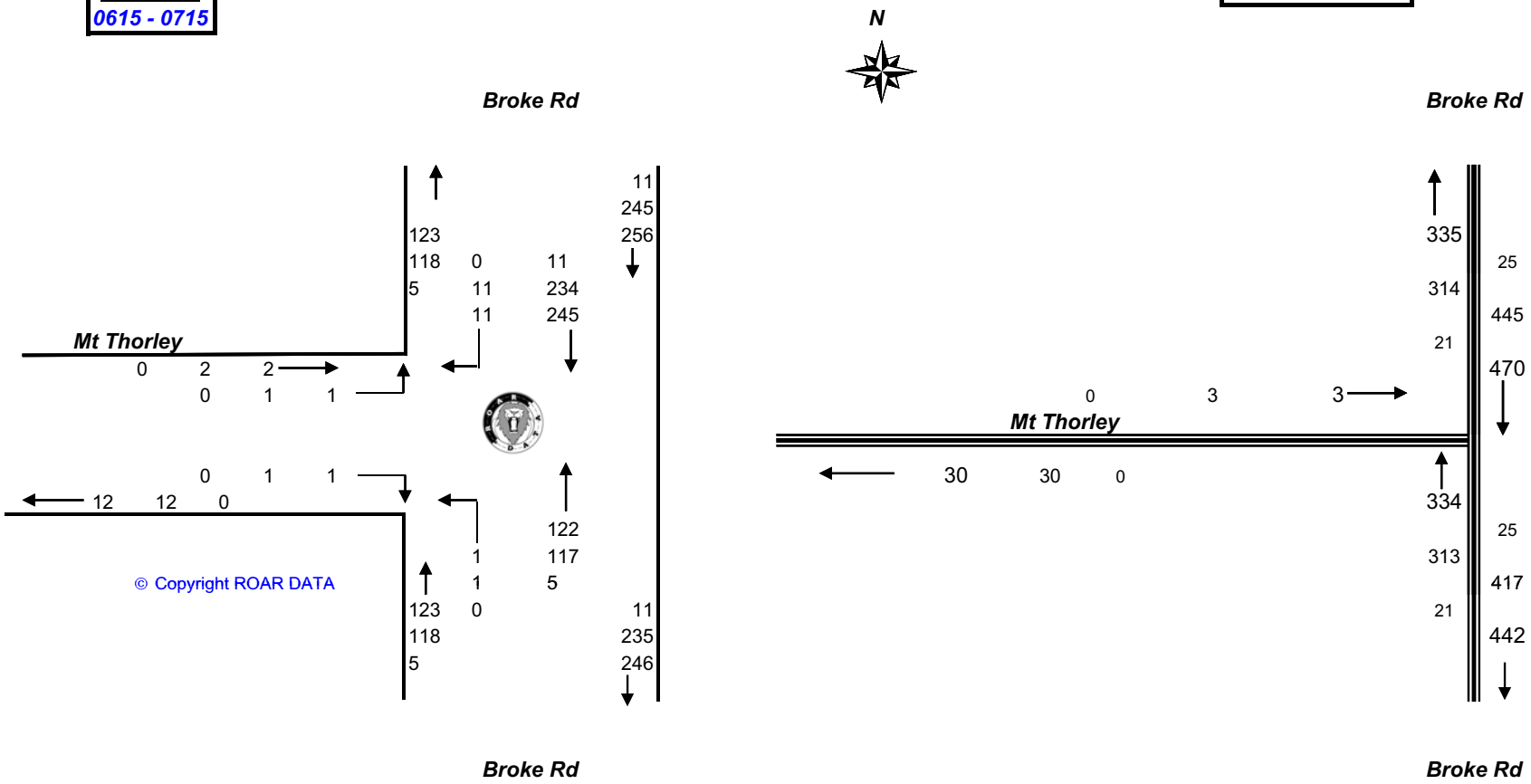
Day/Date : Tuesday 4th March 2014

AM PEAK
0615 - 0715

TOTAL VOLUMES FOR COUNT PERIOD



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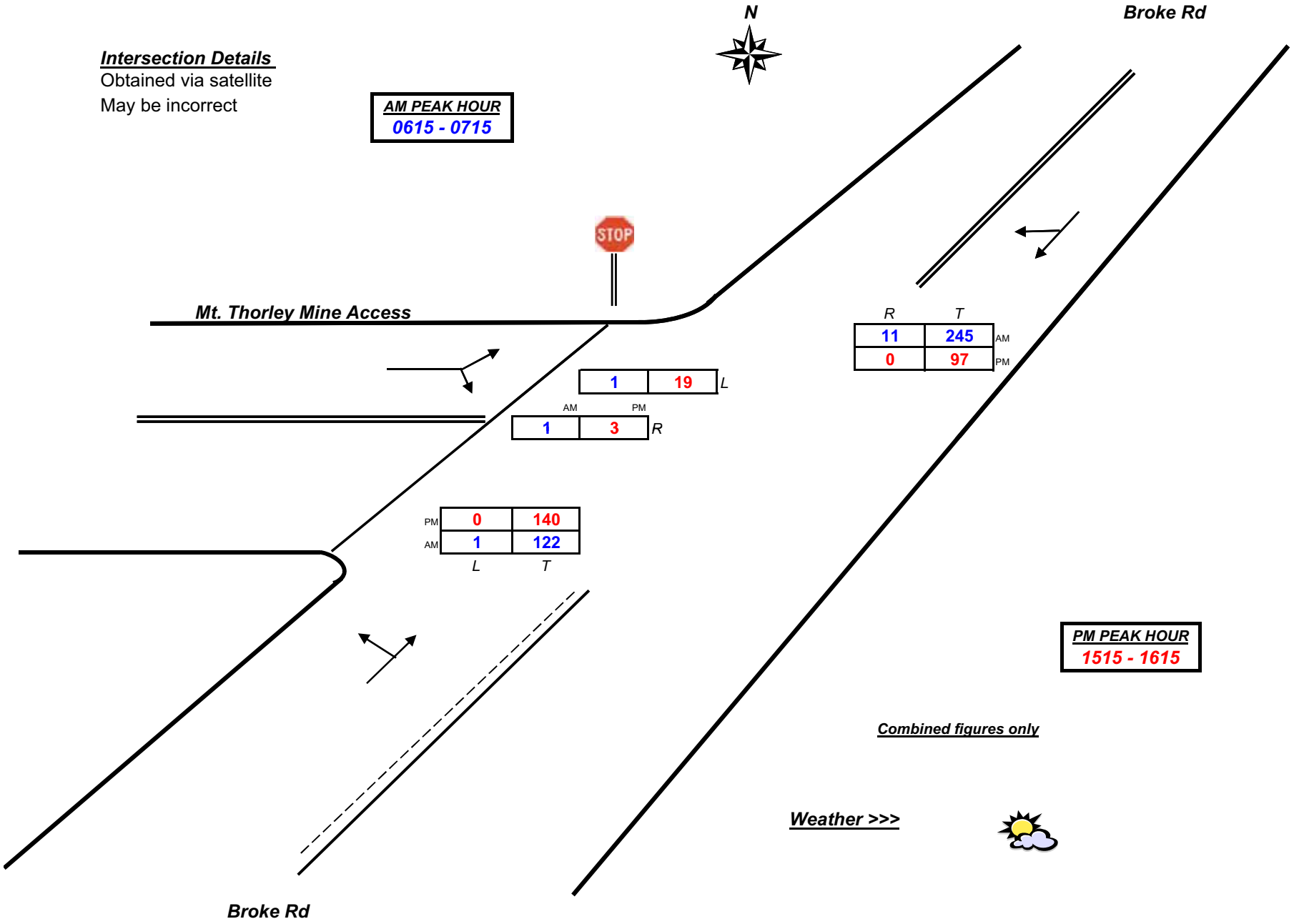

R.O.A.R. DATA

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Mobile.0418239019

Client : EMGA
Job No/Name : 5030 MT. THORLEY Mine Access
Day/Date : Tuesday 4th March 2014

PEDS	NORTH	WEST	SOUTH	
Time Per	*Broke Rd*	*Mt Thorley*	*Broke Rd*	TOT
1500 - 1515				0
1515 - 1530		NOT		0
1530 - 1545		REQUIRED		0
1545 - 1600				0
1600 - 1615				0
1615 - 1630				0
1630 - 1645				0
1645 - 1700				0
1700 - 1715				0
1715 - 1730				0
1730 - 1745				0
1745 - 1800				0
Per End	**0**	**0**	**0**	**0**

PEDS	NORTH	WEST	SOUTH	
Peak Per	*Broke Rd*	*Mt Thorley*	*Broke Rd*	TOT
1500 - 1600	0	0	0	**0**
1515 - 1615	0	0	0	**0**
1530 - 1630	0	0	0	**0**
1545 - 1645	0	0	0	**0**
1600 - 1700	0	0	0	**0**
1615 - 1715	0	0	0	**0**
1630 - 1730	0	0	0	**0**
1645 - 1745	0	0	0	**0**
1700 - 1800	0	0	0	**0**
PEAK HR	**0**	**0**	**0**	**0**

Lights	NORTH		WEST		SOUTH		
	Broke Rd		*Mt Thorley*		*Broke Rd*		
Time Per	T	R	L	R	L	T	TOT
1500 - 1515	32	0	4	0	0	29	**65**
1515 - 1530	24	0	3	0	0	33	**60**
1530 - 1545	26	0	2	0	0	35	**63**
1545 - 1600	17	0	9	2	0	22	**50**
1600 - 1615	24	0	5	1	0	45	**75**
1615 - 1630	23	0	3	0	0	23	**49**
1630 - 1645	15	0	2	0	0	30	**47**
1645 - 1700	17	0	1	0	0	32	**50**
1700 - 1715	25	0	1	0	0	33	**59**
1715 - 1730	19	0	0	0	0	17	**36**
1730 - 1745	22	0	0	0	0	22	**44**
1745 - 1800	11	0	1	0	0	23	**35**
Per End	**255**	**0**	**31**	**3**	**0**	**344**	**633**

Heavies	NORTH		WEST		SOUTH		
	Broke Rd		*Mt Thorley*		*Broke Rd*		
Time Per	T	R	L	R	L	T	TOT
1500 - 1515	0	0	0	0	0	1	**1**
1515 - 1530	1	0	0	0	0	1	**2**
1530 - 1545	2	0	0	0	0	2	**4**
1545 - 1600	1	0	0	0	0	1	**2**
1600 - 1615	2	0	0	0	0	1	**3**
1615 - 1630	2	0	0	0	0	0	**2**
1630 - 1645	0	0	0	0	0	1	**1**
1645 - 1700	1	0	0	0	0	2	**3**
1700 - 1715	0	0	0	0	0	2	**2**
1715 - 1730	0	0	0	0	0	0	**0**
1730 - 1745	0	0	0	0	0	1	**1**
1745 - 1800	0	0	0	0	0	2	**2**
Per End	**9**	**0**	**0**	**0**	**0**	**14**	**23**

Combined	NORTH		WEST		SOUTH		
	Broke Rd		*Mt Thorley*		*Broke Rd*		
Time Per	T	R	L	R	L	T	TOT
1500 - 1515	32	0	4	0	0	30	**66**
1515 - 1530	25	0	3	0	0	34	**62**
1530 - 1545	28	0	2	0	0	37	**67**
1545 - 1600	18	0	9	2	0	23	**52**
1600 - 1615	26	0	5	1	0	46	**78**
1615 - 1630	25	0	3	0	0	23	**51**
1630 - 1645	15	0	2	0	0	31	**48**
1645 - 1700	18	0	1	0	0	34	**53**
1700 - 1715	25	0	1	0	0	35	**61**
1715 - 1730	19	0	0	0	0	17	**36**
1730 - 1745	22	0	0	0	0	23	**45**
1745 - 1800	11	0	1	0	0	25	**37**
Per End	**264**	**0**	**31**	**3**	**0**	**358**	**656**

Lights	NORTH		WEST		SOUTH		
	Broke Rd		*Mt Thorley*		*Broke Rd*		
Peak Per	T	R	L	R	L	T	TOT
1500 - 1600	99	0	18	2	0	119	**238**
1515 - 1615	91	0	19	3	0	135	**248**
1530 - 1630	90	0	19	3	0	125	**237**
1545 - 1645	79	0	19	3	0	120	**221**
1600 - 1700	79	0	11	1	0	130	**221**
1615 - 1715	80	0	7	0	0	118	**205**
1630 - 1730	76	0	4	0	0	112	**192**
1645 - 1745	83	0	2	0	0	104	**189**
1700 - 1800	77	0	2	0	0	95	**174**
PEAK HR	**91**	**0**	**19**	**3**	**0**	**135**	**248**

Heavies	NORTH		WEST		SOUTH		
	Broke Rd		*Mt Thorley*		*Broke Rd*		
Peak Per	T	R	L	R	L	T	TOT
1500 - 1600	4	0	0	0	0	5	**9**
1515 - 1615	6	0	0	0	0	5	**11**
1530 - 1630	7	0	0	0	0	4	**11**
1545 - 1645	5	0	0	0	0	3	**8**
1600 - 1700	5	0	0	0	0	4	**9**
1615 - 1715	3	0	0	0	0	5	**8**
1630 - 1730	1	0	0	0	0	5	**6**
1645 - 1745	1	0	0	0	0	5	**6**
1700 - 1800	0	0	0	0	0	5	**5**
PEAK HR	**6**	**0**	**0**	**0**	**0**	**5**	**11**

Combined	NORTH		WEST		SOUTH		
	Broke Rd		*Mt Thorley*		*Broke Rd*		
Peak Per	T	R	L	R	L	T	TOT
1500 - 1600	103	0	18	2	0	124	**247**
1515 - 1615	97	0	19	3	0	140	**259**
1530 - 1630	97	0	19	3	0	129	**248**
1545 - 1645	84	0	19	3	0	123	**229**
1600 - 1700	84	0	11	1	0	134	**230**
1615 - 1715	83	0	7	0	0	123	**213**
1630 - 1730	77	0	4	0	0	117	**198**
1645 - 1745	84	0	2	0	0	109	**195**
1700 - 1800	77	0	2	0	0	100	**179**
PEAK HR	**97**	**0**	**19**	**3**	**0**	**140**	**259**

R.O.A.R. DATA
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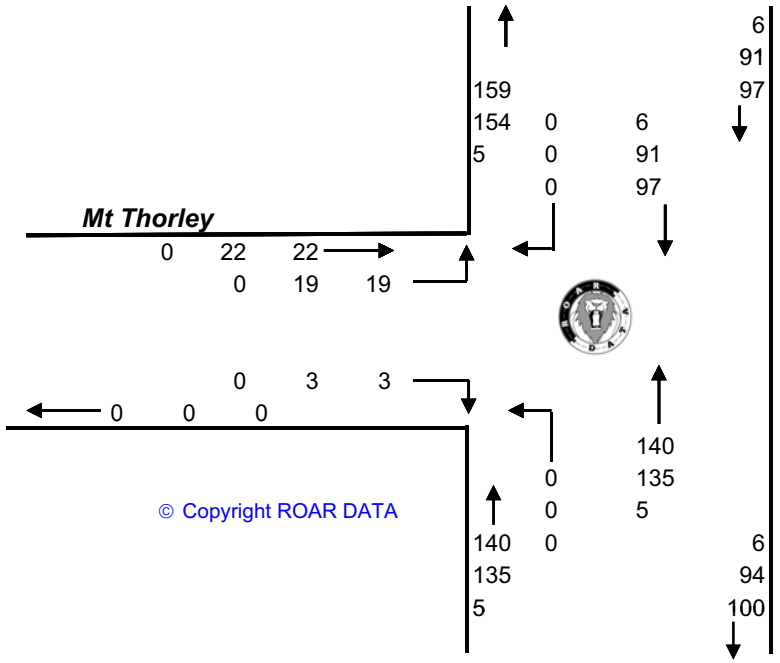
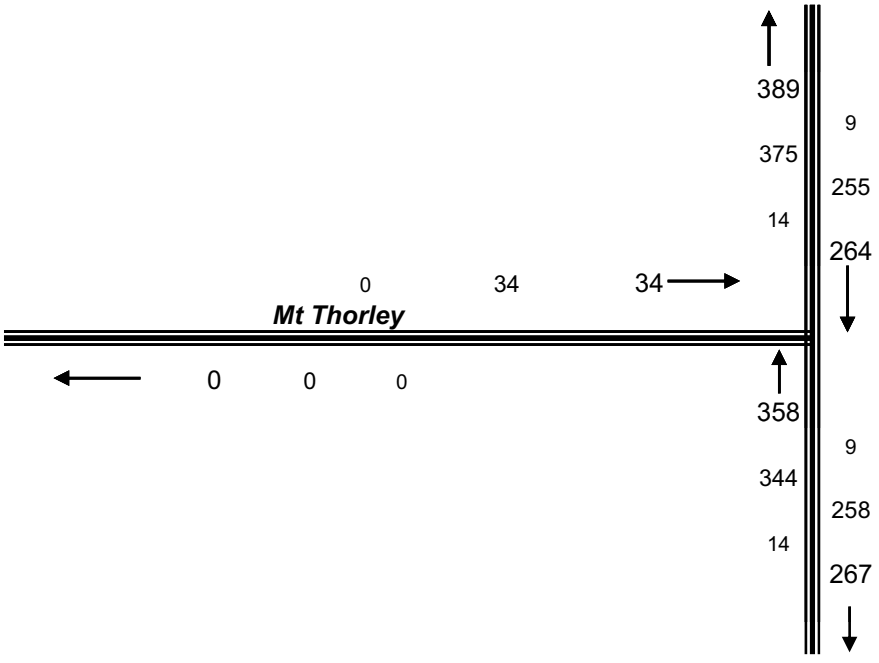
Client : EMGA
Job No/Name : 5030 MT. THORLEY Mine Access
Day/Date : Tuesday 4th March 2014

PM PEAK
1515 - 1615



TOTAL VOLUMES FOR COUNT PERIOD



R.O.A.R. DATA

Reliable, Original & Authentic Results

Ph.88196847, Fax 88196849.
Mobile.0418239019

Client : EMGA
Job No/Name : 5030 MT. THORLEY Mine Access
Day/Date : Tuesday 4th March 2014

PEDS	WEST	NORTH	EAST	
Time Per	Putty Rd	Warkworth	Putty Rd	TOT
0600 - 0615				0
0615 - 0630		NOT		0
0630 - 0645		REQUIRED		0
0645 - 0700				0
0700 - 0715				0
0715 - 0730				0
0730 - 0745				0
0745 - 0800				0
0800 - 0815				0
0815 - 0830				0
0830 - 0845				0
0845 - 0900				0
Per End	0	0	0	0

PEDS	WEST	NORTH	EAST	
Peak Per	Putty Rd	Warkworth	Putty Rd	TOT
0600 - 0700	0	0	0	0
0615 - 0715	0	0	0	0
0630 - 0730	0	0	0	0
0645 - 0745	0	0	0	0
0700 - 0800	0	0	0	0
0715 - 0815	0	0	0	0
0730 - 0830	0	0	0	0
0745 - 0845	0	0	0	0
0800 - 0900	0	0	0	0
PEAK HR	0	0	0	0

Lights	WEST		NORTH		EAST		
	Putty Rd		Warkworth		Putty Rd		
Time Per	T	L	R	L	R	T	TOT
0600 - 0615	5	0	0	5	18	2	30
0615 - 0630	1	5	0	14	39	1	60
0630 - 0645	11	0	0	14	19	1	45
0645 - 0700	11	0	1	17	10	4	43
0700 - 0715	7	1	2	63	23	3	99
0715 - 0730	4	1	1	5	13	3	27
0730 - 0745	5	0	0	8	9	5	27
0745 - 0800	9	0	0	5	5	3	22
0800 - 0815	10	1	0	5	6	5	27
0815 - 0830	15	0	1	5	7	8	36
0830 - 0845	11	0	0	2	5	2	20
0845 - 0900	12	0	0	3	3	8	26
Per End	101	8	5	146	157	45	462

Heavies	WEST		NORTH		EAST		
	Putty Rd		Warkworth		Putty Rd		
Time Per	T	L	R	L	R	T	TOT
0600 - 0615	0	0	0	0	0	0	0
0615 - 0630	0	1	0	0	1	0	2
0630 - 0645	0	0	0	0	1	0	1
0645 - 0700	0	0	0	0	1	0	1
0700 - 0715	1	0	0	0	0	0	1
0715 - 0730	0	0	0	0	0	2	2
0730 - 0745	1	0	0	0	0	0	1
0745 - 0800	0	0	0	0	0	0	0
0800 - 0815	0	0	0	0	2	0	2
0815 - 0830	1	0	0	0	1	0	2
0830 - 0845	1	0	0	2	4	0	7
0845 - 0900	1	0	0	2	0	0	3
Per End	5	1	0	4	10	2	22

Combined	WEST		NORTH		EAST		
	Putty Rd		Warkworth		Putty Rd		
Time Per	T	L	R	L	R	T	TOT
0600 - 0615	5	0	0	5	18	2	30
0615 - 0630	1	6	0	14	40	1	62
0630 - 0645	11	0	0	14	20	1	46
0645 - 0700	11	0	1	17	11	4	44
0700 - 0715	8	1	2	63	23	3	100
0715 - 0730	4	1	1	5	13	5	29
0730 - 0745	6	0	0	8	9	5	28
0745 - 0800	9	0	0	5	5	3	22
0800 - 0815	10	1	0	5	8	5	29
0815 - 0830	16	0	1	5	8	8	38
0830 - 0845	12	0	0	4	9	2	27
0845 - 0900	13	0	0	5	3	8	29
Per End	106	9	5	150	167	47	484

Lights	WEST		NORTH		EAST		
	Putty Rd		Warkworth		Putty Rd		
Peak Per	T	L	R	L	R	T	TOT
0600 - 0700	28	5	1	50	86	8	178
0615 - 0715	30	6	3	108	91	9	247
0630 - 0730	33	2	4	99	65	11	214
0645 - 0745	27	2	4	93	55	15	196
0700 - 0800	25	2	3	81	50	14	175
0715 - 0815	28	2	1	23	33	16	103
0730 - 0830	39	1	1	23	27	21	112
0745 - 0845	45	1	1	17	23	18	105
0800 - 0900	48	1	1	15	21	23	109
PEAK HR	30	6	3	108	91	9	247

Heavies	WEST		NORTH		EAST		
	Putty Rd		Warkworth		Putty Rd		
Peak Per	T	L	R	L	R	T	TOT
0600 - 0700	0	1	0	0	3	0	4
0615 - 0715	1	1	0	0	3	0	5
0630 - 0730	1	0	0	0	2	2	5
0645 - 0745	2	0	0	0	1	2	5
0700 - 0800	2	0	0	0	0	2	4
0715 - 0815	1	0	0	0	2	2	5
0730 - 0830	2	0	0	0	3	0	5
0745 - 0845	2	0	0	2	7	0	11
0800 - 0900	3	0	0	4	7	0	14
PEAK HR	1	1	0	0	3	0	5

Combined	WEST		NORTH		EAST		
	Putty Rd		Warkworth		Putty Rd		
Peak Per	T	L	R	L	R	T	TOT
0600 - 0700	28	6	1	50	89	8	182
0615 - 0715	31	7	3	108	94	9	252
0630 - 0730	34	2	4	99	67	13	219
0645 - 0745	29	2	4	93	56	17	201
0700 - 0800	27	2	3	81	50	16	179
0715 - 0815	29	2	1	23	35	18	108
0730 - 0830	41	1	1	23	30	21	117
0745 - 0845	47	1	1	19	30	18	116
0800 - 0900	51	1	1	19	28	23	123
PEAK HR	31	7	3	108	94	9	252

R.O.A.R. DATA

Client : EMGA

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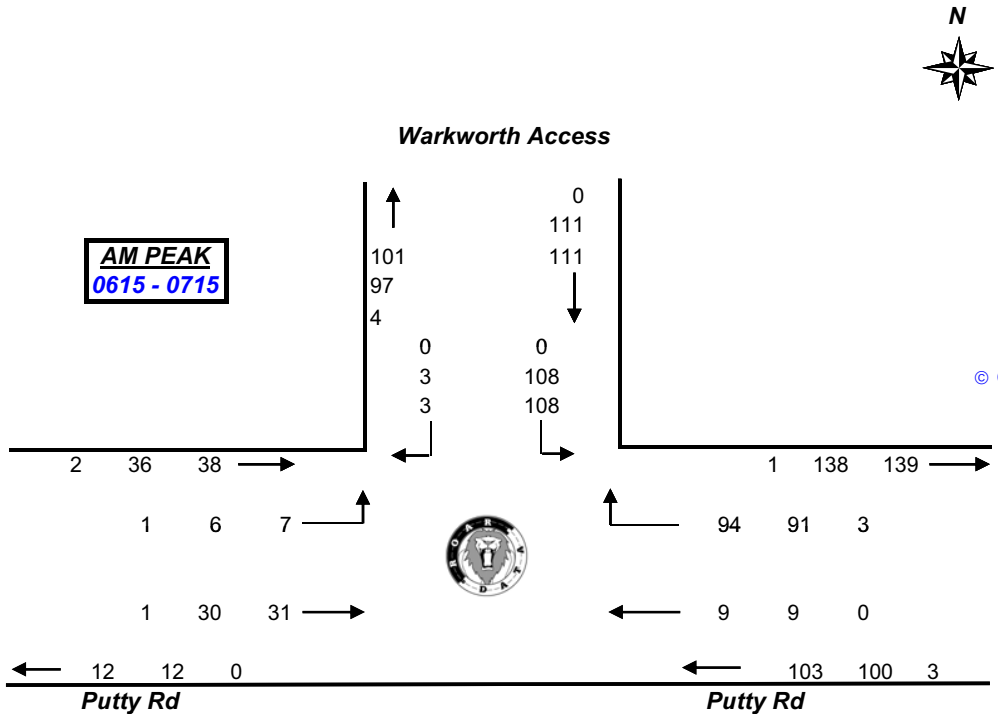
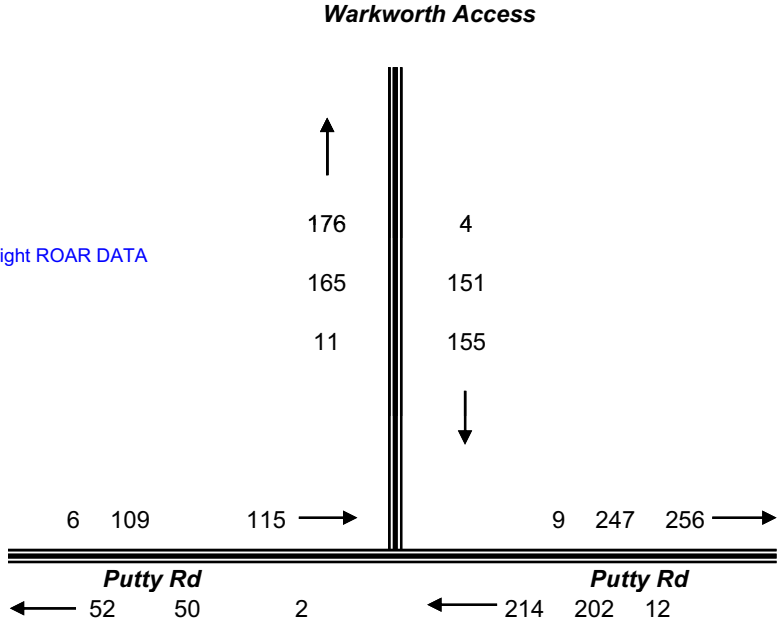
Job No/Name : 5030 MT. THORLEY Mine Access
Day/Date : Tuesday 4th March 2014

TOTAL VOLUMES FOR COUNT PERIOD





R.O.A.R. DATA
Reliable, Original & Authentic Results
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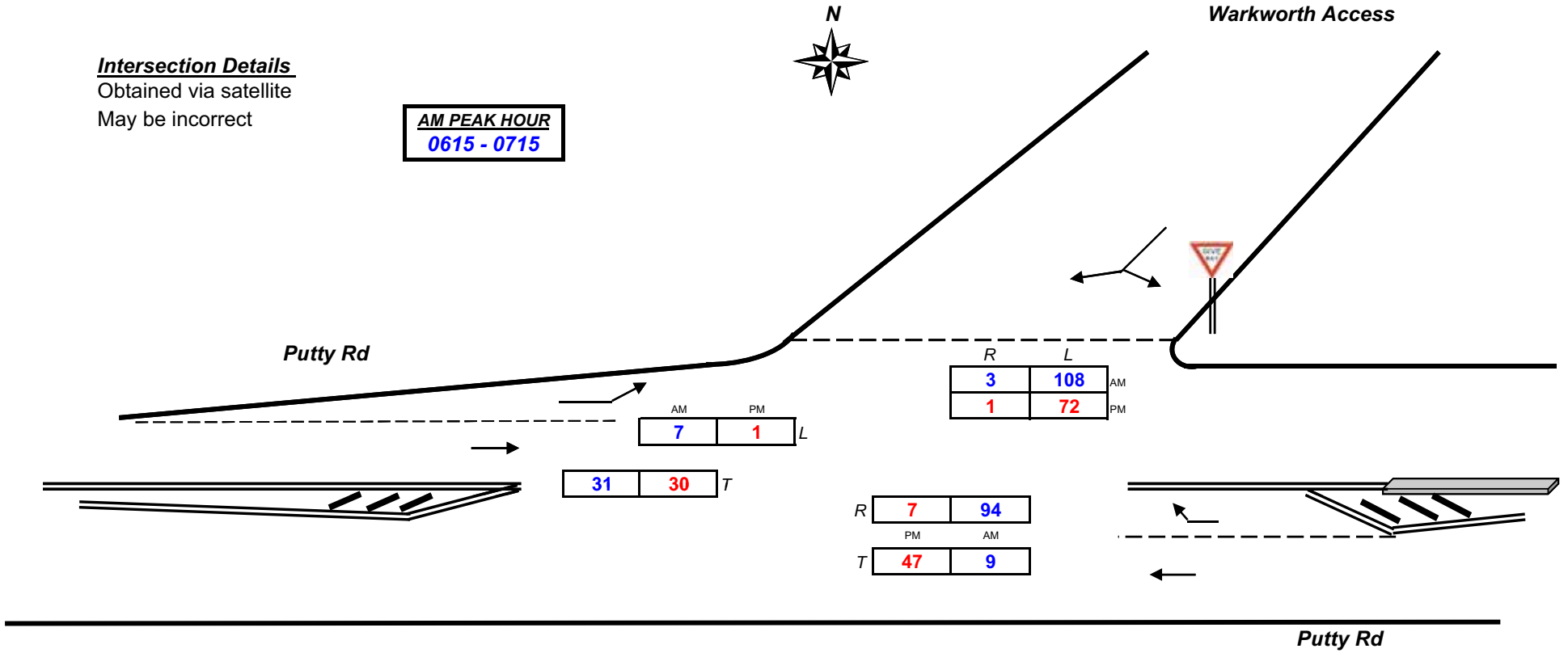
Client : EMGA
Job No/Name : 5030 MT. THORLEY Mine Access
Day/Date : Tuesday 4th March 2014

Intersection Details
Obtained via satellite
May be incorrect

AM PEAK HOUR
0615 - 0715



Combined figures only

PM PEAK HOUR
1530 - 1630

Weather >>>

R.O.A.R. DATA

Reliable, Original & Authentic Results

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Mobile.0418239019

Client : EMGA
Job No/Name : 5030 MT. THORLEY Mine Access
Day/Date : Tuesday 4th March 2014

PEDS	WEST	NORTH	EAST	
Time Per	Putty Rd	Warkworth	Putty Rd	TOT
1500 - 1515				0
1515 - 1530		NOT		0
1530 - 1545		REQUIRED		0
1545 - 1600				0
1600 - 1615				0
1615 - 1630				0
1630 - 1645				0
1645 - 1700				0
1700 - 1715				0
1715 - 1730				0
1730 - 1745				0
1745 - 1800				0
Per End	0	0	0	0

PEDS	WEST	NORTH	EAST	
Peak Per	Putty Rd	Warkworth	Putty Rd	TOT
1500 - 1600	0	0	0	0
1515 - 1615	0	0	0	0
1530 - 1630	0	0	0	0
1545 - 1645	0	0	0	0
1600 - 1700	0	0	0	0
1615 - 1715	0	0	0	0
1630 - 1730	0	0	0	0
1645 - 1745	0	0	0	0
1700 - 1800	0	0	0	0
PEAK HR	0	0	0	0

Lights	WEST		NORTH		EAST		
	Putty Rd		Warkworth		Putty Rd		
Time Per	T	L	R	L	R	T	TOT
1500 - 1515	7	0	0	15	5	5	32
1515 - 1530	4	0	1	6	3	14	28
1530 - 1545	8	1	1	25	2	10	47
1545 - 1600	10	0	0	10	1	4	25
1600 - 1615	4	0	0	23	2	14	43
1615 - 1630	7	0	0	11	2	14	34
1630 - 1645	6	0	0	11	2	9	28
1645 - 1700	2	0	0	6	0	13	21
1700 - 1715	6	1	0	5	11	17	40
1715 - 1730	7	1	0	8	13	8	37
1730 - 1745	2	0	0	7	5	7	21
1745 - 1800	5	0	0	17	32	18	72
Per End	68	3	2	144	78	133	428

Heavies	WEST		NORTH		EAST		
	Putty Rd		Warkworth		Putty Rd		
Time Per	T	L	R	L	R	T	TOT
1500 - 1515	3	0	0	0	0	1	4
1515 - 1530	0	0	0	0	1	0	1
1530 - 1545	1	0	0	2	0	1	4
1545 - 1600	0	0	0	0	0	1	1
1600 - 1615	0	0	0	1	0	1	2
1615 - 1630	0	0	0	0	0	2	2
1630 - 1645	1	0	0	0	0	0	1
1645 - 1700	0	0	0	0	0	0	0
1700 - 1715	2	0	0	0	0	0	2
1715 - 1730	1	0	0	0	0	0	1
1730 - 1745	0	0	0	0	0	0	0
1745 - 1800	0	0	0	0	0	2	2
Per End	8	0	0	3	1	8	20

Combined	WEST		NORTH		EAST		
	Putty Rd		Warkworth		Putty Rd		
Time Per	T	L	R	L	R	T	TOT
1500 - 1515	10	0	0	15	5	6	36
1515 - 1530	4	0	1	6	4	14	29
1530 - 1545	9	1	1	27	2	11	51
1545 - 1600	10	0	0	10	1	5	26
1600 - 1615	4	0	0	24	2	15	45
1615 - 1630	7	0	0	11	2	16	36
1630 - 1645	7	0	0	11	2	9	29
1645 - 1700	2	0	0	6	0	13	21
1700 - 1715	8	1	0	5	11	17	42
1715 - 1730	8	1	0	8	13	8	38
1730 - 1745	2	0	0	7	5	7	21
1745 - 1800	5	0	0	17	32	20	74
Per End	76	3	2	147	79	141	448

Lights	WEST		NORTH		EAST		
	Putty Rd		Warkworth		Putty Rd		
Peak Per	T	L	R	L	R	T	TOT
1500 - 1600	29	1	2	56	11	33	132
1515 - 1615	26	1	2	64	8	42	143
1530 - 1630	29	1	1	69	7	42	149
1545 - 1645	27	0	0	55	7	41	130
1600 - 1700	19	0	0	51	6	50	126
1615 - 1715	21	1	0	33	15	53	123
1630 - 1730	21	2	0	30	26	47	126
1645 - 1745	17	2	0	26	29	45	119
1700 - 1800	20	2	0	37	61	50	170
PEAK HR	29	1	1	69	7	42	149

Heavies	WEST		NORTH		EAST		
	Putty Rd		Warkworth		Putty Rd		
Peak Per	T	L	R	L	R	T	TOT
1500 - 1600	4	0	0	2	1	3	10
1515 - 1615	1	0	0	3	1	3	8
1530 - 1630	1	0	0	3	0	5	9
1545 - 1645	1	0	0	1	0	4	6
1600 - 1700	1	0	0	1	0	3	5
1615 - 1715	3	0	0	0	0	2	5
1630 - 1730	4	0	0	0	0	0	4
1645 - 1745	3	0	0	0	0	0	3
1700 - 1800	3	0	0	0	0	2	5
PEAK HR	1	0	0	3	0	5	9

Combined	WEST		NORTH		EAST		
	Putty Rd		Warkworth		Putty Rd		
Peak Per	T	L	R	L	R	T	TOT
1500 - 1600	33	1	2	58	12	36	142
1515 - 1615	27	1	2	67	9	45	151
1530 - 1630	30	1	1	72	7	47	158
1545 - 1645	28	0	0	56	7	45	136
1600 - 1700	20	0	0	52	6	53	131
1615 - 1715	24	1	0	33	15	55	128
1630 - 1730	25	2	0	30	26	47	130
1645 - 1745	20	2	0	26	29	45	122
1700 - 1800	23	2	0	37	61	52	175
PEAK HR	30	1	1	72	7	47	158

R.O.A.R. DATA

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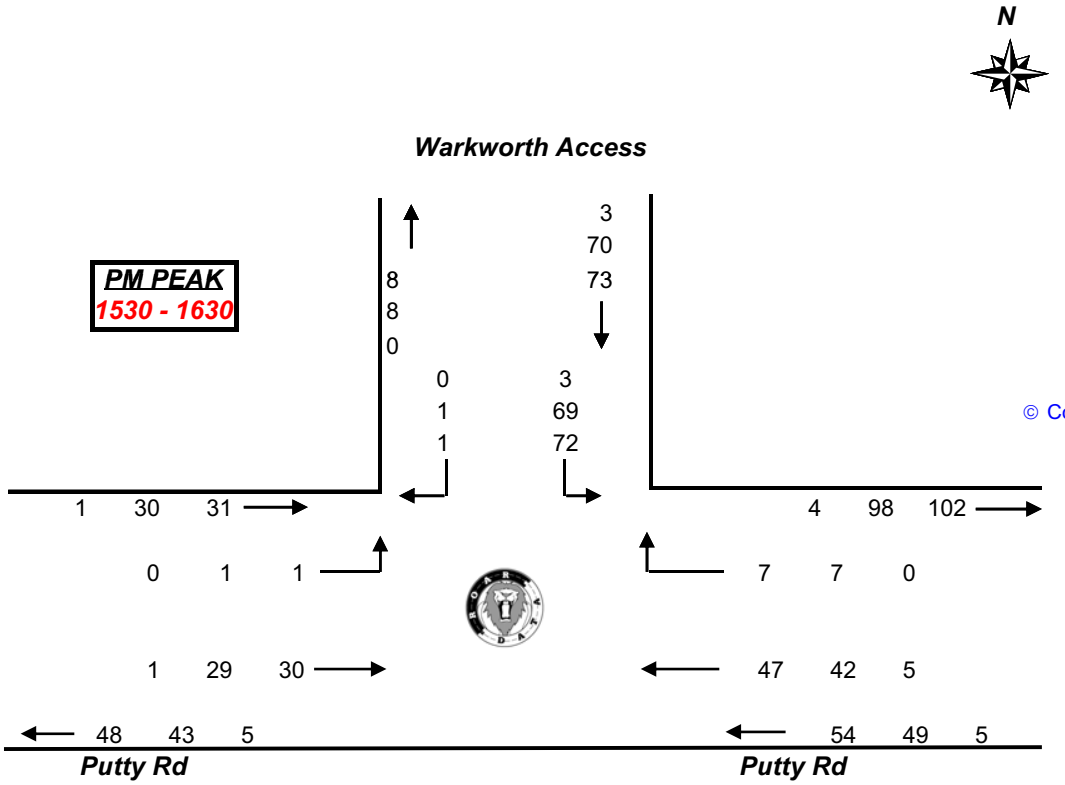
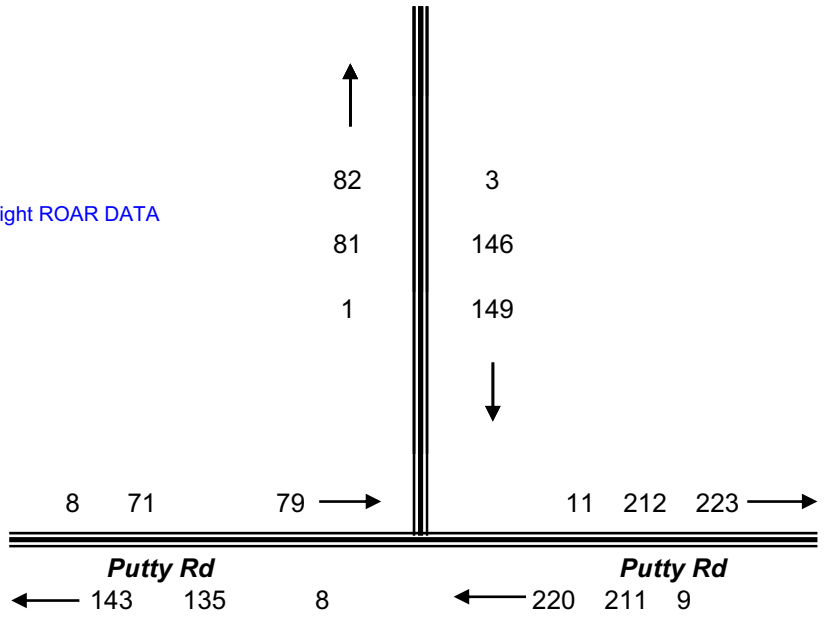
Client : EMGA
Job No/Name : 5030 MT. THORLEY Mine Access
Day/Date : Tuesday 4th March 2014

TOTAL VOLUMES FOR COUNT PERIOD

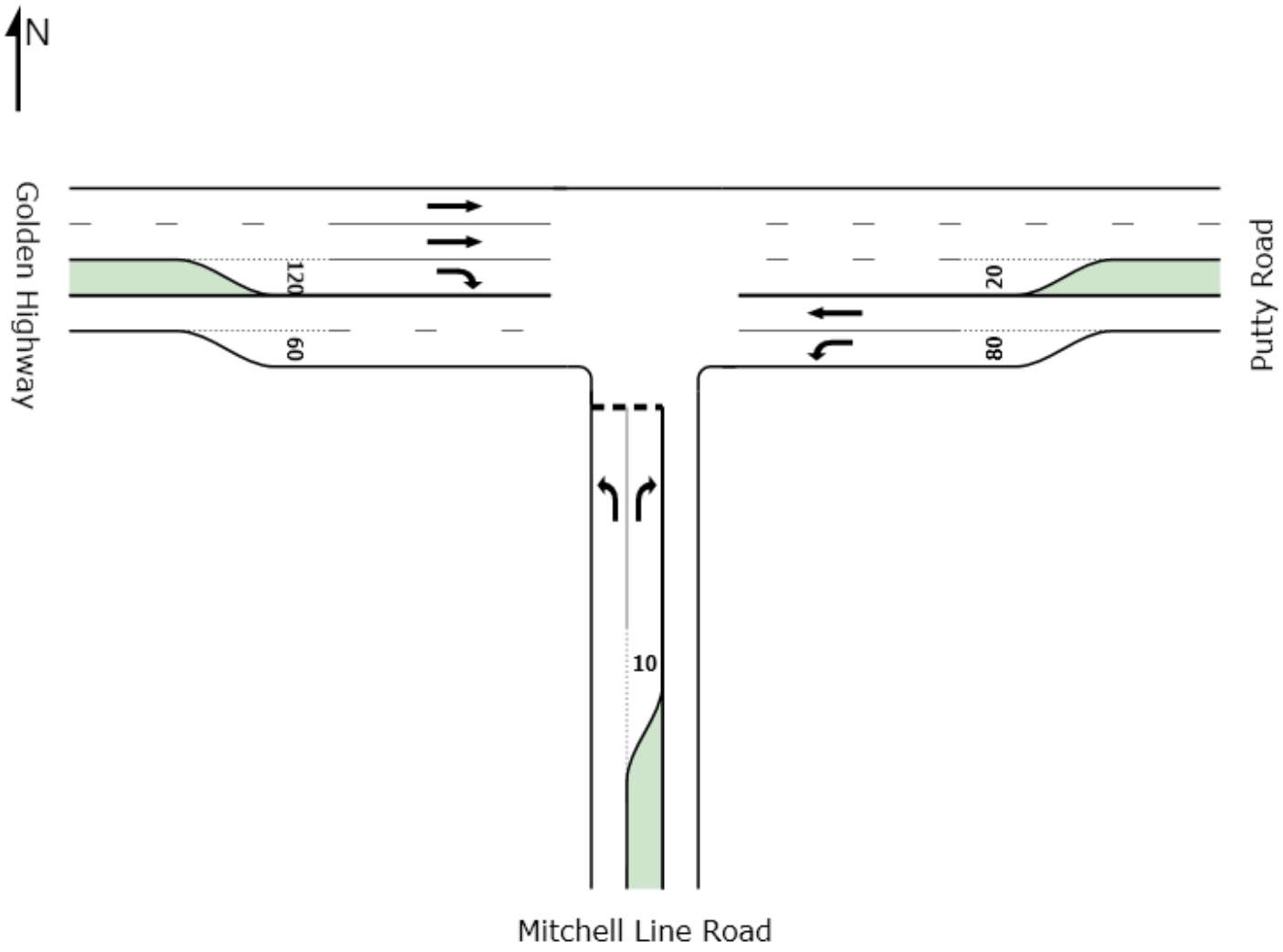


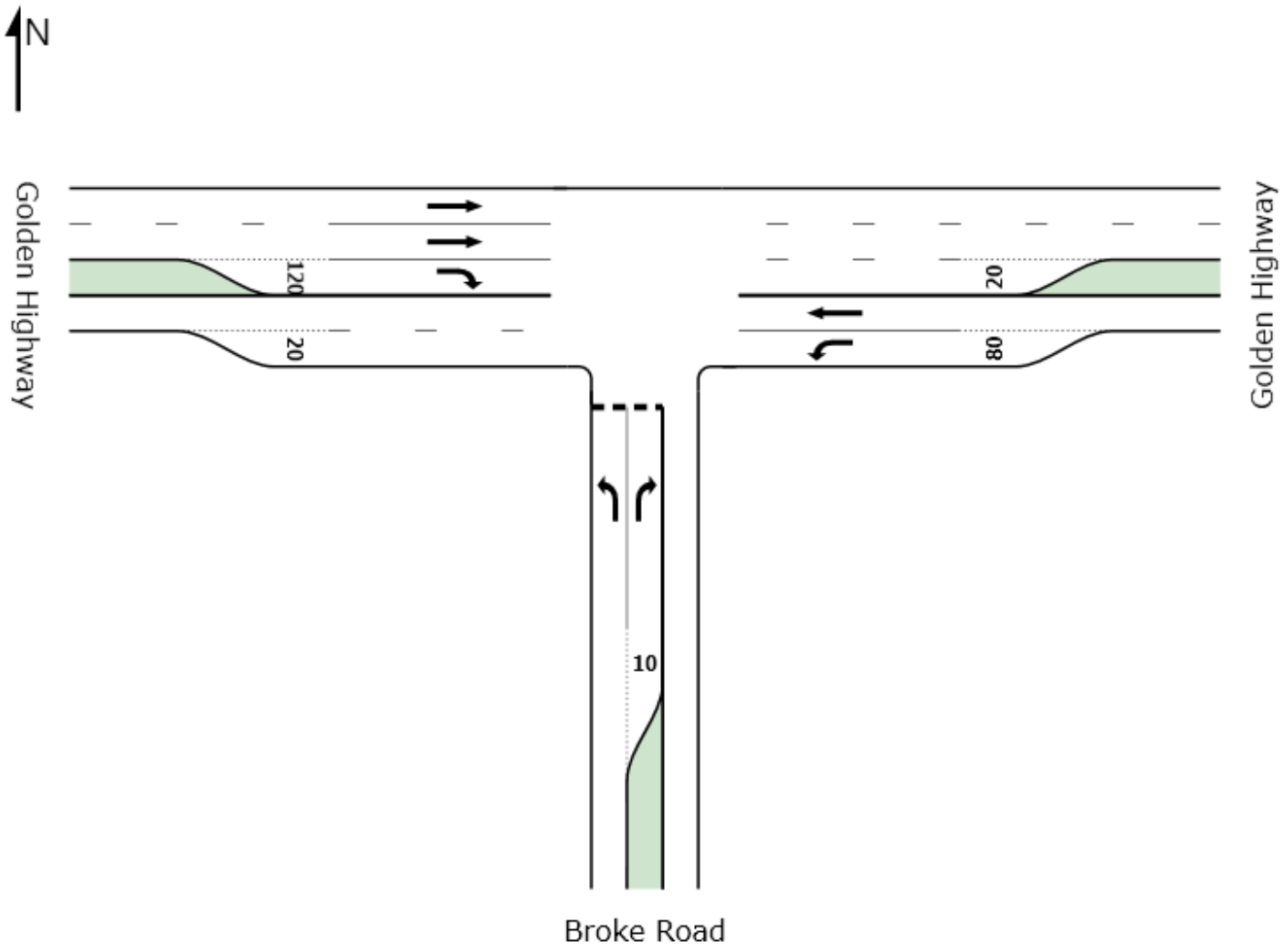


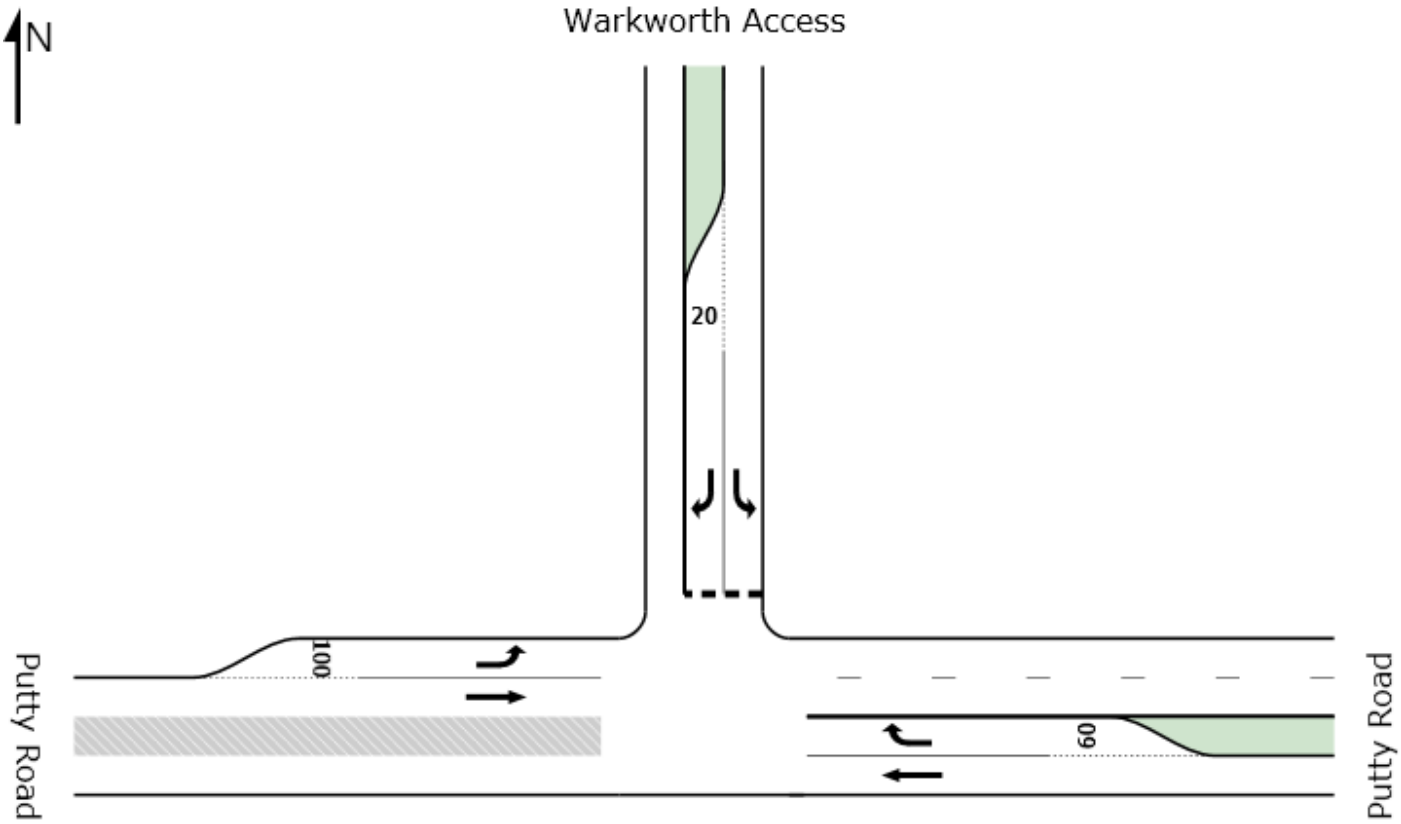
Appendix C

SIDRA intersection analysis results

N
Broke Road
CHPP Access
Broke Road


N
Golden Highway
120
60
Putty Road
20
80
10
Mitchell Line Road


N
Golden Highway
Golden Highway
120
20
20
80
10
Broke Road


N
Warkworth Access
20
100
60
Putty Road
Putty Road

MOVEMENT SUMMARY

Site: Golden Hwy Broke Road
Intersection 2014 AM Peak

T Intersection
Giveway / Yield (Two-Way)

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Broke Road											
1	L	79	5.0	0.186	20.3	LOS B	0.6	4.7	0.69	0.93	58.6
3	R	44	5.0	0.253	31.6	LOS C	0.8	5.7	0.81	0.97	47.4
Approach		123	5.0	0.253	24.3	LOS B	0.8	5.7	0.73	0.94	54.1
East: Golden Highway											
4	L	215	5.0	0.120	13.0	LOS A	0.0	0.0	0.00	0.76	69.1
5	T	729	5.0	0.386	0.0	LOS A	0.0	0.0	0.00	0.00	100.0
Approach		944	5.0	0.386	3.0	NA	0.0	0.0	0.00	0.17	90.9
West: Golden Highway											
11	T	284	5.0	0.075	0.0	LOS A	0.0	0.0	0.00	0.00	100.0
12	R	41	5.0	0.086	19.5	LOS B	0.3	2.2	0.69	0.92	59.6
Approach		325	5.0	0.086	2.5	NA	0.3	2.2	0.09	0.12	92.3
All Vehicles		1392	5.0	0.386	4.7	NA	0.8	5.7	0.09	0.23	86.1

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model used.

MOVEMENT SUMMARY

Site: Golden Hwy Broke Road
Intersection 2014 PM Peak

T Intersection
Giveway / Yield (Two-Way)

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Broke Road											
1	L	29	5.0	0.030	13.9	LOS A	0.1	0.8	0.29	0.70	67.1
3	R	130	5.0	0.369	16.5	LOS B	1.0	7.4	0.47	0.80	63.7
Approach		159	5.0	0.369	16.0	LOS B	1.0	7.4	0.44	0.78	64.3
East: Golden Highway											
4	L	37	5.0	0.021	13.0	LOS A	0.0	0.0	0.00	0.76	69.1
5	T	175	5.0	0.093	0.0	LOS A	0.0	0.0	0.00	0.00	100.0
Approach		212	5.0	0.093	2.3	NA	0.0	0.0	0.00	0.13	92.9
West: Golden Highway											
11	T	574	5.0	0.152	0.0	LOS A	0.0	0.0	0.00	0.00	100.0
12	R	60	5.0	0.051	13.8	LOS A	0.2	1.5	0.31	0.70	67.0
Approach		634	5.0	0.152	1.3	NA	0.2	1.5	0.03	0.07	95.6
All Vehicles		1005	5.0	0.369	3.8	NA	1.0	7.4	0.09	0.19	88.4

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model used.

MOVEMENT SUMMARY

Site: Golden Hwy Broke Road
Intersection 2017 AM Peak

T Intersection
Giveway / Yield (Two-Way)

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Broke Road											
1	L	84	5.0	0.215	21.5	LOS B	0.8	5.6	0.72	0.94	57.2
3	R	47	5.0	0.254	34.1	LOS C	0.9	6.7	0.84	0.98	45.5
Approach		131	5.0	0.254	26.0	LOS B	0.9	6.7	0.76	0.95	52.4
East: Golden Highway											
4	L	228	5.0	0.127	13.0	LOS A	0.0	0.0	0.00	0.76	69.1
5	T	773	5.0	0.409	0.0	LOS A	0.0	0.0	0.00	0.00	100.0
Approach		1001	5.0	0.409	3.0	NA	0.0	0.0	0.00	0.17	90.9
West: Golden Highway											
11	T	301	5.0	0.080	0.0	LOS A	0.0	0.0	0.00	0.00	100.0
12	R	43	5.0	0.098	20.3	LOS B	0.3	2.5	0.72	0.93	58.5
Approach		344	5.0	0.098	2.5	NA	0.3	2.5	0.09	0.12	92.0
All Vehicles		1476	5.0	0.409	4.9	NA	0.9	6.7	0.09	0.23	85.7

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model used.

MOVEMENT SUMMARY

Site: Golden Hwy Broke Road
Intersection 2017 PM Peak

T Intersection
Giveway / Yield (Two-Way)

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Broke Road											
1	L	31	5.0	0.032	14.0	LOS A	0.1	0.8	0.30	0.70	67.1
3	R	138	5.0	0.397	17.1	LOS B	1.2	8.6	0.49	0.82	62.8
Approach		169	5.0	0.397	16.5	LOS B	1.2	8.6	0.45	0.80	63.5
East: Golden Highway											
4	L	39	5.0	0.022	13.0	LOS A	0.0	0.0	0.00	0.76	69.1
5	T	186	5.0	0.098	0.0	LOS A	0.0	0.0	0.00	0.00	100.0
Approach		225	5.0	0.098	2.3	NA	0.0	0.0	0.00	0.13	92.9
West: Golden Highway											
11	T	608	5.0	0.161	0.0	LOS A	0.0	0.0	0.00	0.00	100.0
12	R	64	5.0	0.055	13.9	LOS A	0.2	1.6	0.32	0.70	67.0
Approach		672	5.0	0.161	1.3	NA	0.2	1.6	0.03	0.07	95.6
All Vehicles		1066	5.0	0.397	3.9	NA	1.2	8.6	0.09	0.20	88.1

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model used.

MOVEMENT SUMMARY

Site: Golden Hwy MLOR
Intersection 2014 AM Peak

T Intersection
Giveway / Yield (Two-Way)

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Mitchell Line Road											
1	L	528	5.0	0.700	20.6	LOS B	7.1	52.1	0.73	1.10	58.3
3	R	9	5.0	0.036	20.5	LOS B	0.1	0.6	0.61	0.83	58.3
Approach		537	5.0	0.700	20.6	LOS B	7.1	52.1	0.73	1.09	58.3
East: Putty Road											
4	L	7	5.0	0.004	13.0	LOS A	0.0	0.0	0.00	0.76	69.1
5	T	416	5.0	0.220	0.0	LOS A	0.0	0.0	0.00	0.00	100.0
Approach		423	5.0	0.220	0.2	NA	0.0	0.0	0.00	0.01	99.3
West: Golden Highway											
11	T	163	5.0	0.043	0.0	LOS A	0.0	0.0	0.00	0.00	100.0
12	R	165	5.0	0.176	15.1	LOS B	0.7	5.4	0.48	0.79	65.7
Approach		328	5.0	0.176	7.6	NA	0.7	5.4	0.24	0.40	79.4
All Vehicles		1288	5.0	0.700	10.6	NA	7.1	52.1	0.36	0.56	73.3

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model used.

MOVEMENT SUMMARY

Site: Golden Hwy MLOR
Intersection 2014 PM Peak

T Intersection
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Mitchell Line Road											
1	L	67	7.0	0.067	13.9	LOS A	0.2	1.8	0.27	0.70	67.3
3	R	6	7.0	0.022	19.0	LOS B	0.1	0.4	0.55	0.78	60.5
Approach		73	7.0	0.067	14.4	LOS A	0.2	1.8	0.29	0.71	66.7
East: Putty Road											
4	L	12	7.0	0.007	13.2	LOS A	0.0	0.0	0.00	0.76	69.1
5	T	145	7.0	0.078	0.0	LOS A	0.0	0.0	0.00	0.00	100.0
Approach		157	7.0	0.078	1.0	NA	0.0	0.0	0.00	0.06	96.8
West: Golden Highway											
11	T	378	7.0	0.101	0.0	LOS A	0.0	0.0	0.00	0.00	100.0
12	R	326	7.0	0.270	14.0	LOS A	1.3	9.7	0.32	0.71	67.0
Approach		704	7.0	0.270	6.5	NA	1.3	9.7	0.15	0.33	81.6
All Vehicles		934	7.0	0.270	6.2	NA	1.3	9.7	0.14	0.31	82.4

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model used.

MOVEMENT SUMMARY

Site: Golden Hwy MLOR
Intersection 2017 AM Peak

T Intersection
Giveway / Yield (Two-Way)

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Mitchell Line Road											
1	L	560	5.0	0.766	22.5	LOS B	9.0	65.9	0.78	1.18	56.0
3	R	10	5.0	0.041	21.3	LOS B	0.1	0.8	0.63	0.86	57.4
Approach		570	5.0	0.766	22.5	LOS B	9.0	65.9	0.78	1.17	56.0
East: Putty Road											
4	L	7	5.0	0.004	13.0	LOS A	0.0	0.0	0.00	0.76	69.1
5	T	441	5.0	0.234	0.0	LOS A	0.0	0.0	0.00	0.00	100.0
Approach		448	5.0	0.234	0.2	NA	0.0	0.0	0.00	0.01	99.3
West: Golden Highway											
11	T	173	5.0	0.046	0.0	LOS A	0.0	0.0	0.00	0.00	100.0
12	R	175	5.0	0.193	15.3	LOS B	0.8	5.9	0.50	0.81	65.4
Approach		348	5.0	0.193	7.7	NA	0.8	5.9	0.25	0.41	79.2
All Vehicles		1366	5.0	0.766	11.4	NA	9.0	65.9	0.39	0.60	71.7

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model used.

MOVEMENT SUMMARY

Site: Golden Hwy MLOR
Intersection 2017 PM Peak

T Intersection
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Mitchell Line Road											
1	L	71	7.0	0.072	14.0	LOS A	0.3	2.0	0.28	0.71	67.2
3	R	6	7.0	0.023	19.5	LOS B	0.1	0.4	0.57	0.79	59.8
Approach		77	7.0	0.072	14.4	LOS A	0.3	2.0	0.30	0.71	66.6
East: Putty Road											
4	L	13	7.0	0.007	13.2	LOS A	0.0	0.0	0.00	0.76	69.1
5	T	154	7.0	0.083	0.0	LOS A	0.0	0.0	0.00	0.00	100.0
Approach		167	7.0	0.083	1.0	NA	0.0	0.0	0.00	0.06	96.7
West: Golden Highway											
11	T	401	7.0	0.107	0.0	LOS A	0.0	0.0	0.00	0.00	100.0
12	R	346	7.0	0.289	14.1	LOS A	1.4	10.5	0.34	0.71	66.8
Approach		747	7.0	0.289	6.5	NA	1.4	10.5	0.16	0.33	81.5
All Vehicles		991	7.0	0.289	6.2	NA	1.4	10.5	0.14	0.31	82.3

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model used.

MOVEMENT SUMMARY

Site: MT Thorley CHPP Broke Road Access 2014 AM Peak

T Intersection
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Broke Road											
1	L	1	4.0	0.065	12.5	LOS A	0.0	0.0	0.00	1.53	63.3
2	T	122	4.0	0.065	0.0	LOS A	0.0	0.0	0.00	0.00	100.0
Approach		123	4.0	0.065	0.1	NA	0.0	0.0	0.00	0.01	99.6
North: Broke Road											
8	T	245	4.0	0.138	0.5	LOS A	0.9	6.3	0.27	0.00	85.8
9	R	11	4.0	0.138	13.4	LOS A	0.9	6.3	0.27	1.37	65.9
Approach		256	4.0	0.138	1.1	NA	0.9	6.3	0.27	0.06	84.9
West: CHPP Access											
10	L	1	4.0	0.003	11.2	LOS A	0.0	0.1	0.32	0.58	53.0
12	R	1	4.0	0.003	11.1	LOS A	0.0	0.1	0.32	0.69	53.2
Approach		2	4.0	0.003	11.1	LOS A	0.0	0.1	0.32	0.63	53.1
All Vehicles		381	4.0	0.138	0.8	NA	0.9	6.3	0.19	0.05	88.9

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model used.

MOVEMENT SUMMARY

Site: MT Thorley CHPP Broke Road Access 2014 PM Peak

T Intersection
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Broke Road											
1	L	1	4.0	0.074	12.5	LOS A	0.0	0.0	0.00	1.53	63.3
2	T	140	4.0	0.074	0.0	LOS A	0.0	0.0	0.00	0.00	100.0
Approach		141	4.0	0.074	0.1	NA	0.0	0.0	0.00	0.01	99.7
North: Broke Road											
8	T	97	4.0	0.052	0.5	LOS A	0.3	2.2	0.28	0.00	85.9
9	R	1	4.0	0.052	13.1	LOS A	0.3	2.2	0.28	1.34	66.0
Approach		98	4.0	0.052	0.7	NA	0.3	2.2	0.28	0.01	85.7
West: CHPP Access											
10	L	19	4.0	0.023	10.0	LOS A	0.1	0.6	0.26	0.63	54.2
12	R	3	4.0	0.023	9.9	LOS A	0.1	0.6	0.26	0.71	54.6
Approach		22	4.0	0.023	10.0	LOS A	0.1	0.6	0.26	0.64	54.3
All Vehicles		261	4.0	0.074	1.1	NA	0.3	2.2	0.13	0.07	88.2

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model used.

MOVEMENT SUMMARY

Site: MT Thorley CHPP Broke Road Access 2017 AM Peak

T Intersection
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Broke Road											
1	L	1	4.0	0.068	12.5	LOS A	0.0	0.0	0.00	1.53	63.3
2	T	129	4.0	0.068	0.0	LOS A	0.0	0.0	0.00	0.00	100.0
Approach		130	4.0	0.068	0.1	NA	0.0	0.0	0.00	0.01	99.7
North: Broke Road											
8	T	260	4.0	0.145	0.6	LOS A	0.9	6.7	0.29	0.00	85.3
9	R	11	4.0	0.145	13.4	LOS A	0.9	6.7	0.29	1.36	66.0
Approach		271	4.0	0.145	1.1	NA	0.9	6.7	0.29	0.06	84.5
West: CHPP Access											
10	L	1	4.0	0.003	11.4	LOS A	0.0	0.1	0.33	0.58	52.8
12	R	1	4.0	0.003	11.3	LOS A	0.0	0.1	0.33	0.69	53.0
Approach		2	4.0	0.003	11.3	LOS A	0.0	0.1	0.33	0.63	52.9
All Vehicles		403	4.0	0.145	0.8	NA	0.9	6.7	0.19	0.04	88.6

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model used.

MOVEMENT SUMMARY

Site: MT Thorley CHPP Broke Road Access 2017 PM Peak

T Intersection
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Broke Road											
1	L	1	4.0	0.078	12.5	LOS A	0.0	0.0	0.00	1.53	63.3
2	T	148	4.0	0.078	0.0	LOS A	0.0	0.0	0.00	0.00	100.0
Approach		149	4.0	0.078	0.1	NA	0.0	0.0	0.00	0.01	99.7
North: Broke Road											
8	T	103	4.0	0.055	0.6	LOS A	0.3	2.4	0.29	0.00	85.5
9	R	1	4.0	0.055	13.2	LOS A	0.3	2.4	0.29	1.34	66.1
Approach		104	4.0	0.055	0.7	NA	0.3	2.4	0.29	0.01	85.3
West: CHPP Access											
10	L	19	4.0	0.023	10.1	LOS A	0.1	0.6	0.27	0.63	54.2
12	R	3	4.0	0.023	10.0	LOS A	0.1	0.6	0.27	0.71	54.6
Approach		22	4.0	0.023	10.1	LOS A	0.1	0.6	0.27	0.64	54.2
All Vehicles		275	4.0	0.078	1.1	NA	0.3	2.4	0.13	0.06	88.2

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model used.

MOVEMENT SUMMARY

Site: Warkworth Putty Road Access
2014 AM Peak

T Intersection
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
East: Putty Road											
5	T	9	3.0	0.005	0.0	LOS A	0.0	0.0	0.00	0.00	100.0
6	R	94	3.0	0.078	12.9	LOS A	0.3	2.0	0.12	0.70	62.5
Approach		103	3.0	0.078	11.7	NA	0.3	2.0	0.11	0.64	65.2
North: Warkworth Access											
7	L	108	3.0	0.093	9.2	LOS A	0.4	2.5	0.11	0.65	54.9
9	R	3	3.0	0.006	10.0	LOS A	0.0	0.1	0.29	0.62	54.2
Approach		111	3.0	0.093	9.3	LOS A	0.4	2.5	0.12	0.64	54.9
West: Putty Road											
10	L	7	3.0	0.004	12.7	LOS A	0.0	0.0	0.00	0.75	63.3
11	T	31	3.0	0.016	0.0	LOS A	0.0	0.0	0.00	0.00	100.0
Approach		38	3.0	0.016	2.3	NA	0.0	0.0	0.00	0.14	92.2
All Vehicles		252	3.0	0.093	9.2	NA	0.4	2.5	0.10	0.57	62.5

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model used.

MOVEMENT SUMMARY

Site: Warkworth Putty Road Access
2014 PM Peak

T Intersection
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
East: Putty Road											
5	T	47	6.0	0.025	0.0	LOS A	0.0	0.0	0.00	0.00	100.0
6	R	7	6.0	0.006	13.0	LOS A	0.0	0.1	0.10	0.70	62.6
Approach		54	6.0	0.025	1.7	NA	0.0	0.1	0.01	0.09	94.3
North: Warkworth Access											
7	L	72	6.0	0.063	9.4	LOS A	0.2	1.7	0.10	0.65	54.9
9	R	1	6.0	0.002	9.5	LOS A	0.0	0.0	0.22	0.61	54.5
Approach		73	6.0	0.063	9.4	LOS A	0.2	1.7	0.10	0.65	54.9
West: Putty Road											
10	L	1	6.0	0.001	12.5	LOS A	0.0	0.0	0.00	0.75	63.3
11	T	30	6.0	0.016	0.0	LOS A	0.0	0.0	0.00	0.00	100.0
Approach		31	6.0	0.016	0.4	NA	0.0	0.0	0.00	0.02	98.6
All Vehicles		158	6.0	0.063	5.0	NA	0.2	1.7	0.05	0.33	71.3

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model used.

MOVEMENT SUMMARY

Site: Warkworth Putty Road Access
2017 AM Peak

T Intersection
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
East: Putty Road											
5	T	10	3.0	0.005	0.0	LOS A	0.0	0.0	0.00	0.00	100.0
6	R	94	3.0	0.078	12.9	LOS A	0.3	2.0	0.12	0.70	62.4
Approach		104	3.0	0.078	11.6	NA	0.3	2.0	0.11	0.63	65.5
North: Warkworth Access											
7	L	108	3.0	0.093	9.3	LOS A	0.4	2.5	0.12	0.64	54.9
9	R	3	3.0	0.006	10.1	LOS A	0.0	0.1	0.30	0.62	54.2
Approach		111	3.0	0.093	9.3	LOS A	0.4	2.5	0.12	0.64	54.8
West: Putty Road											
10	L	7	3.0	0.004	12.7	LOS A	0.0	0.0	0.00	0.75	63.3
11	T	33	3.0	0.017	0.0	LOS A	0.0	0.0	0.00	0.00	100.0
Approach		40	3.0	0.017	2.2	NA	0.0	0.0	0.00	0.13	92.6
All Vehicles		255	3.0	0.093	9.1	NA	0.4	2.5	0.10	0.56	62.8

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model used.

MOVEMENT SUMMARY

Site: Warkworth Putty Road Access
2017 PM Peak

T Intersection
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
East: Putty Road											
5	T	50	6.0	0.027	0.0	LOS A	0.0	0.0	0.00	0.00	100.0
6	R	7	6.0	0.006	13.0	LOS A	0.0	0.1	0.10	0.70	62.6
Approach		57	6.0	0.027	1.6	NA	0.0	0.1	0.01	0.09	94.6
North: Warkworth Access											
7	L	72	6.0	0.063	9.4	LOS A	0.2	1.7	0.11	0.65	54.9
9	R	1	6.0	0.002	9.6	LOS A	0.0	0.0	0.23	0.61	54.5
Approach		73	6.0	0.063	9.4	LOS A	0.2	1.7	0.11	0.65	54.9
West: Putty Road											
10	L	1	6.0	0.001	12.5	LOS A	0.0	0.0	0.00	0.75	63.3
11	T	32	6.0	0.017	0.0	LOS A	0.0	0.0	0.00	0.00	100.0
Approach		33	6.0	0.017	0.4	NA	0.0	0.0	0.00	0.02	98.7
All Vehicles		163	6.0	0.063	4.8	NA	0.2	1.7	0.05	0.32	71.9

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model used.

MOVEMENT SUMMARY

Site: WSD Golden Hwy Broke Road
Intersection 2017 AM Peak

T Intersection
Giveway / Yield (Two-Way)

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Broke Road											
1	L	130	5.0	0.332	22.8	LOS B	1.3	9.8	0.75	0.97	55.7
3	R	47	5.0	0.258	34.6	LOS C	0.9	6.8	0.84	0.98	45.2
Approach		177	5.0	0.332	25.9	LOS B	1.3	9.8	0.78	0.98	52.4
East: Golden Highway											
4	L	228	5.0	0.127	13.0	LOS A	0.0	0.0	0.00	0.76	69.1
5	T	773	5.0	0.409	0.0	LOS A	0.0	0.0	0.00	0.00	100.0
Approach		1001	5.0	0.409	3.0	NA	0.0	0.0	0.00	0.17	90.9
West: Golden Highway											
11	T	301	5.0	0.080	0.0	LOS A	0.0	0.0	0.00	0.00	100.0
12	R	51	5.0	0.117	20.4	LOS B	0.4	3.0	0.72	0.93	58.4
Approach		352	5.0	0.117	3.0	NA	0.4	3.0	0.10	0.14	90.8
All Vehicles		1530	5.0	0.409	5.6	NA	1.3	9.8	0.11	0.26	83.9

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model used.

MOVEMENT SUMMARY

Site: WSD Golden Hwy Broke Road Intersection 2017 PM Peak

T Intersection
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Broke Road											
1	L	46	5.0	0.048	14.0	LOS A	0.2	1.2	0.31	0.71	67.0
3	R	138	5.0	0.412	18.1	LOS B	1.3	9.4	0.52	0.86	61.4
Approach		184	5.0	0.412	17.1	LOS B	1.3	9.4	0.47	0.82	62.8
East: Golden Highway											
4	L	39	5.0	0.022	13.0	LOS A	0.0	0.0	0.00	0.76	69.1
5	T	186	5.0	0.098	0.0	LOS A	0.0	0.0	0.00	0.00	100.0
Approach		225	5.0	0.098	2.3	NA	0.0	0.0	0.00	0.13	92.9
West: Golden Highway											
11	T	608	5.0	0.161	0.0	LOS A	0.0	0.0	0.00	0.00	100.0
12	R	106	5.0	0.092	13.9	LOS A	0.4	2.7	0.33	0.71	66.9
Approach		714	5.0	0.161	2.1	NA	0.4	2.7	0.05	0.11	93.3
All Vehicles		1123	5.0	0.412	4.6	NA	1.3	9.4	0.11	0.23	86.4

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model used.

MOVEMENT SUMMARY

Site: WSD Golden Hwy MLOR
Intersection 2017 AM Peak

T Intersection
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Mitchell Line Road											
1	L	560	5.0	0.766	22.5	LOS B	9.0	65.9	0.78	1.18	56.0
3	R	10	5.0	0.041	21.3	LOS B	0.1	0.8	0.63	0.86	57.4
Approach		570	5.0	0.766	22.5	LOS B	9.0	65.9	0.78	1.17	56.0
East: Putty Road											
4	L	7	5.0	0.004	13.0	LOS A	0.0	0.0	0.00	0.76	69.1
5	T	441	5.0	0.234	0.0	LOS A	0.0	0.0	0.00	0.00	100.0
Approach		448	5.0	0.234	0.2	NA	0.0	0.0	0.00	0.01	99.3
West: Golden Highway											
11	T	173	5.0	0.046	0.0	LOS A	0.0	0.0	0.00	0.00	100.0
12	R	175	5.0	0.193	15.3	LOS B	0.8	5.9	0.50	0.81	65.4
Approach		348	5.0	0.193	7.7	NA	0.8	5.9	0.25	0.41	79.2
All Vehicles		1366	5.0	0.766	11.4	NA	9.0	65.9	0.39	0.60	71.7

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model used.

MOVEMENT SUMMARY

Site: WSD Golden Hwy MLOR
Intersection 2017 PM Peak

T Intersection
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Mitchell Line Road											
1	L	71	7.0	0.072	14.0	LOS A	0.3	2.0	0.28	0.71	67.2
3	R	6	7.0	0.023	19.5	LOS B	0.1	0.4	0.57	0.79	59.8
Approach		77	7.0	0.072	14.4	LOS A	0.3	2.0	0.30	0.71	66.6
East: Putty Road											
4	L	13	7.0	0.007	13.2	LOS A	0.0	0.0	0.00	0.76	69.1
5	T	154	7.0	0.083	0.0	LOS A	0.0	0.0	0.00	0.00	100.0
Approach		167	7.0	0.083	1.0	NA	0.0	0.0	0.00	0.06	96.7
West: Golden Highway											
11	T	401	7.0	0.107	0.0	LOS A	0.0	0.0	0.00	0.00	100.0
12	R	346	7.0	0.289	14.1	LOS A	1.4	10.5	0.34	0.71	66.8
Approach		747	7.0	0.289	6.5	NA	1.4	10.5	0.16	0.33	81.5
All Vehicles		991	7.0	0.289	6.2	NA	1.4	10.5	0.14	0.31	82.3

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model used.

MOVEMENT SUMMARY

Site: WSD MT Thorley CHPP Broke Road Access 2017 AM Peak

T Intersection
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Broke Road											
1	L	1	4.0	0.093	12.5	LOS A	0.0	0.0	0.00	1.53	63.3
2	T	175	4.0	0.093	0.0	LOS A	0.0	0.0	0.00	0.00	100.0
Approach		176	4.0	0.093	0.1	NA	0.0	0.0	0.00	0.01	99.8
North: Broke Road											
8	T	268	4.0	0.150	0.8	LOS A	1.0	7.3	0.34	0.00	82.9
9	R	11	4.0	0.150	13.6	LOS A	1.0	7.3	0.34	1.32	66.6
Approach		279	4.0	0.150	1.3	NA	1.0	7.3	0.34	0.05	82.3
West: CHPP Access											
10	L	1	4.0	0.003	11.9	LOS A	0.0	0.1	0.39	0.58	52.2
12	R	1	4.0	0.003	11.8	LOS A	0.0	0.1	0.39	0.70	52.5
Approach		2	4.0	0.003	11.9	LOS A	0.0	0.1	0.39	0.64	52.4
All Vehicles		457	4.0	0.150	0.9	NA	1.0	7.3	0.21	0.04	88.0

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model used.

MOVEMENT SUMMARY

Site: WSD MT Thorley CHPP Broke Road Access 2017 PM Peak

T Intersection
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Broke Road											
1	L	1	4.0	0.086	12.5	LOS A	0.0	0.0	0.00	1.53	63.3
2	T	163	4.0	0.086	0.0	LOS A	0.0	0.0	0.00	0.00	100.0
Approach		164	4.0	0.086	0.1	NA	0.0	0.0	0.00	0.01	99.7
North: Broke Road											
8	T	145	4.0	0.077	0.7	LOS A	0.5	3.5	0.31	0.00	84.5
9	R	1	4.0	0.077	13.3	LOS A	0.5	3.5	0.31	1.32	66.3
Approach		146	4.0	0.077	0.8	NA	0.5	3.5	0.31	0.01	84.4
West: CHPP Access											
10	L	19	4.0	0.024	10.2	LOS A	0.1	0.6	0.29	0.63	54.1
12	R	3	4.0	0.024	10.2	LOS A	0.1	0.6	0.29	0.73	54.4
Approach		22	4.0	0.024	10.2	LOS A	0.1	0.6	0.29	0.65	54.1
All Vehicles		332	4.0	0.086	1.0	NA	0.5	3.5	0.16	0.05	87.9

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model used.

MOVEMENT SUMMARY

Site: WSD Warkworth Putty Road Access 2017 AM Peak

T Intersection
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
East: Putty Road											
5	T	14	3.0	0.007	0.0	LOS A	0.0	0.0	0.00	0.00	100.0
6	R	94	3.0	0.078	12.9	LOS A	0.3	2.0	0.15	0.69	62.2
Approach		108	3.0	0.078	11.3	NA	0.3	2.0	0.13	0.60	66.3
North: Warkworth Access											
7	L	108	3.0	0.095	9.3	LOS A	0.4	2.6	0.15	0.64	54.7
9	R	3	3.0	0.006	10.3	LOS A	0.0	0.1	0.32	0.62	53.9
Approach		111	3.0	0.095	9.4	LOS A	0.4	2.6	0.15	0.64	54.7
West: Putty Road											
10	L	7	3.0	0.004	12.7	LOS A	0.0	0.0	0.00	0.75	63.3
11	T	52	3.0	0.027	0.0	LOS A	0.0	0.0	0.00	0.00	100.0
Approach		59	3.0	0.027	1.5	NA	0.0	0.0	0.00	0.09	94.9
All Vehicles		278	3.0	0.095	8.4	NA	0.4	2.6	0.11	0.51	64.8

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model used.

MOVEMENT SUMMARY

Site: WSD Warkworth Putty Road Access 2017 PM Peak

T Intersection
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
East: Putty Road											
5	T	67	6.0	0.036	0.0	LOS A	0.0	0.0	0.00	0.00	100.0
6	R	7	6.0	0.006	13.0	LOS A	0.0	0.1	0.11	0.70	62.5
Approach		74	6.0	0.036	1.2	NA	0.0	0.1	0.01	0.07	95.8
North: Warkworth Access											
7	L	72	6.0	0.063	9.4	LOS A	0.2	1.7	0.12	0.64	54.8
9	R	1	6.0	0.002	9.8	LOS A	0.0	0.0	0.26	0.61	54.3
Approach		73	6.0	0.063	9.4	LOS A	0.2	1.7	0.12	0.64	54.8
West: Putty Road											
10	L	1	6.0	0.001	12.5	LOS A	0.0	0.0	0.00	0.75	63.3
11	T	38	6.0	0.020	0.0	LOS A	0.0	0.0	0.00	0.00	100.0
Approach		39	6.0	0.020	0.3	NA	0.0	0.0	0.00	0.02	98.9
All Vehicles		186	6.0	0.063	4.3	NA	0.2	1.7	0.05	0.28	74.5

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model used.

MOVEMENT SUMMARY

Site: WSD+BUO Golden Hwy Broke Road Intersection 2017 AM Peak

T Intersection
Giveway / Yield (Two-Way)

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Broke Road											
1	L	130	5.0	0.335	23.0	LOS B	1.4	9.9	0.76	0.98	55.5
3	R	47	5.0	0.261	34.9	LOS C	0.9	6.9	0.84	0.98	44.9
Approach		177	5.0	0.335	26.2	LOS B	1.4	9.9	0.78	0.98	52.2
East: Golden Highway											
4	L	240	5.0	0.134	13.0	LOS A	0.0	0.0	0.00	0.76	69.1
5	T	773	5.0	0.409	0.0	LOS A	0.0	0.0	0.00	0.00	100.0
Approach		1013	5.0	0.409	3.1	NA	0.0	0.0	0.00	0.18	90.6
West: Golden Highway											
11	T	301	5.0	0.080	0.0	LOS A	0.0	0.0	0.00	0.00	100.0
12	R	51	5.0	0.119	20.6	LOS B	0.4	3.0	0.73	0.93	58.2
Approach		352	5.0	0.119	3.0	NA	0.4	3.0	0.11	0.14	90.8
All Vehicles		1542	5.0	0.409	5.7	NA	1.4	9.9	0.11	0.26	83.7

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model used.

MOVEMENT SUMMARY

Site: WSD+BUO Golden Hwy Broke Road Intersection 2017 PM Peak

T Intersection
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Broke Road											
1	L	46	5.0	0.048	14.0	LOS A	0.2	1.2	0.31	0.71	67.0
3	R	150	5.0	0.448	18.5	LOS B	1.5	10.8	0.53	0.88	60.9
Approach		196	5.0	0.448	17.5	LOS B	1.5	10.8	0.48	0.84	62.2
East: Golden Highway											
4	L	39	5.0	0.022	13.0	LOS A	0.0	0.0	0.00	0.76	69.1
5	T	186	5.0	0.098	0.0	LOS A	0.0	0.0	0.00	0.00	100.0
Approach		225	5.0	0.098	2.3	NA	0.0	0.0	0.00	0.13	92.9
West: Golden Highway											
11	T	608	5.0	0.161	0.0	LOS A	0.0	0.0	0.00	0.00	100.0
12	R	106	5.0	0.092	13.9	LOS A	0.4	2.7	0.33	0.71	66.9
Approach		714	5.0	0.161	2.1	NA	0.4	2.7	0.05	0.11	93.3
All Vehicles		1135	5.0	0.448	4.8	NA	1.5	10.8	0.11	0.24	85.9

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model used.

MOVEMENT SUMMARY

Site: WSD+BUO Golden Hwy MLOR
Intersection 2017 AM Peak

T Intersection
Giveway / Yield (Two-Way)

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Mitchell Line Road											
1	L	568	5.0	0.781	23.1	LOS B	9.6	69.9	0.80	1.20	55.4
3	R	10	5.0	0.042	21.4	LOS B	0.1	0.8	0.64	0.86	57.3
Approach		578	5.0	0.781	23.1	LOS B	9.6	69.9	0.79	1.19	55.4
East: Putty Road											
4	L	7	5.0	0.004	13.0	LOS A	0.0	0.0	0.00	0.76	69.1
5	T	445	5.0	0.236	0.0	LOS A	0.0	0.0	0.00	0.00	100.0
Approach		452	5.0	0.236	0.2	NA	0.0	0.0	0.00	0.01	99.3
West: Golden Highway											
11	T	173	5.0	0.046	0.0	LOS A	0.0	0.0	0.00	0.00	100.0
12	R	175	5.0	0.193	15.4	LOS B	0.8	5.9	0.50	0.81	65.3
Approach		348	5.0	0.193	7.7	NA	0.8	5.9	0.25	0.41	79.1
All Vehicles		1378	5.0	0.781	11.7	NA	9.6	69.9	0.40	0.61	71.3

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model used.

MOVEMENT SUMMARY

Site: WSD+BUO Golden Hwy MLOR
Intersection 2017 PM Peak

T Intersection
Giveway / Yield (Two-Way)

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Mitchell Line Road											
1	L	71	7.0	0.072	14.0	LOS A	0.3	2.0	0.28	0.71	67.2
3	R	6	7.0	0.023	19.7	LOS B	0.1	0.4	0.57	0.79	59.6
Approach		77	7.0	0.072	14.5	LOS A	0.3	2.0	0.30	0.71	66.6
East: Putty Road											
4	L	13	7.0	0.007	13.2	LOS A	0.0	0.0	0.00	0.76	69.1
5	T	154	7.0	0.083	0.0	LOS A	0.0	0.0	0.00	0.00	100.0
Approach		167	7.0	0.083	1.0	NA	0.0	0.0	0.00	0.06	96.7
West: Golden Highway											
11	T	405	7.0	0.109	0.0	LOS A	0.0	0.0	0.00	0.00	100.0
12	R	354	7.0	0.296	14.1	LOS A	1.5	10.8	0.34	0.71	66.8
Approach		759	7.0	0.296	6.6	NA	1.5	10.8	0.16	0.33	81.4
All Vehicles		1003	7.0	0.296	6.3	NA	1.5	10.8	0.14	0.32	82.2

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model used.

MOVEMENT SUMMARY

Site: WSD+BUO MT Thorley CHPP
Broke Road Access 2017 AM Peak

T Intersection
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Broke Road											
1	L	1	4.0	0.093	12.5	LOS A	0.0	0.0	0.00	1.53	63.3
2	T	175	4.0	0.093	0.0	LOS A	0.0	0.0	0.00	0.00	100.0
Approach		176	4.0	0.093	0.1	NA	0.0	0.0	0.00	0.01	99.8
North: Broke Road											
8	T	280	4.0	0.156	0.8	LOS A	1.1	7.6	0.34	0.00	82.8
9	R	11	4.0	0.156	13.6	LOS A	1.1	7.6	0.34	1.32	66.6
Approach		291	4.0	0.156	1.3	NA	1.1	7.6	0.34	0.05	82.2
West: CHPP Access											
10	L	1	4.0	0.003	12.0	LOS A	0.0	0.1	0.40	0.58	52.1
12	R	1	4.0	0.003	11.9	LOS A	0.0	0.1	0.40	0.70	52.4
Approach		2	4.0	0.003	12.0	LOS A	0.0	0.1	0.40	0.64	52.2
All Vehicles		469	4.0	0.156	0.9	NA	1.1	7.6	0.22	0.04	87.8

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model used.

MOVEMENT SUMMARY

Site: WSD+BUO MT Thorley CHPP
Broke Road Access 2017 PM Peak

T Intersection
Giveway / Yield (Two-Way)

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Broke Road											
1	L	1	4.0	0.093	12.5	LOS A	0.0	0.0	0.00	1.53	63.3
2	T	175	4.0	0.093	0.0	LOS A	0.0	0.0	0.00	0.00	100.0
Approach		176	4.0	0.093	0.1	NA	0.0	0.0	0.00	0.01	99.8
North: Broke Road											
8	T	145	4.0	0.077	0.7	LOS A	0.5	3.5	0.32	0.00	84.0
9	R	1	4.0	0.077	13.3	LOS A	0.5	3.5	0.32	1.31	66.4
Approach		146	4.0	0.077	0.8	NA	0.5	3.5	0.32	0.01	83.8
West: CHPP Access											
10	L	19	4.0	0.025	10.3	LOS A	0.1	0.6	0.30	0.64	54.0
12	R	3	4.0	0.025	10.2	LOS A	0.1	0.6	0.30	0.73	54.3
Approach		22	4.0	0.025	10.3	LOS A	0.1	0.6	0.30	0.65	54.1
All Vehicles		344	4.0	0.093	1.0	NA	0.5	3.5	0.16	0.05	88.0

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model used.

MOVEMENT SUMMARY

Site: WSD+BUO Warkworth Putty Road Access 2017 AM Peak

T Intersection
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
East: Putty Road											
5	T	14	3.0	0.007	0.0	LOS A	0.0	0.0	0.00	0.00	100.0
6	R	94	3.0	0.078	12.9	LOS A	0.3	2.0	0.15	0.69	62.2
Approach		108	3.0	0.078	11.3	NA	0.3	2.0	0.13	0.60	66.3
North: Warkworth Access											
7	L	108	3.0	0.095	9.3	LOS A	0.4	2.6	0.15	0.64	54.7
9	R	3	3.0	0.006	10.3	LOS A	0.0	0.1	0.32	0.62	53.9
Approach		111	3.0	0.095	9.4	LOS A	0.4	2.6	0.15	0.64	54.7
West: Putty Road											
10	L	7	3.0	0.004	12.7	LOS A	0.0	0.0	0.00	0.75	63.3
11	T	52	3.0	0.027	0.0	LOS A	0.0	0.0	0.00	0.00	100.0
Approach		59	3.0	0.027	1.5	NA	0.0	0.0	0.00	0.09	94.9
All Vehicles		278	3.0	0.095	8.4	NA	0.4	2.6	0.11	0.51	64.8

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model used.

MOVEMENT SUMMARY

Site: WSD+BUO Warkworth Putty Road Access 2017 PM Peak

T Intersection
Giveway / Yield (Two-Way)

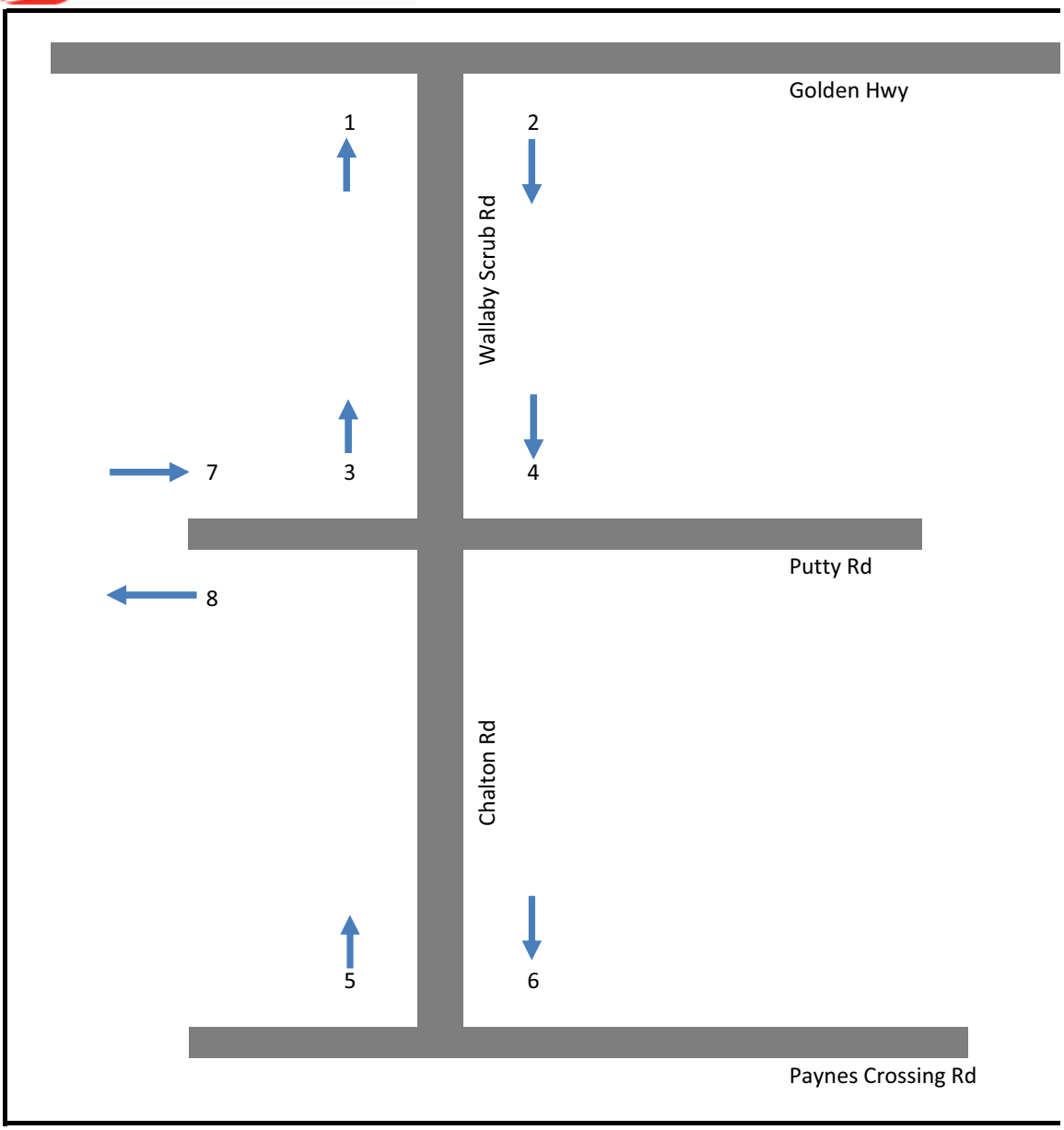
Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
East: Putty Road											
5	T	67	6.0	0.036	0.0	LOS A	0.0	0.0	0.00	0.00	100.0
6	R	7	6.0	0.006	13.0	LOS A	0.0	0.1	0.11	0.70	62.5
Approach		74	6.0	0.036	1.2	NA	0.0	0.1	0.01	0.07	95.8
North: Warkworth Access											
7	L	72	6.0	0.063	9.4	LOS A	0.2	1.7	0.12	0.64	54.8
9	R	1	6.0	0.002	9.8	LOS A	0.0	0.0	0.26	0.61	54.3
Approach		73	6.0	0.063	9.4	LOS A	0.2	1.7	0.12	0.64	54.8
West: Putty Road											
10	L	1	6.0	0.001	12.5	LOS A	0.0	0.0	0.00	0.75	63.3
11	T	38	6.0	0.020	0.0	LOS A	0.0	0.0	0.00	0.00	100.0
Approach		39	6.0	0.020	0.3	NA	0.0	0.0	0.00	0.02	98.9
All Vehicles		186	6.0	0.063	4.3	NA	0.2	1.7	0.05	0.28	74.5

Level of Service (LOS) Method: Delay (RTA NSW).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model used.

Appendix D

Origin Destination traffic surveys

SKYHIGH
THE TRAFFIC SURVEY COMPANY



Job	: Wallaby Scrub Road
Description	: Origin Destination Matrices
Date	: Tues 4th March

SKYHIGH
THE TRAFFIC SURVEY COMPANY

RAW MATCH

Time Period : 05:00 to 17:00

	Out	1	3	4	6	8	Totals
In	Vol	318	333	273	350	381	**1655**
2	266			224	132	52	**408**
3	333	285					**285**
4	273				133	52	**185**
5	369	186	193			22	**401**
7	458	79	75		21		**175**
Totals	**1699**	**550**	**268**	**224**	**286**	**126**	**1454**

Time Period : 05:00 to 06:00

	Out	1	3	4	6	8	Totals
In	Vol	44	59	6	5	7	**121**
2	7			3	1	1	**5**
3	59	39					**39**
4	6				1	3	**4**
5	52	35	37			1	**73**
7	37	5	6		1		**12**
Totals	**161**	**79**	**43**	**3**	**3**	**5**	**133**

Time Period : 06:00 to 07:00

	Out	1	3	4	6	8	Totals
In	Vol	77	76	12	13	9	**187**
2	13			10	7	1	**18**
3	76	63					**63**
4	12				8	1	**9**
5	71	50	53			0	**103**
7	50	7	6		0		**13**
Totals	**222**	**120**	**59**	**10**	**15**	**2**	**206**

Time Period : 07:00 to 08:00

	Out	1	3	4	6	8	Totals
In	Vol	29	31	20	30	22	**132**
2	22			17	10	5	**32**
3	31	29					**29**
4	20				9	4	**13**
5	21	13	13			0	**26**
7	42	10	9		1		**20**
Totals	**136**	**52**	**22**	**17**	**20**	**9**	**120**

Time Period : 08:00 to 09:00

	Out	1	3	4	6	8	Totals
In	Vol	30	29	16	29	31	**135**
2	14			9	7	4	**20**
3	29	24					**24**
4	16				12	3	**15**
5	38	19	19			5	**43**
7	62	7	5		6		**18**
Totals	**159**	**50**	**24**	**9**	**25**	**12**	**120**

Time Period : 09:00 to 10:00

	Out	1	3	4	6	8	Totals
In	Vol	14	16	15	22	30	**97**
2	15			13	8	5	**26**
3	16	14					**14**
4	15				8	5	**13**
5	14	8	8			3	**19**
7	43	8	7		4		**19**
Totals	**103**	**30**	**15**	**13**	**20**	**13**	**91**

Time Period : 10:00 to 11:00

	Out	1	3	4	6	8	Totals
In	Vol	15	14	14	11	29	**83**
2	12			11	7	4	**22**
3	14	14					**14**
4	14				7	4	**11**
5	27	6	6			0	**12**
7	32	9	8		0		**17**
Totals	**99**	**29**	**14**	**11**	**14**	**8**	**76**

Time Period : 11:00 to 12:00

EXPANDED MATCH TO ALLOW FOR MISSED NUMBER PLATES

Time Period : 05:00 to 17:00

	Out	1	3	4	6	8	Totals
In	Vol	318	333	273	350	381	**1655**
2	266			230	168	54	**452**
3	333	313					**313**
4	273				168	53	**221**
5	369	215	232			23	**470**
7	458	81	90		29		**200**
Totals	**1699**	**609**	**322**	**230**	**365**	**130**	**1656**

Time Period : 05:00 to 06:00

	Out	1	3	4	6	8	Totals
In	Vol	44	59	6	5	7	**121**
2	7			5	2	2	**9**
3	59	44					**44**
4	6				1	3	**4**
5	52	38	48			1	**87**
7	37	6	10		2		**18**
Totals	**161**	**88**	**58**	**5**	**5**	**6**	**162**

Time Period : 06:00 to 07:00

	Out	1	3	4	6	8	Totals
In	Vol	77	76	12	13	9	**187**
2	13			10	9	1	**20**
3	76	76					**76**
4	12				10	1	**11**
5	71	64	68			0	**132**
7	50	8	8		0		**16**
Totals	**222**	**148**	**76**	**10**	**19**	**2**	**255**

Time Period : 07:00 to 08:00

	Out	1	3	4	6	8	Totals
In	Vol	29	31	20	30	22	**132**
2	22			17	13	5	**35**
3	31	29					**29**
4	20				11	4	**15**
5	21	15	15			0	**30**
7	42	11	11		1		**23**
Totals	**136**	**55**	**26**	**17**	**25**	**9**	**132**

Time Period : 08:00 to 09:00

	Out	1	3	4	6	8	Totals
In	Vol	30	29	16	29	31	**135**
2	14			9	9	4	**22**
3	29	27					**27**
4	16				16	3	**19**
5	38	23	23			5	**51**
7	62	6	6		8		**20**
Totals	**159**	**56**	**29**	**9**	**33**	**12**	**139**

Time Period : 09:00 to 10:00

	Out	1	3	4	6	8	Totals
In	Vol	14	16	15	22	30	**97**
2	15			13	10	5	**28**
3	16	14					**14**
4	15				10	5	**15**
5	14	7	8			3	**18**
7	43	7	8		6		**21**
Totals	**103**	**28**	**16**	**13**	**26**	**13**	**96**

Time Period : 10:00 to 11:00

	Out	1	3	4	6	8	Totals
In	Vol	15	14	14	11	29	**83**
2	12			11	9	4	**24**
3	14	15					**15**
4	14				9	4	**13**
5	27	6	6			0	**12**
7	32	8	8		0		**16**
Totals	**99**	**29**	**14**	**11**	**18**	**8**	**80**

Time Period : 11:00 to 12:00

	Out	1	3	4	6	8	Totals
In	Vol	15	14	10	15	33	**87**
2	13			9	5	3	**17**
3	14	13					**13**
4	10				5	4	**9**
5	28	7	8			2	**17**
7	37	5	5		3		**13**
Totals	**102**	**25**	**13**	**9**	**13**	**9**	**69**

Time Period : 12:00 to 13:00

	Out	1	3	4	6	8	Totals
In	Vol	15	14	10	15	33	**87**
2	13			9	6	3	**18**
3	14	14					**14**
4	10				6	4	**10**
5	28	9	9			3	**21**
7	37	5	5		4		**14**
Totals	**102**	**28**	**14**	**9**	**16**	**10**	**77**

Time Period : 12:00 to 13:00

	Out	1	3	4	6	8	Totals
In	Vol	22	22	17	21	31	**113**
2	16			13	7	7	**27**
3	22	21					**21**
4	17				4	7	**11**
5	24	10	10			2	**22**
7	33	6	5		0		**11**
Totals	**112**	**37**	**15**	**13**	**11**	**16**	**92**

Time Period : 13:00 to 14:00

	Out	1	3	4	6	8	Totals
In	Vol	22	22	17	21	31	**113**
2	16			13	9	7	**29**
3	22	22					**22**
4	17				5	7	**12**
5	24	11	12			2	**25**
7	33	6	6		0		**12**
Totals	**112**	**39**	**18**	**13**	**14**	**16**	**100**

Time Period : 13:00 to 14:00

	Out	1	3	4	6	8	Totals
In	Vol	22	22	21	26	29	**120**
2	20			14	4	4	**22**
3	22	20					**20**
4	21				6	5	**11**
5	34	16	16			2	**34**
7	25	3	4		1		**8**
Totals	**122**	**39**	**20**	**14**	**11**	**11**	**95**

Time Period : 14:00 to 15:00

	Out	1	3	4	6	8	Totals
In	Vol	22	22	21	26	29	**120**
2	20			18	6	5	**29**
3	22	22					**22**
4	21				9	6	**15**
5	34	17	17			2	**36**
7	25	3	5		1		**9**
Totals	**122**	**42**	**22**	**18**	**16**	**13**	**111**

Time Period : 14:00 to 15:00

	Out	1	3	4	6	8	Totals
In	Vol	16	18	35	55	56	**180**
2	30			31	17	6	**54**
3	18	17					**17**
4	35				17	5	**22**
5	24	8	8			3	**19**
7	36	6	7		4		**17**
Totals	**143**	**31**	**15**	**31**	**38**	**14**	**129**

Time Period : 15:00 to 16:00

	Out	1	3	4	6	8	Totals
In	Vol	16	18	35	55	56	**180**
2	30			31	21	6	**58**
3	18	16					**16**
4	35				21	5	**26**
5	24	10	10			3	**23**
7	36	6	8		6		**20**
Totals	**143**	**32**	**18**	**31**	**48**	**14**	**143**

Time Period : 15:00 to 16:00

	Out	1	3	4	6	8	Totals
In	Vol	17	13	71	72	44	**217**
2	68			60	37	5	**102**
3	13	15					**15**
4	71				37	5	**42**
5	18	5	5			3	**13**
7	30	7	7		0		**14**
Totals	**200**	**27**	**12**	**60**	**74**	**13**	**186**

Time Period : 16:00 to 17:00

	Out	1	3	4	6	8	Totals
In	Vol	17	13	71	72	44	**217**
2	68			60	46	5	**111**
3	13	17					**17**
4	71				46	5	**51**
5	18	5	5			3	**13**
7	30	8	8		0		**16**
Totals	**200**	**30**	**13**	**60**	**92**	**13**	**208**

Time Period : 16:00 to 17:00

	Out	1	3	4	6	8	Totals
In	Vol	17	19	36	51	60	**183**
2	36			34	22	7	**63**
3	19	16					**16**
4	36				19	6	**25**
5	18	9	10			1	**20**
7	31	6	6		1		**13**
Totals	**140**	**31**	**16**	**34**	**42**	**14**	**137**

	Out	1	3	4	6	8	Totals
In	Vol	17	19	36	51	60	**183**
2	36			34	28	7	**69**
3	19	17					**17**
4	36				24	6	**30**
5	18	10	11			1	**22**
7	31	7	7		1		**15**
Totals	**140**	**34**	**18**	**34**	**53**	**14**	**153**

Appendix E

Rural Fire Service response - Wallaby Scrub Road

NSW RURAL FIRE SERVICE

Mr. Mark Molan
Operations Support & Projects
Coal and Allied
127 John St
Singleton NSW
2330

Your reference
Our reference: 2014/05:Ops

19th May 2014

Dear Mr Molan,

Wallaby Scrub Rd

I refer to our meeting on the 15th April 2014 in regards to the proposed development of the Mt Thorley mine complex and the forecast closure of Wallaby Scrub Rd.

Wallaby Scrub Rd provides important access between the townships of Broke, Bulga and Jerrys Plains during bushfires and other emergencies where additional units from the Rural Fire Brigades can be quickly brought in to assist each other. Typical incidents range from bush, grass and scrub fires, house fires as well as motor vehicle accidents and fires. Wallaby Scrub Rd is also an important containment line option during major bushfires.

Whilst our preferred option would be the relocation of Wallaby Scrub Rd to maintain access for emergency services, an acceptable second option is the construction of a suitable fire trail on the perimeter of the proposed expansion and constructed to a standard as documented in the NSW Bushfire Coordinating Committee policy No. 2/2007. Our recommendation would be a strategic classification of Essential. This is a fire trail without which fire response and suppression in an area would be severely compromised. All reasonable efforts must be made to ensure that this trail is trafficable to the agreed vehicle carrying capacity at all times. Sudden problems such as tree falls and land slips should be rectified as soon as identified. This trail should be checked on occasions throughout each year, and particularly before the commencement of the local bush fire season.

Physical barriers to vehicle access must not be deliberately installed, unless they are readily broached by fire fighters. That is, a locked gate with key access for fire fighters would be acceptable; fixed bollards, felled trees, piles of rock and the like would not be acceptable, as the obstruction cannot be removed by a fire fighting crew without additional machinery.

Further more detailed information on the construction standards is available on the RFS website or by contacting myself at the local office.

Regards,

S. Brown

Inspector Steve Brown
Operations Officer

Hunter Valley Team

Postal address

NSW Rural Fire Service
Hunter Valley Team
PO Box 3111
SINGLETON NSW 2330

Street address

NSW Rural Fire Service
Hunter Valley Team
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Appendix P

Social impact assessment

Appendix P — Social impact assessment

P

EMGA Mitchell McLennan

Warkworth Continuation 2014 and Mount Thorley Operations 2014

Social impact assessment

Prepared for Warkworth Mining Limited and Mt Thorley Operations Pty Limited | 13 June 2014

Planning + Environment + Acoustics

Warkworth Continuation 2014 and Mount Thorley Operations 2014

Social impact assessment

Prepared for Warkworth Mining Limited and Mt Thorley Operations Pty Limited | 13 June 2014

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Warkworth Continuation 2014 and Mount Thorley Operations 2014

Final

Report H14014RP1|Prepared for Warkworth Mining Limited and Mt Thorley Operations Pty Limited Operations Pty Limited|13 June 2014

Prepared by	Brett McLennan	Approved by	Luke Stewart
Position	Director	Position	Director
Signature		Signature	
Date	13 June 2014	Date	13 June 2014

This report has been prepared in accordance with the brief provided by the client and has relied upon the information collected at or under the times and conditions specified in the report. All findings, conclusions or recommendations contained in the report are based on the aforementioned circumstances. The report is for the use of the client and no responsibility will be taken for its use by other parties. The client may, at its discretion, use the report to inform regulators and the public.

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1 Introduction

1.1 Background

Warkworth Mine and the adjoining Mount Thorley Operations (MTO) are long standing members of the Hunter Valley community having commenced operations in 1981.

Warkworth Mine and MTO are owned by different entities; namely, the Warkworth joint venture participants (see Section 4) and the Mt Thorley joint venture participants. This separate ownership is reflected in each mine having its own standalone mining leases and development consent. Coal & Allied is the main shareholder in each mine and has been appointed by the respective owners to manage the mines as an integrated operation; namely, Mount Thorley Warkworth (MTW). A single management team for the adjoining mines provides various cost savings across each operation by way of integration. Further, equipment, personnel, water, rejects and coal preparation are shared and provide significant synergies for both operations. The MTW operation has a workforce of approximately 1,300 persons on average, which includes contractors.

Development consent for the Warkworth Continuation 2014 is required to enable continuation of operations at Warkworth Mine beyond 2015. An overview of the proposal is provided in Section 3.1.1.

Development consent for the Mount Thorley Operations 2014 is required to prevent the sterilisation of coal resource that is approved for extraction but cannot be mined within the current consent period. It would also enable the ongoing provision of services to the adjacent Warkworth Mine which is critical to the viability of both mines. An overview of the proposal is provided in Section 3.1.2.

The subject resources at both mines can be extracted efficiently and effectively by the respective applicants because of the hundreds of millions of dollars invested in the mines since they commenced operations and, that as existing mines, they have established access to product transport and distribution infrastructure such as road, rail and port.

The continued operation of MTW has significant social and economic benefits in the form of continuing employment for a workforce of approximately 1,300 persons on average, which would enable the mines to continue to be a major employer in the Singleton Local Government Area (LGA), net economic benefits of some $1.5billion and royalties of some $617million.

1.2 Overview

EMGA Mitchell McLennan Pty Limited (EMM) was engaged by Warkworth Mining Limited and Mt Thorley Operations Pty Limited to undertake a Social Impact Assessment (SIA) of the Mount Thorley Operations 2014 and Warkworth Continuation 2014 mining proposals (herein referred to as the proposals).

The SIA describes the existing social environment and considers the key changes that are likely to result, either directly or indirectly, from the proposals. As the proposals are to continue operations beyond 2015 at Warkworth Mine and 2017 at MTO, enabling the combined operations at MTW to maintain as far as possible 1,300 jobs over the longer term, the greatest impacts to the socio-economic environment and community services are projected to occur if the proposal does not proceed.

The stakeholder perceived impacts and opportunities of the proposal have been determined through consultation and are assessed with the technical assessment of impacts in this EIS or considering external literature. The combined assessment of perceived and technical impacts address the NSW Land and Environment (L&E) Court judgement for the Warkworth Extension Project, referred to as Warkworth Extension 2010, (see Section 3.1.1) (par. 430) that states that the assessment of impacts should include consideration of the "subjective fear or concern" of stakeholders and the "concrete likely effects of the proposed development".

This SIA forms part of the two EISs that accompany applications by WML and Mt Thorley Operations Pty Limited for the respective proposals, in accordance with Part 4, Division 4.1 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act). The report is intended to assist the Department of Planning and Environment (DP&E) in its assessment of the merit of the proposals and inform the Minister for Planning (or delegate) in determining as to whether or not to grant approval.

This SIA has been based on the combined proposals. It considers the key changes that may result, either directly or indirectly, from the proposal proceeding. The SIA also considers key changes resulting from the proposals not proceeding. Where relevant, an assessment of social impacts/ opportunities has been provided for each proposal; for example, if a potential impact or opportunity relates exclusively to one proposal but not the other.

The SIA report is structured as follows:

- **Section 2 – Approach**: social impact definitions, SIA approach and methodology, process, and relevant regulation and requirements.

- **Section 3 – Proposals and context:** proposal description and proposal context including existing MTW workforce characteristics, operational context, Coal & Allied's community investment and engagement activities and the operations socio-economic linkages with the region (including results of an employee and supplier survey).

- **Section 4 – Community profile and context:** community profile (including geography, history, and socio-demographic data) and community context (including the relevant legislative and governance context, issues review, and regional industry and mining overview).

- **Section 5 – Social impact assessment**: assessment of the proposal's potential social impacts based on the existing social and economic conditions, community services, stakeholder perceptions and technical study outcomes.

- **Section 6 – Management, mitigation and enhancement:** development of appropriate management, mitigation or enhancement strategies to address identified and prioritised social impacts and opportunities.

- **Section 7 – Conclusion:** summary of the key assessment findings and recommendations.

2 Approach

This section outlines the SIA approach including the methodology, details of the engagement process and relevant regulations and requirements.

2.1 Requirement to consider social impacts

Section 79C of the EP&A Act requires the consent authority to consider a number of matters when determining a development application (DA) made under Part 4 of that Act. Section 79C(1)(b) requires a consent authority to take into consideration the "likely impacts of that development, including social impacts in the locality".

The Secretary's Requirements issued for both proposals on 22 May 2014 require "an assessment of the likely social impacts of the development (including perceived impacts), paying particular attention to any impacts on Bulga village". This report was prepared in accordance the Secretary's Requirements. This assessment has also been guided by the approach to assessing social impacts that was advocated in the L&E Court judgment (see below and Section 3.1) and regulatory requirements in other states (see DSDIP 2013), as currently, there are no relevant regulations or guidelines for conducting SIAs in NSW.

2.2 Defining social impacts

Social impacts include any intended or unintended changes to one or more of the following as a result of a proposal (Vanclay 2003):

- people's way of life (for example, how they live, work and play);
- their culture (for example, shared beliefs and values);
- their community (for example, cohesion, stability and character);
- political systems (for example, democratisation and participation);
- the environment (for example, impacts on amenity from dust and noise);
- people's health and well-being (for example, physical, mental, social, spiritual health and well-being);
- personal and property rights (for example, economic affects, disadvantage and civil liberties); and
- people's fears and aspirations (for example, fears about the future of the community and their children).

In assessing social impact, consideration must be given to the foundation or rationale for concerns held and expressed in relation to a proposed development. The L&E Court has found that community concerns are required to be considered in assessing social impacts, and those concerns require support in objectively assessing evidence before a decision can be made of adverse impact. In *New Century Developments Pty Ltd v Baulkham Hills Shire Council* [2003] L&E Court 154, Lloyd J heard a merit appeal against the refusal by the Council of a DA for a Muslim prayer house. Lloyd J held that:

> 62A fear or concern without rational or justified foundation is not a matter, by itself, can be considered as an amenity or social impact pursuant to s 79C(1) of the EP&A Act (*Newton v Wyong Shire Council*, NSWLEC, McClellan J, 6 September 1983, unreported, *Jarasius v Forestry Commission of New South Wales* (1990) 71 LGRA 79 at 93 per Hemmings J; *Perry Properties Pty Ltd v Ashfield Municipal Council*(2000) 110 LGERA 345 at 350 per Cowdroy J). Where there is no evidence to support a rational fear it will be irrelevant that members of a community may have modified their behaviour arising from such an unjustified fear (*Dixon* at [71]).
>
> 63 It follows that in forming an opinion on the probable impact of a proposed development on the amenity of an area, tangible or otherwise, a court would prefer views from residents which are based upon specific, concrete, likely effects of the proposed development. That is consistent with the statement of Mason P in *Fairfield City Council v Liu* at [2] that "... the demonstrable social effect of a particular ... use is relevant under s 90(1)(d) [now s 79C]" (see also *Dixon* at [48]).

In *Telstra Corporation Ltd v Hornsby Shire Council* [2006] L&E Court 133, Preston CJ heard a merit appeal against the refusal by the Council of a DA for a mobile phone base station. Preston CJ held:

> 195 A fear or concern without rational or justified foundation is not a matter which, by itself, can be considered as an amenity or social impact pursuant to s 79C(1) of the EPA Act: *Newton v Wyong Shire Council*, unreported, LEC No. 40135 of 1982, 6 September 1983, , McClellan J, pp 110, 11;*Jarasius v Forestry Commission of New South Wales* (1988) 71 LGRA 79 at 92; *Perry Properties Pty Ltd v Ashfield Municipal Council*(2000) 110 LGERA 345 at 350 [22]; *New Century Developments Pty Ltd v Baulkham Hills Shire Council* (2003) LGERA 301 at 316[62]. 'Mere local prejudice' or 'the resistance of uninformed opinion to innovation' is not a basis for rejecting a proposal: *Cecec (No. 8) Pty Ltd v Mosman Municipal Council* (1960) 5 LGRA 251 at 263; *Foreman v Sutherland Shire Council* (1964) 10 LGRA 261 at 269.

In Bulga Milbrodale Progress Association Inc v Minister for Planning and Infrastructure and Warkworth Mining Limited [2013] L&E Court 408, Preston CJ held that:

> 408 ... consideration of both the objective data for the broader community, and the experiential evidence from residents of the impacts at the local level, is required to have a complete picture of the likely social impacts of the Project.

This SIA has also considered the foundation or rationale for concerns held and expressed in relation to the proposal, as reflected in the L&E judgments above. As described in this section and Section 4, a range of stakeholders were consulted to determine their perceptions of the proposal and its potential impacts and these are assessed with the outcomes of technical studies prepared by industry leading specialists.

2.3 SIA approach and methodology

As described in Section 1, Warkworth Mine and MTO function as an integrated mine at an operational level. From a social and local community perspective, potential social impacts/ opportunities generated by the two mines are created jointly and, therefore, a combined assessment has been prepared for the proposals. It is noted, however, that on occasion it is most relevant to consider the social impacts/ opportunities of the respective proposals in isolation.

The approach undertaken in this SIA employs a multi-method framework—multiple research approaches (i.e. theoretical frameworks) and strategies (i.e. quantitative and qualitative methodologies) are adopted in an iterative way to enhance validity and understanding of the research problem (i.e. social impacts). This approach is often referred to as ‘methodological triangulation’ in that it allows for cross verification from a combination of several research methodologies in the study of the same phenomenon (Rothbauer 2008).

2.4 SIA process

A range of key activities are undertaken as part of an SIA, as outlined in Figure 2.1. The SIA activities[1] are detailed in the following sub-sections. It is important to note that these activities are not necessarily linear; therefore, some activities overlap and continue throughout the assessment process (for example, stakeholder engagement).

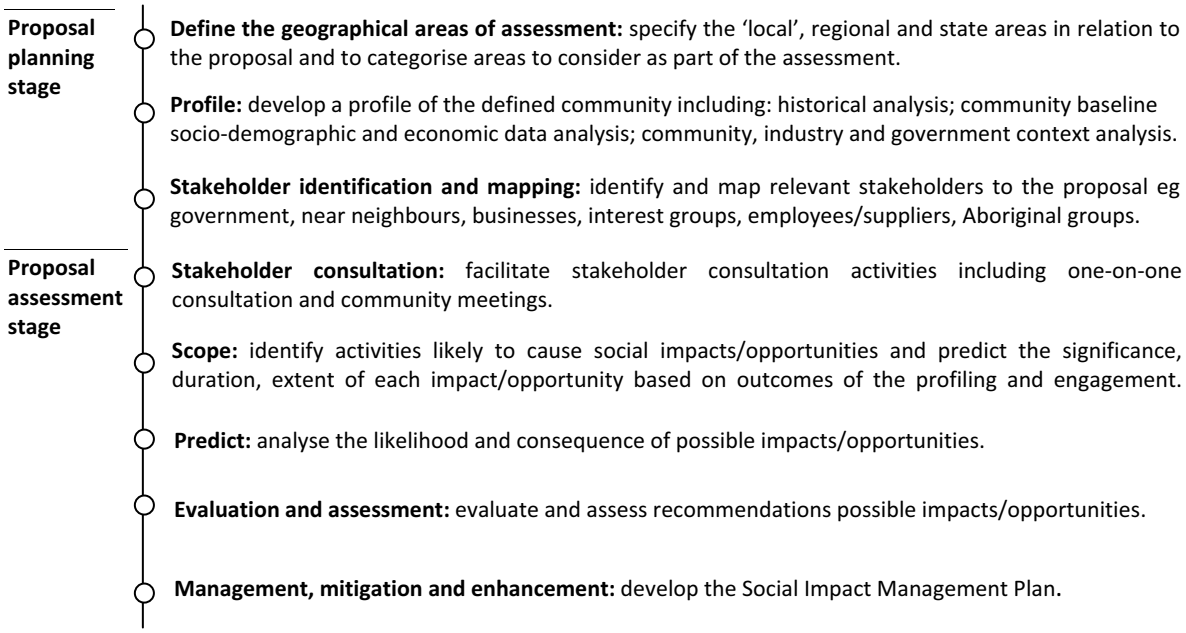


Figure 2.1 SIA process

2.4.1 Defining the geographical area of assessment

People's perception of social impacts often varies depending on their location and experience with the proposal. For instance, those that live in close proximity tend to focus on matters relating to amenity and property values. Whereas those further from the proposal tend to focus on potential impacts associated with social infrastructure (for example, housing, schools, transport etc) and socio-economic benefits either direct or indirectly. Therefore, scale is an important consideration in a social impact assessment.

For the purposes of the SIA, the 'community' is described by the following categories and associated geographical scales[2]:

[1] SIA activities were undertaken from January to May 2014.

[2] Geographical classifications align with those used in the Australian Bureau of Statistics (ABS) Census: State Suburb (SSC) and Local Government Area (LGA).

- Local community: The local community refers to those areas with close linkages to or in close proximity to the operation:
    - 'Near neighbours' defined as stakeholders who reside in the neighbouring villages of Bulga, Warkworth, Long Point and Gouldsville and those stakeholders who reside on properties in close proximity to the MTW operation. A particular focus on Bulga village is given in accordance with the Secretary's requirements.
    - In the context of the community profile (Section 4) this includes 'State suburbs' (SSCs) defined using available ABS census data and where there is a significant resident population. SSCs used in the SIA include the Bulga SSC, Broke SSC and Singleton SSC.
- Assessment area LGAs: Singleton LGA is the main area considered as part of the assessment as this is where the proposal is located. Maitland, Cessnock, Muswellbrook, and Upper Hunter Shire LGAs are also included given the socio-economic linkages between MTW and these LGAs.
- NSW is used given the resource is owned by the State and exploitation of the resource is a State decision.

The SIA also refers to the Hunter Region as the broader context area of the assessment (see further detail and area map in Section 4.1).

2.4.2 Stakeholder mapping and consultation

A stakeholder consultation strategy was developed to identify key stakeholders and detail a programme for stakeholder consultation. This was based on consultation with local and regional stakeholders undertaken by Coal & Allied throughout the life of the operation, and in particular since 2009 (with 2009 being the year consultation for the Warkworth Extension 2010 proposal was undertaken).

Stakeholder identification and mapping was undertaken using the information sourced as part of the profiling activities (see Figure 2.1), together with the existing stakeholder database developed by Coal & Allied's Communities Team. The database includes the names and contact details of near neighbours and other key stakeholders who have engaged with the Communities Team, or who have contacted Coal & Allied regarding MTW operations.

The consultation programme was implemented throughout the assessment process. The programme involved consultation with key stakeholders to identify social opportunities and impacts that are directly and indirectly related to the proposals.

The consultation was conducted using the following methods:

- **One-on-one consultation:** with key stakeholders to assess social impacts and opportunities and to help formulate mitigation strategies. A semi-structured interview guide was used to conduct the interviews which asked questions across key themes: perceptions of social impacts associated with the proposal; potential for management and mitigation of these impacts; opportunities associated with the proposal and potential enhancement strategies; perceptions of existing operational impacts and management strategies; costs and benefits of mining in the region; needs and aspirations in the community; preferred forms of information and engagement.

- **Community information sessions:** two community engagement and two community information sessions were held in Bulga and Singleton: (1) to provide an opportunity for anyone who had not already been contacted as part of the SIA engagement process to provide feedback on the proposal; and, (2) to provide an overview of the EIS process. The sessions offered stakeholders a chance to provide feedback and input into the SIA process.

- **Information provision:** a project information factsheet was developed and distributed to all households in the Singleton LGA to provide notification and overview of the proposal and EIS/SIA process. Regular media releases and articles were also used to notify local communities of the proposal, assessment details and consultation activities. Information was also provided to the existing MTW Community Consultative Committee (CCC) as part of regular, scheduled meetings.

A total of 151 stakeholders participated in the SIA consultation process. Table 2.1 shows the categories of stakeholder groups who participated and their proportional representation in the SIA process.

A strong focus of the engagement was with near neighbours and residents of local communities such as Bulga, as set out our in the Secretary's requirements with 44 per cent of participants being near neighbours. The Bulga community was also represented with 20 per cent of Bulga residents participating in the consultation process.

As part of the engagement programme consultation was also undertaken with MTW employees (see Section 3.2.1) and suppliers, the majority of whom reside or have a business in the Hunter Region, local community groups, Singleton Council and other service providers. The views of the broader Singleton community were sought through engagement sessions held in the Coal & Allied Singleton shop front however limited attendance made it difficult to quantify the views of this broader population group through this mechanism.

Table 2.1 Stakeholder groups and participation

Stakeholder group	Proportional representation in SIA consultation (%)
Near neighbours	44%
Local businesses/business groups	13%
Environmental groups	3%
Community/interest groups	7%
Media	0.5%
Local Government	5%
Aboriginal/cultural heritage stakeholders	3%
MTW employees/suppliers	15%
Mining industry employees/suppliers	6%

Table 2.1 Stakeholder groups and participation

Stakeholder group	Proportional representation in SIA consultation (%)
Health, education, community, emergency services	3%
Other	0.5%
Total number of stakeholders	**151**
MTW employee and supplier survey	**Number of participants**
Employee respondents	373
Supplier respondents	348
Total survey responses	**721**

Notes: Percentages based on a total of 151 SIA participants. An individual may represent multiple stakeholder groups. Individuals are only counted if they have participated in the SIA – i.e. recorded as part of the SIA consultation activities. As noted above near neighbours includes residents close to the mine in Bulga, Long Point/Gouldsville and Warkworth. Local businesses/business groups include a range of local businesses in the Singleton LGA and relevant regional industry groups. Environmental groups include representatives from local and regionally focused environmental groups. Community/interest groups include both local community groups from Bulga and specific interest groups from the broader Singleton LGA. Media include representatives from local/regional media sources. Government include representatives from local government, in this instance Singleton Council. Aboriginal/cultural heritage stakeholders include representatives and leaders of the local/regional Aboriginal community. MTW employees/suppliers include employees, contractors and suppliers to MTW. Mining industry employees/suppliers include those employed at nearby coal mines in the region or suppliers to those mines. Health, education, community and emergency services include representatives from schools, medical professionals, NGO representatives and emergency service providers from the Singleton LGA.

Throughout the SIA consultation programme, any stakeholders who had questions about the proposal or the EIS/SIA process were able to notify Coal & Allied via a freecall phone number, dedicated email inquiry line, or via the community shopfront in Singleton; all of which are advertised on communication materials. Any matters raised were and will continue to be recorded in a central database and followed up by Coal & Allied staff, and where relevant, EMM. This system follows the relevant Rio Tinto guidelines: Communities Standard (2011), and Community Consultation and Engagement Guidance (2011) (see Section 3.1.6 for more details on these guidelines).

2.4.3 Scoping, prediction and assessment of social impacts

During this phase, potential impacts and opportunities were identified and predicted, informed by both the social baseline study, other technical studies as part of the EIS, and the feedback from stakeholders.

Changes from the proposals are inter-related and the impacts and opportunities were considered three groups; namely:

- socio-economic impacts;
- impacts on community services; and
- stakeholder perceptions and assessment outcomes.

Potential impacts and opportunities are reported in Section 5.

2.4.4 Management, mitigation and enhancement

The impacts identified in the SIA are coupled with appropriate management, mitigation or enhancement strategies in Section 6.

Following submission of the SIA a Social Impact Management Plan (SIMP) will be developed by Coal & Allied to ensure ongoing implementation and monitoring of social management strategies throughout the proposal lifecycle. The key objectives of the SIMP are to detail the roles and responsibilities of applicants, stakeholders, government and communities throughout the life of the proposals, in managing social impacts and opportunities during operation and decommissioning stages (see Section 6).

3 Proposals and context

This section provides an overview of the proposals and existing approved operations at MTW, to provide additional social context for the proposal. Information has been sourced from a review of company documents and reports and surveys of MTW employees and suppliers. Figure 3.1 shows the proposal location.

3.1 Proposals

3.1.1 Warkworth Continuation 2014

Warkworth Mine is an open cut coal mine approximately 8km south-west of Singleton in the Hunter Valley, NSW. The mine is owned by the Warkworth joint venture participants and operated by Coal & Allied (managed by Rio Tinto Coal Australia) on behalf of the joint venture participants. The mine currently operates under Development Consent No. DA 300-9-2002-i issued by the then Minister for Planning in May 2003 under Part 4 of the EP&A Act. The mine also operates under two separate Commonwealth approvals (*Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act)); EPBC 2002/629 and EPBC 2009/5081.

Warkworth Mine has been in operation since 1981 and the originally approved operation has been modified several times. As noted, Warkworth Mine and MTO have been integrated at an operational level since 2004 as MTW.

Warkworth Mine currently operates three integrated open cut mining areas the North, West and South Pits with West and North Pits being the focus of production. Run-of-mine (ROM) coal from Warkworth Mine is transported to either the Warkworth or Mount Thorley Coal Preparation Plants (CPP) for processing. The majority of product coal from the CPPs is transported via conveyor to either to the Mount Thorley Coal Loader (MTCL) for export with a small portion conveyed to the Redbank Power Station. Coal loaded onto trains at the MTCL is transported to the Port of Newcastle for export.

The Warkworth Continuation 2014 seeks an approval under Part 4, Division 4.1 of the EP&A Act to extend mining beyond the current limits. Key components comprise:

- an extension of the approved mining disturbance footprint by approximately 698ha to the west of current operations (referred to as the proposed 2014 disturbance area);
- the ability to transfer overburden to MTO to complete MTO's final landform;
- the closure of Wallaby Scrub Road;
- an option to develop an underpass beneath Putty Road for the third bridge crossing yet to be constructed (while retaining the current approval for an overpass);
- minor changes to the design of the Northern out-of-pit (NOOP) dam; and
- the continued use of secondary access gates to the mine site and offsets for activities such as drilling, offset management, and equipment shutdown pad access amongst other things.

Under the development consent granted in 2003, Warkworth Mine has approval to operate until 19 May 2021. The proposal seeks a 21 year development consent period from the date of any approval. If approval is granted in late 2014, operations at Warkworth Mine are forecast to continue to 2035, a 14 year extension over the current approval. It is noted that the proposed 2014 disturbance area includes the proposed western extension of mining and a services corridor (referred to as the proposed extension area).

Approximately 63ha of land approved to be mined by MTO in accordance with its development consent is within the Warkworth Mine's proposal footprint. The majority of the area within the proposed development consent boundary is owned by WML and Miller Pohang Coal Company Pty Limited.

The proposal follows a previous environmental assessment for an extension of mining in a similar area in 2010. The proposal was titled the Warkworth Extension Project and is herein referred to as Warkworth Extension 2010. The Project Approval for Warkworth Extension 2010 was appealed in the L&E Court and upheld on 15 April 2013. Notwithstanding, Warkworth Mine retains Commonwealth approval for the extension. The approval is for the activities and the spatial extent the subject of the proposal.

The L&E Court decision resulted in the inability of Warkworth Mine to operate along the required strike length in West Pit to maintain viable production rates. Accordingly, a 350m extension referred to as Modification 6 was sought and approved in early 2014, to enable mining to continue in the very short-term whilst enabling longer term mine planning at Warkworth Mine to continue regarding its future.

The decision by the L&E Court in respect of the Warkworth Extension 2010 was a merit appeal determined on those particular facts the subject of the appeal. Accordingly, it is not a binding legal precedent that limits the discretion of future decision makers in respect of the current proposal.

Since the L&E Court judgment, Coal & Allied has been reviewing options for the mine and planning for its future. Numerous design alternatives have been canvassed, providing consideration to, amongst other matters, the issues raised in the L&E Court case. A number of issues raised in the case were specifically related to social impacts and the assessment process, and have been considered as part of this SIA (see further details on the matters raised in the L&E Court case in Section 2.2 and the issues addressed in this SIA in Section 6).

While the current proposal has similarities to the Warkworth Extension 2010, there are a number of important differences and improvements. These were developed with consideration to, amongst other matters, feedback received during stakeholder engagement for the proposal and the L&E Court judgement. Further, significant operational improvements, particularly regarding noise and dust management, have been made since the 2010 application.

3.1.2 Mount Thorley Operations 2014

MTO is an open cut coal mine approximately 10.5km south-west of Singleton in the Hunter Valley, NSW. The mine is operated by Coal & Allied (managed by Rio Tinto Coal Australia) on behalf of WML. The mine currently operates under Development Consent No. DA 34/95 issued by the then Minister for Planning on 22 June 1996 under Part 4 of the EP&A Act.

Mining activities approved under DA 34/95 have mostly been completed with the exception of Loders Pit and Abbey Green North (AGN) Pit with rehabilitation well-progressed on the east of the Site. ROM coal from MTO is transported to either the MTO or Warkworth Mine CPPs for processing. Extraction of coal from other pits has been completed; overburden emplacement is ongoing. Product coal from the CPPs is transported via conveyor to the MTCL. Coal loaded onto trains at the MTCL is transported to the Port of Newcastle for export.

The Mount Thorley Operations 2014 seeks a continuation of all aspects of MTO as it presently operates and extends or alters them, including:

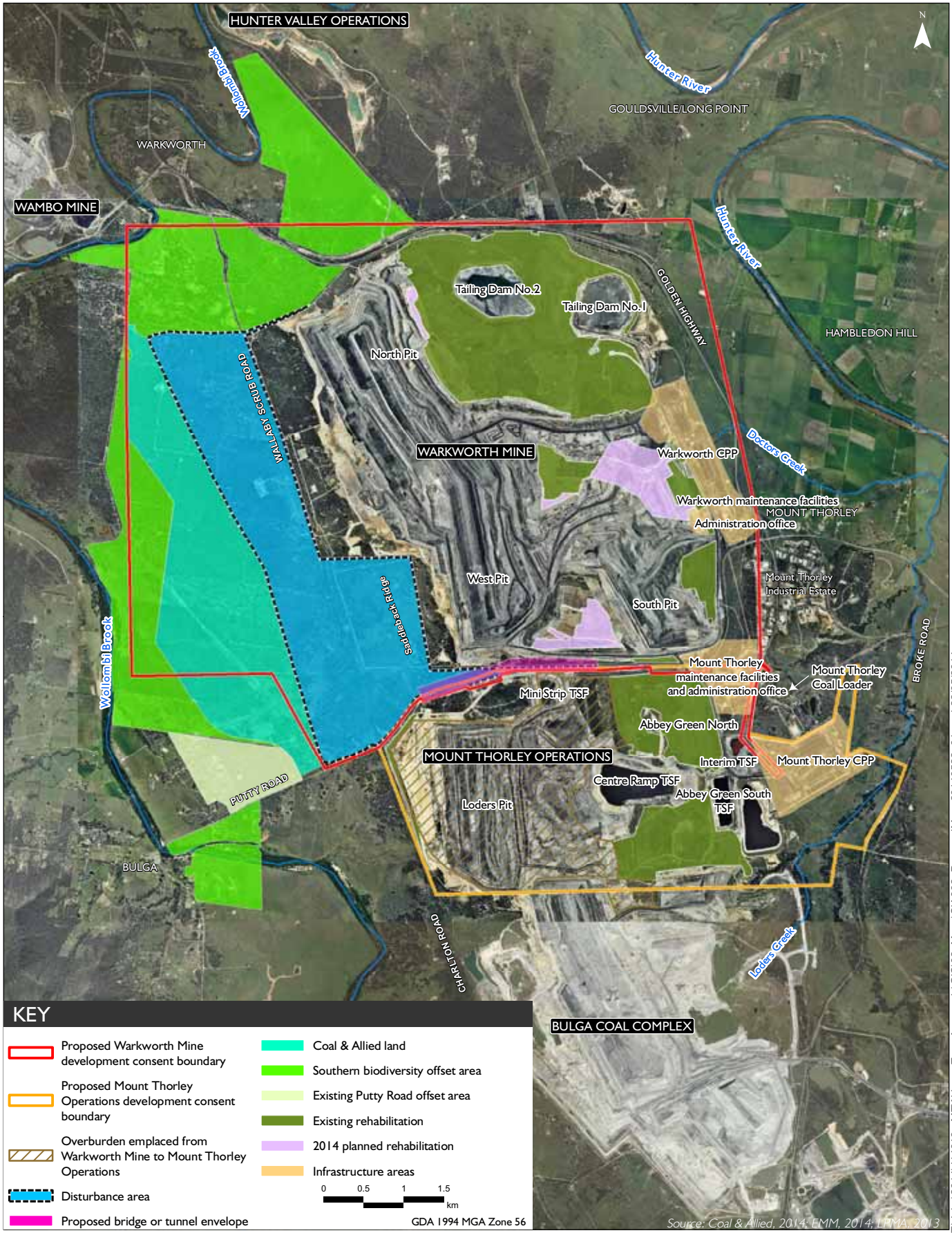
- completion of mining in Loders Pit and AGN Pit;
- transfer of overburden between MTO and Warkworth Mine to assist in rehabilitation and development of the final landform including the filling of Loders Pit void;
- maintain existing extraction rate of 10 million tonnes per year (Mtpa) of ROM coal;
- maintain and upgrade to the integrated MTW water management system (WMS), including:
    - upgrade to the approved discharge point and rate of discharge into Loders Creek via the Hunter River Salinity Trading Scheme;
    - ability to transfer and accept mine water from neighbouring operations (ie Bulga Coal Complex, Wambo Mine, Warkworth Mine and Hunter Valley Operations);
    - increase in the storage capacity of the southern out-of-pit (SOOP) dam;
- maintain and upgrade to the integrated MTW tailings management infrastructure:
    - including use of the northern part of Loders Pit as a tailings storage facility after completion of mining; and
    - wall lift to Centre Ramp Tailings Facility;
- upgrade to the MTO CPP to facilitate an increase in maximum throughput with the ability to receive this coal from Warkworth Mine;
- acknowledge all approved interactions with the Bulga Coal Complex; and
- continue coal transfer between Warkworth Mine and MTO and transportation of coal via the MTCL to the Port of Newcastle.

Mining in Loders Pit is expected to be completed in approximately 2020. Mining in AGN is yet to commence; however, it is anticipated to take approximately two years and be completed before 2022.

All activities, including coal extraction would be within disturbance areas approved under the existing development consent.

Mining activities are approved at MTO until 22 June 2017 under its development consent. The proposal seeks a 21 year development consent period from the date of any approval. If approval is granted in 2014, operations at MTO are forecast to continue to end of 2035, an 18 year extension over the current approval. The extension in timeframe is to facilitate the continued integration of operations with Warkworth Mine.

Land within the proposed development consent boundary is owned by Miller Pohang Coal Company Pty Limited.



Proposal map

Warkworth Mine continuation 2014 and Mount Thorley Operations 2014
Social Impact Assessment

Figure 3.1

3.1.3 Workforce

The average workforce currently employed at MTW is approximately 1,300 persons, with the majority (about 75 per cent) direct employees and the remainder of the workforce (about 25 per cent) made up of full time contractors.

MTW workforce demographics are characterised by:

- the employee workforce is predominantly male (about 90 per cent of all employees), as is the contractor workforce (about 75 per cent of all contractors);
- Indigenous employees represent about two per cent of the total MTW workforce, with a similar representation within the contractor workforce; and
- the dominant age group across both employees and contractors is 35-39 years (16 per cent of employees and 21 per cent of contractors).

The primary place of residence for employees is Singleton LGA (34.9 per cent), with most of the remainder of the workforce residing in nearby LGAs of Maitland (17.1 per cent) and Cessnock (19.4 per cent).

3.1.4 Suppliers

In 2013, MTW spent:

- $188million on 228 local suppliers from Upper Hunter, Muswellbrook, Singleton, Maitland and Cessnock LGAs;
- $147million on 377 suppliers from the rest of NSW; and
- $238million on 198 suppliers from the rest of Australia.

Supplier organisations were mainly mining (32 per cent), manufacturing (29 per cent), wholesale trade (7 per cent) and construction (7 per cent) industries (MTW Supplier Contribution and Participation survey 2014).

The regional offices of supplier organisations were mainly in Singleton (26 per cent), Newcastle (19 per cent) and Maitland (12 per cent) LGAs, with 'Other LGAs' (23 per cent) typically being LGAs in Sydney, Brisbane and the Central Coast.

Two-thirds of suppliers indicated that they employed 20 people or less (66 per cent) while 18 per cent indicated that they employed 21 to 30 employees (MTW Supplier Contribution and Participation survey 2014).

3.1.5 Complaint management

Coal & Allied's Communities Standard provides for a complaints and grievance mechanism. Matters raised and frequency received by MTW in 2013 is shown in Figure 3.2.

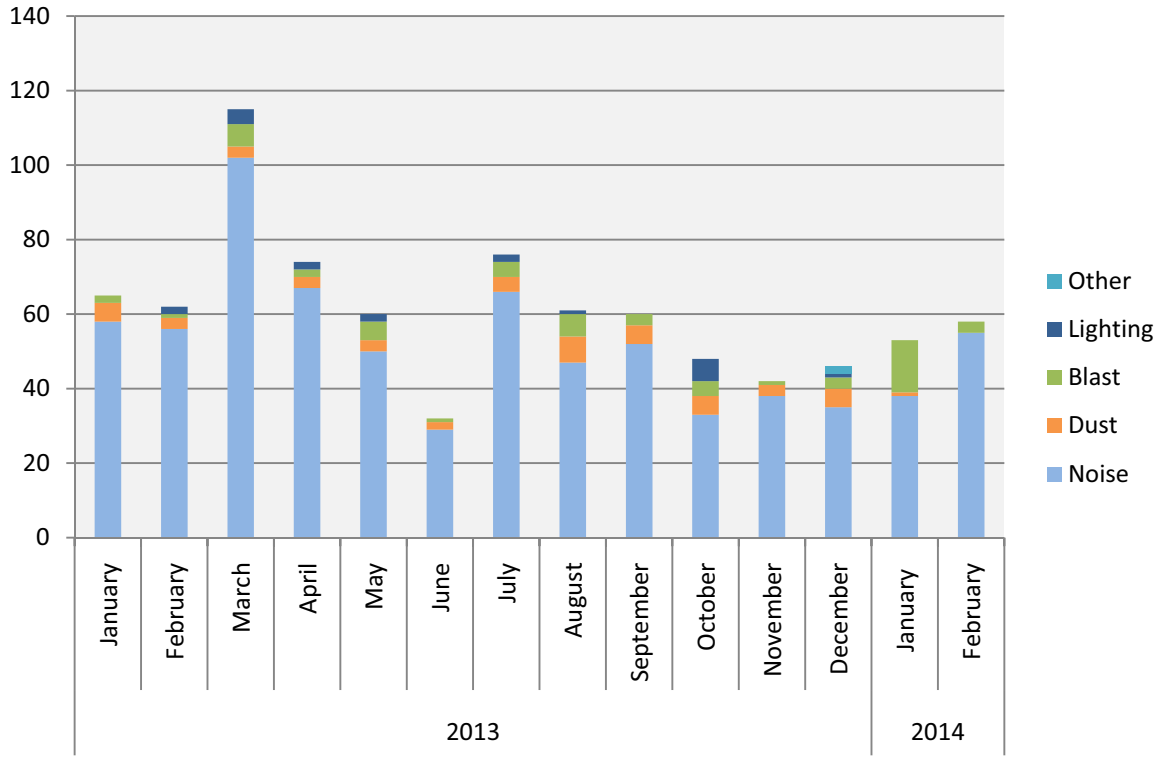


Figure 3.2 Matters raised and month, 2013

Source: Mount Thorley Warkworth Complaints Register (2013). Available online at: http://www.riotintocoalaustralia.com.au/ouroperations/5090_complaints_register.asp

While the majority of matters raised related to noise, blasting and air quality, a review of monitoring data indicates that MTW is compliant with relevant noise, blasting and air quality criteria.

3.1.6 Community engagement and investment

Community engagement is guided by Rio Tinto guidelines and standards including the *Communities Standard 2011*; *Community Consultation and Engagement Guidance 2011*; *Social Impact and Assessment Guidance 2011*; and the *Social Risk Analysis Guidance Note 2011*.

The Coal & Allied Community Relations programme manages and supports relationships with a range of stakeholder groups across its MTW and Hunter Valley Operations, including: community groups; near neighbours; Aboriginal community and groups; government (particularly local government); education sector; industry and business associations; non-government organisations including research institutions, strategic community partners; and, to some extent, media and local suppliers.

Current community activities and programmes include:

- Consultation and engagement: near neighbour engagement programme (including one-on-one and group events); council engagement; business community and industry forum engagement; schools engagement; community events; Aboriginal community engagement; MTW CCC.

- Community development: investment across three funds – Community Development Fund (CDF); Aboriginal Community Development Fund (ACDF); and Site Donations Committee. The CDF was initiated in 1999. In 2011, Coal & Allied announced the continuation of the Community Development Fund and committed $4.5million to distribute to eligible projects between January 2012 and December 2014. The aim of the fund is to support projects and programmes that would create opportunities that would provide a lasting benefit to the wider community. The ACDF was initiated in 2006 and is a 20 year commitment to the Aboriginal Community of the Hunter Valley. Since its inception, the fund has spent over $3million on projects that would deliver long term, sustainable outcomes for the Upper Hunter Valley Aboriginal community in areas such as business development, education and training and health. The fund currently contributes approximately $600,000 annually and has an additional $900,000 in a Future Fund. The MTW Site Donation Committee provides annual funding for community projects in accordance with the funding guidelines of the Committee. This includes projects which contribute to near neighbour communities, including the Bulga community.

- Communications: key communications are undertaken and maintained through the Singleton shopfront; Coal & Allied Information Line; website and email; quarterly newsletters, factsheets and media; site tours/open days; internal communication, input into external monitoring and compliance activities, community involvement in monitoring; regular CCC meetings and other forums/groups (refer to Section 6.2).

Community awareness of the company's community engagement and investment activities is high, with 60 per cent of residents surveyed in the Hunter Region indicating they are aware or very aware of the CDFs. Of those who were aware, six in ten either agreed (45 per cent) or strongly agreed (15 per cent) that the Coal & Allied Community Development Fund was benefiting the local community by providing support for appropriate and effective programs (HVRF 2013).

The suite of management, mitigation and enhancement initiatives that would continue to be implemented under the proposals are provided in Section 6.3.

3.2 Socio-economic linkages between MTW and the region

Employees and suppliers of MTW were surveyed in March 2014. The surveys provide an insight into the ways in which MTW employees and suppliers contribute to, and participate in, the Hunter community.

3.2.1 MTW Employee Contribution and Participation Survey

i Introduction

An invitation to complete the employee survey was sent by email to more than 400 MTW employees. Of this sample, 228 completed the survey online. Employees who do not have regular access to computers at work were invited to complete a paper-based survey at pre-shift meetings; resulting in the completion of 145 paper-based surveys. In total, 373 employees completed the survey.

The employee survey consisted of 18 questions related to place and status of residence, employment status and remuneration, and various questions on contribution and participation to the communities in the LGAs and the Hunter Region more broadly.

ii Residency

The findings of the employee survey revealed that the resident LGA data from the survey sample was statistically similar to current HR data, with the Singleton (34.9 per cent), Maitland (30.8 per cent) and Cessnock (16.1 per cent) LGAs the prominent areas of residence. Length of employment was also similar with almost 60 per cent indicating that they had worked at MTW for less than 5 years (2-5 years [46.4 per cent]; 1-2 years [7.8 per cent]; <1 year [4.9 per cent]), 24.5 per cent for 5-10 years and over 16 per cent more than 10 years (10-15 years [4.9 per cent]; >15 years [11.6 per cent]) (see Figure 3.2).

In terms of length of residency, almost two-thirds of employee respondents indicated that they had lived in their current resident suburb for less than 10 years (<1 year [6.7 per cent]; 1-2 years [9.7 per cent]; 2-5 years [26.6 per cent]; 5-10 years [20.4per cent]). Housing status was dominated by the mortgage holder category, with 61.5 per cent of employee respondents holding a mortgage; 20.2 per cent renting, 15.9 per cent owning their property outright and 2.9 per cent living with friends or family. The high proportion of employees either owning their own home outright or paying a mortgage demonstrates the strong ties the workforce have to the local community.

iii Economic contribution

Employee respondents were asked to estimate the percentage of that income spent in their LGA. Over two-thirds of respondents estimated that they spent between 30 per cent and 80 per cent of their incomes in their LGA. The most nominated quintile was the 70 per cent to 90 per cent band, with almost a third of all respondents estimating their local spend in that range. For estimated percentage of their income spent in the Hunter Region, respondents indicated a higher percentage spend in the Region. The highest quintile for estimated regional spend was the 80 per cent to 100 per cent band, with over 40 per cent of responses falling in this range. The highest two quintiles, 60 per cent to 80 per cent and 80 per cent to 100 per cent, constituted almost 70 per cent of total estimates of proportional regional spend (see Figure 3.3). These responses demonstrated the employees at MTW are spending a high portion of their salaries in the Hunter Region contributing to the local economy.

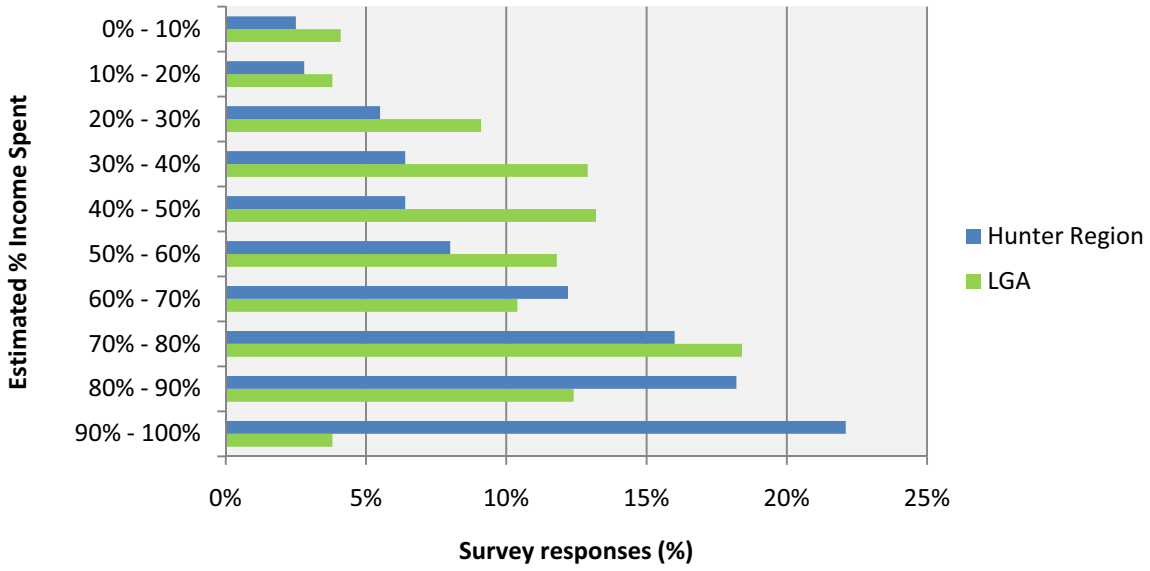


Figure 3.3 Estimated % income spent in LGAs and the Hunter Region

iv Social and community contribution

Employee respondents were then asked a series of questions relating to their direct contribution to, and participation in, community organisations and activities. One hundred and twenty three respondents (33.9 per cent) stated that they currently undertake some form of voluntary work, which is higher than the proportion of residents in Singleton LGA that volunteers. Of those that indicated current voluntary work, the majority carried out this work for sporting or physical recreation organisations (49.6 per cent) followed by emergency services (21.1 per cent), children/ youth (19.5 per cent), education/ training (13.0 per cent) and community/ welfare (12.2 per cent) (see Figure 3.4).

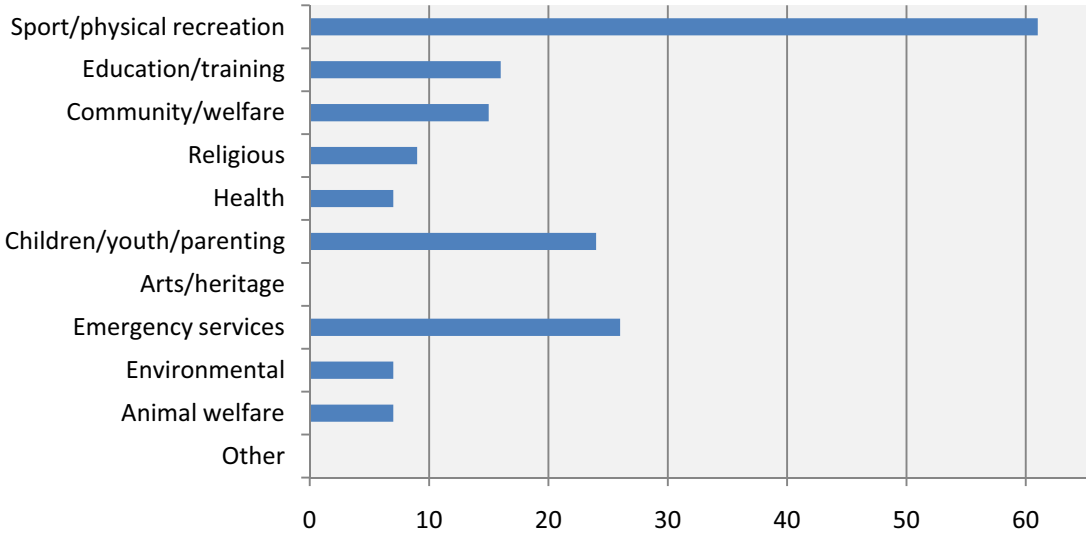


Figure 3.4 Organisation type for voluntary work

In relation to the type of voluntary work undertaken, three primary categories of responses were evident: teaching/instructing/coaching/refereeing (52 responses); fundraising (41 responses); and, committee work (33 responses). The majority of respondents estimated that they dedicate between 1-10 hours per month to voluntary work in the Hunter Region with some 22.3 per cent dedicating 10-20 hours per month (see Figure 3.5).

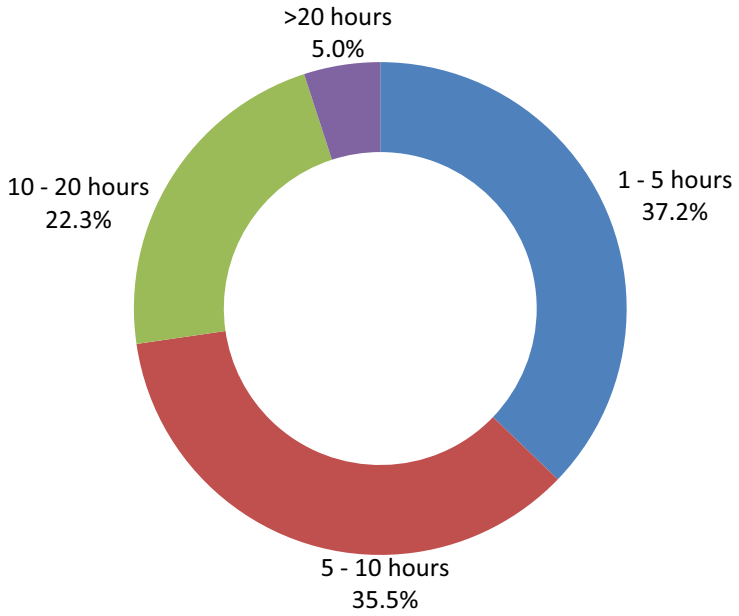


Figure 3.5 Hours per month dedicated to voluntary work

Participants were also asked to think about the voluntary work activity they spent the most time on and to nominate the LGA in which this generally occurred. The results mirrored the residency data, although there was a slightly larger percentage of respondents that nominated Singleton LGA (45.9 per cent) as the location for voluntary work.

The survey then sought information on employee participation in community activities. Responses tended to fall into the three categories of playing sport (226 responses), attending community events (150 responses), and/ or attending school events (121 responses). The majority of those respondents who participated in community activities did so for between 1-10 hours per month (1-5 hours [45.3 per cent]; 5-10 hours [24.1 per cent]), with some 15 per cent dedicating 10-20 hours per month. Again, the location for these activities tended to reflect residency, however Newcastle LGA was more prominent in the community activity location results (8.3 per cent).

3.2.2 MTW Supplier Contribution and Participation Survey

i Introduction

An invitation to complete the online supplier survey was sent by email to over 450 suppliers and 256 valid survey responses were received.

The supplier survey consisted of 16 questions related to industry type, location, workforce size, supplier relationship with MTW, and the contribution and participation to LGAs and the Hunter Region more broadly.

ii Industry

Respondents to the supplier survey were first asked to identify the main industry of their organisation, with mining (32.0 per cent) and manufacturing (29.3 per cent) dominant (see Figure 3.6).

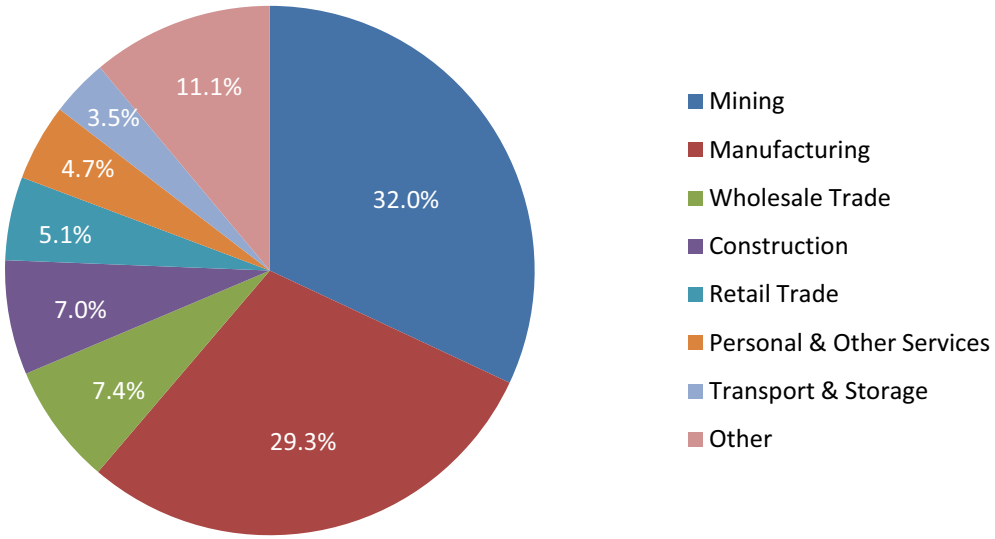


Figure 3.6 Main industry of MTW suppliers

The main LGAs for regional offices of respondent supplier organisations included Singleton (26.2 per cent), Newcastle (19.0 per cent) and Maitland (12.3 per cent), with 'Other LGA' (22.6 per cent) typically including LGAs in Sydney, the Central Coast and Brisbane. When asked how many employees currently work at the local/ regional office, two-thirds of all respondents indicated that 20 or less employees (66.4 per cent) worked at the office (<5 employees [21.3 per cent]; 6-10 employees [19.7 per cent]; 11-20 employees [25.4 per cent]), whilst 18 per cent indicated that the office had between 21 and 30 employees (see Figure 3.7).

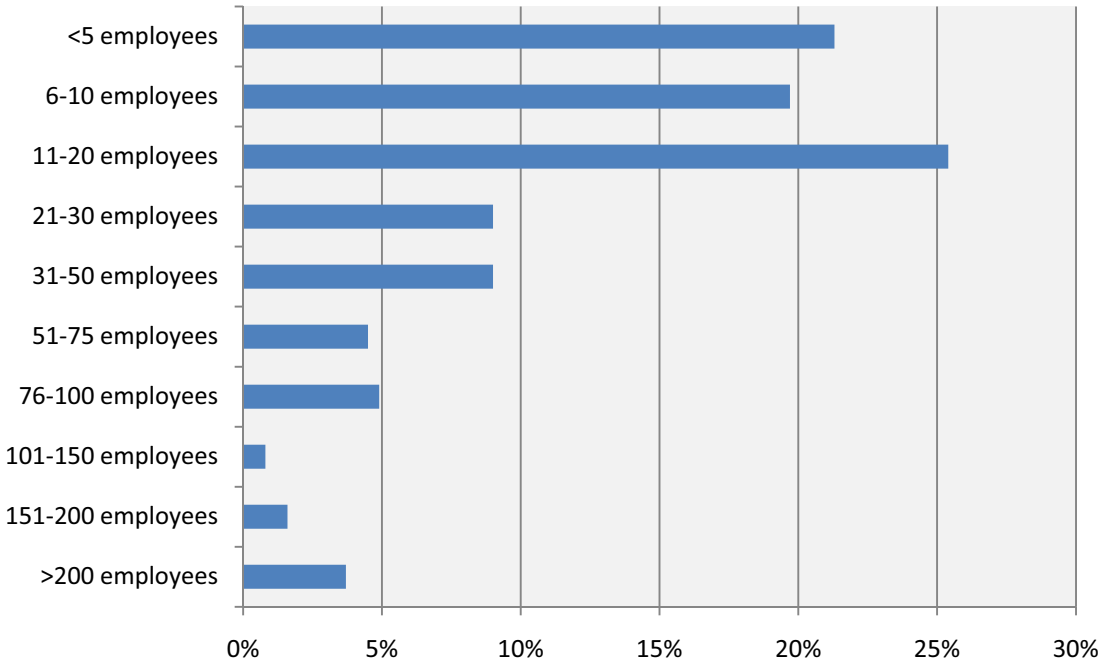


Figure 3.7 Number of employees at local/ regional office

iii Economic contribution

The survey then asked participants to estimate the value of their supplier relationship with MTW in the last financial year (total amount spent by MTW on their goods and/ or services in 2012/13). The average value of responses was $1.194 million, with the aggregate value for the 214 respondents to the question standing at $255.5 million. Respondents were also asked to estimate how much of their annual business expenditure (including wages and all other outlays) is spent in the LGA of their main local/ regional office. Estimates were reasonably evenly spread across the deciles, with the most prominent quintiles being the 30 per cent-40 per cent and 70 per cent-90 per cent bands. Estimates for percentage spend in the Hunter region as a whole tended to fall in the 70 per cent-100 percentile.

The survey also analysed the degree to which respondent organisations were reliant on MTW, with respondents asked to provide an estimate of their total annual business revenue that is directly related to MTW. Over 60 per cent of respondents indicated that less than 10 per cent of their revenue was directly related to MTW, with nearly 90 per cent indicating that less than 30 per cent of their revenues were directly attributable to MTW (see Figure 3.8).

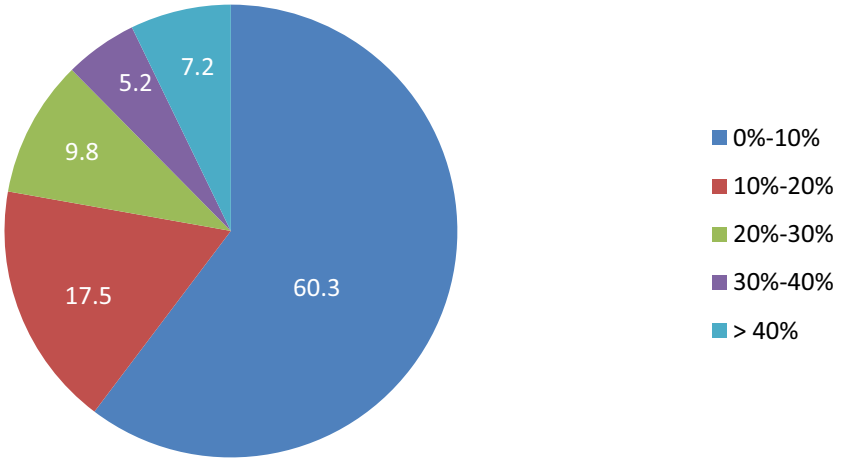


Figure 3.8 Percentage of total annual business revenue estimated to be directly related to MTW

iv Social and community contribution

In relation to corporate contributions to community organisations (for example, charities, community services, health care) in the Hunter Region, 75 per cent of participants indicated that they make direct financial contributions. The types of organisations to which these contributions were made included sporting (84 responses), welfare (65 responses), emergency services (55 responses), education (42 responses) and health (41 responses) organisations. The total financial contribution to these community organisations for the past 12 months was generally estimated to be between $500 - $25,000, with the primary band being $1,001 - $10,000 (see Figure 3.9).

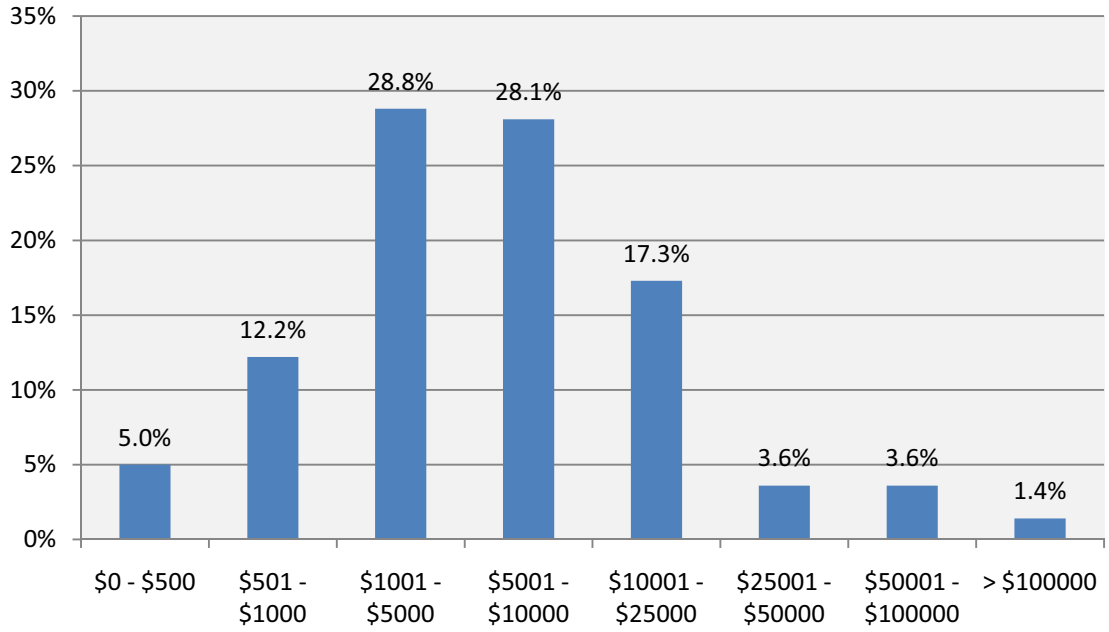


Figure 3.9 Total financial contributions to community organisations in the past 12 months

Community organisations with the highest financial contributions were generally from Singleton LGA (33.8 per cent) Newcastle LGA (25.9 per cent) and Maitland LGA (12.2 per cent).

Participants were asked whether they made any non-financial contributions (eg donating equipment, company resources, use of facilities) to community organisations in the Hunter Region, with 52.2 per cent of respondents indicating that their organisation makes these types of contributions. Community organisations receiving non-financial contributions included sporting (50 responses), community welfare (35 responses), education (27 responses), youth (21 responses) and emergency services (20 responses) organisations. The primary types of non-financial contribution made included donation of new/ used equipment (48 responses), allowing employees time off work to contribute (44 responses), use of company facilities or services at no cost (42 responses), advisory services at no cost (26 responses) and training at no cost (24 responses) (see Figure 3.10).

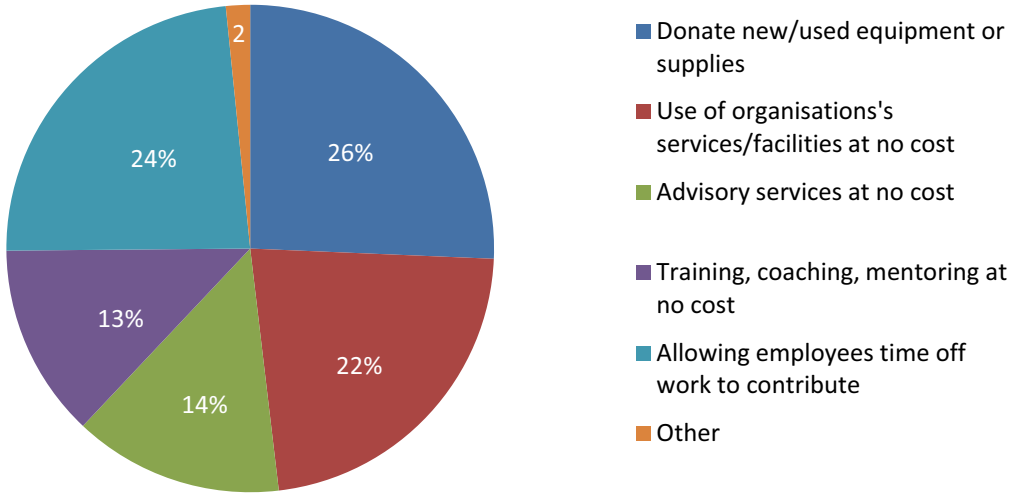


Figure 3.10 Type of non-financial contributions made by supplier to community organisations

Finally, suppliers were asked to think about the community organisation that receives the most substantial non-financial contribution from their company and to indicate in which LGA that organisation generally operates. Singleton (38.5 per cent), Newcastle (19.8 per cent) and Maitland (10.4 per cent) LGAs dominated responses, which correlate with the results of the dominant LGAs for financial contributions to voluntary organisations.

3.2.3 Summary

The Employee and Supplier Surveys undertaken indicate that MTW has strong links to the economic and social fabric of the Hunter Valley. Key links included:

- 61.5 per cent of employees holding a mortgage in the region;
- one third of employees of MTW listed as spending between 70 and 90 per cent of their income in their LGA and 80 to 100 percent of their income in the greater Hunter Region;
- 33.9 per cent of employees undertake some form of voluntary work including for sporting of physical recreation organisations, emergency services, children/ youth services, education/ training services, and community/ welfare;
- the average value of the supplier relationship with MTW in the last financial year (total amount spent by MTW on their goods and/or services in 2012/13) was estimated by supplier survey respondents to be approximately $2million, with the aggregate value for the 214 respondents of approximately $256million;
- suppliers derive 30 percent or less of their revenues directly from MTW with some 7 per cent relying on more than 40 per cent of their revenues directly from MTW;
- most suppliers to MTW spend between 30 and 40 per cent of their annual business expenditure in the LGAs of their main local/regional offices;

- 75 per cent of MTW suppliers make direct financial contributions to community organisations in the areas of sporting, welfare, emergency services, education and health; and
- total financial contributions from MTW supplier organisations to community organisations over the past 12 months is estimated to be between $500 - $25,000 per supplier.

4 Community profile and context

This section details the community profile and context in which MTW is located. It is divided into two sections: a community profile, which describes the local geographic area and key socio-economic indicators; and, a description of the regional context, which details governance/ legislative structures, and regional industry and mining activities. The purpose of the profile is to establish a baseline from which impacts and opportunities associated with the proposal can be assessed.

The profile relies on a number of primary and secondary sources to develop a picture of the local community, region and project context. Firstly, a range of socio-economic data sources were used including: primarily, the ABS Population and Housing Census data (2006, 2011); and also a number of publications from the Hunter Valley Research Foundation (HVRF). Secondly, a range of primary and secondary information sources were used to build a picture of the community in terms of the culture, history, industry, governance context, key events and trends that have shaped and continue to characterise the area. These sources included online and print media, government and NGO policy documents, legislation and court proceedings, and academic research and publications.

4.1 Community profile

The community profile relies on several key data sources; primarily the ABS Population and Housing Census data (2006, 2011) and a number of publications from the Hunter Valley Research Foundation (HVRF), including the Hunter Valley Socio-Economic Baseline Study, Hunter Region Economic Indicators, and Well-being Watch (HVRF 2013a,b,c).

4.1.1 Local geographic area

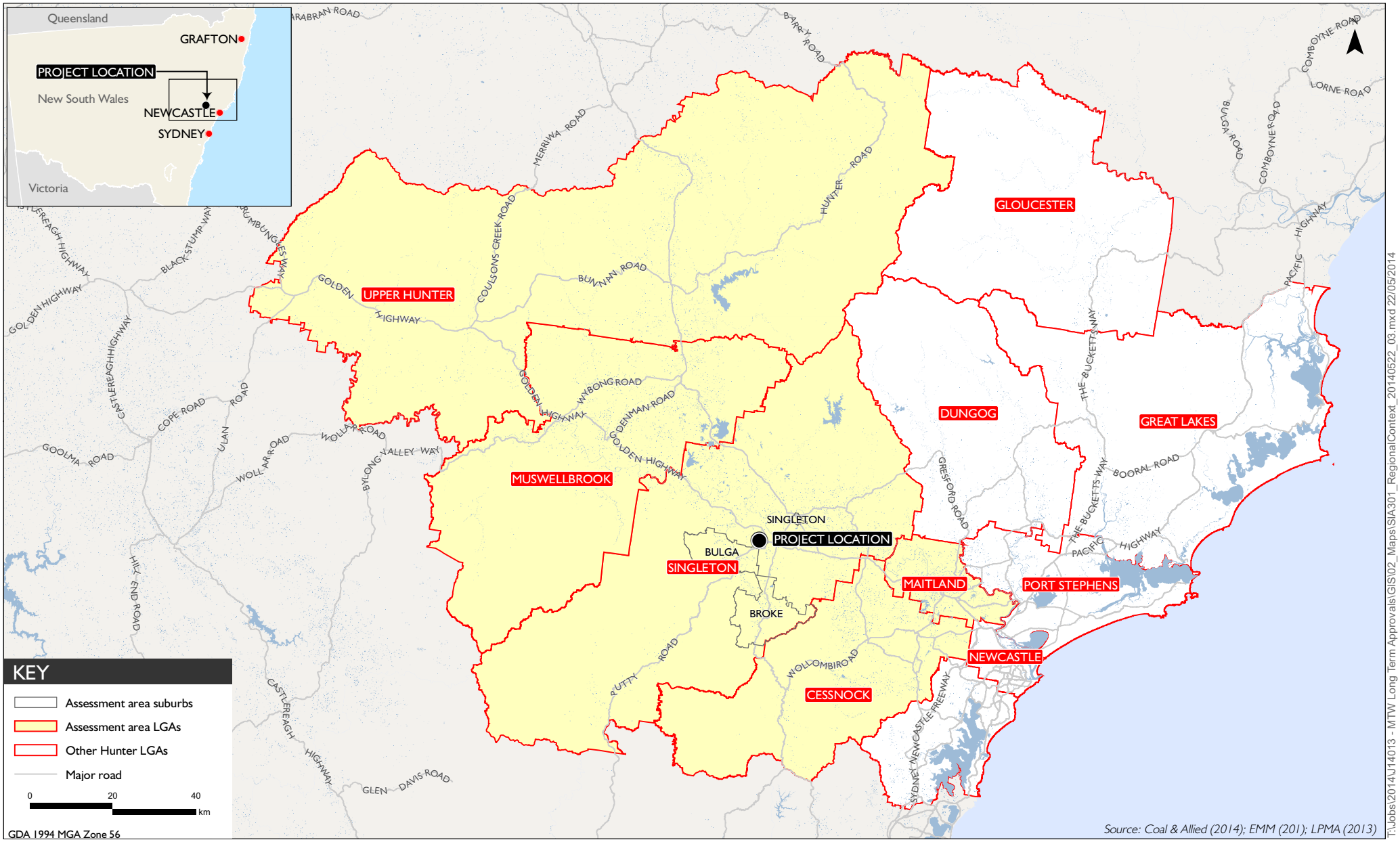
The proposal is situated in the Singleton LGA, which lies approximately 200km north-west of Sydney and 80km inland from Newcastle (the largest city in the region) (see Figure 4.1). The Singleton LGA covers an area of approximately 4,893km^2 and includes the town of Singleton, the villages of Broke, Bulga, Milbrodale and smaller surrounding communities.

The region is characterised by towns that have developed along the major rivers and river valleys, initially in response to mining and agricultural opportunities. The Hunter River is one of the largest river valleys on the NSW coast with a catchment of 2.2 million ha (DoPI 2012).

4.1.2 History

i Aboriginal cultural heritage

The area's Traditional Owners are the Wonnarua people (also referred to as Wanaruah or Wonnaruah). The Wonnarua traditional lands also extended through to Muswellbrook and Upper Hunter LGAs, bordering the traditional lands of the Darkinjung and the Wiradjuri peoples (Walsh 2009). According to the dreamtime of this region, the area was created by a great spirit called Baiame.



The proposal context map

Warkworth Mine continuation 2014 and Mount Thorley Operations 2014
Social Impact Assessment

Figure 4.1

The exact number of Wonnarua people in this area prior to European settlement is unknown; however, the population is known to have declined after increasing European settlement in the Hunter Region during the 1820-1830s due to disruption of traditional lands, movements between Aboriginal groups, and health impacts. By the 1860s, Aboriginal people in the area were encouraged to settle on government reserves. The St Clair Mission was established in the region in 1893, with the Wonnarua comprising a significant proportion of those in residence at the mission (Blyton 2004).

The Wonnarua people have maintained a strong sense of their cultural identity and connections with the land despite these impacts. There are cultural heritage sites and places of significance recorded throughout the region. In the Warkworth area, sites have been identified during cultural heritage assessment surveys (see Appendix N of the EIS). More broadly within the Upper Hunter Valley the Wonnarua Nation Aboriginal Corporation has implemented a programme to document and map the oral, historical and written records, and the language of the Wonnarua people (Muurrbay 2009; WNAC 2014).

ii European heritage

The earliest European presence in the Hunter region dates back to the 1790s, when coal was discovered by a party searching for escaped convicts. The resource was exploited at a low level and shipped to Sydney, but difficult terrain hampered attempts to explore the region. More in-depth survey of the coastlines east and north of the Hunter region were undertaken by John Oxley in 1818, and the following year the countryside was explored by John Howe, Chief Constable of Windsor. Government plans for the establishment of free settlements in the Hunter Region followed, and soon after towns became established around the higher population areas, such as Jerry's Plains in the 1830s and Bulga in the 1840s.

Plans for the construction of the Great North Road were developed in the early 1820s to accommodate the influx of settlers moving into the Hunter Valley. Between 1829 and 1830 the road was extended by convict gangs from Wollombi to Broke, and branch lines to Patrick's Plains (Whittingham/Singleton) and Cockfighter's Creek (Warkworth) were added.

The land became used for a variety of purposes, with pastoral grazing and wheat growing being the primary industries. At Warkworth, originally known as Cockfighter's Creek, the land remained primarily used for grazing and little development occurred, apart from a few hotels constructed along the road alignment in the 1840s for people travelling between the Hunter Valley and Sydney.

From the early 1900s until World War II, dairying was the primary industry in the Hunter Valley. In the lands around Bulga and Warkworth, lucerne growing was popular and to a lesser extent viticulture supported by timber felling, fruit production and grazing.

In 1942, during World War II, a Royal Australian Air Force (RAAF) base with a landing strip was established in Warkworth as a satellite to its parent base in Bulga. The base included hideouts to conceal bomber aircraft and a number of buildings including mess facilities and ablutions blocks, and petrol storage tanks. As the threat of attack dissolved with end of the war, the base was eventually decommissioned and the majority of assets were auctioned and removed by 1949.

Acquisition of coal mining leases in the Hunter began in the 1970s to 1980s. The mining lease for Warkworth was granted in 1976, and mining operations began in 1981.

4.1.3 Current socio-economic context

The following sections detail the current socio-economic context of the region, including characteristics and trends across key demographic themes, namely: population; economy and industry; education; health and well-being; social and community; and, housing, infrastructure and services.

Each section includes a brief outline of key statistics and trends, and a summary table of relevant statistics. Following this, a summary of the profile is provided in order to identify the primary existing areas of socio-economic risk and opportunity in the local area and region—ie existing risks and opportunities, which may be amplified by the changes proposed as part of the proposal.

i Population

The key factors shaping changes in the profile of any region are the volume, make-up and growth of population. In the assessment area, the population profile has changed significantly over the last five years, more rapidly than that of NSW, and at quite different rates across the LGAs and SSCs, as summarised below and in Table 4.1:

- The overall rate of population growth in the assessment area LGAs was slightly faster than in the previous five-year period from 2001-06; albeit marked by differentiations with increases in growth in Cessnock, Muswellbrook and the Upper Hunter and decreases in Maitland and Singleton LGAs.

- Between 2006 and 2011 the population in the key regional centres of Maitland and Cessnock grew at a faster rate (9.1 per cent and 10.0 per cent respectively) than Singleton LGA (3.5 per cent) and NSW (5.6 per cent). These centres are the focus of greenfield housing development and regional development planning initiatives (see Section 4.2) and these factors may account for the faster growth rates.

- Bulga and Broke SSCs have grown significantly between 2006 and 2011[3], with a population growth of 11.5per cent and 17.7per cent (an increase of 37 and 96 persons respectively). Singleton SSC has declined -4.7 per cent (a decrease of 273 persons).

- The concentration of population growth in the area has centred on the junction of Cessnock, Maitland and Singleton LGAs, and also in the areas around Aberdeen and Scone (Upper Hunter Shire LGA) (HVRF 2013b).

- There is a slightly higher proportion of males in the Singleton (51 per cent) and Muswellbrook (51.7 per cent) LGAs when compared with Maitland, Cessnock and the Upper Hunter Shire LGAs (49-50 per cent) and NSW (49 per cent). There are also a higher proportion of Indigenous persons in the region than in NSW, particularly in the village of Bulga (8.3 per cent), and the LGAs of Muswellbrook (5.4 per cent) and Cessnock (4.8 per cent) relative to their respective residential populations.

[3]Due to changes in geographical boundaries between the 2001 and 2011 Census, comparisons between these years are misleading and subsequently are not included in this assessment for Bulga, Broke and Singleton SSCs, Camberwell and Warkworth SSCs, and Upper Hunter Shire LGA. Therefore, comparisons are limited to the 2006 and 2011 Census for these areas.

- There is a large number of young people aged 5-14 years (16 per cent), 15-24 years (16 per cent), and working adults aged 25-54 years (45 per cent) residing in Singleton LGA when compared with NSW (13 per cent and 41per cent respectively). Since 2006, Singleton has experienced a 20 per cent decline in the 5-15 year age group and increases in the 20-29 year age group, largely through in-migration associated with the mining workforce. With the exception of Singleton, the 60-70 year old age group is the biggest contributor to population growth in the region. Bulga and Broke in particular have a substantially older profile, with relatively low numbers of young children aged 0-4 years and of the primary family-formation age groups between 25 and 35 years old (HVRF 2013b).

- The area has high in-migration levels and around 20 per cent of current residents have lived outside the area in 2006. The majority of arrivals into the region moved from elsewhere in NSW outside the Hunter Region, followed by people previously resident in Newcastle or Lake Macquarie. The exception to this was Singleton, for which Queensland was the second biggest contributor of new residents, as a result of mining workforce migrations (HVRF 2013b). Mining industry growth contributed significantly to population increases between 2006 and 2011.

- Muswellbrook LGA had the highest level of net in-migration among the LGAs, with only 51 per cent of persons having had the same address five years ago, compared to 57per cent in NSW. The other LGAs more closely matched the average, except for Cessnock LGA in which 60 per cent of the population had the same address five years ago. Bulga SSC had the lowest level of net in-migration amongst the SSCs, with over 71per cent having had the same address five years ago.

- There is a relatively high level of mobility among young adults aged 25-29 years—they were the least likely to have lived in the same LGA five years earlier and most likely to have lived outside the Hunter Region, followed by those aged between 30-34 years (HVRF 2013b).

- Overall, it is estimated that the Hunter Region population will grow from 622,000 in 2012 to about 762,000 by 2036 (Deloitte Access Economics 2013). By this time, the population of the lower Hunter Region is projected to reach approximately 640,000 people (growing from 520,000 in 2012); however, population growth in the upper Hunter Region will be more variable as a result of the cyclical nature of the dominant mining and agriculture sectors, which heavily influence the size and demographic composition of smaller LGAs (Deloitte Access Economics 2013).

Table 4.1 Socio-demographic data Population and demographic indicators

	Bulga SSC*	Broke SSC*	Singleton SSC*	Singleton LGA	Maitland LGA	Cessnock LGA	Muswellbrook LGA	Upper Hunter Shire LGA*	NSW
Population 2011 (count of persons and % population change 2001-11)									
2001	N/A	N/A	N/A	20,384	53,718	45,071	14,746	N/A	6,311,168
2006	321	540	5,783	21,937	61,880	46,206	15,236	12,976	6,549,177
2011	358	636	5,510	22,694	67,478	50,841	15,791	13,753	6,917,660
% population change 2001-06	N/A	N/A	N/A	7.6%	15.2%	2%	3.3%	N/A	3.7%
% population change 2006-11	11.5%	17.7%	-4.7%	3.5%	9%	10%	3.7%	6%	5.6%
Demographic characteristics 2011 (% of total population)									
Male	183 (51%)	328 (51.6%)	2,741 (49.7%)	11,648 (51%)	33,005 (49%)	25,257 (50%)	8,163 (51.7%)	6,865 (49.9%)	3,408,878 (49%)
Female	175 (49%)	308 (48.4%)	2,769 (50.3%)	11,046 (49%)	34,473 (51%)	25,583 (50%)	7,628 (48.3%)	6,889 (50.1%)	3,508,780 (51%)
Indigenous	30 (8.3%)	11 (1.7%)	246 (4.5%)	845 (3.7%)	2,355 (3.5%)	2,456 (4.8%)	847 (5.4%)	537 (3.9%)	172,621 (2.5%)
Age groups 2011 (% of total population)									
0-4 years	18 (5%)	55 (8.6%)	338 (6.1%)	1,651 (8%)	5,043 (7%)	3,801 (7%)	1,246 (7.9%)	984 (7.2%)	458,736 (7%)
5-14 years	58 (16%)	78 (12.2%)	707 (12.8%)	3,381 (16%)	9,778 (14%)	7,064 (14%)	2,358 (14.9%)	1,922 (13.9%)	873,776 (13%)
15-24 years	48 (13%)	69 (10.8%)	798 (14.5%)	3,292 (16%)	9,036 (13%)	6,520 (13%)	2,195 (13.9%)	1,578 (11.5%)	893,101 (13%)
25-54 years	139 (39%)	256 (40.2%)	2,196 (39.9%)	9,564 (45%)	27,351 (41%)	19,732 (39%)	6,639 (42%)	5,257 (38.2%)	2,863,574 (41%)
55-64 years	58 (16%)	113 (17.7%)	571 (10.4%)	2,452 (12%)	7,710 (11%)	6,570 (13%)	1,680 (10.6%)	1,753 (12.7%)	810,290 (12%)
65+ years	39 (11%)	67 (10.5%)	900 (16.2%)	2,354 (11%)	8,561 (13%)	7,153 (14%)	1,676 (10.7%)	2,257 (16.3%)	1,018,180 (15%)
Same usual address 5 years ago 2011 (% of people aged 5 years and over with same address 5 years ago)									
% of persons	71%	59%	58%	57%	58%	60%	51%	58%	57%

Notes: **due to changes in geographical boundaries between the 2001 and 2011 Census, comparisons between these years are misleading and subsequently are not included in this assessment for Bulga, Broke and Singleton SSCs, and Upper Hunter Shire LGA. Therefore, comparisons are limited to the 2006 and 2011 Census for these areas. The data table does not display 'inadequately described' or 'not stated' categories of Census data.*

ii Economy and industry

Industries in the Hunter Region include coal mining, agriculture (particularly dairy, beef cattle, vegetable growing and pasture production) and associated service industries, horse breeding, power generation, tourism, viticulture and wine making, and defence (DoPI 2012; HVRF 2013b).

Singleton is the State's largest producer of coal, giving the region a multi-faceted industrial profile. The high export prices for coal in the past decade propelled an expansion of capacity in the region's coalfields, including significant investments in infrastructure in the coal transport chain and the Port of Newcastle. The Hunter Valley Coal Chain is recognised as the largest coal export operation in the world, consisting of 35 coal mines owned by 13 coal producers, more than 27 points for loading coal onto trains, and three port coal export terminals loading more than 1,400 vessels each year through the Port of Newcastle (HVRF 2013b). The Hunter Valley Coal Chain Coordinator Limited (HVCCC) was established in 2009 to assist in the management of the coal chain, with membership including all current Hunter Region coal chain producers as well as service providers. In 2012-13, a record 142.64 million tonnes of coal was exported from the Port of Newcastle, which surpassed the previous year's exports by 17 per cent (HVRF 2013a). The decline in thermal coal prices and high foreign exchange rate over the past two years has seen a downturn in the coal mining industry in the region.

A number of indicators suggest that while mining activity was historically very high, significant declines in Australian thermal coal prices, amongst other factors, over the past two years have had a negative impact on activity. Investment in new tangible assets has fallen by more than half between December 2012 and December 2013. These trends are consistent with the expectation by the HVRF (HVRF 2013a, b) that few additional mining investment proposals will progress in the medium term, excepting moderate expansions of existing mines.

The effects of the mining slowdown are also being observed in the labour market. There is now an excess of qualified mining engineers in NSW (Australian Journal of Mining, 2014), as well as a shortage of positions for mining apprentices and trainees in the Hunter Valley (Australian Mining 2013). HVRF (2013a) note that the unemployment rate in the Hunter Valley region has increased notably since 2011. Recent job losses have also occurred in the wider industry, with approximately 1,500 direct mining jobs lost in the Hunter Valley over the last 18 months (NSW Mining 2014) not including layoffs that occurred in May 2014. These job losses and their respective flow-on effects are representative of the indicators described in Section 4.1.3.

HVRF's measure of employment intentions suggest that further weakness in the Hunter region labour market can be anticipated. Employment intentions have declined since December 2011; HVRF's most recent measures are lower than during the Global Financial Crisis. Similar trends are also evident in the HVRF's Household Survey, which suggests that consumer confidence and purchasing intentions in the Hunter Valley region remains negative. Overall, HVRF conclude that the economic outlook for the Hunter region reflects the end of the previous expansion phase combined with a drive to achieve efficiencies, the effects of which are now being felt by local suppliers, contractors and operational employees.

Agricultural industries in the region are supported by the rich soils, temperate climate, good quality water supply, and proximity and access to Sydney (DoPI 2012). The thoroughbred breeding and viticulture/wine making industries are recognised in the recent NSW Government strategic regional land use planning as Critical Industry Clusters (CIC) (see DoPI 2012). Neither proposal is located in an area designated as a CIC (see Section 4.2.1). The thoroughbred horse breeding industry is situated around Scone in the Upper Hunter Shire LGA. There are more than 70 studs located in the area including international operations such as Coolmore and Darley Emirates (near Denman). Over $2 billion (AUD) has been invested in the region's stud farms and horses in recent years (DoPI 2012). In 2009, 2,650 Australian thoroughbred horses were exported with a value in excess of $100 million – representing an increase of more than 50 per cent on the 1,631 horses in 2000 and as much as 90 per cent of the total value of Australian thoroughbred exports (HTBA 2014).

The region's viticulture and wine making industry is a significant contributor to the regional and national economy. The region produces over 39 million litres of premium wine annually – distributed to domestic markets and over 50 countries internationally. The saleable value of this wine is estimated at over $270 million per year, with flow on value of over $230 million (HVWIA 2014). There are 125 wineries and over 6,000 ha of vineyard in the region, which is Australia's oldest wine region. Moreover, over 2.8 million tourists visit the wine growing area per annum, which is estimated to generate over $560 million worth of business in the region (HVWIA 2014).

Key economic and industry statistics and trends in the assessment area include (also see Table 4.2):

- Expansion of the labour force across the assessment area between 2006 and 2011, growing substantially more than for NSW as a whole, largely as a result of increased demand flowing from mining investment (HVRF 2013b).

- Participation rates rose and unemployment rates fell across the assessment area, particularly in Cessnock LGA between 2006 and 2011 (HVRF 2013b). Cessnock LGA continued to have the lowest participation rate, highest unemployment rate, and highest proportion of part-time employment across the LGAs. The unemployment rate was lowest in Singleton LGA (3.3 per cent), followed by Upper Hunter Shire (3.6 per cent), then Muswellbrook (4.8 per cent) and Maitland (5 per cent). Cessnock was the only LGA with an unemployment rate (6.5 per cent) above that of NSW (5.9 per cent).

- Youth unemployment rates were substantially below those for NSW except in Cessnock LGA and had fallen from 2006 levels, particularly in Singleton LGA (HVRF 2013b).Unemployment rates were higher among residents in the assessment area who had not completed Year 12 or equivalent education.

- More recent statistics for 2013 show increases in unemployment rates over the past few years in the Hunter Region in relation to a decline in the mining sector (see HVRF 2013a), although there are signs of stabilisation over the last 6 months to December 2013. Part of this stabilisation is related to a concurrent decline in the participation rate, with more people leaving the labour force due to a worsening labour market or retirement. The stabilisation is also driven by lower interest rates, which has been assisting regional growth, particularly in the housing sector (HVRF 2013a).

- The rates of full-time employment in 2011 were generally at or above the state average across all LGAs and SSCs; except for Cessnock, which had 57 per cent full-time employment and 29.7 per cent part-time employment, compared with rates of 60 per cent and 20 per cent in NSW.

- All income indicators increased across the area between 2006 and 2011, and at a faster rate than for NSW as a whole, with individual incomes rising substantially in Singleton and Muswellbrook LGAs in conjunction with mining investment (HVRF 2013b). Individual incomes in Singleton and Muswellbrook LGAs were $640/week and $619/week respectively, significantly higher than for NSW ($561/week). The other LGAs in the area were much closer to the NSW average, except for Cessnock LGA which remained substantially lower than the average, despite a growth in both personal and family incomes between 2006 and 2011. The SSCs in the assessment area were also generally similar or higher than the NSW individual income averages, with Broke the highest at $595/week, followed by Bulga $576/week and Singleton $558/week.

- Mining is the dominant industry of employment across the assessment area, representing up to 22 per cent of the workforce in Singleton LGA, and up to 21 per cent in Bulga, well above the NSW proportion of 1.6 per cent. While not evident in these figures, the consolidation of the coal mining sector is starting to weigh on the regional economy and the labour market with a reduction in employment in the industry (see HVRF 2013a).

- Other sectors experiencing substantial growth across the assessment area included construction, and other services, also influenced by the growth in mining, while health care and social assistance continued a long-term trend of increasing share of total employment.

- Other important industries in the region include agriculture and associated service industries (although employment levels have generally contracted), horse breeding, electricity production, tourism, viticulture and wine making (see DP&I 2012).

- All LGAs were generally dominated by lower-skilled occupations (ie technicians and trades workers, machinery operators and drivers, labourers) in comparison to NSW, particularly in Muswellbrook and Cessnock LGAs.

Table 4.2 Socio-demographic data Employment and industry indicators

	Bulga SSC	Broke SSC	Singleton SSC	Singleton LGA	Maitland LGA	Cessnock LGA	Muswellbrook LGA	Upper Hunter Shire LGA	NSW
Employment 2011 (% of labour force, people aged 15 years and over)									
Full-time	118 (64%)	200 (61%)	1,734 (64.2%)	7,665 (65%)	19,745 (60%)	12,731 (57%)	4,954 (63.7%)	4,309 (63.6%)	2,007,924 (60%)
Part-time	39 (21%)	86 (26.2%)	671 (24.9%)	2,991 (25%)	9,567 (29%)	6,630 (29.7%)	1,944 (25%)	1,793 (26.5%)	939,465 (28%)
Unemployed	8 (4.3%)	14 (4.3%)	129 (4.8%)	394 (3.3%)	1,641 (5%)	1,449 (6.5%)	375 (4.8%)	243 (3.6%)	196,525 (5.9%)
Median income 2011 (Median income ($) per week for people aged 15 years and over)									
Individual	$576	$596	$558	$640	$562	$472	$619	$552	$561
Household	$1,882	$1,537	$1,314	$1,692	$1,292	$1,042	$1,399	$1,071	$1,237
Top 3 industries of employment 2011 (% of employed people aged 15 years and over)									
	Coal mining 21.2%	Coal mining 15%	Coal mining 22.8%	Coal mining 22%	Coal mining 5.3%	Coal mining 8.7%	Coal mining 18.5%	Sheep, beef, cattle 10.2%	School education 4.4%
	Cafes, restaurants 4.5%	Beverage manufacturing 6.3%	Cafes, restaurants 4.5%	Cafes, restaurants 3.5%	School education 4.7%	Cafes, restaurants 4.4%	Cafes, restaurants 4.0%	Coal mining 9.2%	Cafes, restaurants 4.1%
	Public order and safety 3.4%	Accommodation 4.4%	School education 3.8%	School education 3.2%	Cafes, restaurants 4.6%	Accommodation 3.6%	School education 3.7%	Other livestock farming 5.9%	Hospitals 3.2%
Top 3 occupations 2011 (% of employed people aged 15 years and over)									
	Machinery operators, drivers 19.7%	Managers21.1%	Machinery operators, drivers 19.8%	Machinery operators, drivers 19%	Technicians, trades 18.1%	Technicians, trades19%	Technicians, trades 20.2%	Technicians, trades 17.1%	Professionals 22.7%
	Technicians, trades 17.4%	Technicians, trades 14.5%	Technicians, trades 18.5%	Technicians, trades 18.8%	Professionals 16.6%	Machinery operators, drivers 14.6%	Machinery operators, drivers 17.6%	Managers 16.6%	Clerical, administrative 15.1%
	Labourers 16.3%	Machinery operators, drivers 13.8%	Professionals 13.1%	Professionals 12.4%	Clerical, administrative 14.1%	Labourers 13.4%	Labourers 13%	Labourers 15.9%	Managers 13.3%
Median mortgage repayments / rent 2011 (Median mortgage repayment ($) per month / Median rent ($) per week)									
Median rent	$200	$265	$250	$260	$259	$230	$230	$170	$300
Median mortgage	$2,200	$1,950	$1,842	$2,000	$1,733	$1,517	$1,733	$1,600	$1,993

Notes: The data table does not display 'inadequately described' or 'not stated' categories of Census data.

iii Education

Education attainment levels in the assessment area are generally below state averages, particularly in Muswellbrook and Cessnock LGAs. Education continues to be identified as a risk area for the future sustainability of the area, particularly given the growth in knowledge-based employment nationally and the likelihood of declining mining industry employment over the long-term (HVRF 2013b).

Key statistics and trends in education in the region are (also see Table 4.3):

- The number of children attending primary and high school has generally increased or decreased in line with population changes between 2006 and 2011, reflecting minimal changes in attendance rates reported by schools over this period (HVRF 2013b). The proportion attending high school had increased slightly among 14 to 18 year olds, and substantially among 16 year olds between 2006 and 2011, largely in response to legislative change (HVRF 2013b).

- There are eight government schools and two non-government schools in the Singleton LGA, including seven primary schools, one high school and two combined schools (i.e. Years K-12):

    - King Street Public School (government, primary school, 435 enrolments in 2013);
    - Mount Pleasant Public School (government, primary school, 54 enrolments in 2013);
    - Singleton Public School (government, primary school, 428 enrolments in 2013);
    - Singleton Heights Public School (government, primary school, 589 enrolments in 2013);
    - Broke Public School (government, primary school, 59 enrolments in 2013);
    - Milbrodale Public School (government, primary school, 11 enrolments in 2013);
    - Jerrys Plains Public School (government, primary school, 21 enrolments in 2013);
    - Singleton High School (government, high school, 1221 enrolments in 2013);
    - Australian Christian College – Singleton (non-government, combined, 106 enrolments in 2013); and
    - St Catherine's Catholic College (non-government, combined, 876 enrolments in 2013).

- The Muswellbrook LGA has seven primary schools and one high school; the Upper Hunter Shire LGA has 11 primary schools and four high schools/combined schools; Cessnock LGA has 28 primary schools and four high schools/combined schools; Maitland has 19 primary schools and nine high schools/combined schools. The Hunter Institute of Technical and Further Education (TAFE) also maintains a campus in Singleton and Muswellbrook LGAs (ACARA 2014).

- The number of people attending TAFE institutions was unchanged from 2006. The overall number masked a decline in participation by males largely offset by increased participation by females, particularly among 15 to 19 year olds. The decline in male participation was most marked in Muswellbrook LGA, despite the establishment of the Mining Skills Centre within Muswellbrook TAFE, which appeared to attract significant student numbers from outside the LGA (HVRF 2013b).

- The number of students attending university and other tertiary institutions increased, and the increase was greater than for NSW. However, the level of participation within the assessment area (15.5per cent of 15 to 24 year olds) was still about half that for NSW (33.9 per cent) (HVRF 2013b).

- Year 12 completion rates increased across the area but remained well below the state average, so much so that that the gap between the area and the state actually widened between 2006 and 2011. Year 12 completion rates among younger residents (aged 18 to 24) declined across most of the area and most noticeably in Muswellbrook LGA, possibly related to the availability of work and other training options in the mining industry.

- Post-school qualifications were held by higher proportions of residents in Cessnock and Maitland LGAs, and lower proportions of residents in Singleton, Muswellbrook and Upper Hunter Shire LGAs compared with NSW, although there was some narrowing of the gap relative to 2006 for the latter LGAs.

- Among those who held post-school qualifications, the proportion with certificate level qualifications was much higher than for NSW, while the proportion with university level or other graduate qualifications was much lower. This reflects both the structure of the regional labour market and the relative lack of access to university or similar tertiary institutions, in contrast to Newcastle LGA (the location of the closest regional university).

- The Socio-Economic Index for Areas (SEIFA) Index of Education and Occupation rank of Maitland LGA improved between 2006 and 2011, but that of Singleton LGA and, to a lesser extent, Upper Hunter Shire declined, while the very low rankings of Cessnock and Muswellbrook LGAs were virtually unchanged. These results reflect both the relative decline in Year 12 completions and the emphasis on Certificate level qualifications in these LGAs (HVRF 2013b).

Table 4.3 Education indicators

	Bulga SSC	Broke SSC	Singleton SSC	Singleton LGA	Maitland LGA	Cessnock LGA	Muswellbrook LGA	Upper Hunter Shire LGA	NSW
Type of educational institution attending (%of persons attending an educational institution)									
Pre-school	0%	9%	6.4%	7.1%	7.3%	7%	6.7%	7.5%	5.9%
Infants/primary	33.9%	28.1%	28.2%	31.5%	30.7%	28.8%	28.7%	32.6%	25.7%
Secondary	26%	25.5%	25.9%	24.9%	23%	22.5%	21.2%	23.3%	21.1%
Technical or further educational institution	13.4%	6.9%	11.3%	9.7%	8.5%	8.2%	7.2%	8.2%	7.9%
University or other tertiary institution	5.4%	3.7%	5.6%	5.6%	9.6%	5.4%	4%	3.9%	14.2%
Other type of educational institution	3.6%	3.7%	1.9%	1.7%	1.7%	1.7%	1.3%	1.3%	2.4%
Highest year of school completed 2011 (%of persons aged 15 years and over who are no longer attending primary or secondary school)									
Year 12 or equivalent	25%	41%	30%	33%	35%	25%	28%	32%	49%
Non-school qualifications 2011 (%of persons aged 15 years and over with a qualification)									
Postgraduate degree level	2%	4%	3%	2%	3%	1%	2%	2%	7%
Graduate diploma / graduate certificate level	3%	0%	1%	2%	2%	1%	2%	2%	3%
Bachelor degree level	17%	19%	14%	15%	16%	11%	12%	14%	25%
Advanced diploma and diploma level	15%	12%	12%	12%	14%	11%	11%	11%	14%
Certificate level	42%	43%	49%	51%	47%	50%	48%	47%	31%

Notes: The data table does not display 'inadequately described' or 'not stated' categories of Census data.

iv Health and well-being

Health data is typically limited in scale and time; such that health databases generally have long lag times and encompass large geographical areas (usually LGAs). Hence, the majority of data used in this health profile is presented for the five assessment area LGAs only, and sourced from several key databases[4]. The data presented in this profile is categorised according to the key population health indicators used by NSW Health: health services and facilities; hospitalisations; deaths; health risk behaviours; and, health status (over the most recent period for which data is available). Key findings across each of these focus areas are listed below.

Health services and facilities

- The region as a whole has a relatively high number and broad distribution of diverse health services and facilities including: a rural referral hospital; district hospitals; community hospital; multipurpose services; a private hospital; residential aged care facilities; community health centres.

- There is relatively good access to a regular general practitioner (GP) with the majority of residents in the broader Hunter Medicare Local region (88 per cent) identifying they have a regular GP. Cessnock (96 per cent) and Maitland (91 per cent) have the greatest proportion of the population with a regular GP, compared to the Upper Hunter Shire (74 per cent) and Muswellbrook (64 per cent). In addition, residents in Muswellbrook (39 per cent) and the Upper Hunter Shire (39 per cent) reported the highest proportion of 'barriers to accessing a GP', generally associated with travel times and the inability to get to appointments on time.

- The ageing population in the region will place significant and growing pressures on governments to meet healthcare service and infrastructure demands into the future.

Hospitalisations

- All LGAs in the assessment area were generally characterised by above average rates of hospitalisation. Singleton and the Upper Hunter Shire LGAs have significantly more hospitalisations per capita overall than the NSW average and all five LGAs also have a significantly higher proportion of potentially preventable hospitalisations than NSW, particularly for lifestyle diseases and risk factors. All LGAs, except for Singleton, have a significantly higher proportion of hospitalisations for coronary heart disease and for diabetes, and all LGAs except for the Upper Hunter Shire have higher than NSW average rates of high body mass related hospitalisations.

Deaths

The most recent available data indicate that the overall cancer death rate was higher in Muswellbrook LGA (94.0 per 100,000 people) and lower in Singleton LGA (68.0 per 100,000 people) than in non-metropolitan NSW (82.4 per 100,000 people).

[4] Health database sources: Hunter New England Local Health District website, NSW Health (http://www.hnehealth.nsw.gov.au/services_and_facilities); Health Statistics website, NSW Health (http://www.healthstats.nsw.gov.au); Social Health Atlas of Australia, Public Health Information Development Unit, University of Adelaide (http://www.publichealth.gov.au/sha/social-health-atlases.html); Well-being Watch Report and Hunter Valley Socio-Economic Baseline Study, HVRF (http://www.hvrf.com.au/regional-research-program); Hunter Medicare Local Population Health Snapshot, Hunter Medicare Local (www.gpaccess.com.au/library/Snapshot.pdf).

- Death rates from respiratory disease in the assessment area were lower than in non-metropolitan NSW (9.7 per 100,000 people), with the exception of Muswellbrook LGA which was slightly higher (10.0 per 100,000 people). The most recent air quality and health study in the Hunter Region found no evidence of significantly elevated respiratory issues for residents in the region when compared with the rest of rural NSW (Merritt et al. 2013). A recent review of emergency department data found higher rates for asthma and respiratory disease presentations in this region when compared with Sydney residents; however, higher rates were also noted for a number of rural communities with no potential mining or power generation exposures (NSW Health 2012).

- Road traffic accident deaths are significantly higher in the assessment area than for the remainder of non-metropolitan NSW (7.6 deaths per 100,000 people), particularly in Cessnock (10.5 deaths per 100,000 people) and Singleton (9.7 deaths per 100,000 people).

- The five LGAs reflect state averages with regards to smoking and alcohol-related deaths and all potentially avoidable deaths (except for Cessnock). However, Singleton, Muswellbrook and the Upper Hunter Shire LGAs have significantly more deaths attributable to being overweight or obese than NSW overall.

- The median age at death for all five LGAs was broadly similar to non-metropolitan NSW with Muswellbrook LGA being the lowest at 77 years and Upper Hunter Shire the highest at 81 years (HVRF 2013b).

Health risk behaviours

- Data for the assessment area indicates that the two LGAs with the highest proportion of women who smoke during pregnancy, namely Cessnock (27 per cent) and Muswellbrook (24 per cent), also had the highest proportion of low birth weight babies (7.9per cent and 8.2per cent respectively). Of particular concern in the assessment area are the very high infant and child mortality rates in Cessnock and the Upper Hunter Shire LGAs, which are well above the non-metropolitan NSW average.

- Immunisation rates in the LGA are high, with more than 9 in 10 children in each of the LGAs immunised, which is also similar to the rate for non-metropolitan NSW.

- Generally, over two thirds of residents in the assessment area did not meet the recommended level of physical activity (less than five days of at least 30 minutes of moderate-intensity physical activity per week), particularly in Cessnock and the Upper Hunter Shire LGAs.

Health status and self-reported health

- Only 3 per cent of Hunter residents indicated high levels of psychological distress. Almost one in every six Hunter Medicare Local area residents reported that they needed to access mental health services within the last 12 months, comprising: psychologists (39.0 per cent); general practitioners (32.6 per cent); psychiatrists (12.6 per cent); counsellors (6.8 per cent); community mental health teams (2.4 per cent). The reliance on GPs for mental health services remains quite high in the assessment area, and particularly high in the Upper Hunter Shire and Cessnock LGAs, indicating a traditional reliance on GPs but also a lack of allied health services in these LGAs (HVRF 2013b).

- There are no significant differences in management rates of mental health conditions in the Hunter Valley region compared with the rest of rural NSW. Management rates of depression and anxiety are not higher, nor or prescription rates of antidepressants (NSW Health 2013).

- In 2012, approximately 60 per cent of the adult population in the region reported being in good to very good health, and a further 18 per cent reported excellent health. Just 16 per cent of residents reported fair health and a further 5 per cent indicated poor health. There has been no significant change in health status over time (since 2006) (HVRF 2013d).

- An analysis of GP data for rural communities in close proximity to coalmining and coal-fired power generation in the Hunter Valley indicates there were no significantly higher rates of problems managed or medications prescribed for Hunter Valley region residents compared with the rest of rural NSW. Rates of respiratory problem management in the Hunter Valley region did not change significantly over time, while for all other rural NSW areas, these rates significantly decreased (NSW Health 2013).

v Social and community indicators

There are a range of indicators that reflect the social and community characteristics of an area including: family type and ethnicity; disadvantage; crime; volunteering; and, perceptions of community amenity. A summary of key findings across each of these areas is listed here, with a more detailed profile provided in Appendix B.

Families and ethnicity

- The assessment area generally had a higher proportion of family households than the NSW average in 2011, particularly in Bulga SSC where nearly all households were characterised as family households.

- The distribution of household types across all areas generally shifted closer to NSW distributions between 2006 and 2011, while still maintaining a slightly higher overall proportion of families and a slightly lower overall proportion of lone and group households. Other key characteristics include: the relative dominance of nuclear families (couples with children and no other relatives) in Singleton and Maitland; an above-average proportion of lone person households in the Upper Hunter Shire LGA (with its older age profile); and a relatively high incidence of single parent families in Cessnock LGA (HVRF 2013b).

- Muswellbrook LGA experienced a relatively rapid growth of lone person households, contributing 81 per cent to the net growth in the number of households between 2006 and 2011, combined with a decline (24 per cent) in the number of couple family households with children. Singleton LGA experienced a similar, although less marked, growth of lone person households and a small decrease in the number of couple families with children, while growth in the number of couple families with no children was also a major contributor to net growth in the number of households. Multiple family households grew much faster in Cessnock LGA than elsewhere. Cessnock and Upper Hunter Shire LGAs were also notable for growth in the number of single parent families.

- The assessment area experienced relatively little change between 2006 and 2011 in the ethnic and cultural mix of the population (based on ancestry and country of birth). This relative stability reflected the dominance of Australian-born people (steady at 88 per cent) and those of British heritage.

Disadvantage

- The SEFIA provides a basis for comparison of the level of socio-economic advantage and disadvantage between LGAs (153 LGAs in NSW). The result of the 2011 SEIFA indicate:

    - Cessnock LGA is one of the most disadvantaged LGAs in NSW. Although its rank improved marginally between 2006 and 2011, it remained well below that of all other LGAs.

    - Maitland LGA ranked above the median in 2006 and experienced a substantial improvement in its ranking between 2006 and 2011 on both disadvantage and advantage indices.

    - Singleton LGA had the highest SEIFA scores of any of the LGAs in the assessment area, ranking among the top quarter of LGAs in NSW on both indices in 2011. While there was minimal change in ranking between 2006 and 2011, Singleton LGA measured an increased level of relative advantage, reflecting increased levels of personal and household incomes.

    - Muswellbrook LGA maintained a median level ranking of both disadvantage and advantage within NSW, with a marginal improvement between 2006 and 2011.

    - Upper Hunter Shire LGA showed a increase in its SEIFA rankings, particularly in terms of its relative level of advantage, which rose from well below to above the median for NSW.

Crime

- Relatively high rates of reported criminal activity across much of the assessment area, particularly in Cessnock LGA when compared with NSW. Rates of crime against property, particularly motor vehicle theft and stealing from motor vehicles, were among the highest in the state in Cessnock, Singleton and Muswellbrook LGAs. The rate of reported break and enters to dwellings also increased over most of the LGAs except Maitland.

- Across the assessment area there were improvements in rates of malicious damage to property (Cessnock, Singleton, Muswellbrook LGAs), assault (non-domestic) (Singleton and Cessnock LGAs), and stealing from a dwelling (Maitland LGA).

Volunteering and caring

- Most of the LGAs had rates of volunteering above the NSW average (11.4%), with the exception of the LGAs of Maitland (14.8 per cent) and Cessnock (12.5 per cent).Bulga SSC had the highest rate of all areas, with 23 per cent of those aged over 15 years undertaking voluntary work. Across all the LGAs, rates of volunteering were lower for males than females, in line with state-wide trends (HVRF 2013b).

Perceptions of community amenity

- Social harmony in the local area was rated about the same across the five LGAs, between 2008 and 2013 well-being perception surveys (HVRF 2013d). However, sense of community safety was perceived as worse on balance, significantly more so in Muswellbrook and Cessnock LGAs than the neighbouring LGAs, where over 50 per cent of respondent's perceived deterioration in safety.

- Just over 60 per cent of respondents identified a positive change in the area compared with five years ago, including: more/better shops (most frequently nominated in Singleton and Maitland); better services and/or facilities (most frequently nominated in Muswellbrook); the F3 link (most frequently nominated in Cessnock); improvements related to housing (most frequently nominated in Maitland and Muswellbrook).

- More than 80 per cent of respondents were aware of some negative changes in their area compared with five years ago. Over one-third of respondents said they were not aware of a change. Mining expansion was the most frequently cited negative change in the mining impacted areas, while a proportion of respondents cited the recent mining slowdown as the biggest negative change (HVRF 2013b).

- There was generally a high level of satisfaction with access to services and facilities: there was high satisfaction recorded for sport and recreation facilities across the LGAs; the level of satisfaction with activities and services for older people was second highest; there was moderate satisfaction with education and training opportunities.

vi Housing

Key statistics and trends in housing type, cost and supply/demand in the region are summarised below and in Table 4.4.

- The proportion of occupied private dwellings generally reflects the state average in all LGAs except the Upper Hunter Shire. Both Cessnock and Maitland LGAs have experienced large increases in occupied private dwellings between 2006 and 2011, both in actual number and proportional terms, as a result of significant greenfield housing development throughout these areas (HVRF 2013b).

- As would be expected in these rural areas, there is a predominance of separate houses, as opposed to semi-detached and unit housing (see Table 4.4); however, the increase in these types of housing has been significant since 2006, particularly in Singleton, Maitland and Cessnock LGAs.

- There was a higher proportion of dwellings being purchased and a lower proportion being rented in the assessment area compared with NSW (see Table 4.4). Upper Hunter Shire and Cessnock LGAs contained a larger proportion of fully owned dwellings, reflecting the older population age profile of these areas, while Singleton and Maitland LGAs contained a higher proportion of mortgagees. Muswellbrook had a notably lower share of fully owned housing and a higher share of rental housing than the other LGAs.

- Median mortgage repayments were higher than the state average in Singleton LGA and Bulga SSC (see previous Table 4.2). Mortgage repayments also rose more rapidly than the NSW increase between 2006 and 2011 (HVRF 2013b). The trends in replacement of older retirees with working age residents with a mortgage may have also contributed to this increase. The median rents in the assessment area are lower than state averages providing access to affordable rental housing (see previous Table 4.2); however, the rate of increase was higher than NSW in the assessment area between 2006 and 2011. Despite these increases, housing stress (where the mortgage repayment or rent costs exceed 30 per cent of gross household income, ABS 2011) is low across the assessment area compared to state averages, which may also be aided by high mining-related wages.

- Over the last five years, the regional residential housing market has outperformed NSW benchmarks and those for comparable regions in Sydney and Wollongong. For example, Singleton LGA had the highest median price in the Hunter Region at $437,000 as at June 2013 – this median was more than 5 per cent higher than the equivalent in Newcastle LGA. Nonetheless, the region's housing market is currently finding a new balance between the waning stimulus of the mining sector and the rising stimulus from lower interest rates. It is expected that the housing market will lag to some extent, through latent price and construction activity, and market growth in Muswellbrook, Singleton and the Upper Hunter Shire LGAs will stall relative to the more metropolitan LGAs of Cessnock, Maitland, Lake Macquarie and Newcastle (HVRF 2013b).

- Rental price growth for three-bedroom houses has slowed markedly over the year to June. At the same time, indications are that vacancy rates have risen (to 2.9per cent for the Hunter Region as a whole in June 2013). The decline in contract labour arising from the mining sector's consolidation is driving these trends, although lower interest rates may also be encouraging some First Home Buyers to leave the rental market. This trend provides some respite for tenants marginalised by higher rents, but will also act to reduce provision of rental accommodation to the assessment area over the coming years (HVRF 2013b).

Table 4.4 Socio-demographic data Housing indicators

	Bulga SSC	Broke SSC	Singleton SSC	Singleton LGA	Maitland LGA	Cessnock LGA	Muswellbrook LGA	Upper Hunter Shire LGA	NSW
Dwelling type 2011 (%of all dwellings)									
Occupied private dwellings	76.2%	73.2%	89.8%	89.8%	93.7%	90.5%	88.9%	84.7%	90.3%
Unoccupied private dwellings	23.8%	26.8%	10.2%	10.2%	6.3%	9.5%	11.1%	15.3%	9.7%
Dwelling structure 2011 (%of occupied private dwellings)									
Separate house	100%	98.6%	82.6%	88.8%	88.2%	91.7%	89%	92.0%	69.5%
Semi-detached	0%	0%	5.8%	5.2%	6.2%	4.8%	3.9%	2.0%	10.7%
Flat, unit, apartment	0%	0%	10.6%	4.5%	4.9%	3.0%	5.7%	3.7%	18.8%
Other dwelling	0%	1.4%	0.9%	1.5%	0.7%	0.4%	1.0%	2.1%	0.9%
Dwelling occupation 2011 (average number per dwelling/household)									
Average number of bedrooms per dwelling	3.5	3.2	3	3.3	3.3	3.1	3.2	3.2	3
Average number of people per household	3.1	2.8	2.4	2.7	2.7	2.6	2.6	2.4	2.6
Tenure 2011 (%of occupied private dwellings)									
Owned outright	31.2%	33.8%	33.8%	30.7%	30.9%	34.8%	27.3%	35.3%	33.2%
Owned with a mortgage	46.4%	41.3%	29.4%	39.7%	39.7%	36.3%	33.5%	30.9%	33.4%
Rented	22.3%	23.5%	33.8%	27.3%	26.8%	25.2%	35.7%	29.6%	30.1%
Other tenure	0%	1.4%	0.4%	0.6%	0.6%	0.7%	0.7%	1.1%	0.8%
Housing affordability 2011 (%of households where rent or mortgage repayments are 30%,%%, or greater, of total household income)									
Rent30%or greater	4.5%	2.4%	8.6%	5.8%	8.7%	9.2%	9.9%	6.3%	11.6%
Mortgage 30%or greater	13.0%	7.0%	5.3%	7.5%	8.6%	8.2%	5.9%	6.5%	10.5%

Notes: The data table does not display 'inadequately described' or 'not stated' categories of Census data. Data sourced from: ABS Census, Community Profiles 2011.

vii Infrastructure

There has been considerable investment in infrastructure across the assessment area, with most major projects associated with mining activity and related rail and port infrastructure, particularly the Hunter Valley Coal Chain (HVRF 2013b). Major projects completed by mid-2013 within the region had a total estimated value of $674 million (BREE 2013). While the bulk of this expenditure flows outside the region, the stimulatory effect on local employment and business is evident in the data, reflecting a robust regional economy over the period.

Recent and proposed major projects in the assessment area include, but are not limited to (HVRF 2013b; see also Section 4.2.2):

- **Education:** almost half of total identifiable public infrastructure investment in the period 2009-2011 in the area was on building upgrades (libraries, halls, outdoor learning areas and classrooms) associated with the previous Federal Government's Building the Education Revolution (BER) programme. Cessnock LGA, with its very low SEIFA score for Education and Occupation, was the main beneficiary of the BER. A total of $4 million was also allocated to the Upper Hunter Tertiary Education Centre as part of the Resources for Regions funding programme (NSW Government's fund for supporting regional and rural NSW communities affected by mining), to help address skill needs in the coal industry.

- **Transport:** projects to construct or upgrade roads and bridges constituted the second biggest category of public infrastructure. These projects were mostly funded by state grants or local council capital budgets, with a small contribution from the Federal Government, as detailed below:

    - The F3 link or 'Hunter Expressway' provides a 40 km four-lane freeway link between the F3 Freeway near Seahampton, and the New England Highway, west of Branxton and is jointly funded with the Australian Government providing $1.5 billion and the NSW Government contributing up to $200 million.

    - The NSW Local Infrastructure Renewal Scheme (LIRS) supported borrowing of $4.8 million by Upper Hunter Shire Council, and $1.5 million by Cessnock City Council, primarily for timber bridge renewal and has provided access for councils in the Upper Hunter to a further $9 million to address maintenance backlogs, and $16.5 million for revitalisation of the Maitland High Street precinct.

    - Resources for Regions programme awarded: $3.5 million for upgrades to the Denman Intersection in Muswellbrook; $7.2 million throughout Muswellbrook LGA as part of the Hunter's Mine Affected Roads Package; $7.6 million for a roads safety and improvement for the Muswellbrook industrial services centre; $11.9 million towards CBD renewal to improve traffic flows and Ryan Avenue improvement project in Singleton; $6 million for upgrades to the Regional Livestock Markets in Singleton.

    - The significant investment in rail infrastructure over the period, through the Australian Rail Track Corporation (ARTC) and the HVCCC has been a major feature of investment in transport infrastructure and development and is planned to continue through to at least 2021, although not necessarily at current levels.

    - Newcastle Airport in Port Stephens LGA remains the only base for commercial air services into the assessment area, having been recently awarded $11 million through the Resources for Regions programme for a further upgrade of terminal facilities. Small private airfields at Cessnock, Rutherford and Scone do not provide regular passenger flights.

- **Water, sewer, and waste management:** these services, and supporting infrastructure, are provided by Hunter Water in Cessnock and Maitland LGAs, and will be included in the Lower Hunter Water Plan for sustainable provision over the next 20 years, due for release in 2014. The Plan is likely to highlight a recent shift away from investment in water infrastructure to a greater emphasis on the utilisation of existing assets.

- **Civic projects:** public investment in civic infrastructure in the assessment area has included upgrade of the Maitland Regional Art Gallery, a Visitor Information Centre in Singleton, new library in Muswellbrook, and new council chambers in Scone in the Upper Hunter Shire. Projects recently funded through the Hunter Infrastructure and Investment Fund (HIIF) include $5.7 million for refurbishment of a sporting complex in Singleton, $2 million for refurbishment of the Upper Hunter Conservatorium of Music, and $2 million for a regional theatre space within a renovation of Maitland Town Hall.

- **Energy:** until recently, responsibility for power generation infrastructure rested primarily with the State Government, with two major coal-fired power stations managed by State-owned Macquarie Generation in Muswellbrook LGA (Liddell and Bayswater Power Stations). The State Government has invested at least $48.5 million in upgrading technology at these stations, and in the extension of the solar plant at Liddell. However, future proposals are in doubt following the decision by the State Government to privatise all power generation facilities in the State. The sale of assets is in progress, under the *NSW Electricity Generator Assets (Authorised Transactions) Act 2012*. Redbank Power Station, which was commissioned in 2001 is located to the north of Warkworth Mine. The Power Station is fuelled by beneficiated, dewatered tailings from MTW, delivered by conveyor. It has the capacity to generate 151MW of electricity.

- **Private infrastructure and development:** private investment in infrastructure and development from 2008-2013 was focused on promotion of leisure and tourism industries in Cessnock (two large residential golf course developments) and on new or upgraded commercial premises, primarily shopping centres, in all of the LGAs in the assessment area. This included a $55 million refurbishment to the Singleton Square Shopping Centre in Gowrie Street, Singleton. Investment in private health and aged care infrastructure was evident in Maitland LGA. In addition, a $25 million aged care facility has been proposed for Scone. Cessnock's Huntlee Stage 1 development, by the LWP Property Group, has been approved and includes up to 7,500 residential dwellings, 200 ha of employment lands and a mixed use town centre.

- **Government facilities:** a $97 million upgrade to the Cessnock Correctional Centre, funded by the State Government, was completed in 2012. A $200 million upgrade to Singleton Army Barracks, funded by the Federal Government, is in progress.

4.1.4 Profile summary

Table 4.5 provides a summary of socio-economic risks and opportunities in the assessment area currently that are of relevance to the proposal. These risks and opportunities have been identified where LGAs/suburbs are underperforming (ie risks) or over-performing (ie opportunities) on state and regional averages for a particular socio-demographic factor. This assessment provides a basis from which to assess any potential changes that might occur as a result of the proposals.

Table 4.5 Relevant existing socio-economic risks and opportunities

Risks	Opportunities
Population	
	Stimulatory effects of high rates of population growth in the region, particularly in Maitland and Cessnock
Loss of population due to mining slow down and variable population change – in response to workforce change in the mining and related sectors (HVRF 2013b)	Employment and industry capacity supported by growth in working age population
	Sustainable population growth predicted in Newcastle and Maitland LGAs
Employment and industry	
Declining labour force participation rates, in line with broader national trends	Generally low levels of unemployment and youth unemployment (except in Cessnock)
Reliance on a dominant industry of employment – mining	Generally high income levels
Consolidation of the mining sector and impacts on employment and the regional economy	Contribution of the mining industry to employment and associated high incomes and economic benefits
Dominance of lower skilled occupations	Ongoing and long-term growth in the health care and social assistance industry
Land use conflict between key regional industries in close proximity	Co-location of strong performing and prominent national industries – horse-breeding, viticulture, agriculture, tourism
Education	
Low rates of Year 12 completion (particularly in Muswellbrook)	Access to diverse education facilities – including private and public schools, TAFE (Singleton, Muswellbrook-includes a dedicated Mining Skills Centre, and Newcastle) and regional university (University of Newcastle)
Very low rates of university level qualifications and high rates of certificate level post-school qualifications	
Health	
High rates of hospitalisations, particularly in Singleton and the Upper Hunter Shire LGA – for coronary heart disease, diabetes, and high body mass	Generally good access to a range of health services and facilities: including rural, district and private hospitals, multipurpose services, residential aged care, community health services and regular GP services
High rates of deaths attributable to being overweight or obese, particularly Singleton, Muswellbrook and the Upper Hunter Shire LGAs	High rates of child vaccination
Some higher rates of cancer deaths, only in Cessnock and Muswellbrook LGAs	Self-reported health is generally good to excellent
	Low levels of reported psychological stress
High rates of road traffic accidents and death particularly in Cessnock and Singleton LGAs	
Higher rates of risky alcohol consumption, particularly in Singleton and Muswellbrook LGAs	
Social and community	
Growth in lone person households, particularly in the mining towns of Muswellbrook and Singleton	High rates of family households
Lack of ethnic and cultural mix	Generally higher rates of volunteering, except in Cessnock and Maitland
Growing divide between disadvantaged LGAs (Cessnock) and advantaged LGAs (Singleton, Muswellbrook, Maitland) in the region	

Table 4.5 Relevant existing socio-economic risks and opportunities

Risks	Opportunities
Higher rates of crime particularly motor vehicle theft, stealing from motor vehicles, and break and enters, in Singleton, Muswellbrook and Cessnock LGAs – related to a declining sense of community safety	Good self-reported levels of social harmony
Mining expansion identified as a negative change in the area (HVRF 2013a) (decline also considered a negative change)	Identified positive changes including expansion of retail, services and infrastructure in the region
	Good self-reported access to sport and recreation facilities, aged activities and services, and education facilities
Housing and infrastructure	
Lack of housing type diversity	Housing development and growth particularly in Cessnock and Maitland
Adjustments in the housing and infrastructure sector in response to the decline of mining investment	High rates of housing fully owned or being purchased
	Low levels of housing stress
	Considerable investment in infrastructure across the assessment area, particularly associated with mining activity and related rail and port infrastructure, and including civic, education and other investment
	Rental price decline and rising vacancy rates

4.2 Regional context

This section provides an outline of the governance and industry issues that contribute to the regional context for the proposal. It begins with an overview of the governance context for the proposals—briefly addressing key policies and plans at all tiers of government—before addressing the regional industry and mining context in the Hunter Region.

4.2.1 Governance context

i Commonwealth Government

The current Commonwealth governance context includes a number of potential changes of relevance to the proposal. With the transition to the Coalition Government after the 2013 election, many relevant legislative and policy platforms of the former Labor Government are under review, on hold, or before parliament for amendment or repeal. These platforms include the Securing a Clean Energy Future Plan, Minerals Resource Rent Tax (MRRT), and Commonwealth *Fair Work Act 2009 (FWA)*.

The COAG reform agenda has also shaped the governance context at the Commonwealth level. The underlying premise of the reforms has been greater integration of planning and service delivery and a focus on outcomes, rather than financial and other inputs as measures of progress, together with independent reporting of performance (HVRF 2013b).

The five key themes of the agenda (COAG 2013) are: a long-term strategy for economic and social participation; a national economy driven by Australia's competitive advantages; a more sustainable and liveable Australia; better health services and a more sustainable health system for all Australians; Closing the Gap on Indigenous disadvantage.

The main vehicle for delivery of the reforms agreed between Commonwealth and State Governments was a series of National Partnership Agreements and associated funding arrangements that have been progressively developed. For the assessment area, the most relevant of these agreements include:

- **National Skills and Workforce Development Agreement:** directed primarily at the Vocational and Education Training (VET) system and equipping the working age population to meet the changing needs of the economy, the Agreement aims at halving the proportion of Australians aged 20-64 years without qualifications at Certificate level III and above, and doubling the number of diploma and advanced diploma completions, between 2009 and 2020 (HVRF 2013b). Within the Hunter Region, this reform has been associated with new approaches to the delivery of workforce training and the restructuring of TAFE offerings (partly in response to State Government budgetary constraints) and includes initiatives such as the Muswellbrook Mining Skills Centre—in partnership with the major mining organisations in the area (HVRF 2013b) (see Section 4.1.3 for details on educational outcomes in the assessment area).

- **National Health Reform Agreement:** initiated in 2013, the Agreement amended funding and structural arrangements between the Commonwealth and State Governments for health care provision. Key areas of change included increased funding for primary care through Medicare Locals, a renewed focus on community-based health services, increased Commonwealth responsibility for the health care of older Australians and increased responsibility for the States for young people with a disability. For the Singleton LGA and the Hunter Region, the Agreement engendered a significant transformation in funding sources, accreditation standards and reporting structures for many providers of health and related services. The Coalition Government is expected to maintain the substance of the health reforms (HVRF 2013b).

- **National Partnership Agreement to Deliver a Seamless National Economy:** aims to implement 45 separate reforms (deregulation, areas of competition and reform to regulation making and review processes) across diverse sectors. These include several reforms of particular relevance to the assessment area and RTCA operations, namely: mine safety; infrastructure – regulation of significant ports (associated National Ports Strategy); occupational licensing; heavy vehicle transport; and, rail safety (HVRF 2013b).

Until these regulatory and planning frameworks are altered or withdrawn, they remain important aspects of the governance and social context for the proposal. The current Government is likely to maintain the majority and substance of these reforms; however, the Coalition has flagged a reduction in the Commonwealth Government bureaucracy by increasing State Government responsibilities, which marks a shift away from the 'collaborative federalism' model.

ii NSW Government

At the State Government level, the most important policies and plans shaping the governance context for the proposal are the: State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007 (Mining SEPP); and, the Strategic Regional Land Use Plan (SRLUP) [including the Upper Hunter Strategic Regional Land Use Plan (UHSRLUP)], detailed below.

State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007 (Mining SEPP)

The Mining SEPP aims to provide for the proper management and development of mineral, petroleum and extractive material resources for the social and economic welfare of the State. The SEPP establishes planning controls to encourage ecologically sustainable development through the environmental assessment and management of the development of these resources. The SEPP gives legal effect (via an amendment) to the Upper Hunter Critical Industry Cluster (CIC) and the Gateway Assessment Process, both critical to land use and assessment issues for the proposal (see discussion of CICs and the Gateway Process in Strategic Regional Land Use Plan below).

On November 4 2013, the NSW Government published an amendment to the SEPP [Amendment (Resource Significance) 2013] which seeks to:

- ensure the significance of the resources (major or minor) must be considered in the decision-making process as an important, but not the only, factor;
- stipulate the key environmental, ecological and amenity criteria to protect water resources, habitat and amenity;
- require that the economic and environmental issues mentioned above are properly balanced; and
- elevate the importance of the Office of Environment and Heritage (OEH) in the assessment process, by ensuring a consent authority must consider OEH's advice on biodiversity mitigation and offset measures (NSW Planning & Infrastructure 2013).

The greatest weighting is afforded to the economic benefits of the activity to the State and the region in which the development occurs and to the relative significance of the resource when compared with other resources across NSW.

The Mining SEPP establishes specific criteria for noise, air quality, air blast overpressure, ground vibration and aquifer interference. For these, the Mining SEPP states that the criteria are non-discretionary development standards for the purposes of section 79C (2) and (3) of the EP&A Act. This means that if a mining development, which is the subject of a development application, complies with those standards, the consent authority:

- is not entitled to take those standards into further consideration in determining the development application;
- must not refuse the application on the ground that the development does not comply with those standards; and
- must not impose a condition of consent that has the same, or substantially the same, effect as those standards but is more onerous than those standards.

Strategic Regional Land Use Plan (SRLUP) [including the Upper Hunter Strategic Regional Land Use Plan (UHSRLUP)]

The SRLUP was developed to better manage the potential land use conflicts arising from the location of agricultural land and the mining and coal seam gas (CSG) industries, with the goal of protecting valuable agricultural services and land. Importantly, the SRLUP contains provisions for the creation of CICs and the establishment of the Gateway Assessment Process, described below:

- **CICs** are concentrations of highly productive industries within a region that are related to each other, contribute to the identity of that region and provide significant employment opportunities. Designation of an area as a CIC prevents new coal seam gas activity within the area and requires proposals for State-significant mining projects within the area to go through the Gateway Assessment Process. One such CIC is the Upper Hunter CIC, designated to protect the thoroughbred breeding and viticulture industries in the Hunter Valley (see also Section 4.2).

- **The Gateway Assessment Process** is an independent, scientific assessment of the impact of new State-significant mining and coal seam gas proposals on strategic agricultural land and its associated water resources. Strategic agricultural land comprises: biophysical strategic agricultural land – land which has the best quality soil and water resources and is capable of sustaining high levels of productivity; and, CIC land – concentrations of highly productive industries within a region that are related to each other. The Mining and Petroleum Gateway Panel, comprising independent scientific experts, oversees the process, which must occur before an applicant can submit a development application. The Commonwealth Government are also involved in the process, through a Referral Protocol of the National Partnership Agreement on Coal Seam Gas and Large Coal Mining Development (discussed above), which ensures that all project decisions in NSW which could have a significant impact on a water resource will consider the advice of the Commonwealth's Independent Expert Scientific Committee (CIESC).

As a component of the SRLUP and finalised in January 2013, the UHSRLUP provides a framework for decisions about competing land uses for agricultural, resource extraction and residential development in the Upper Hunter (incorporating Singleton, Muswellbrook, Dungog, Upper Hunter and Gloucester LGAs). The UHSRLUP:

- identified and mapped strategic agricultural land (SAL) and other resource areas in the Upper Hunter and the Gateway Assessment Process for the Upper Hunter CIC;

- set policy objectives around infrastructure, provision of land for employment development and housing, provision of health and community amenity services, the natural environment and climate change, and cultural heritage; and

- provided links to a proposed Upper Hunter Infrastructure Plan, Upper Hunter Workforce Plan and Upper Hunter Urban Development Plan, and to implementation of recommendations in the Upper Hunter Economic Diversification Report.

Other relevant NSW policies and plans include:

- **Lower Hunter Regional Strategy (LHRS)/ Lower Hunter Regional Growth Plan (LHRGP):** the LHRS guides local planning and informs decisions on service and infrastructure delivery in the five LGAs of Newcastle, Lake Macquarie, Port Stephens, Maitland and Cessnock. The strategy focuses on several key themes, including: housing supply; job creation; development of growth centres; establishment of green corridors; and, protection for high quality agricultural land and natural resources. The NSW Government is currently working through the process of replacing the LHRS with the LHRGP. The primary focus of the LHRGP is to align new housing and jobs with the new Hunter Transport Plan and Hunter Strategic Infrastructure Plan.

- **Hunter Regional Action Plan 2021:** documents priorities for an integrated land use, transport and infrastructure investment framework, aligned with the NSW State Plan 2021. The plan provides a comprehensive list of short-term priorities and commits funding for the Hunter Region as a whole. Planned actions with particular relevance to this proposal include: development of the Upper Hunter Workforce Plan; public road infrastructure projects in Singleton and Muswellbrook; completion of the Hunter Expressway; preliminary planning for Singleton and Muswellbrook bypasses; delivery of an agribusiness energy efficiency programme in Upper Hunter and Singleton LGAs; upgrade of Muswellbrook Hospital Emergency Department (HVRF 2013b).

- **The Economic Assessment of Mining Affected Communities (NSW Trade & Investment):** identified the disparity between State revenues from mining affected communities and the total amount spent by State Government on local infrastructure and services. The assessments, conducted in 2011 and 2012, identified Singleton and Muswellbrook LGAs as the two communities where revenues were significantly greater than expenditure, particularly on a per capita basis, while the reverse was true in most other mining affected LGAs, particularly Cessnock. The assessments underpin the Resources for Regions grant funding programme for infrastructure projects in eight mining affected LGAs that align with the State Infrastructure Strategy (HVRF 2013b).

- **Upper Hunter Economic Diversification Project:** commissioned by the six Upper Hunter councils and primarily funded by the NSW Government in 2011, the project's principal objective was the identification of new and emerging business and employment opportunities over the next25 years, with a strong focus on economic planning activities to 2016. The plan identifies issues for the region including a narrow industry base, uneven population growth, environmental issues, competing land use and resource issues, and the availability of local jobs. Proposed strategies to strengthen and diversify the Upper Hunter economy included: increasing local populations to build on existing critical mass; building on specific industry strengths and local advantages; developing new industries based on emerging opportunities; and, developing knowledge intensive activities.

- **Hunter Strategic Infrastructure Plan (HSIP):** has been progressively developed by the Hunter Development Corporation (in collaboration with other NSW Government agencies, the Commonwealth Government and its affiliated bodies, and Hunter Councils). The HSIP seeks to provide the strategic framework for infrastructure investment in the Hunter Region, to better understand the infrastructure capacity of the region, and to identify areas where infrastructure could be enhanced to boost productivity. The plan primarily focuses on the Lower Hunter. The HSIP is currently awaiting approval by the Federal and NSW Governments (HVRF 2013b).

iii Local government

Over the past decade, the local governance has been marked by an increasing focus on the integration of planning and service delivery across tiers of government, coupled with requirements for improved community consultation and greater transparency in reporting. This transition has been recently advanced by the progressive implementation (since 2009) of the Integrated Planning and Reporting Framework (IPR), under amendments to the NSW *Local Government Act 1993* (LG Act). The specific aims of the IPR framework are to: improve integration of various statutory planning and reporting processes undertaken by councils; strengthen councils' strategic focus; streamline reporting processes; and, ensure that the LG Act and the Integrated Planning and Reporting Guidelines support a strategic and integrated approach to planning and reporting by local councils.

The IPR requires all local governments to develop 10-year Community Strategic Plans (CSPs), in consultation with their communities, to better capture the community's aspirations and priorities and to create closer synergies with State and Federal plans. The CSPs must address social, environmental, economic and civic leadership issues in an integrated manner, must be based on the social justice principles of equity, access, participation and rights, and must give due regard to the State Plan and other relevant State and regional plans. The CSP must interact with local councils' Resourcing Strategies (budgetary, workforce, and asset management) and Local Environment Planning (LEP) instruments, and the CSP must in turn feed into councils' Delivery Programs (4 year cycles) and Operational Plans (1 year cycles). The IPR requires continual monitoring and reporting (to the Department of Local Government).

The IPR processes have highlighted revenue shortfalls for local governments, including Singleton and neighbouring LGAs, particularly related to maintenance of assets (roads, community infrastructure). This has resulted in applications to the Independent Pricing and Regulatory Tribunal (IPART) for special rate rises above the Rate Cap set in NSW (with varying degrees of success), and in internal reviews to increase efficiency of service delivery.

In June 2012, Singleton Council released and endorsed its CSP 'Our Place: A Blue Print for 2022'. The plan incorporated consultation with over 800 stakeholders across the Singleton LGA in 2011 and rests on the four pillars of community, places, environment and leadership. Each pillar of the CSP includes projected outcomes matched to specific strategies, indicators and required relationships. Other key policies and plans for the Singleton LGA include:

- Singleton Land Use Strategy (SLUS): incorporates Singleton Council's key land use policies and principles and baseline information for preparation of Council's Local Environmental Plan (LEP). The SLUS identifies potential infrastructure requirements, indicates land potentially suitable for rezoning, and outlines the State Government's perspective that 'Singleton has sufficient land zoned in the Singleton Heights area for approximately 2,000 new dwellings' (UHSRLUP 2013). The main area for future residential development is the North Singleton area, with the Hunter Green and Bridgeman Ridge residential areas expected to yield between 1,100 and 1,200 lots and the proposed Gowrie Links residential area yielding a further 450 to 550 lots.

- Singleton Town Centre Master Plan: key objectives of the master plan include – recognising and protecting the role of the Singleton Town Centre; encouraging opportunities for economic growth and new businesses; increasing opportunities for town centre residential living (including higher density and affordable housing); ensure high quality urban design outcomes; strengthen association of the town centre with the Hunter River; identify site consolidation and redevelopment opportunities; and, protect the character of residential precincts and heritage conservation areas.

Given its geographical position, Singleton Council has had significant involvement with the coal mining sector. Primary issues of concern for the Council in relation to coal mining in the Singleton region include: housing and accommodation (a housing strategy in currently being developed in line with the objectives of the CSP); loss of community, sense of rural place, and village life; pressure on infrastructure and services; the inflationary and deflationary effects on the LGA of coal industry economic movements; drive in/ drive out (DIDO) workforces; health and community impacts of mining shift work; and the distributional inequities of the benefits and costs of mining operations (Singleton Council 2012).

The Local Government governance context for the proposal is also informed by the policies and plans of neighbouring assessment area LGAs—the key instruments of which are outlined in Table 4.6.

Table 4.6 Neighbouring Assessment Area LGA Governance Context

Council	Policy/ Plan	Focus
Muswellbrook	2013-2023 CSP	Incorporates the Community Engagement Strategy and integration with LEP and State planning instruments
	Residential and Rural Residential Strategy 2013	Housing and land development trends, opportunities and constraints
Upper Hunter	Community Engagement Strategy 2010	Outlines a framework for development of the CSP (yet to be finalised)
	Upper Hunter Shire Land Use Strategy 2011	Land use strategies to guide housing development. Also guided development of the new Upper Hunter LEP (replacing Scone LEP, Merriwa LEP and Murrurundi LEP)
Cessnock	Cessnock 2023 CSP	Community development, place-making, sustainability and economic development
	City Wide Settlement Strategy 2010	Seeks to implement the requirements of the LHRS and accommodate projected population increases from the Hunter Expressway development
Maitland	Maitland + 10 CSP	Community and economic development in light of significant population increases and structural adjustment
	Maitland Urban Settlement Strategy 2013	Implications of new urban development, including effects on servicing, existing land uses, environmental values and the historic and rural character of Maitland

iv Political context

The Singleton region is represented federally by Joel Fitzgibbon (Australian Labor Party) in his now 18 years as Member for Hunter. Mr Fitzgibbon currently serves as Shadow Minister for Agriculture in opposition and sits on the Standing Committee on Agriculture and Industry. The major neighbouring electorate, Paterson, is represented by Bob Baldwin (Liberal Party) who serves as Parliamentary Secretary to the Minister for Industry.

At the State Government level, the Singleton LGA falls within the electorate of the Upper Hunter, which is represented by George Souris (National Party) in the NSW Government. The neighbouring electorates of Maitland and Cessnock are represented by Robyn Parker (Liberal Party) and Clayton Barr (Australian Labor Party) respectively.

Local councils in the project area are principally composed of independent representatives, particularly in the Singleton, Muswellbrook and Upper Hunter LGAs. Political party membership among candidates and elected councillors is more customary in Cessnock and Maitland LGAs. The Mayors of Cessnock, Maitland and Singleton are popularly elected, while those of Muswellbrook and Upper Hunter Shire are elected by their fellow councillors. Singleton Council changed its council structure in 2012, abolishing the wards system and moving to an elected Mayor and nine elected councillor system. The current Mayor is John Martin OAM.

As is evident from the political context outlined above, great variability exists across tiers of government. The often overlapping electoral landscape includes all three major political parties and, at the local level, a proportion of Independents.

4.2.2 Industry and mining context

i Industry context

Mirroring changes in the broader Australian economy, the industry context for the proposal is characterised by structural adjustment away from heavy industries and manufacturing and towards primary industry (mining and agriculture), the services sector, and construction, transport and wholesale trade (see also Section 4.1.3). The growth of the resources sector over the past decade has catalysed concern over the development of a 'two-speed economy', where industry imbalance leads to distributional inequities. This concern particularly increased during the period in the wake of the GFC, in which overall economic growth has been driven by the resources sector in Australia, other sectors of the economy (particularly manufacturing and retail) have stalled or declined, and governments at all levels have begun to address budget deficits (Deloitte Access Economics 2013; HVRF 2013b).

A Deloitte Access Economics (2013) report, commissioned by Regional Development Australia, suggests that the Hunter economy is likely to experience higher average annual economic growth (2.4 per cent) when compared with the rest of NSW (2.1 per cent) to 2036. The report predicts mining sector growth in the region and suggests that this growth will stimulate other sectors of the economy, including coal supply networks and the construction, transport and wholesale trade sectors (see Figure 4.2 for a map of the Hunter Region coalfields). It goes on to outline the major influences facing Hunter industry over the coming decades, including:

- **Integration with Asia**: implications for coal and gas, agriculture, education and services sectors.
- **Changing settlement patterns**: robust population growth, housing supply, service and infrastructure pressures.
- **Transitioning to a less carbon intensive economy**: necessitates economic diversification and innovation.
- **Digital economy advancements**: continued growth in advanced information technologies driving business innovation and adjustment, health and education delivery changes, and economic diversification.

Key risks to Hunter industry include a weakening of the mining sector beyond 2020 due to softer demand, and continued deterioration of the heavy industry sector due to global competitiveness pressures and transitions to lower emissions activities. In assessing the balance of risks in the region, the report (Deloitte Access Economics 2013: ix) notes that:

> In considering the overall economic opportunities and risks for the Hunter over the next two decades, it should be noted they are unlikely to be balanced evenly. The economic upside for the region is likely to manifest in stronger and more balanced growth and consolidation. In effect, growth is driven by greater development prospects for the region's strategic industries.
>
> In contrast, the downside risks are likely to be more abrupt — potentially involving the closure or substantial downscaling of parts of the region's industrial base and a large reduction in regional employment.

As such, the development of a two-speed economy in the Hunter Region is a distinct risk facing Hunter industry and one that governments, planners and industry must address in strategic planning instruments.

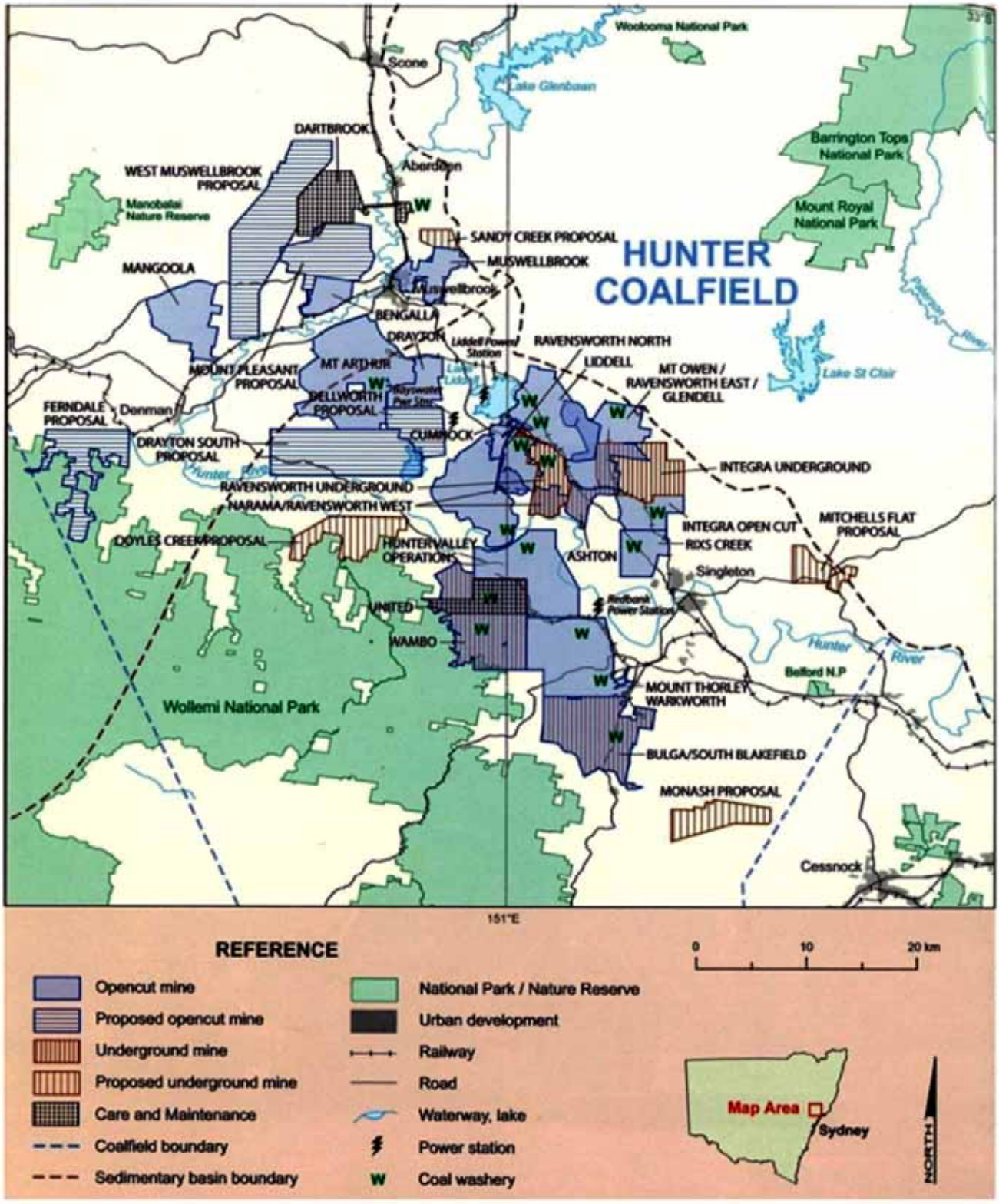
Deloitte Access Economics (2013) noted that, with 40 per cent of the State's coal resources located in the Hunter, the mining industry accounts for approximately a quarter of the Hunter economy and employs around 17,700 full-time equivalent workers—representing around 7.2 per cent of the regional workforce. Moreover, the sector is projected to contribute around 24.2 per cent of total regional output by 2036—representing an increase of almost 2 per cent from 2012. In the Upper Hunter, mining contributes almost 60 per cent of economic output (Deloitte Access Economics 2013).

The Upper Hunter Mining Dialogue (UHMD) was established in 2012. The UHMD brings together the nine coal producers of the Upper Hunter, community, environmental, agricultural and business groups, as well as local government and state government agencies, to address the cumulative impacts of mining and growth in the region. Throughout 2012 and 2013, industry and stakeholders participated in a series of workshops to establish five year goals and associated projects in the areas of: water; emissions and health; social impacts and infrastructure; and land management.

Joint Working Groups, made up of industry and stakeholders, are guiding the development of the projects and the selection of new projects to continue progressing towards the five year goals (NSW Minerals Council 2014). An example of this is the current Grazing Study which Coal & Allied is providing a pilot site for. The aim of the project is the answer the question "Can rehabilitated mine land sustainably support productive and profitable grazing in the Upper Hunter Valley, NSW?" Cattle will graze on rehabilitated mine land and on un-mined sites (analogue sites), chosen because they are representative of the area. The study will take four years and will allow comparisons of the sites to be made across a number of measures, including: animal health; soil and pasture composition; and economic outcomes.

Over the past decade, the mining industry context for the proposal has significantly changed, including: an almost doubling of global commodity prices (despite recent weakening); a major restructure of the contractual arrangements for the movement of coal; significant upgrades to coal chain transport and ship-loading infrastructure; and substantial expansion of production capacities (HVRF 2013b). Nevertheless, the slowing of the coal mining sector is starting to impact the regional economy and the labour market.

As described in Section 4.1.3ii, recent job losses have also occurred in the wider industry, with approximately 1,500 direct mining jobs lost in the Hunter Valley over the last 18 months (NSW Mining 2014) not including layoffs that occurred in May 2014. These job losses and their respective flow-on effects are representative of the indicators described above (refer to Section 4.1.3).



Source: NSW Trade & Investment, Resources & Energy (2013)

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Hunter region coalfields

Warkworth Mine continuation 2014 and Mount Thorley Operations 2014
Social Impact Assessment

Figure 4.2

5 Social impact assessment

5.1 Introduction

The assessment of potential social changes under the proposals grouped as follows:

- socio-economic impacts;
- impacts on community services; and
- stakeholder perceptions and assessment outcomes.

As noted in Section 1.2, the SIA has been based on the combined proposals. It considers the key changes that may result, either directly or indirectly, from the proposal proceeding. Where relevant, an assessment of social impacts/ opportunities has been provided for each proposal; for example, if a potential impact or opportunity relates exclusively to one proposal but not the other.

5.2 Socio-economic impacts

5.2.1 Perceived socio-economic impacts

The economic study prepared for the EIS considers the net economic benefits and the regional and state impacts of the proposals (the proposals scenario) relative to a no development case (referred to as the reference scenario). In the reference scenario, it assumed that the development application for the Warkworth Continuation 2014 (and MTO 2014) is refused.

The reference case is provided as a basis for conservatively evaluating the incremental value of the proposal. However, as described the economic assessment (Appendix F of the EIS), the reference case is not likely to eventuate as mining under this scenario would not be economically viable due to extraction constraints when mining in West Pit at Warkworth Mine is forecast to reach consent limits in 2015. The SIA adopts the same conservative assumption.

As part of the stakeholder consultation process, stakeholders were asked to consider the socio-economic impacts if the proposals did not proceed and the reference case eventuated.

Some stakeholders, particularly near neighbours, felt that there would be minimal negative impacts if Warkworth Continuation 2014 (and Mount Thorley Operations 2014) did not proceed, suggesting that most employees would continue at MTW in the short-term or move to other mining operations.

Other stakeholders identified job losses as an immediate and critical impact if the proposals did not go ahead. These stakeholders commonly described the loss of 1,300 jobs at MTW operations and the negative impacts this would have on the local economy and community. The commonly identified impacts of these job losses included:

- workers and their families moving away from the area;
- workers and their families faced with unemployment and financial difficulties;
- reduced local spending;
- decreased local businesses;

- population decline; and
- reduced community life and participation.

These stakeholders also commonly identified the flow-on negative impacts on local suppliers, other businesses and on the local economy and community generally. These matters are discussed below.

5.2.2 Continuation of employment and net benefits

As noted above in Section 5.2.1 the economic study considered both the net economic benefits and the regional and state impacts of the proposals (the proposals scenario) relative to a no development case (referred to as the reference scenario). In the reference scenario, it assumed that the development application for the Warkworth Continuation 2014 (and MTO 2014) is refused.

The two scenarios differ in terms of their production and employment (and associated costs) profiles. In the proposal scenario, current average employment and production levels would continue until 2030 and decline toward the end of the open cut life with production complete by the end of 2035. In the reference scenario, coal production and employment would begin to decline from 2016 onwards and would cease by 2021.

The economic study prepared by BAEconomics (Appendix F of the EIS) states that while mining activity has been historically very high, a number of indicators suggest that significant declines in Australian thermal coal prices, amongst other factors, over the past two years have had a negative impact on economic activity. Capital investment in new tangible assets in the mining sector has fallen by more than half between December 2012 and December 2013. These trends are consistent with the expectation by the HVRF that few additional mining investment proposals will progress in the medium term, excepting those required to maintain economic production that require minimal upfront capital.

In addition, HVRF's Upper Hunter Region Economic Indicators (HVRF 2014), states that "business conditions in the Upper Hunter through calendar year 2013 were the most difficult, and affected the greatest number of businesses, since the HVRF's Business Survey began in 2001".

The effects of the mining slowdown are also being observed in the labour market. In a reversal of trends of the more recent past, there is now an excess of qualified mining engineers in NSW (Australian Journal of Mining 2014), as well as a shortage of positions for mining apprentices and trainees in the Hunter Valley (Australian Mining 2013). HVRF note that the unemployment rate in the Hunter Valley region has increased notably since 2011.

HVRF's measure of employment intentions suggest that further weakness in the Hunter region labour market can be anticipated. Employment intentions have declined since December 2011. HVRF's most recent measures are lower than during the Global Financial Crisis. Similar trends are also evident in the HVRF's Household Survey, which suggests that consumer confidence and purchasing intentions in the Hunter Valley region remains negative.

The economic study assumed that, in the event that the proposal application is refused and MTW closes by 2021, 30 percent of employees made redundant would be re-employed in the same year, and that 40 per cent of employees made redundant would be re-employed in the subsequent year. The remaining 30 per cent of people are assumed to either leave the workforce altogether or to move interstate. Based on the declining economic conditions described above and the significant recent loss of jobs at other mines in the Hunter Valley, these are considered to be conservative assumptions.

It is clear that the proposal provides significant economic benefits. The benefits of MTW include annual average employment of almost 1,300 full time people on average, approximately $6.1billion in additional expenditure (including capital investment), and over $617million in royalties.

In net present value (NPV) terms, the proposals combined would deliver net benefits to NSW of around $1.5billion.

The economic flow-on effects attributable to Warkworth Continuation 2014 in NPV terms amount to:

- for NSW, the additional disposable income received by employees of $346 million, additional annual employment of 191 full time employees, and a contribution to NSW gross operating surplus of $407 million;
- for the Mid and Upper Hunter region, the additional disposable income received by employees of $204 million, and additional annual employment of 198 full time employees; and
- for the Singleton LGA, the additional disposable income received by employees of $75 million, and additional annual employment of 57 full time employees.

The economic flow-on effects attributable to Mount Thorley Operation 2014 in NPV terms amount to:

- for NSW, the additional disposable income received by employees of $39million, additional annual employment of 15 full time employees, and a contribution to NSW gross state product of $45million;
- for the Mid and Upper Hunter region, the additional disposable income received by employees of $23million, and additional annual employment of 16 full time employees; and
- for the Singleton LGA, the additional disposable income received by employees of $9million, and additional annual employment of 4 full time employees.

These benefits would not be realised should the proposals be refused.

i Direct employee contribution to the regional economy

The employee survey estimated the percentage income that is spent by participants in their LGA. Over two-thirds of employees estimated that they spent between 30 per cent and 80 per cent of their incomes in their LGA. Almost a third of all employees estimated their local spend in the 70 per cent to 90 per cent band (Figure 5.1). A much higher percentage was spent in the entire Hunter Region.

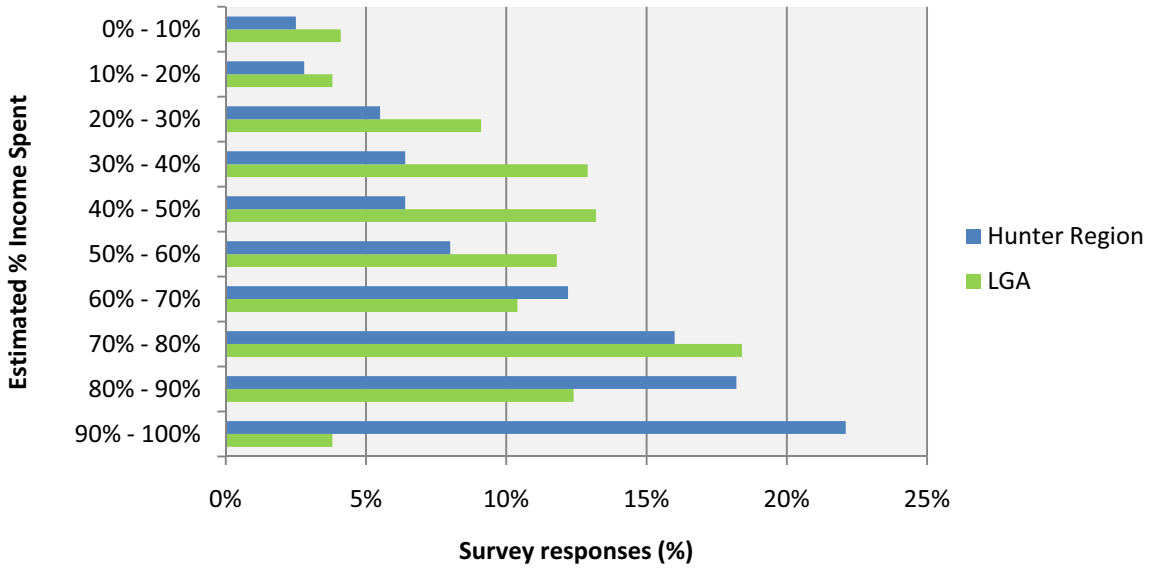


Figure 5.1 Estimated income spent in LGAs and the Hunter Region

The employee contribution to the regional economy would be substantially reduced should job losses occur and current employees either left the region to find employment, stayed in the region but were unable to find employment or their income was reduced in an alternative place or work in the region.

ii Population decline

The stakeholder consultation process identified a common concern that workers and their families would move away from the area if the proposal was not to proceed. The potential impacts of these concerns can be assessed by comparing the proposal scenario discussed in the economic study.

As described in the economic assessment (Appendix F of the EIS) the reference scenario conservatively assumed that of the employees made redundant, 70 per cent (910 people) of would be re-employed in the same year or the subsequent year. The remaining 30 per cent (390 people) were assumed to either leave the workforce altogether or to move interstate. If it is assumed that of those who are not re-employed, 50 per cent move from the region, 195 former employees would leave the region.

Assuming the impacts on the workforce in the reference scenario are equal across all regions, the impacts within the different LGAs are presented in Table 5.1.

Table 5.1 Employee residential location and impacts of reference scenario

LGAs	Percentage of workforce	Employees	Not re-employed Remain in the region (15%)	Not re-employed Leave the region (15%)
Upper Hunter and Muswellbrook	3.0	39	27	6
Singleton	34.9	454	318	68
Maitland	17.1	222	155	33
Cessnock	19.4	252	176	38
Great Lakes	1.5	20	14	3

Table 5.1 Employee residential location and impacts of reference scenario

LGAs	Percentage of workforce	Employees	Not re-employed Remain in the region (15%)	Not re-employed Leave the region (15%)
Dungog	0.8	10	7	2
Port Stephens	8.1	105	74	16
Newcastle	6.9	90	63	14
Lake Macquarie	6.1	79	55	12
Other	2.2	29	20	4
Total	**100**	**1300**	**910**	**195**

Notes: Totals may differ due to rounding.

Based on an average number of people in each household of 2.7 (2011 census data for Singleton LGA) and assuming that 195 former employees leave the region as a household unit, a total of 527 people would leave the region in the reference case. The approximate distribution of these departures is provided in Table 5.2.

Table 5.2 Population decline

Area	Not re-employed Leave the region (15%)	Population decline (employees + family members)*
Upper Hunter and Muswellbrook	6	16
Singleton	68	184
Maitland	33	89
Cessnock	38	103
Great Lakes	3	8
Dungog	2	5
Port Stephens	16	43
Newcastle	14	38
Lake Macquarie	12	32
Other	4	11
Total	**195**	**527**

*Notes: * Based on an average household size of 2.7.*
Totals may differ due to rounding.

Flow-on benefits (jobs) from direct employment provide additional jobs in the community. Reducing direct employment therefore also reduces these flow-on jobs in the community. Therefore, the total number of people leaving the region would be expected to be greater than the 527 former employees and their families.

iii Impact on housing market

Consultation with stakeholders (including Singleton residents, businesses and real estate agents) suggested that the recent contraction of the coal industry had contributed to the weakening of the property market through decreased demand. Local business stakeholders (Singleton-based real estate agents) suggested that the market was 'over-heated' during the coal mining boom, and that current soft property market figures may reflect a recalibration of the market towards a more realistic and stable trend.

This is demonstrated in recent property market data for the Singleton LGA (Housing NSW 2014) which shows a decline in sales results and a dramatic fall in rental returns for Singleton LGA. Median sales prices fell consistently in 2013 (almost 9 per cent annual decline for all properties) and rental returns fell by approximately 25 per cent on average in the 12 months to December 2013.

A population decline due to workers made redundant by the closure of the Warkworth Mine and MTO moving out of the region or a decline in the financial resources of previous employees would be likely to contribute to reduced property sales, sale prices and rental property demand.

iv Reduced local spending and decline in businesses

MTW spends a significant amount of money in the local area on local and regional suppliers, supporting a variety of businesses. In 2013, MTW spending on suppliers (based upon the postcode from which the good or service was invoiced) included:

- $188million with 228 local suppliers from Upper Hunter, Muswellbrook, Singleton, Maitland and Cessnock LGAs;
- $147million with 377 suppliers from the rest of NSW; and
- $238million with 198 suppliers from the rest of Australia.

The above figures correlate with the results of an online survey of suppliers to MTW in March 2014.

Under the reference scenario, the majority of spend by MTW on suppliers within the local area, as well as significant amount of spend by employees within the local area would cease by 2021, if not beforehand. This results in a significant reduction of spend per year (hundreds of millions of dollars) in the local area which would significantly impact local businesses, particularly those that demonstrated a degree of reliance on MTW for their business.

5.3 Community services

5.3.1 Education

Participants of the employee survey were asked to indicate the number of children they had in educational facilities in the Hunter Region. Of the 337 employees who responded to the employee survey, 209 had families. These employees had a total of 184 children attending educational facilities in the Hunter Valley. Based on the survey data, there is an average of 0.55 children per employee or 715 in total. Based on the assumptions detailed earlier, the departure of 15 percent of the workforce would include a reduction in the number of children in the region by a similar proportion and, therefore, may lead to a reduction of 107 children attending an education facility in the region (Table 5.3).

Table 5.3 Educational attendance by MTW employees

Facility	Estimated number of children of MTW employees	Number leaving the region (assumed 15%)
Childcare facility	186	28
Primary school	279	42
High school	186	28
Newcastle University	36	5
Technical college	29	4
Total	**715**	**107**

While the reduction in population will lower demand for school places and health services it is likely that this could place stress on future funding for these services particularly for smaller local community schools such as Milbrodale, Broke and Jerrys Plains Public Schools that had 11, 59 and 21 enrolments in 2013, respectively.

5.3.2 Employee contributions to community organisations

During the survey of suppliers and employees in March 2014, employees and suppliers were asked a series of questions relating to their direct contribution to, and participation in, community organisations and activities.

In the employee survey, 123 employees (33 per cent of responses) stated that they currently undertake some form of voluntary work, which is higher than the proportion of residents in Singleton LGA that volunteers (HVRF 2013b and ABS 2011). Of those that indicated current voluntary work activities, the majority carried out this work for sporting or physical recreation organisations (50 per cent of responses) followed by emergency services (21 per cent), children and youth (20 per cent), education and training (13 per cent) and community/ welfare (12 per cent) (see Figure 5.2).

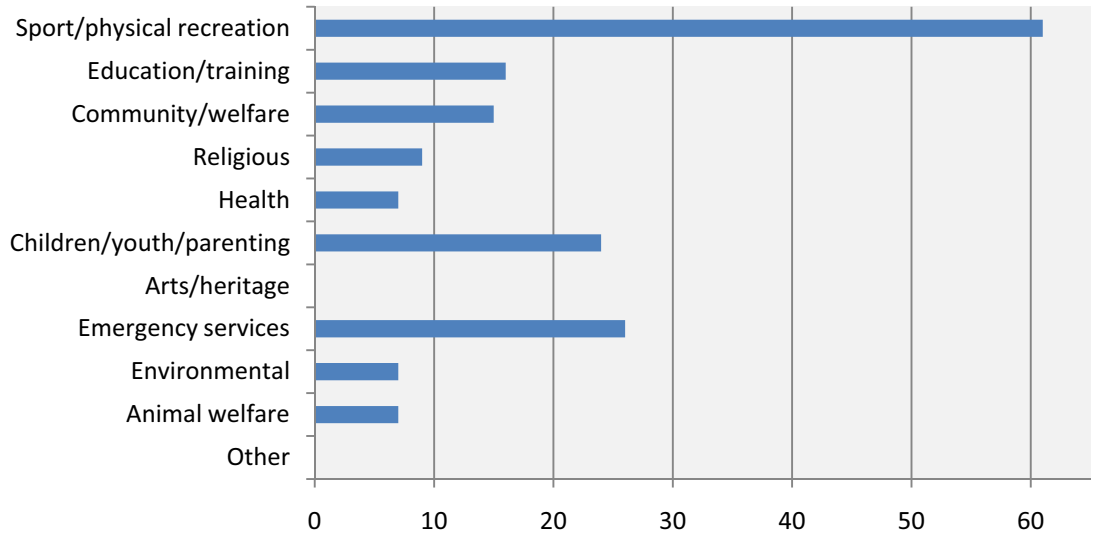


Figure 5.2 Organisation type for voluntary work

The majority of employees (73 per cent) estimated that they dedicate between 1 and 10 hours per month to voluntary work in the Hunter Region. About 22 per cent dedicated 10 to 20 hours per month to voluntary work (see Figure 5.3). Of those that indicated current voluntary work activities, the majority carried out this work for sporting or physical recreation organisations (49.6 per cent of responses) followed by emergency services (21.1 per cent), children/ youth (19.5 per cent), education/ training (13.0 per cent) and community/ welfare (12.2 per cent).

MTW employees contribute to community life and participate in community organisations. This would be substantially reduced if previous employees leave the region to seek work. The flow on effect for organisations which require volunteers may be a loss of capacity to carry out community activities through the loss of MTW employees and their voluntary contributions.

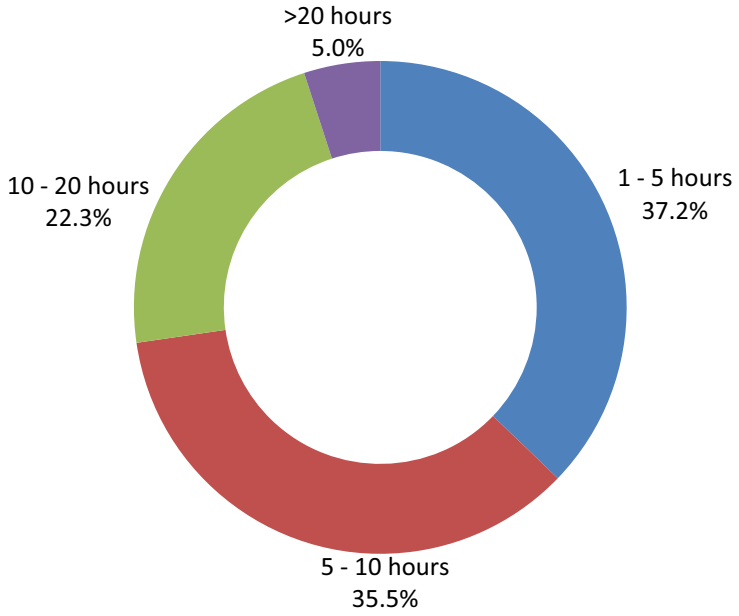


Figure 5.3 Hours per month dedicated to voluntary work

5.3.3 Supplier contributions to community organisations

About 75 per cent of suppliers surveyed indicated that they make direct financial contributions to community organisations (for example, charities, community services and health care) in the Hunter Region. The organisations supported included sporting (84 responses), welfare (65 responses), emergency services (55 responses), education (42 responses) and health (41 responses) organisations. The financial contribution on these community organisations for the past 12 months is shown in Figure 5.4.

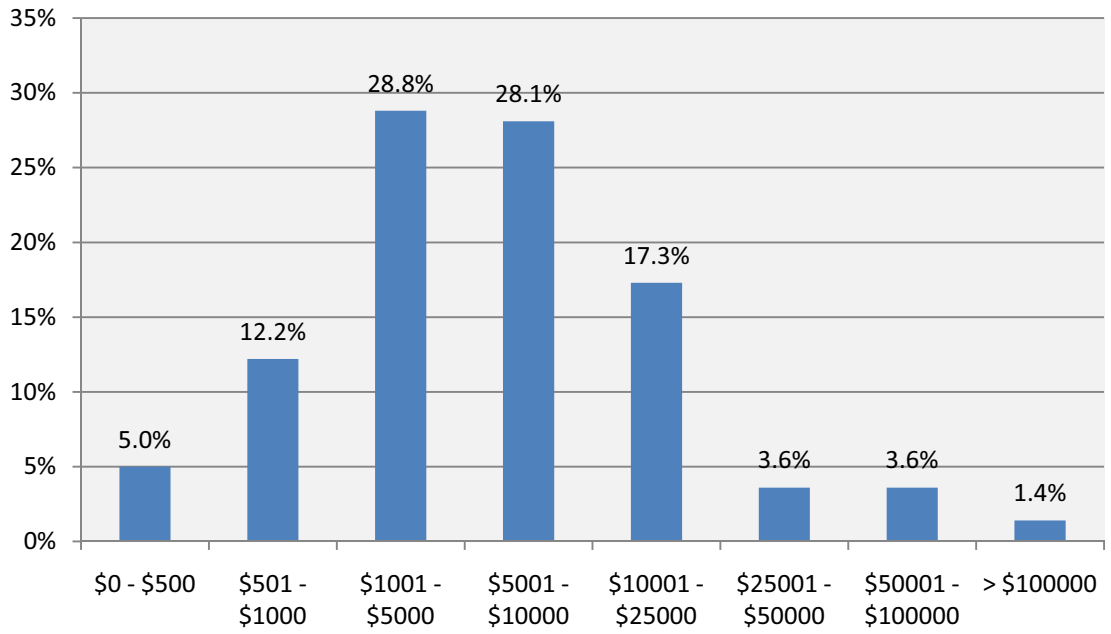


Figure 5.4 **Total financial contributions of suppliers to community organisations in the past 12 months**

Suppliers also made any non-financial contributions (for example, donating equipment, company resources and use of facilities) to community organisations in the Hunter Region. The number of non-financial contributions in each sector is shown in Figure 5.5. It is noted that totals add to 101 per cent due to rounding.

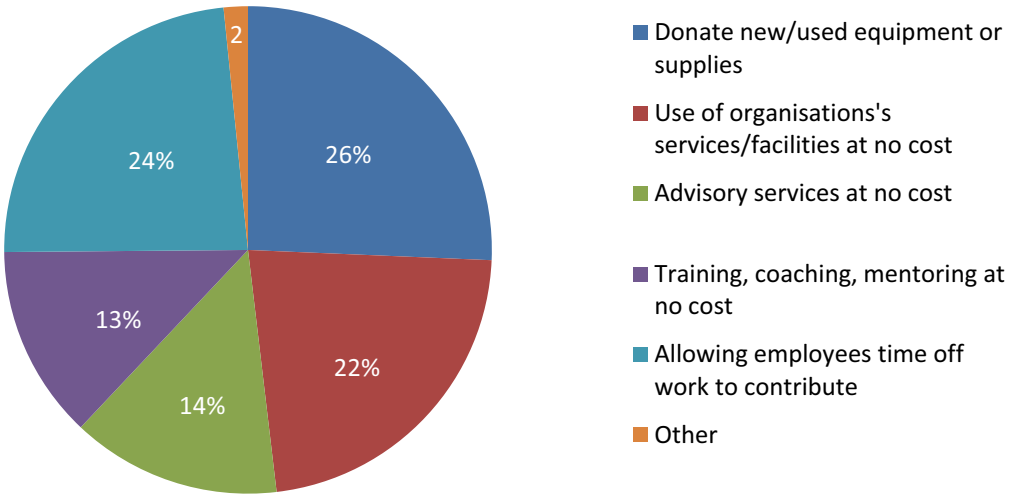


Figure 5.5 **Type of non-financial contributions made by supplier to community organisations**

Suppliers are also actively engaged in and contribute to community organisations, particularly through volunteer work.

The continued use of suppliers by MTW contributes to the financial success of these suppliers and allows them and their employees to contribute to and participate in community organisations in the region. In the absence of the proposal, the financial viability and the contributions of some of these suppliers would, at the least, be reduced.

5.4 Stakeholder perceptions and assessment outcomes

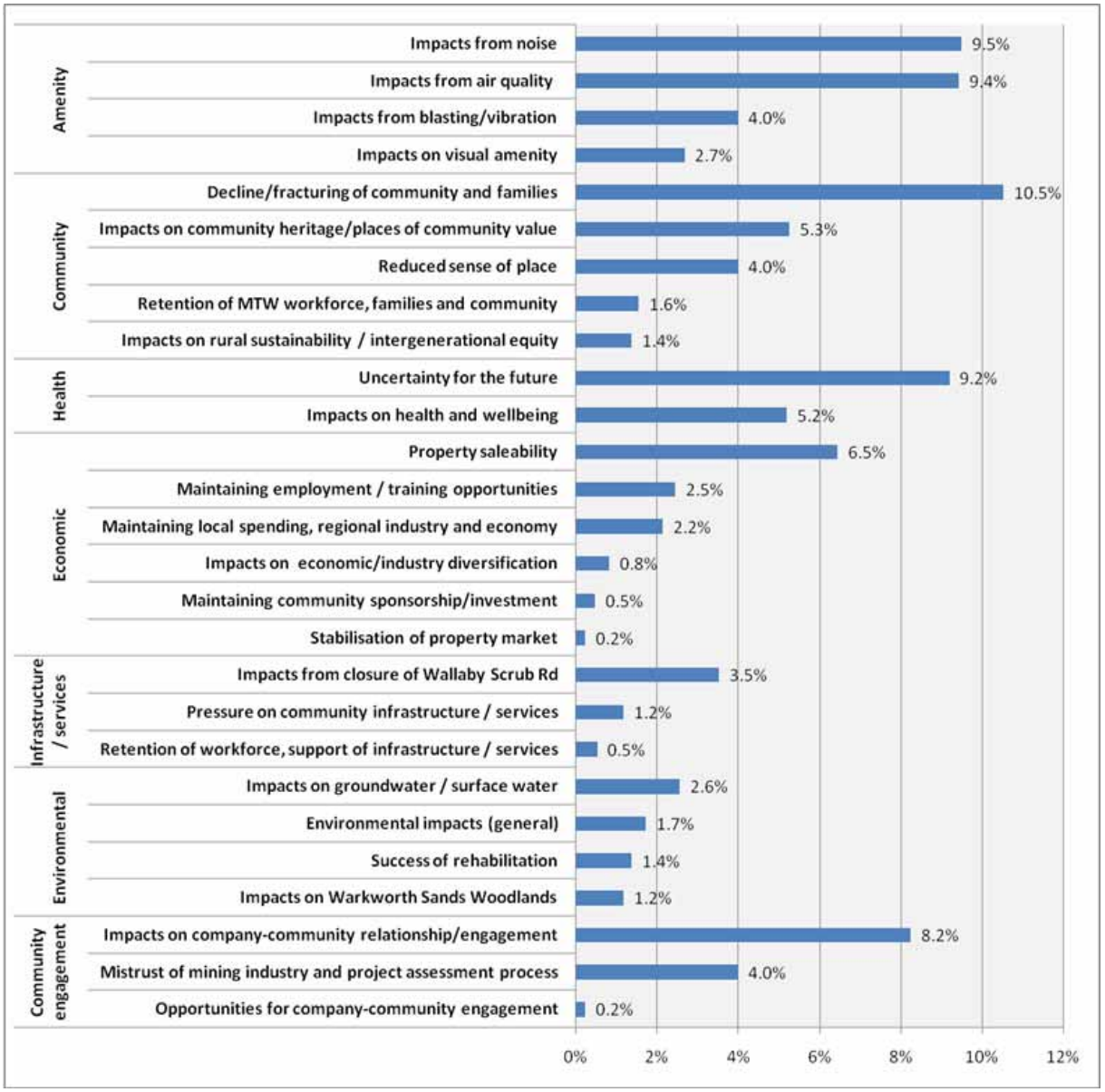
The technical assessments are central in understanding and addressing impacts but it is important to understand stakeholder perceptions of impacts and opportunities so they can be considered in designing appropriate social management, mitigation or enhancement strategies. This section provides an assessment of the perceived impacts and opportunities associated with the proposals. It also provides a technical assessment of each of these perceived impacts and opportunities sourced from relevant technical studies and literature.

The perceived impacts and opportunities are categorised into seven groups:

- amenity;
- environmental;
- community;
- health and well-being;
- economic;
- infrastructure and services; and
- community engagement, relationships and governance.

The frequency that participating stakeholders identified specific impacts and opportunities is shown in Figure 5.6 providing an indication of key areas of focus for assessment. Table 5.4 provides a summary of perceived impacts and opportunities and the technical assessment of the impacts and opportunities. They provide particular attention on near neighbours as near neighbours represented 44 per cent of those who participated in the survey.

It is noted that technical study outcomes apply to both proposals unless explicitly stated otherwise. Where results apply to one of the proposals only, the respective proposal title precedes the text.



Notes: Percentages are based on the total number of responses (1,673) from the 151 participants.
Data does not include results of the employee and supplier surveys.

Figure 5.6 Perceived impacts and opportunities of the proposal

Table 5.4 Social impacts and opportunities from the proposal – perceived and technical assessment

	Impact/opportunities	
	Perceived	**Technical assessment**
Amenity		
Noise	**Noise levels and impacts on amenity, health and well-being** Noise was the most frequently identified perceived impact. Near neighbours (that is, residents living in proximity to the mine with potential noise exposure) perceive that the proposal is very likely to contribute to noise (including low frequency noise), impacting on the amenity, health and well-being of residents in Bulga, Long Point and Gouldsville. The majority of responses relating to noise levels were related to the Warkworth Continuation 2014, not the Mount Thorley Operations 2014 proposal.	**Noise management** The applicants have committed to implementing best practice sound suppression on all major plant. Further, the applicant's are in the final stages of developing a pre-emptive real time noise modelling interface (a first in the NSW mining industry) and is using best practice real time noise monitoring and management techniques. This constitutes all reasonable and feasible mitigation that has and would be adopted under the proposal. **Assessment criteria** The Mining SEPPs' non-discretionary standard for cumulative amenity noise levels at privately-owned residential dwellings is met for Bulga village, and noise impacts are predicted to be below the acceptable noise levels and amenity of the village as a rural area will be maintained. Further, the Mining SEPPs' non-discretionary standard for cumulative amenity noise levels is also met at other surrounding localities such as Gouldsville and Long Point. The L&E Court judgement (par. 64), notes that experience of noise levels from current mine operations is more than an expression of subjective fear or concern. However, while noise levels may be perceived differently by different stakeholders, the noise assessment used objective INP noise criteria that have been selected to protect at least 90 per cent of the population living in the vicinity of industrial noise sources from the adverse effects of noise for at least 90 per cent of the time. **Project specific noise levels** The determining factor for the project specific noise levels (PSNLs) for all residences is the intrusiveness criteria. Background levels have been set at appropriate levels to determine these. *Warkworth Continuation 2014* Significant exceedances (>5dB(A)) of the PSNLs are predicted to occur at four assessment locations, three at Warkworth village (77, 102 and 264) and one to the north of Bulga village (34). Assessment location 77 is currently afforded acquisition rights from an adjacent mining operation. Assessment location 264 is inferred to have acquisition rights from an adjacent mine but is not currently included in its approval. Assessment location 102 is Warkworth Hall, which is a non-residence. Significant exceedances (>5dB(A)) of the PSNLs are not predicted at any other surrounding localities including Long Point and Gouldsville. *Mount Thorley Operations 2014* A significant exceedance (>5dB(A)) of the PSNL is predicted to occur at one assessment location at Mount Thorley Industrial Estate (149) which is currently afforded acquisition rights from MTO under the development consent. It is noted that operational noise levels from the proposal are not expected to be materially different from current noise levels for locations east of the mine given relatively no changes to current activities in the eastern parts of the Site. Noise levels would be within 1 or 2dB(A) of the PSNLs for the majority of the residences at Bulga under the proposals. Changes of 1 to 2dB are imperceptible (see Appendix G of the EIS). **Low frequency noise**

Table 5.4 Social impacts and opportunities from the proposal – perceived and technical assessment

Impact/opportunities	
Perceived	**Technical assessment**
	Noise levels are predicted to meet relevant Broner criteria for low frequency noise and INP criteria for sleep disturbance at representative assessment locations under the proposals. **Cumulative noise** *Warkworth Continuation 2014* Cumulative noise levels would satisfy the INP (and Mining SEPP) night time criterion at all but one representative assessment location in Warkworth village (77). As this is a representative location, the criterion is also likely to be exceeded at two neighbouring locations in Warkworth village (102 and 264). It should be noted that these assessment locations are currently afforded acquisition rights from an adjacent mining operation. The status of assessment location 264 is referenced above. *Mount Thorley Operations 2014* Cumulative noise levels would satisfy the INP (and Mining SEPP) night time criterion at all but two representative assessment locations in Warkworth village (77) and Mount Thorley Industrial Estate (146). As these are representative locations, the criterion is also likely to be exceeded at two neighbouring locations in Warkworth village (102 and 264) and two neighbouring locations in Mount Thorley Industrial Estate (144 and 915). It should be noted that these assessment locations are currently afforded acquisition rights from MTO or Wambo Mine with the exception of 264, which is inferred to have acquisition rights from Wambo Mine but is not currently included in its approval. **Traffic noise** *Warkworth Continuation 2014* The closure of Wallaby Scrub Road and resulting increased traffic on detoured roads would not result in an exceedance of relevant noise criteria. All reasonable and feasible measures have been applied to control noise from Warkworth Mine. Overall, one additional privately-owned residence that is not within either Warkworth Mine's or a neighbouring mine's existing acquisition zone (as per existing development consents), would be afforded acquisition rights under the proposal. Furthermore, given that the cumulative noise levels have been met at the majority of assessment locations, and it is unlikely there would be additional noise sources nearby in the future, the residences at Bulga generally have a rural level of amenity as defined in the NSW Industrial Noise Policy. Coal & Allied would implement operational, noise and blasting management strategies and monitoring as detailed in noise and vibration study. Specifically for Bulga, this includes measures such as a trigger action response process (TARP), whereby noise level triggers from the MTW real time noise monitoring network initiate a series of management measures to reduce offsite noise levels.

Table 5.4 Social impacts and opportunities from the proposal – perceived and technical assessment

	Impact/opportunities	
	Perceived	**Technical assessment**
Air quality	**Air quality impacts** Near neighbours expressed concern that the proposals are likely to contribute to air quality impacts from dust, diesel emissions and blast fumes. It is perceived that air quality would deteriorate due to increasing proximity of the mine to Bulga, the proposed disturbance of approximately 698ha of land, and air quality impacts experienced from current operations under the Warkworth Continuation 2014. **Impacts of air quality on health and well-being** Some stakeholders perceive that air quality impacts on amenity, health and well-being of affected residents are likely.	**Air quality management** Air quality goals are benchmarks set to protect the general health and amenity of the community in relation to air quality. Air quality impacts are currently managed at MTW through an existing integrated management system which involves the implementation of a monitoring network, best practice mitigation measures, and operational control strategies and measures with the objective of continuous improvement (see Appendix H of the EIS). Recent air quality monitoring results for 2012 and 2013 have shown that the both Warkworth Mine and MTO are complying with the relevant air quality criteria. **Particulate matter** The Mining SEPP's non-discretionary standard for cumulative air quality is met at all but two privately-owned residential dwellings (assessment locations 77 and 264) which are in Warkworth village. These assessment locations, and one non-residence (102 – Warkworth Hall), may experience concentrations above the relevant air quality goals for 24-hour average and annual average PM_{10} (particulate matter with a diameter of 10µm or less). Assessment location 77 is currently afforded acquisition rights from a neighbouring mine. Assessment location 264 is inferred to have acquisition rights from neighbouring mines but is not currently included in its approval. These results apply to both proposals. The Mining SEPP's non-discretionary standard for cumulative air quality at privately-owned residential dwellings is met for Bulga village and air quality impacts are predicted to be below the acceptable air quality concentrations and amenity of the village will be maintained. *Warkworth Continuation 2014* Twenty four mine-owned assessment locations are predicted to experience concentrations above the relevant air quality goals for 24-hour average and annual average PM_{10}. A subset of these assessment locations may also experience concentrations above the relevant air quality goals for annual average total suspended particulate matter (TSP) and incremental and total annual average dust deposition. *Mount Thorley Operations 2014* Fifteen mine-owned assessment locations are predicted to experience concentrations above the relevant air quality goals for 24-hour average and annual average PM_{10}. A subset of these assessment locations may also experience concentrations above the relevant air quality goals for annual average total suspended particulate matter (TSP) and incremental and total annual average dust deposition. Cumulative $PM_{2.5}$ (particulate matter with a diameter of 2.5µm or less) concentrations would be below the National Environment Protection Measure (NEPC 2003) advisory reporting standards at all of the assessment locations where the concentrations of other pollutants are below the relevant air quality goals under both proposals. Dust from mining is generally coarse in fraction (> $PM_{2.5}$) whereas the fine fraction dust (< $PM_{2.5}$) of concern to human health typically originates from combustion sources.

Table 5.4 Social impacts and opportunities from the proposal – perceived and technical assessment

	Impact/opportunities	
	Perceived	**Technical assessment**
		Diesel emissions and blast fume emissions No air quality impacts are predicted to result from diesel emissions (NO_2 and CO) and blast fume emissions.
Blasting and vibrations	**Blasting and vibration impacts** Near neighbours perceive that the Warkworth Continuation 2014 is likely to contribute to vibration impacts from blasting on the amenity and properties of residents in Bulga, Milbrodale, areas of Broke, Long Point and Gouldsville. Stakeholders perceive that vibration impacts from the Warkworth Continuation 2014 on the amenity and properties of affected residents are likely as mining operations and blasting activities come closer to Bulga.	**Blasting and vibration impacts** *Warkworth Continuation 2014* Blast noise overpressure and ground vibration limits would be met with the implementation of appropriate blast management (see more detail in the noise and vibration study). The blasting impact assessment focused on Bulga Bridge and St Phillip's Church in Warkworth Village as the most sensitive local structures. As the minimum separation distance between these structures and blast areas would be at least 2.5km, it is highly unlikely that these structures would be impacted. Subject to the implementation of the protocols outlined in the MTW Blast Management Plan no impacts are predicted to result from blast fume emissions. MTW is currently implementing a predictive management system to aid with management of blasting operations. Such a system uses actual conditions for each blast to predict the potential impact which may occur. The prediction is made on the basis of forecast weather data, allowing operators to schedule a blast to the time of least impact over the course of the upcoming day. In effect the system updates the blasting restrictions for each individual blast on the basis of predicted impact. The system thus deals with the spatially and time varying weather and terrain influences and is generally more reliable than relying on a fixed set of wind speed and wind direction restrictions. *Mount Thorley Operations 2014* The proposal is for continuation of mining operations which would remain within the current approved boundaries. Blasting impacts would therefore remain as previously assessed in past noise and vibration impact assessments for MTO.
Visual amenity	**Visual amenity impacts** Near neighbours expressed concern that the Warkworth Continuation 2014 is very likely to contribute to visual amenity impacts on residents of Bulga, Milbrodale, areas of Broke, Long Point and Gouldsville. It is perceived that visual amenity would deteriorate due to the increasing proximity of the mine to Bulga and given the surrounding landforms. Some stakeholders expressed concern that this would particularly be experienced at properties in Bulga on the western side of Inlet Road and nearby	**Visual amenity impacts** *Warkworth Mine 2014* As described in visual impact study that forms part of the EIS, open cut coal mines, including Warkworth Mine, and supporting infrastructure are a prominent landscape feature the landscape. The proposal would extend exposure to views from the west of the Site, and decrease the distance between sensitive viewers and mine and rehabilitated landform, in the long-term. The active mining face would advance away from sensitive viewers in the east under the proposal. Overburden emplacement at the Site would continue to be visible to some viewers in Bulga. Some residences west of the Site, such as elevated residences around Bulga village, may experience high visual impacts. However in the broader area, overall visual impacts of the proposal would generally be moderate to low, as the impact on visual amenity would be limited, localised and consistent with existing views. The existing topography and vegetation would continue to provide screening to the mine to varying extents depending on view location and elevation.

Table 5.4 Social impacts and opportunities from the proposal – perceived and technical assessment

	Impact/opportunities	
	Perceived	**Technical assessment**
	roads/streets, the western side of Putty Road and nearby roads/streets, and the elevated sections of the western side of Wambo Road. The above concerns principally related to the Warkworth Continuation 2014.	*Mount Thorley Operations 2014* Existing topography and vegetation would continue to provide screening to MTO as mining within Loders Pit continues and overburden is emplaced within the Site. Some residences west of the Site, such as elevated residences around Bulga village, may experience high visual amenity impacts. Progressive rehabilitation of disturbed areas and implementation of visual impact mitigation measures would be undertaken to minimise impacts on visual amenity. **Visual impact mitigation measures** Visual impact mitigation measures would be put in place to mitigate the potential impacts on the overall surrounding landscape for both proposals. This would include vegetation and bund screening to the boundaries of the Sites. In addition, site-specific visual assessments (SSVAs) would be available to individual landowners of potentially impacted properties. These SSVAs would prescribe specific mitigation measures, if either proposal is determined to have high or high/moderate visual impact at the property. Implementation of the mitigation measures prescribed in SSVAs at impacted properties will be important to substantially reduce these amenity impacts. Progressive rehabilitation of the Sites would further reduce the level of contrast in the viewing landscape and, ultimately, result in a higher level of visual integration.
Environmental		
Groundwater and surface water	**Groundwater impacts** Groundwater matters were raised in relation to the Warkworth Continuation 2014. Stakeholders raised concern about impacts on groundwater from the proposal, including: • well and bore water decline at privately-owned properties; • impacts on the general hydrogeological system of the Bulga, Milbrodale and Broke areas; and • subsidence caused by aquifer changes. These were acknowledged as a broader cumulative matter by some near neighbours. These impacts were considered to be	**Groundwater** *Warkworth Continuation 2014* Groundwater modelling predicts there would be no groundwater drawdown at any privately-owned bore greater than 2m. Government policy stipulates that for any bores where the maximum cumulative decline in groundwater levels is predicted to exceed 2m due to mining a make good agreement between the landholder and the applicant should be in place. A reduction of less than 2m is unlikely to noticeably reduce the pumping yield from any bore. Groundwater modelling indicates that risks to groundwater systems are negligible and manageable subject to the obtainment of the necessary water entitlements. The applicant is committed to ensuring the necessary licences are held with sufficient share component and water allocation to account for all water taken from a groundwater or surface water source as a result of an aquifer interference activity, both for the life of the activity and after the activity has ceased. Potential groundwater impacts from the proposal would not result in subsidence and, as such, would not impact on property. Coal & Allied would implement groundwater management strategies and monitoring as detailed in the groundwater study that forms part of the EIS. **Surface water** *Warkworth Continuation 2014*

Table 5.4 Social impacts and opportunities from the proposal – perceived and technical assessment

	Impact/opportunities	
	Perceived	**Technical assessment**
	contributing factors in reducing water supply to properties, damaging properties and impacting way of life through reducing environmental quality in the area. **Surface water impacts** Stakeholders perceived that there would be impacts on surface water from the proposal, particularly the potential continued deterioration of the Wollombi Brook which is considered to be an important environmental, social and community attribute, with several stakeholders citing its long-standing importance to Bulga for agricultural production and recreational activities. Surface water matters raised generally related to the Warkworth Continuation 2014; however, the Mount Thorley Operations 2014 was also referenced.	Impacts of the proposal are unlikely to be significantly different to those from the existing approved operations. Groundwater modelling predicts a reduction in saline Permian groundwater discharge to the Wollombi Brook as mining progresses, reduce the salinity of the alluvium (and subsequently in the brook) during the life of the proposal. Surface water modelling predicts that no uncontrolled release of saline water would occur over the life of the proposal. Excess saline water would continue to be released in accordance with the existing rules of the Hunter River salinity trading scheme. The MTW water management system would continue to operate and prevent sedimentation. As all offsite water supply requirements (if required) and water take under the proposal would be obtained from licensed sources, there would be no adverse impact on other licensed users (subject to climatic conditions and the operation of the water supply scheme). Therefore, agricultural production and recreational activities would not be impacted. Coal & Allied would implement surface water management strategies and monitoring as detailed in the surface water study that forms part of the EIS. *Mount Thorley Operations 2014* The results of the surface water study indicate that the impacts of the proposal on surface water resources are unlikely to be significantly different to the existing approved operations and would not have a significant impact on surface water quality of the adjacent water features. Surface water would continue to be managed under the MTW water management plan and the existing MTW surface water monitoring programme. No additional mitigation measures, to those already implemented, are required for the proposal.
Warkworth Sands Woodland	**Loss of Warkworth Sands Woodland (WSW)** Near neighbours expressed concern about a loss of the 'unique ecology' of WSW under the Warkworth Continuation 2014. It was perceived that this would impact fauna (particularly birdlife) and groundwater systems, removing opportunities for educational and recreational activities such as school visits, bird watching and nature walks. **Biodiversity offsets** Stakeholders were generally sceptical about the effectiveness of biodiversity offsets in areas far-removed from WSW and questioned the achievements of other offsetting projects undertaken in the Hunter Valley. Again, this	**Impacts on vegetation including WSW** *Warkworth Continuation 2014* WSW would be disturbed under the proposal. This would be managed through provision of biodiversity offsets and supplementary measures, such as the re-establishment of Warkworth Sands Grassland to Warkworth Sands Woodland and provision of funds for the development of an Integrated Management Plan for WSW. A thin perched groundwater system of limited extent, recharged by rainfall, is present in the aeolian Warkworth sands that support the WSW ecological community. This system is not in direct hydraulic connection with the underlying Permian fractured rock (AGE, 2014). Therefore, the proposal is not expected to impact on the groundwater system or the associated vegetation community. Open cut mining projects cannot readily avoid impacts where mineral resources are beneath flora and fauna habitats. Listed species and communities, including WSW, were avoided to the greatest possible extent during mine and infrastructure design. The proposal's remaining impacts on WSW and other vegetation were assessed in accordance with contemporary government policy. Coal & Allied would implement the measures to avoid, minimise, mitigate and compensate for the loss of WSW and other native vegetation as described in ecology study that forms part of the EIS.

Table 5.4 Social impacts and opportunities from the proposal – perceived and technical assessment

	Impact/opportunities	
	Perceived	**Technical assessment**
	matter related exclusively to the Warkworth Continuation 2014.	**Biodiversity offsets** *Warkworth Continuation 2014* Offsets for WSW are proposed within the Southern and Northern Biodiversity Offset Areas including existing vegetation and re-establishment. The re-establishment of WSW in areas mapped as WSG which would establish large, fully functioning examples of the EEC through enhancement of areas. In the long-term, this would result in a larger area of WSW than currently exists and would be managed and protected, which is not the case currently. The offsets would also provide habitat into the future for threatened fauna species associated with this vegetation community. In addition, supplementary measures are proposed, including: • development of rehabilitation completion criteria based on the UNE research over the last five years; and • provision of funds for the development of an Integrated Management Plan. The assessment of groundwater dependent ecosystems concluded that no direct impacts to this groundwater system resulting from the proposal would occur. In combination, these measures would result in a larger area of WSW than currently exists that would be managed and protected, which is not the case currently.
Rehabilitation and future land use planning	**Ineffective rehabilitation** Near neighbours and interested stakeholders perceived that past and present rehabilitation practices at MTW and at other mining sites throughout the Hunter Valley have been unsuccessful and that little change in these practices is included as part of the proposal. Several stakeholders suggested that evidence is yet to emerge of open-cut coal mine rehabilitation leading to positive environmental and land use outcomes.	**Rehabilitation achieved and proposed** Rehabilitation at MTW is undertaken in a series of stages as mining progresses. Much of the rehabilitation to date has been in the north of the site predominately away from the public views and is consistent with the progression of mining. The 2013 Annual Environmental Review for MTW illustrates that the rehabilitation completed in 2013 exceeded the commitment outlined in the Mining Operations Plan (MOP). The cumulative rehabilitation undertaken during the MOP period of 126.2ha has also exceeded that committed to in the MOP (121.9ha) at this point in the mine life. The proposals include commitments to leading practice rehabilitation and future innovations in rehabilitation to achieve improved outcomes. Given this is the case, it is unlikely that ineffective rehabilitation would lead to social impacts.

Table 5.4 Social impacts and opportunities from the proposal – perceived and technical assessment

	Impact/opportunities	
	Perceived	**Technical assessment**
Community		
Community and family cohesion	**Loss of population, community members and leaders** The residents of Bulga, Long Point and Gouldsville perceive there may be loss of population, community members and leaders as a result of acquisition and relocation, leading to the gradual decline of community (both facilities/services and existing community connections and village life) and loss of connections between and within communities and families from the proposals.	**Population** The Warkworth Continuation 2014 is required to enable continuation of operations at Warkworth Mine in 2015 and beyond, and so contribute to maintaining the current and the regional population in the medium-term. The Mount Thorley Operations 2014 is required to maintain the viability of both mines and operation of MTO beyond 2017. The decline of smaller rural communities is a broad concern across Australia including in parts of the middle and upper Hunter region that are experiencing decline. A wide range of factors are contributing to this such as improved communications which is encouraging migration to cities and centralisation of services, restructuring of rural industries and reduced employment opportunities, and population aging and non-replacement leading to towns falling below the critical threshold needed to maintain essential services (Productivity Commission 2009 and ABS 2006, 2011). In contrast, Bulga has a number of significant attributes including retail and community facilities (service station, general store, tavern, community hall, sports ground and fire brigade) and it is well located to service the tourist trade being proximal to attractions like wineries and is on the Putty Road tourist route. Consequently, Bulga has experienced both a growth in population and housing prices, has a relatively robust age structure and relatively low rates of population turnover. Impacts predicted from the proposals will not necessitate property acquisitions in Bulga. It is also important to note that in contrast to perceptions any property acquisition rights included in an approval are upon the request of the landowner and are not compulsory. If a landowner does not wish to take up their acquisition rights they do not have to. Any landowner with acquisition rights under an approval can also choose when they might like to have their property acquired, if at all, during the life of the development. For example, if the landowner is happy at the start of the project to stay but 10 years later choose to take up their acquisition rights, the rights will still exist and can be validly processed under the approval. The Bulga population has increased 11.5 per cent or 37 persons between the 2006 and 2011 census. However, it is acknowledged that local stakeholders reflect on gradual population decline in nearby villages such as Warkworth, Camberwell and Ravensworth. Even with the replacement of population that may occur with leasing any acquired properties, or with the new owners living or leasing properties sold by owners voluntarily relocating, concern remains regarding the loss of existing community connections, activity and village life. ABS data shows that Bulga SSC's population increased by 11.5 per cent from 321 to 358 persons between 2006 and 2011, which is double the NSW rate of 5.6 per cent for the same period. In this period, Singleton's population declined by 4.7 per cent. While the proposals would contribute to maintaining the current and the regional population, individual community members would continue to make decisions based on individual circumstances about whether to stay in the area. ABS data has shown that Bulga has a lower population turnover rate than the NSW average: in 2011, 71 per cent of people in the Bulga SSC were recorded at the same address they were five years earlier (compared to 57 per cent for both Singleton and NSW). This suggests that community connections would be relatively strong. It also suggests that the majority of residents consider Bulga to be an attractive place to live and, assuming an acceptable level of amenity can be maintained by the proposal, will continue to be so.

Table 5.4 Social impacts and opportunities from the proposal – perceived and technical assessment

	Impact/opportunities	
	Perceived	**Technical assessment**
Places of community value and sense of place	**Loss of sense of place** A number of near neighbours are worried by the loss of the places of community value and uncertainty regarding the future of the Bulga community, predominately in relation to the Warkworth Continuation 2014. Loss of sense of place has been associated with 'solastalgia', which is defined as the distress that is produced by environmental change impacting on people while they are directly connected to their home environment. Some stakeholders had a sense of distress, loss, depression and abandonment when discussing their connections to home, community, family and the rural environment, and that these connections may be lost as a result of the Warkworth Continuation 2014. **Loss of historic and Aboriginal cultural heritage** Stakeholders also expressed concern that the Warkworth Continuation 2014 would impact on places of community value due to impacts on the Former RAAF Base Bulga Complex, sections of the Great North Road, places of Aboriginal cultural heritage significance and Saddleback Ridge. They also associated indirect impacts of the proposal on places of heritage and community value in Bulga through potential impacts of population decline on the management and maintenance of those places.	**Loss of sense of place** A 'loss of sense of place' is a concern of some Bulga residents. Bulga experiences low population turnover and residents have relatively positive health, employment, crime rate and property ownership characteristics that are illustrative of a stable and cohesive community. The reference case (if the proposals were not to proceed) would have a subsequent 'loss of sense of place' for a different set of stakeholders if viable mining could not be maintained. These would include employees, particularly those that reside in the Singleton LGA (35 per cent of the workforce) and others where the present level of social services could not be maintained (for example reduction in student numbers resulting in school closure). **Loss of historic heritage** *Warkworth Continuation 2014* Small portions of the former RAAF Base Bulga Complex and Great North Road would be impacted by the proposal, and heritage impacts are considered minor. The former RAAF Base Bulga Complex and the Great North Road have been subject to comprehensive assessment, and Conservation Management Plans have been prepared for both. The former RAAF Base Bulga Complex has also been subject to archival recording in accordance with NSW Heritage Office guidelines. No direct or indirect impacts are predicted on heritage items located in and surrounding Bulga village. The study found that with the implementation of the mitigation measures (see Appendix O of the EIS), potential heritage impacts within the study area are likely to be low. Coal & Allied will implement the following additional management measures: • establish the MTW Historic Heritage Conservation Fund – the purpose of the fund is to provide resources for local historical research and heritage conservation projects proposed by the local community; and • establish the Great North Road Conservation Fund – the purpose of the fund is to provide resources for heritage conservation works on significant surviving elements of the convict built Great North Road located within Singleton LGA (and potentially other areas including the Great North Road World Heritage Area). **Loss of Aboriginal cultural heritage** *Warkworth Continuation 2014* Places of material Aboriginal cultural heritage have been identified within the proposed 2014 disturbance area. There are 110 places of material cultural heritage within the proposed 2014 disturbance area that would be disturbed or destroyed as a result of the proposal. However, there are no Aboriginal cultural heritage places with scientific values that constitute a constraint on the proposal. Aboriginal cultural heritage at MTW would continue to be managed under the auspices of the Cultural Heritage Working Group and the Aboriginal cultural heritage management plan. In particular, the Wollombi Brook Aboriginal Cultural Heritage Conservation Area would be established for the long-term conservation and management of Aboriginal cultural heritage places and values (see Aboriginal cultural heritage study that forms part of the EIS).

Table 5.4 Social impacts and opportunities from the proposal – perceived and technical assessment

	Impact/opportunities	
	Perceived	**Technical assessment**
MTW workforce and their families	**Retention of MTW workforce and their families** A range of stakeholders identified positive opportunities for the community from the proposals. These opportunities were largely identified for the broader Singleton LGA as a result of the retention of the MTW workforce and their families as a result of the proposal. It was described that the workforce and their families contribute to the community, not only economically (through local spending and support for local business), but also through community participation (attendance at local schools, participation in sporting and other community events and community volunteering).	**Indirect contributions of the proposal on the community** The local community is experiencing impacts from the recent downturn in the coal industry including a decline in population and the loss of mine workers and their families. Approximately 35 per cent of the MTW workforce lives in Singleton LGA, 56 per cent of the workforce have children who attend educational facilities in their local LGA and approximately 33 per cent participate in volunteering in their local LGA. The MTW workforce and their families contribute to the local and regional economy and community through high levels of local spend and through the continuing use of community facilities and participation in the community, such as through volunteering. The employee and supplier survey results indicate that there would be benefits to small to medium sized enterprises (SMEs) from the retention of the workforce. The proposals would ameliorate some of uncertainty in the community resulting from the recent downturn in the coal industry.
Intergenerational and intra-generational equity	**Rural sustainability and intergenerational equity** Some stakeholders perceived that there would be impacts on rural sustainability and intergenerational equity as a result of loss of family and community heritage and the loss of rural villages, environment, community and other associated livelihoods (for example, local business and agriculture). These impacts were perceived as potentially permanent and significant due to the perceived inability to replace the heritage, community and land values of the area post-mining.	**Final landform and land uses** Following the completion of mining and rehabilitation, a final landform will remain that is safe, stable, free draining, and non-polluting. This will be integrated with the surrounding landscape. The final landform will support final land uses including for the conservation of native vegetation and for agriculture for existing and future generations. The impacts the proposals on heritage and land-values are described above and below, respectively. **Direct and indirect employment** The proposals would contribute to social equity by providing direct and indirect employment. They would result in the transformation of a geological resource into physical and human capital through investment in infrastructure and workforce training, and, indirectly, through contributions to governments which would enable greater investments in public infrastructure and services.

Table 5.4 Social impacts and opportunities from the proposal – perceived and technical assessment

	Impact/opportunities	
	Perceived	**Technical assessment**
Health and well-being		
Health and well-being – community uncertainty	**Health impacts** Stakeholders, particularly near neighbours, raised concerns regarding health impacts predominately related to the Warkworth Continuation 2014. Perceived health impacts related to stress as a result of uncertainty for the future; and concerns about the health impacts of poor air/water quality. **Stress and uncertainty** Some stakeholders were concerned about health impacts from stress and uncertainty – for themselves, their family and the community. This uncertainty was most often related to: the acquisition process; the future of Bulga and its community; potential decline of community and fracturing of families; a mistrust of the proposal assessment process; uncertainty regarding ability to sell properties, property values, and related impacts on investments/assets and their future.	**Stress-related health impacts** Health and well-being impacts need to be considered at a community level. In a study of the health of Hunter Valley communities in proximity to coal mining and power generation, Merrit et al. (2013) found that: > There were no significant differences in management rates of mental health conditions in the Hunter Valley region compared with the rest of rural NSW. Management rates of depression and anxiety were not higher, nor were prescription rates of antidepressants. This indicates that similar levels of anxiety are experienced in Hunter Valley region compared to rural NSW as a whole although the causes of anxiety may vary between regions. **Health impacts of dust** The air quality and greenhouse gas study that forms part of the EIS was completed in accordance with the applicable NSW and Commonwealth guidelines, standards and impact assessment criteria which take into account the known health effects of particulates on sufferers of asthma, lung conditions and heart disease. Air quality assessment criteria are designed to protect urban communities. Compared to the urban environment, there are less fine particulates in dust from mining and these particulates do not contain combustion products. Therefore, the assessment criteria provide a high level of conservatism when used to determine the acceptable levels of dust from mining projects in rural settings. The assessment results based on these criteria are described in above in 'Impacts on air quality'. **Health impacts of blast fumes** The impacts of blast fumes have been assessed based on guidelines, standards and impact assessment criteria. With the implementation of blast restrictions when required, blasts would not result in assessment criteria being exceeded. The assessment results based on these criteria are described in above in 'Impacts from blasting/vibration'. **Impacts on rainwater tanks** Lucas et al. (2009) investigated the potential for health impacts from coal dust deposited on rooftops and washed into water tanks. With the exception of two mine-owned residences, the incremental dust deposition predicted for the proposal at private and mine-owned residences is less than the 2g/m^2/month incremental criterion in all modelling years. Taking the predicted dust deposition levels, the spatial separation of residences from the mine and the findings of Lucas et al. (2009) into account, the potential for adverse impacts to rainwater tanks from the deposition of coal dust is low, even at the closest residences. **Impacts of mining on health** Merrit et al. (2013) conducted an analysis of general practice data for rural communities in close proximity to coal mining and coal-fired power generation in the Hunter Valley to identify unusual patterns of illness. The study in the NSW Public Health Bulletin concluded that: > There was no evidence of a significant difference in problems managed or medications prescribed by [general

Table 5.4 Social impacts and opportunities from the proposal – perceived and technical assessment

	Impact/opportunities	
	Perceived	**Technical assessment**
		practitioners] GPs for residents of communities potentially affected by heavy industrial activity (coal mining and power generation) in the Hunter Valley region of NSW compared with residents in the remainder of rural NSW during the period 1998–2010. The diverging trend for respiratory problem management over time is worthy of further exploration. The 'diverging trend' refers to a comparison of the management rates of respiratory problems (as a group) during the period 2005–2010 with those for 1998–2004. This indicated that there was no significant change in the Hunter Valley region despite a significant decrease for the remainder of rural NSW over this period. However, the statistical significance of this difference could not be determined due to the sample size. **Other** Particular areas of concern to stakeholders regarding community uncertainty are addressed elsewhere in this table in the following sections: • uncertainty surrounding the acquisition process; • the future of Bulga and its community; • potential decline of community and fracturing of families; • a mistrust of the proposal assessment process; and • uncertainty regarding the ability to sell properties, property values, and related impacts on investments/assets and their future.
Vulnerable groups	**Impacts to vulnerable groups** Some stakeholders expressed concern that some vulnerable groups would be exposed to impacts from the proposals on: their health from the amenity impacts; their economic and asset base due to a perceived inability to sell properties/assets; and indirectly through the potential loss of community services and facilities in light of a perceived decline in community.	**Vulnerable groups** Particular areas of concern to stakeholders regarding vulnerable groups are addressed elsewhere in this table: • potential amenity impacts of the proposal (from noise, dust and vibration); • health matters related to mining; • potential impacts on property values and ability to sell; and • the potential for fracturing of the community. **Mitigation measures** Notwithstanding this, it is recognised that vulnerable groups, including older members of the community, may not adapt to change and can be more susceptible to impacts, perceived or otherwise. In recognition of this concern, Coal & Allied propose to contribute to a Bulga and Near Neighbour Amenity Resource which would provide services such as property maintenance to residents surrounding the operation. Vulnerable near neighbour residents would have access to this resource.

Table 5.4 Social impacts and opportunities from the proposal – perceived and technical assessment

	Impact/opportunities	
	Perceived	**Technical assessment**
Economic		
Properties value, saleability and investor confidence	**Negative impacts on property values and saleability** Near neighbours raised concern that the proposal would have a negative impact on property values and ability to sell in line with current and historical trends. **Positive impacts on property values and saleability** Stakeholders living in Singleton perceived favourable property market opportunities as maintenance of the current workforce would help to stabilise the property market after recent decreases in sales results and rental returns. Some stakeholders (including Singleton residents, businesses and real estate agents) suggested that the recent contraction of the coal industry had contributed to the weakening of the property market through decreased demand. Local business stakeholders (Singleton-based real estate agents) suggested that the market was 'over-heated' during the coal mining boom, and that current soft property market figures may reflect a recalibration of the market towards a more realistic and stable trend.	**Recent property market trends** Recent property market data for the Singleton LGA show a decline in sales results and a dramatic fall in rental returns for Singleton LGA. Median sales prices fell consistently in 2013 (almost 9 per cent annual decline for all properties) and rental returns fell by approximately 25 per cent on average in the 12 months to December 2013. The issue of devaluation of properties was considered by Stubbs (2012) who examined the purchase price of properties within Bulga during the lodgement and determination of the application for the Warkworth Extension Project in 2010 and 2011 and early 2012. Stubbs (2012) examined the sale price of all properties sold in Bulga between 1 April 2008 and 23 May 2012. She noted that the purchase price of properties did not appear to have been affected by the lodgement and assessment of the application, with median property values in Bulga and surrounds increasingly considerably since that time ($282,500 median sale price in the two years prior to lodgement, and $450,000 median sale price since the lodgement) (Stubbs 2012). **Property market stabilisation** The proposals would aim to maintain current workforce levels across MTW operations, which should contribute to population levels in the Singleton LGA (with over 35 per cent of MTW employees residing in Singleton LGA) and, subsequently, partly assist in stabilising the property market. Coal & Allied would continue to manage residential properties via the open market. Coal & Allied utilises the services of local real estate agents to manage its properties to a high standard of maintenance and management.
Property maintenance and impact management costs	**Property maintenance and impact management costs** Near neighbours perceived that the impacts of current operations, particularly dust and vibration impacts, have a direct and ongoing economic cost and that the proposals would intensify those impacts.	**Assessment of impacts** *Warkworth Continuation 2014* Air quality and noise and vibration studies indicate that dust and vibration levels would be within the relevant guidelines. *Mount Thorley Operations 2014* Air quality studies indicate that dust would be within the relevant guidelines. No additional blasting (to that currently approved) as proposed as part of the proposal.

Table 5.4 Social impacts and opportunities from the proposal – perceived and technical assessment

	Impact/opportunities	
	Perceived	**Technical assessment**
	Near neighbour communities are not generally connected to mains water supply, so properties are reliant on tank water.	**Water tanks** Regardless of proximity to mining water tanks generally require routine maintenance to ensure that water quality is maintained. The impacts of the proposal on rainwater tanks are summarised in 'Health and wellbeing impacts'. While there would be no significant impacts to private residences directly attributable to either proposal, Coal & Allied propose contribution to a Bulga and Near Neighbour Amenity Resource to provide services to residents surrounding the operation.
Employment and training	**Employment and training opportunities** Stakeholders identified employment, expenditure on suppliers' services and associated opportunities for skills development and scholarships as primary benefit of the proposals. **Contribution to economic growth** Experience with the growth of the coal industry since the late 1990s gave some stakeholders confidence that the proposal would significantly contribute to employment and economic growth in the Singleton LGA. Local business stakeholders were confident that the proposal would deliver employment and skills development opportunities across the Singleton LGA. Many stated that small downturns in coal industry activity were immediately felt by local suppliers and that the proposal would stabilise supplier workforce numbers and supporting revenues.	**Ongoing workforce and suppliers** MTW currently employees a workforce of approximately 1,300 persons on average. Although Warkworth Mine and MTO are integrated operations and workforce numbers are difficult to assign to the respective development consents, an estimate of 63 per cent (819 persons on average) could be attributed to activities on the Warkworth Mine development application and 37 per cent (481 persons on average) to the MTO development application. The proposal aims to maintain current workforce levels across MTW operations, bringing with them employment and training opportunities and are expected to contribute employment and supplier revenue benefits into the medium-term, with economic opportunities for the region extending over the proposal life-cycle.
Representation of local residents, near neighbours, women, and Aboriginal and Torres Strait Islanders in the MTW workforce	**Representation of local residents, near neighbours, women, and Aboriginal and Torres Strait Islanders in the MTW workforce** A number of near neighbour residents from Bulga, Milbrodale, Long Point/Gouldsville contended that few near neighbours were employed at MTW and that no new targets for lifting employment rates for near neighbour communities or local employment are included	**Locals in the workforce** Almost three quarters of MTW employees and long-term contractors live in the Mid and Upper Hunter region: Singleton LGA (35 per cent), Cessnock (19 per cent) and Maitland LGA (17 per cent). In January 2014, MTW employed 24 people from direct near neighbour communities (for example, Bulga, Milbrodale, Warkworth and Maison Dieu) which equates to approximately 7 per cent of the labour force from those communities. Coal & Allied maintains a continued preference for employees and contractors to reside locally. **Women and Aboriginal people in the MTW workforce** About 12 per cent of the current workforce (both employees and contractors) are women. Rio Tinto Coal Australia's goal is to

Table 5.4 Social impacts and opportunities from the proposal – perceived and technical assessment

	Impact/opportunities	
	Perceived	**Technical assessment**
	in the proposals. .	achieve 15 per cent female employment across it operations (RTCA 2014) which is the average proportion of female employees in the mining Australian industry (WGEA 2013). The Indigenous workforce (both employees and contractors) represent about 2 per cent of the total MTW workforce. Rio Tinto Coal Australia's goal is to achieve five per cent Indigenous employment across its operations (RTCA 2014). The proportion of Indigenous people in the Australian mining industry is four per cent. The MTW Diversity Action Plan has a focus on increasing Indigenous and female employment. Coal & Allied would continue to implement the MTW Apprenticeship and Graduate programme, drawing on local candidates, and consisting of: • five new apprenticeship positions each year; • Aboriginal scholarship programme in partnership with University of Newcastle, supporting two Aboriginal students per annum with a scholarship programme and vacation employment to complete their degrees; • two graduate positions per annum on a two year programme; and • two vacation student positions each year.
Local and regional businesses and industry	**Opportunities for local businesses** Local businesses generally speculated that the economic contribution of the proposals would be the most significant opportunity, with continuity of work and the implications that continuity has for workforce planning and maintenance being cited as the most critical benefits for suppliers.	**Hunter Valley labour market outlook** The HVRF's measure of employment intentions suggest that further weakness in the Hunter Valley labour market can be anticipated. Employment intentions have declined since December 2011 with HVRF's most recent measures lower than those during the Global Financial Crisis of 2008. Similar trends are also evident in the HVRF's (2013b) Household Survey, which suggests that consumer confidence and purchasing intentions in the Hunter Valley remain negative. Overall, HVRF (2013b) conclude that the economic outlook for the Hunter Valley reflects the end of the previous expansion phase combined with a drive to achieve efficiencies, the effects of which are now being felt by local suppliers, contractors and operational employees. Continued MTW operations would assist in maintaining a proportion of supplier revenues. Coal & Allied would continue: • to engage with Singleton Council on key areas of common interest including attraction and retention of residents and long term planning; • the preference for employees and contractors to reside locally; and • the development of the Coal & Allied Local Procurement Strategy incorporating the MTW operation.

Table 5.4 Social impacts and opportunities from the proposal – perceived and technical assessment

	Impact/opportunities	
	Perceived	**Technical assessment**
Corporate community investment and sponsorship	**Continued contribution to, and investment in, local communities** Stakeholders reflected on the potential for continued contribution to, and investment in, local communities through the proposals, including: Aboriginal and Torres Strait Islander employment, education and training opportunities; direct contributions to community service providers; and, contributions made to training and life-skills programmes at Singleton High School.	**Continued contribution to, and investment in, local communities** Existing direct community contributions and investment from MTW operations would continue under the proposals. Employees and suppliers make financial and non-financial contributions to the regional community and participated significantly in community activities, which in turn, contribute to community way of life. The proposals would continue to provide employment and economic benefits to suppliers, allowing employees and suppliers to continue to contribute to the community. A proportion of the MTW Site Donation Committee annual funding would be dedicated for projects which contribute to near neighbour communities, including the Bulga community, and which are in accordance with the funding guidelines of the Committee.
Other industries and diversification	**Retention of skilled employees** Local business stakeholders perceived that it was difficult to retain skilled employees given their migration to mining jobs for higher salaries. **Two-speed economy** Several stakeholders commented on the mining industry's contribution to the creation of a 'two-speed economy', where those employed by or who contract to the industry enjoy substantial financial benefits whilst others deal with the inflationary effects on cost of living generated by spending of these benefits. **Diversification** Local government stakeholders perceived that there is insufficient planning regarding structural diversification of the Singleton LGA economy.	**Requirement for skilled employees** The proposals would continue current requirements for skilled workers and would continue to be a focus of planning in the Singleton LGA, generating potential for continued skills migration from other industries in the region and potential for maintenance of the status quo when it comes to structural diversification planning. **Structural diversification required** The imperative for structural diversification has become even more apparent since the end of the mining boom, with the HVRF (2014) noting that the medium-term outlook for increased non-mining productivity in the region would depend on business capacity to invest in innovation and skills to adapt to, and develop, new products, services and markets as the resources boom fades.

Table 5.4 Social impacts and opportunities from the proposal – perceived and technical assessment

	Impact/opportunities	
	Perceived	**Technical assessment**
Infrastructure and services		
Infrastructure, services and local community facilities	**Pressure on local infrastructure and services** Local government stakeholders perceived that maintenance of MTW workforce numbers would continue to place pressure on local infrastructure, particularly through the frequency of heavy vehicle movements on local roads. However, local government representatives also noted the positive benefits of retention of MTW workforce on community infrastructure and services. Near neighbours perceived that the medium to long-term viability of community facilities and services in Bulga, including the Bulga Hall, tavern and store, would be impacted by proposal-related acquisitions and associated relocation of Bulga residents. Near neighbour stakeholders perceived a failure to adequately plan for lease holdings at the tavern and store following acquisition. It was perceived that changes to these facilities would impact the way of life in the village and access to services, particularly for the elderly, ill and disabled. Local government stakeholder's identified the potential opportunity to stabilise population levels across the Singleton LGA. Subsequently, the contribution of MTW employees to council land rates would be maintained, helping to support the viability of current council services.	**Demand for local infrastructure and services** There would be no increase in the use of local infrastructure and demand for health and allied services, emergency services and emergency departments under the proposals, as the intention is to retain the current level of employment. Traffic would remain similar to current levels and safety levels would be unaffected. The proposals would aim to maintain current average workforce levels across MTW operations, helping to stabilise population levels across the Singleton LGA. Subsequently, the contribution of MTW employees to council land rates would be maintained, helping to support the viability of current council services. The continued MTW workforce and their families would also help maintain the use of local businesses and services, particularly shops, services, schools and childcare facilities. A Voluntary Planning Agreement (VPA) would be negotiated with Singleton Council for the proposals. The VPA presents an opportunity to ensure a proportion of the funds are dedicated to maintaining and/or improving facilities and services in Bulga, other local neighbouring communities, and the Singleton LGA as a whole. As described in the noise section of this table, no residences in Bulga village would be afforded acquisition rights under the proposal due the predicted noise levels being in exceedence of relevant regulatory criteria. It is noted that one resident, assessment location 34, which is north of the village would be afforded acquisition rights. Therefore, proposal related acquisitions would not impact the medium to long-term viability of community facilities and services in Bulga, including the Bulga Hall, tavern and store. The maintenance of the current workforce under the proposal, however, may contribute to the viability of the community facilities and services.

Table 5.4 Social impacts and opportunities from the proposal – perceived and technical assessment

	Impact/opportunities	
	Perceived	**Technical assessment**
Closure of Wallaby Scrub Road – traffic, safety, emergency services	**Wallaby Scrub Road closure impacts** Perceived impacts of Wallaby Scrub Road closure related exclusively to the Warkworth Continuation 2014. Many stakeholders, including emergency services and local council representatives, perceived that the closure of Wallaby Scrub Road is a key impact of the proposal. It is perceived that it would impact vehicle accident rates, emergency services, shift workers and local residents access to towns. Many local stakeholders perceived that there are a high number of accidents at the intersection of Putty Road and the Golden Highway. It was perceived that the proposal would increase the frequency of vehicle movements through this intersection given the closure of Wallaby Scrub Road. It was also perceived that traffic would increase on the Golden Highway between Putty Road and the existing intersection with Wallaby Scrub Road and that, in turn, this would increase vehicle movements through the intersection of Long Point Road and the Golden Highway. Near neighbours perceived increases in accidents at this location given that there are no turning bays at this intersection. Voluntary emergency service stakeholders (Bulga, Warkworth and Jerrys Plains RFS stations) estimated that travel to areas along the Golden Highway west of the Wallaby Scrub Road intersection and east to Long Point Road would require additional travel time for trips to Bulga, Milbrodale and Broke from RFS stations at Warkworth and Jerrys Plains.	**Wallaby Scrub Road closure impacts** *Warkworth Continuation 2014* The traffic and transport study that forms part of the EIS found that the primary traffic impacts as a result of the closure of Wallaby Scrub Road would be as follows: • Level of service would remain unchanged at all intersections. • There would generally be minimal traffic impacts on the detour roads for the Wallaby Scrub Road closure as these roads (and the relevant intersections) have sufficient spare capacity to accommodate the resulting additional traffic with minimal intersection capacity impacts or delays. • The Putty Road and Charlton Road originating vehicle movements would be subject to increased travel distances of approximately 8.8km and 6.2km and additional travel times of 6 and 4 minutes per trip, respectively. • Travel safety and travelling conditions for the detoured traffic is expected to be improved due to improved road construction standards on the Golden Highway. • There would also be some savings in road maintenance costs for the Singleton Council as a result of the road closure. In its letter dated 19 May 2014 (see Appendix P of the EIS), the RFS advises that "whilst its preferred option would be the relocation of Wallaby Scrub Road to maintain access for emergency services, an acceptable second option is the construction of a suitable fire trail on the perimeter of the proposed extension area..". The applicant has committed to the construction of an emergency access road/fire trail between Putty Road and the Golden Highway in accordance with RFS standards under the proposal. Impacts on other local roads generated by Warkworth Mine and MTO employees on external public roads would not change as there would be no change to the combined average project workforce. Truck traffic generated would remain at similar levels.

Table 5.4 Social impacts and opportunities from the proposal – perceived and technical assessment

	Impact/opportunities	
	Perceived	**Technical assessment**
	Near neighbours perceive that the closure of Wallaby Scrub Road would inconvenience all Bulga and Milbrodale and some Broke residents in accessing areas west of the current intersection of Wallaby Scrub Road and Golden Highway.	
Community engagement/relationships and governance		
Company and community relationships	**Opportunities to improve historic community relations** Some stakeholders perceived that there were opportunities to improve historic community relations and management of the mine's current impacts. This perception has impacted community trust. **Positive community relations** Some stakeholders from local business and local government described positive interactions with individual staff at MTW but perceived a general history of poor relations with the mine and a lack of ability to openly discuss, negotiate and engage as part of the local business and resident community.	**Opportunities to improve community relations** Since the Warkworth Extension 2010 proposal, based on feedback received from a range of stakeholders, a suite of ongoing and proposal specific strategies have been developed by Coal & Allied for communications generally and to manage/ mitigate or enhance these proposal-related impacts and opportunities. These are provided in Section 6.2.
Understanding of community and social impacts	**Opportunity to improve understanding of relationships** Some stakeholders perceived the opportunity to improve understanding of relationships with the community through the assessment process.	**Opportunity to improve understanding of relationships** The assessment provides an opportunity to build understanding of community and social impacts and to improve company-community relations. Stakeholder feedback also suggested some satisfaction with the consultation process itself, and the ability to 'be heard'.

Table 5.4 Social impacts and opportunities from the proposal – perceived and technical assessment

	Impact/opportunities	
	Perceived	**Technical assessment**
Government major project assessment process, regulation, monitoring and public representation	**Confidence in government assessment processes** Stakeholders, including near neighbours, local businesses and council, and other interested stakeholders, perceived that the changes encompassed in the Mining SEPP have resulted in a loss of confidence in the NSW Government to adequately assess major mining projects, including this proposal, and to provide protection to, and representation of, the public. Stakeholders pointed to current allegations before the Independent Commission Against Corruption (ICAC) (during early-mid 2014) and the demonstrated connections between some mining companies and the NSW government (for example, improper donations). Stakeholders also discussed the impact on the ability to undertake a merits-based appeal on a project as an impairment of democratic rights. The Warkworth Continuation 2014 is seen by stakeholders to be relevant to the Mining SEPP amendments due to the timing and history of the proposal.	**Government assessment processes** Coal & Allied conduct its operations in accordance with NSW and Commonwealth legislation and internal high standards of conduct, including The Way We Work, its statement of business practice. The proposal will be considered by the NSW Government under the EP&A Act and a range of other legislation, regulations, policies and guidelines. These documents are frequently updated to ensure their ongoing relevancy. The EISs were prepared in accordance with current legislation and government policy and used the most recent and accurate scientific data relevant to the proposals. Feedback received from community and government stakeholder engagement together with the Secretary's requirements and the L&E Court judgement, provided guidance to the assessment approach, ensuring that all potential matters of relevance associated with the proposals were assessed.

6 Management, mitigation and enhancement

6.1 Introduction

A suite of socio-economic management, mitigation and enhancement initiatives are currently implemented at MTW. These would continue under the proposal. The applicants are committed to the implementation of additional measures that relate specifically to the proposals to manage potential adverse impacts and enable opportunities to be realised. Existing and proposal specific initiatives are provided in the sections below.

It is noted that management and mitigation measures referenced in Table 5.1 related to technical studies such as noise and air quality and are not repeated below. These are committed to in the respective technical studies that form part of the EIS.

6.2 Existing socio-economic initiatives

Coal & Allied would continue to implement a range of socio-economic initiatives under the proposals. These initiatives include the following:

- Continued management of Coal & Allied residential properties via the open market. Coal & Allied utilises the services of local real estate agents to manage its properties to a high standard of maintenance and management.
- Continued support for local primary schools – i.e. Broke and Milbrodale Public Schools.
- Continued engagement with Singleton Council on key areas of common interest including attraction and retention of residents and long term planning.
- Continued dedication of a proportion of the MTW Site Donation Committee annual funding for projects which contribute to near neighbour communities, including the Bulga community, and which are in accordance with the funding guidelines of the Committee.
- Continued development of the Coal & Allied Local Procurement Strategy incorporating the MTW operation.
- Continued preference for employees and contractors who reside locally.
- Continued implementation of the MTW Diversity Action Plan, with a key focus on increasing Indigenous and female employment relative to the local demographic context.
- Continued implementation of the MTW Apprenticeship and Graduate programme, drawing on local candidates, and consisting of:
    - five new apprenticeship positions each year;
    - Aboriginal scholarship programme in partnership with University of Newcastle, supporting two Aboriginal students per annum with a scholarship programme and vacation employment to complete their degrees;
    - two graduate positions per annum on a two year programme; and

- two vacation student positions each year.

- Enhance two-way flow of information and feedback between the MTW operation and the community through appropriate programmes such as a 'Community Scorecard'.

- Continued development of a mechanism to provide information on operational monitoring results and responses on a regular basis.

- Continued implementation of the Near Neighbour Engagement Programme (incorporating Bulga, Long Point, Warkworth, Mt Thorley, Milbrodale, Maison Dieu and Gouldsville) as part of Coal & Allied's Multi-Year Community Relations Plan, including:

  - community events (dinners/BBQs) in Bulga each year including optional site tours;

  - a "Closure 101" information session with the community to provide an overview of the Coal & Allied approach to mine closure planning, rehabilitation, future land use and management;

  - specific consultation for mining related activities that require near neighbour community input and communication; and

  - continued provision of a bi-annual open day to provide community stakeholders with the opportunity to visit the site and further understand the operation.

- Continued implementation of a Community Awareness Induction programme for new and existing MTW site employees.

6.3 Proposal specific initiatives

Additional initiatives that relate specifically to the proposals are provided following.

- The development of a Social Impact Management Plan (SIMP) to manage and monitor the implementation of strategies to reduce identified social impacts and enhance social opportunities. The SIMP would detail implementation responsibilities; timing; performance indicators and targets; and monitoring measures. The SIMP would be prepared in consultation with key stakeholders, following the EIS public exhibition and submissions process. The key aims of the SIMP would be to:

  - reflect the findings and recommendations of the SIA and provide a short summary of findings;

  - summarise for all stakeholders the potential positive and negative impacts of the proposals, proposed mitigation and management strategies, and implementation actions;

  - be developed for the life of the proposals; and

  - promote an active and ongoing role for communities, local authorities and all levels of government through operation and decommissioning of the proposals.

- The negotiation of a Voluntary Planning Agreement with Singleton Council. The VPA would present an opportunity to ensure a proportion of the funds are dedicated to maintaining and/or improving facilities and services in Bulga, other local neighbouring communities, and the Singleton LGA as a whole.

- The establishment of a Near Neighbour Amenity Resource to provide support to residents surrounding the operation.

7 Conclusion

Coal mining is a key industry in NSW and is the largest employer in Singleton, Cessnock, Muswellbrook LGAs, and the second largest employer in Upper Hunter Shire LGA. These LGAs have generally experienced population growth greater than the NSW average between 2006 and 2011 (with the exception of Singleton LGA). Average incomes in these areas have also increased by more than the NSW average. However, the recent slowdown in the mining industry has impacted the regional economy.

The proposal would enable operations to continue beyond 2015 allowing MTW to maintain 1,300 jobs over the longer term and for it to continue to be a major employer in the Singleton LGA. As a long standing member of the community, with both mines commencing operations in 1981, the greater impacts on the socio-economic environment and community services from the proposal are predicted to occur if the proposal does not proceed. These would include:

- workers and their families moving away from the area;
- workers and their families faced with unemployment and financial difficulties;
- reduced local spending;
- decreased local businesses;
- contribution to population decline;
- reduced viability of services such as local schools; and
- reduced community life and participation.

The SIA involved a number of activities including: profiling; stakeholder identification and engagement; scoping/prediction; evaluation/assessment; and, management, mitigation and enhancement. These activities provided an understanding of the existing socio-economic environment of the local community and region and a range of stakeholder perceptions of the proposals. The SIA integrated findings from relevant technical studies and literature to inform the assessment process.

The stakeholder perceived impacts and opportunities of the proposal, paying particular attention to Bulga village, were determined through consultation and compared to the outcomes of technical studies that form part of the EISs or with external literature. Matters raised related predominately to amenity, the physical environment, health and well-being, the economy, infrastructure and services, and community engagement, relationships and governance. The majority of the matters are addressed in detail by the corresponding technical studies of the relevant environmental aspect or economic studies. Coal & Allied would continue to address these matters through ongoing consultation process to inform stakeholders of the impacts and opportunities of the proposal and proposed mitigation and management strategies.

In addition, a suite of continuing and new social initiatives have been developed by Coal & Allied to manage or mitigate perceived impacts and to enhance opportunities, based on feedback from stakeholders. These initiatives include the continued investment in the community and engagement with key stakeholders including Singleton Council and near neighbours and enhancement of the two-way flow of information and feedback between the MTW operation and the community through appropriate programmes such as a ‘Community Scorecard’.

A SIMP would be developed for the proposals to further develop these management and mitigation measures and detail a plan of implementation including responsibilities; timing; performance indicators and targets; and monitoring measures. The SIMP would be prepared in consultation with key stakeholders, following the public exhibition and submissions process for both EISs.

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Appendix A

Employee and supplier survey: key findings

A.1 Introduction

This report considers the key findings of the MTW Supplier and Employee Contribution and Participation Surveys (SECAPS). The primary objective of the project was to gain insights into the ways in which MTW employees' and suppliers' contribute to, and participate in, the Hunter community.

The SECAPS were undertaken as part of the SIA process for the Warkworth Continuation 2014 and Mount Thorley Operations 2014 projects and were designed to provide further detail on the social impacts and opportunities of the projects. The key findings report begins with a brief overview of the project approach (timelines and method) before addressing the outcomes of each survey.

A.2 Approach

The SECAPS were carried out in March 2014 in both online and paper-based survey formats. Both surveys were designed to take approximately 5 minutes to complete (given concerns about time-constraints on suppliers and employees) and guaranteed participant anonymity by excluding personal identifiers (e.g. name, IP address, company) from the survey instruments). In total, 629 employees and suppliers completed the survey.[5] The specific approach and details for each survey are outlined below:

- **Employee Survey**: given that a proportion of MTW employees do not have regular work-related computer access, the Employee Survey was delivered in both online and paper-based survey formats. The online survey was sent via an invitation email—including hyperlink to survey—to over 400 employees with regular access to a computer at work. Of this contact sample of 409 employees, 228 completed the online survey. Employees who do not have regular access to computers at work were invited to complete a paper-based survey at pre-shift meetings; resulting in 145 paper-based survey completions. These paper-based surveys were then entered into the online survey system by EMM. In total, 373 employees completed either an online or paper-based survey.

  The Employee Survey consisted of 18 questions related to place and status of residence, employment status and remuneration, and various questions on estimated/ reported contribution and participation to LGAs and the Hunter Region more broadly.

- **Supplier Survey**: the survey was delivered in an online survey format via an invitation email—including hyperlink to survey—to over 450 suppliers, with a final number of valid survey responses of 256. The Supplier Survey consisted of 16 questions related to industry type, location, workforce size, supplier relationship with MTW, and estimated/ reported contribution and participation to LGAs and the Hunter Region more broadly.

Responses for both surveys were collated using an online database, the data from which was then exported to statistical analysis software (IBM SPSS) for coding, clarification and analysis. The key findings from the analysis of each survey are presented below.

[5] There were 629 valid entries in total across the SECAPS; surveys with substantial missing values were excluded from this total sample and, subsequently, from analysis.

A.3 Employee Contribution and Participation Survey

Of the 373 employees who participated in the survey, around 35per cent stated that they currently live in the Singleton LGA, with Maitland LGA (30.8 per cent) and Cessnock LGA (16.1 per cent) the other prominent areas of residence (see Figure A.1).

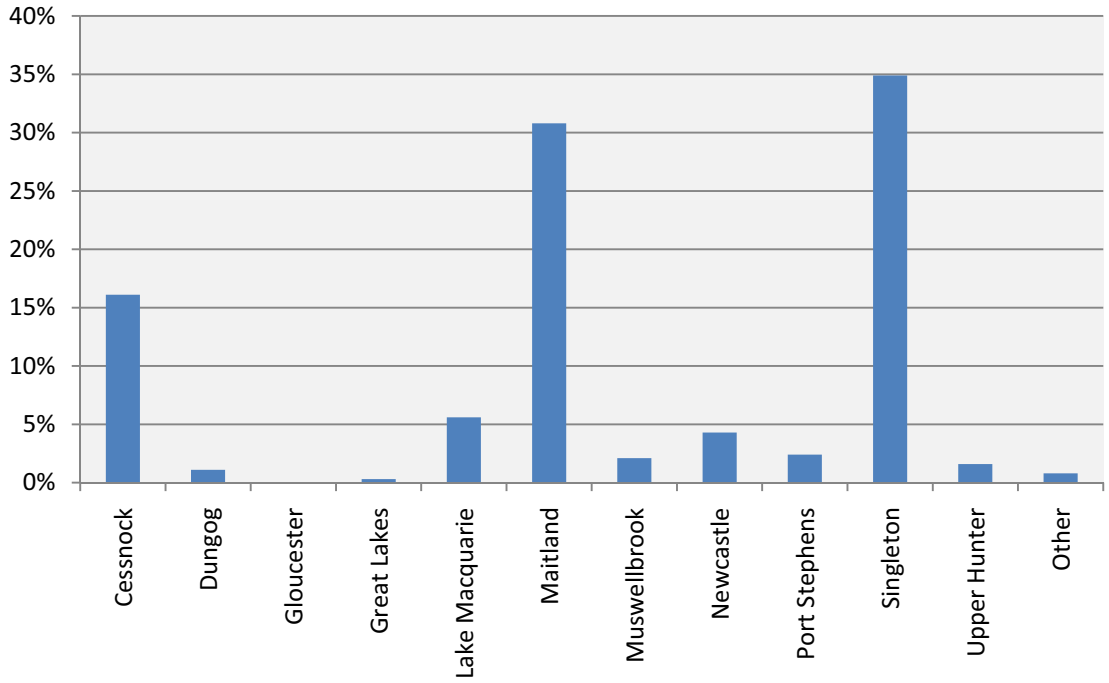

Figure A.1 In which Local Government Area (LGA) do you currently live?

Main suburbs of residence for each of the three major resident LGAs included:

Singleton LGA: Singleton (30.6 per cent), Singleton Heights (16.1 per cent), Hunter view (12.9 per cent), Wattle Ponds (10.5 per cent).

Maitland LGA: Aberglasslyn (26.9 per cent), Rutherford (15.7 per cent), Thornton (9.3 per cent).

Cessnock LGA: Cessnock (17.2 per cent), Branxton (10.3 per cent), Greta (8.6 per cent).

Participants were then asked to recall how long they had lived in that suburb. Almost two-thirds of respondents indicated that they had lived in their current resident suburb for less than 10 years (<1 year (6.7 per cent); 1-2 years (9.7 per cent); 2-5 years (26.6 per cent); 5-10 years (20.4 per cent). Over 20per centre ported having lived in their suburb for more than 20 years (20-30 years (10.2 per cent); >30 years (11.3 per cent), while the remaining 15per cent were resident for between 10 and 20 years (10-15 years (9.7 per cent); 15-20 (5.4 per cent) (see Figure A.2).

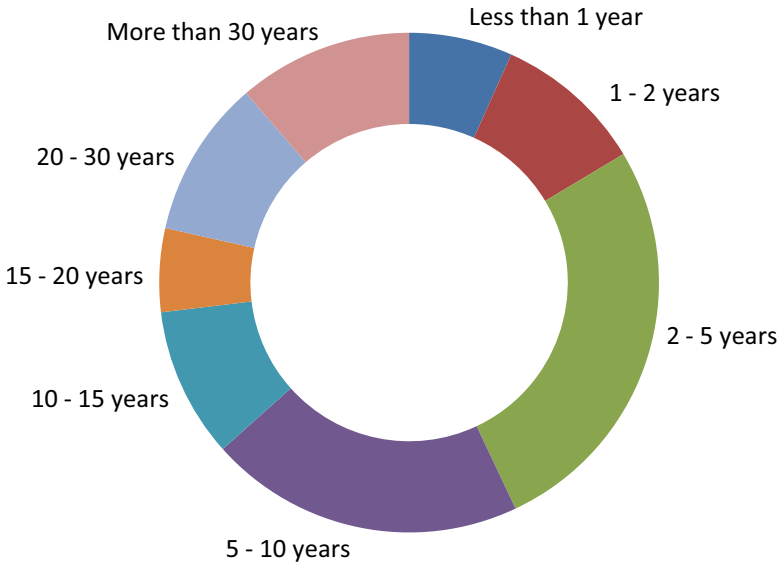

Figure A.2 How long have you lived in this suburb?

Question 4 asked respondents to nominate their housing status in terms of whether they rent, have a mortgage, own outright or are currently boarding with friends or family (see Figure A.3). The mortgage holder category clearly dominated responses, with 61.5 per cent of respondents indicating that they currently have a mortgage; 20.2 per cent indicating that they currently rent, 15.9per cent own their property outright, whilst just 2.9 per cent currently live with friends or family.

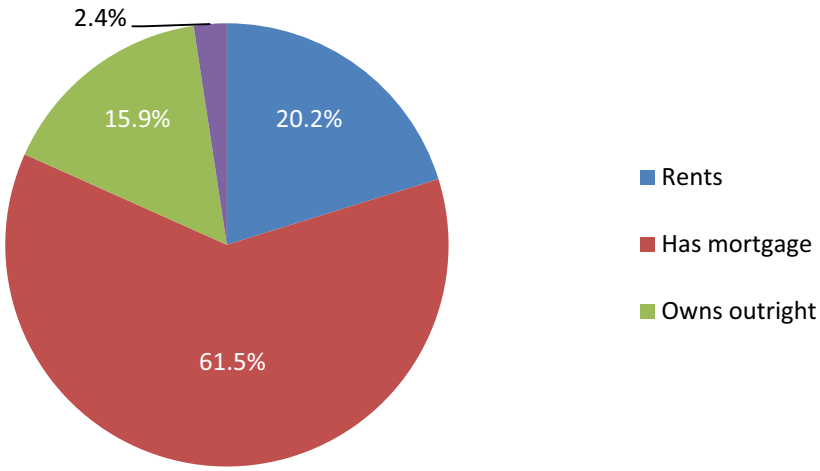

Figure A.3 At your current residence do you rent, have a mortgage, own outright or stay with others?

In terms of work status, 90.3 per cent of respondents indicated that they were currently working full-time at MTW, 8.4 per cent indicated that they worked on a casual contract at MTW, and 1.3 per cent indicated part-time employment at MTW. When asked about the length of their employment, almost 60 per cent indicated that they had worked at MTW for less than 5 years (2-5 years (46.4 per cent); 1-2 years (7.8 per cent); <1 year (4.9 per cent), 24.5 per cent for 5-10 years and over 16 per cent more than 10 years (10-15 years (4.9 per cent); >15 years (11.6 per cent) (see Figure A.4).

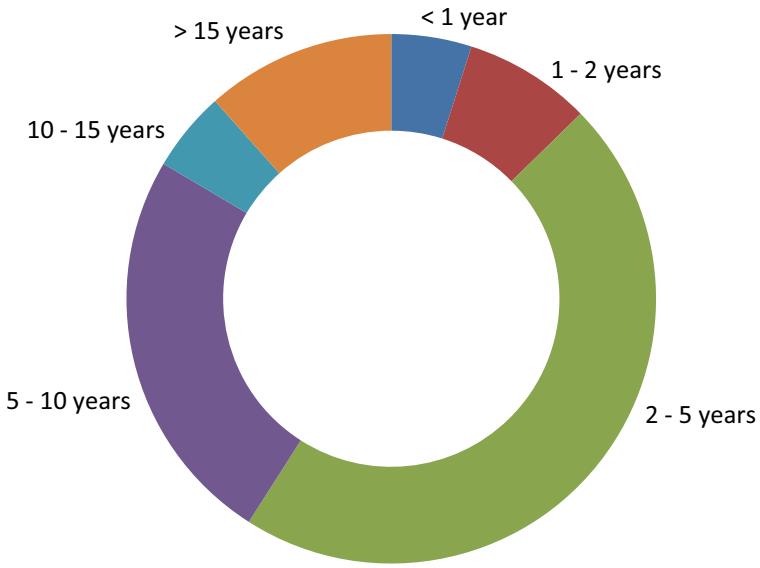

Figure A.4 How long have you been employed at Mt Thorley Warkworth operations?

Participants were also surveyed as to the number of children they have in educational facilities in the Hunter Region. In total, 209 respondents indicated that they had children and that these children attended pre-, primary, secondary and/or tertiary educational facilities—as outlined in Table A.1. The table indicates that employees have younger children (reflecting age demographics for the MTW workforce) and a relatively significant level of childcare facility use when compared with NSW averages.

Table A.1 Educational attendance by number of children

	No. of children				
Facility	**1**	**2**	**3**	**4**	**TOTAL**
Childcare facility	58	18	2	0	78
Primary school	57	49	11	1	118
High School	47	27	4	0	78
Newcastle Uni	13	3	0	0	16
Technical college	9	2	0	0	11

Participants were also asked to nominate the LGA in which these facilities are located. The location data for educational facilities indicated a greater representation of educational facility attendance in the Maitland LGA (almost 50per cent of responses) compared to only 30.8 per cent of the resident LGA share, perhaps reflecting the larger number and range of primary and secondary educational facilities in the Maitland LGA.

Question 7 asked respondents to provide their current pre-tax income (gross) earned from work at MTW operations; given the sensitive nature of providing income details in a survey of this type, the response was made optional. Of the 216 responses received, the response average (mean) was $124,513.72 and the response total was $26,894, 964.00. The income range was $10,800.00 (min) to $350,000.00 (max).[6]

When asked to estimate the percentage of that income that is spent in their LGA, over two-thirds of respondents estimated that they spent between 30 per cent and 80 per cent of their incomes in their LGA; however, the most nominated quintile was the 70 per cent to 90 per cent band, with almost a third of all respondents estimating their local spend in that range [see Figure A.5]. For estimated percentage of their income spent in the Hunter Region, respondents logically indicated a much higher percentage spend in the Region. The highest quintile for estimated regional spend was the 80 per cent to 100 per cent band, with over 40 per cent of responses falling in this range. The highest two quintiles, 60 per cent to 80per cent and 80 per cent to 100 per cent, constituted almost 70 per cent of total estimates of proportional regional spend (see Figure A.5).

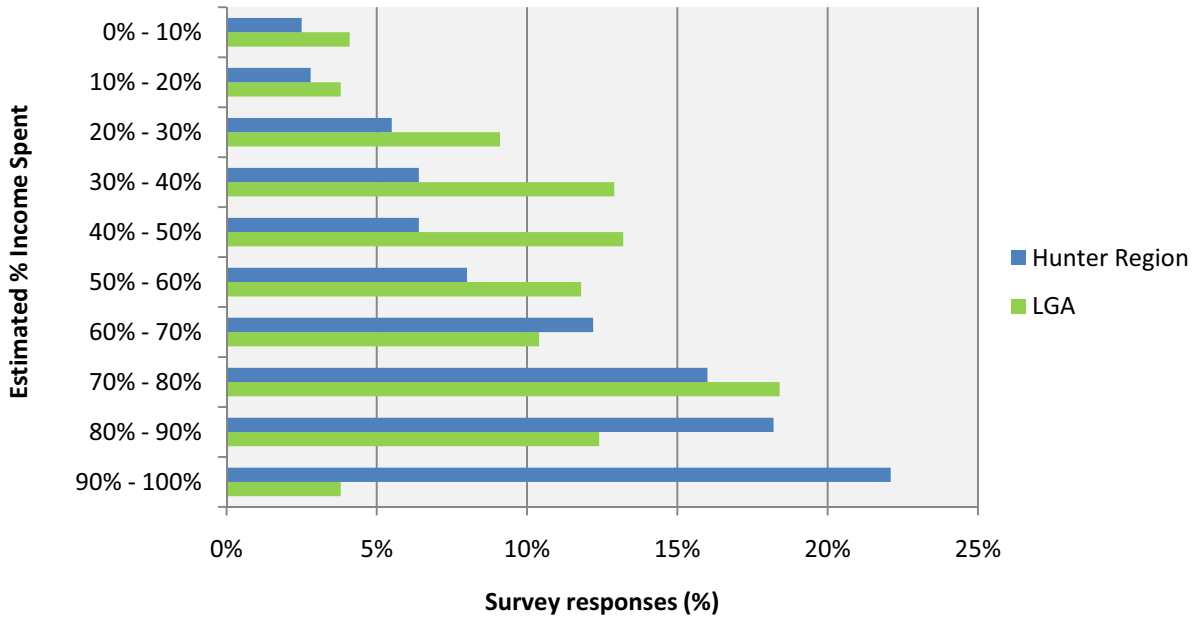

Figure A.5 **What percentage of your income do you estimate is spent in your LGA? What percentage of your income do you estimate is spent in the Hunter Region?**

[6] The response average (mean)of $124,513.72 may not reflect actual gross adjusted annual average salaries given that respondents would normally indicate their normal fortnightly/ monthly base wage without factoring in additional salary remuneration such as allowances, superannuation, benefits, escalations and on-costs.

Participants were then asked eight questions relating to their contribution to and participation in community organisations and activities. Just over one-third of respondents stated that they currently undertake some form of voluntary work (e.g. charity, community services, care, emergency services) and, of those that indicated current voluntary work activities, the majority carried out this work for sporting or physical recreation organisations (49.6 per cent of responses). Other prominent organisations for which respondents carried out voluntary work included emergency services (21.1 per cent), children/ youth/ parenting (19.5 per cent), education/ training (13.0 per cent) and community/ welfare (12.2 per cent) (see Figure A.6).

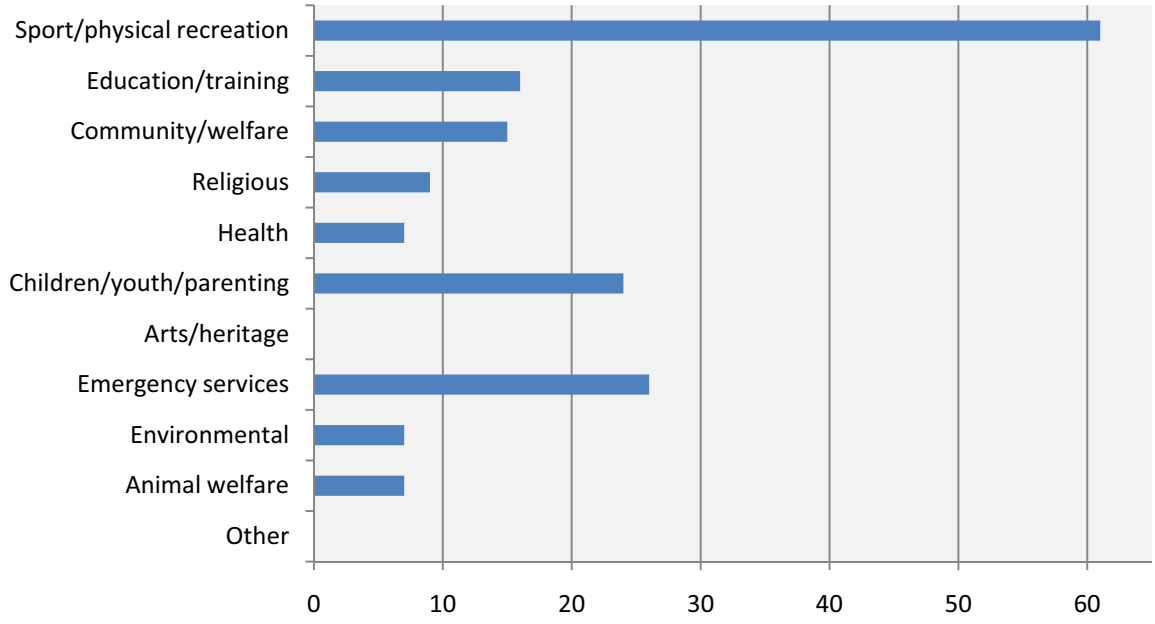

Figure A.6 What type of organisation/s do you undertake voluntary work for?

In relation to the type of voluntary work undertaken, three primary categories of responses were evident: teaching/ instructing/ coaching/ refereeing (52 responses); fundraising (41 responses); and, committee work (33 responses) (see Figure A.7).

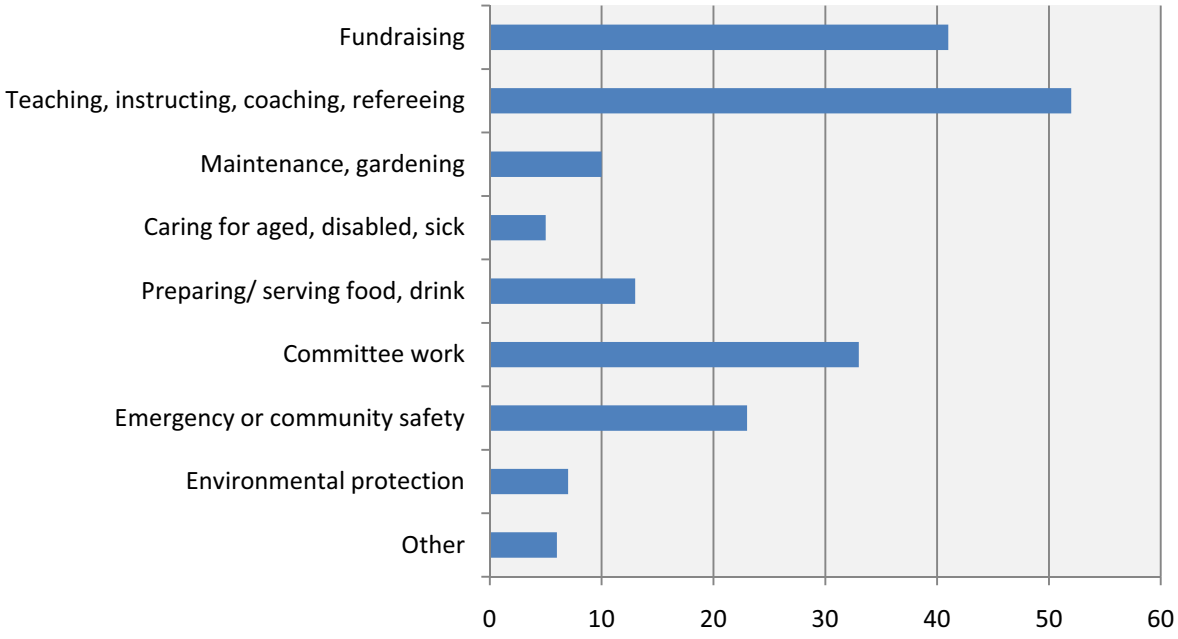

Figure A.7 What type of voluntary work do you mainly undertake?

In terms of time commitment to voluntary work, the majority of respondents dedicated between 1 – 10 hours per month to voluntary work (1-5 hours (37.2 per cent); 5-10 hours (35.5 per cent), with some 22.3 per cent going further and dedicating 10 – 20 hours per month (see Figure A.8). Participants were also asked to think about the voluntary work activity they spent the most time on and to nominate the LGA in which this generally occurred. The results largely (and logically) mirrored the residency data, although there was a slightly larger percentage of respondents that nominated Singleton LGA (45.9 per cent) as the location for voluntary work (see Figure A.9).

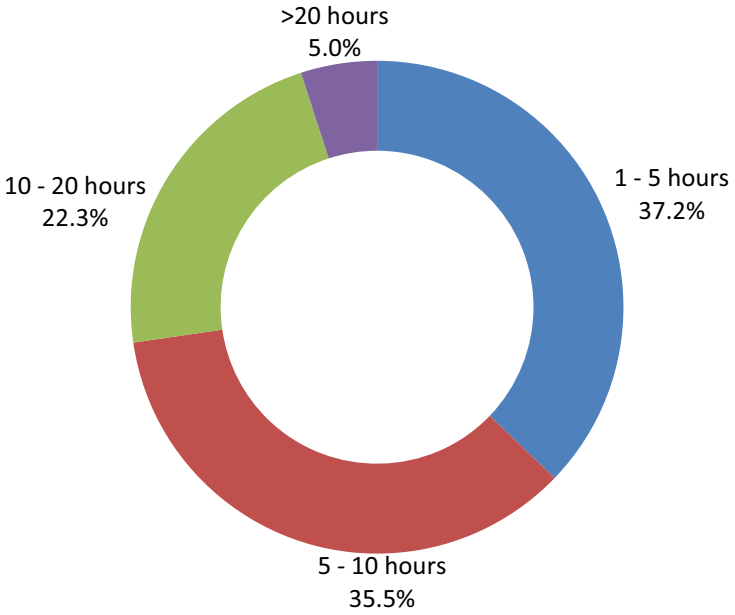

Figure A.8 How many hours per month do you dedicate to voluntary work?

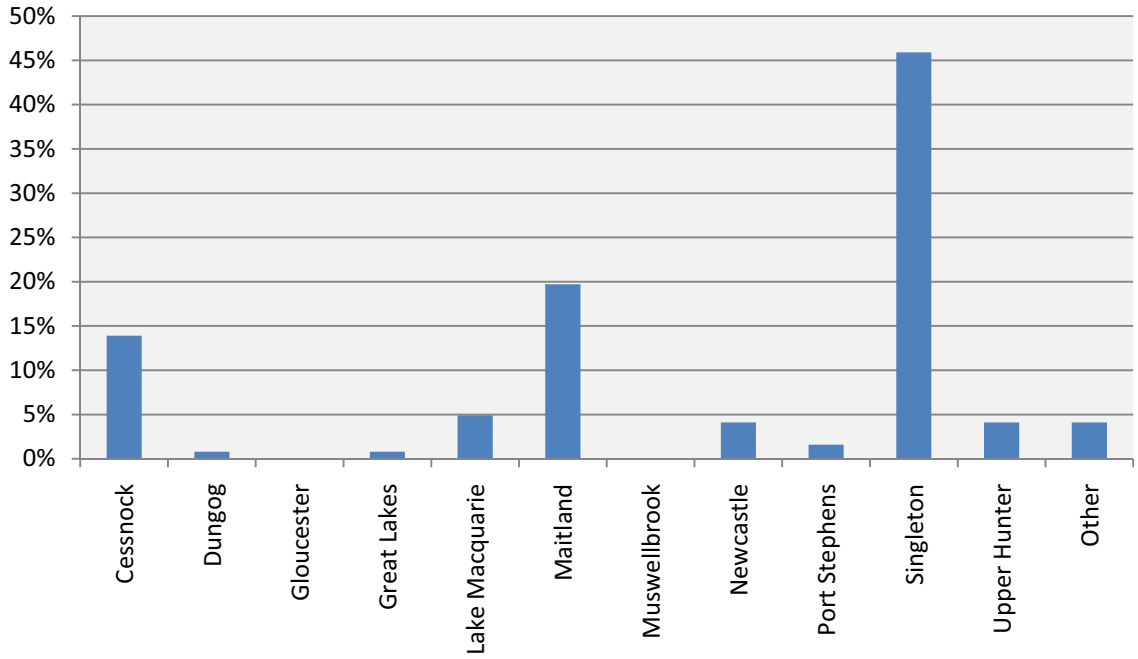

Figure A.9 LGA for primary voluntary work activity

Respondents were also asked whether they participated in any community activities, such as playing sport and/ or attending community events. Responses tended to fall into the three categories of playing sport (226 responses), attending community events (150 responses), and/ or attending school events (121 responses) (see A.10). A reasonably large number of respondents (57) indicated that they did not participate in any community activities—although some self-selection bias may be evident, given that selecting this option took participants to the end of the survey (Figure A.10).

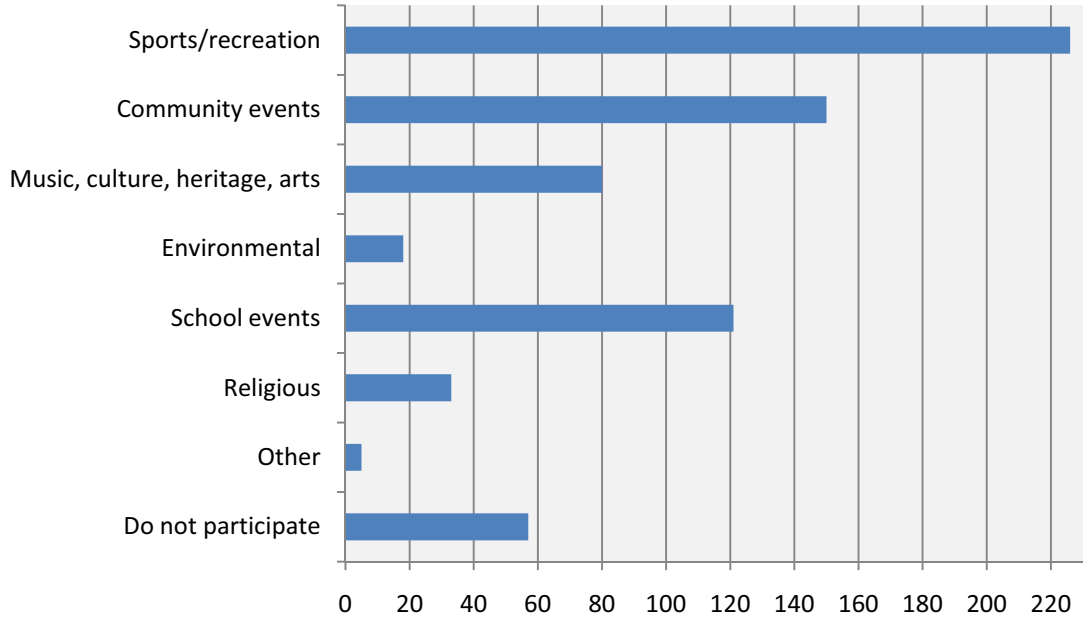

Figure A.10 Do you participate in any of the following community activities?

The majority of those respondents who participated in community activities did so for between 1 – 10 hours per month (1-5 hours (45.3 per cent); 5-10 hours (24.1 per cent), with some 15 per cent dedicating 10 – 20 hours per month (see Figure A.11). Again, the location for these activities tended to reflect residency, however Newcastle LGA was more prominent in the community activity location results (8.3 per cent) (see Figure A.12).

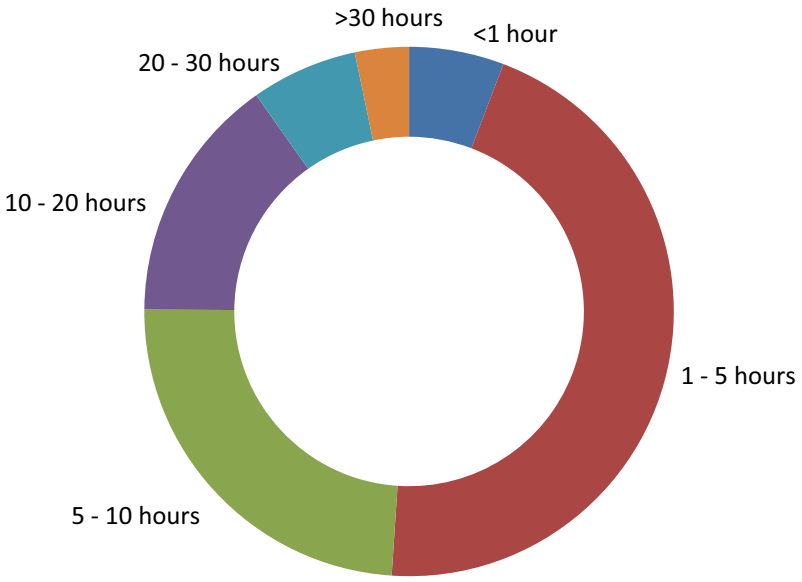

Figure A.11 How any hours per month do you generally spend undertaking community activities?

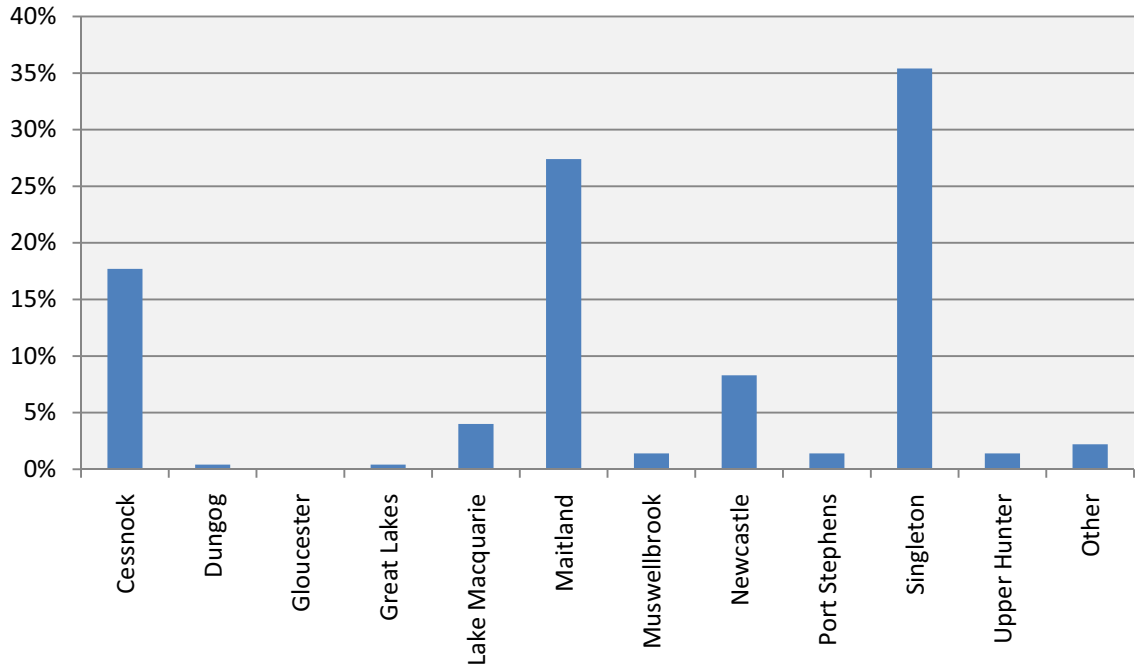

Figure A.12 LGA for primary community activity

A.4 Supplier Contribution and Participation Survey

Respondents to the Supplier Survey were first asked to identify the main industry of their organisation, with mining (32.0 per cent) and manufacturing (29.3 per cent) clearly dominant (see Figure A.13).

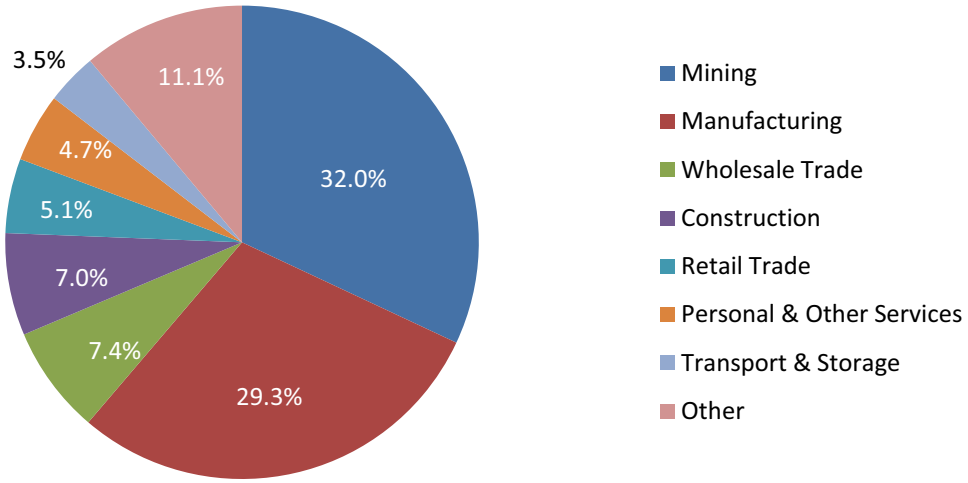

Figure A.13 Which of the following best describes the main industry of your organisation?

The main LGAs for regional offices of respondent supplier organisations included Singleton (26.2 per cent), Newcastle (19.0 per cent) and Maitland (12.3 per cent), with 'Other LGA' (22.6 per cent) typically including LGAs in Sydney, Brisbane and the Central Coast (see Figure A.14).

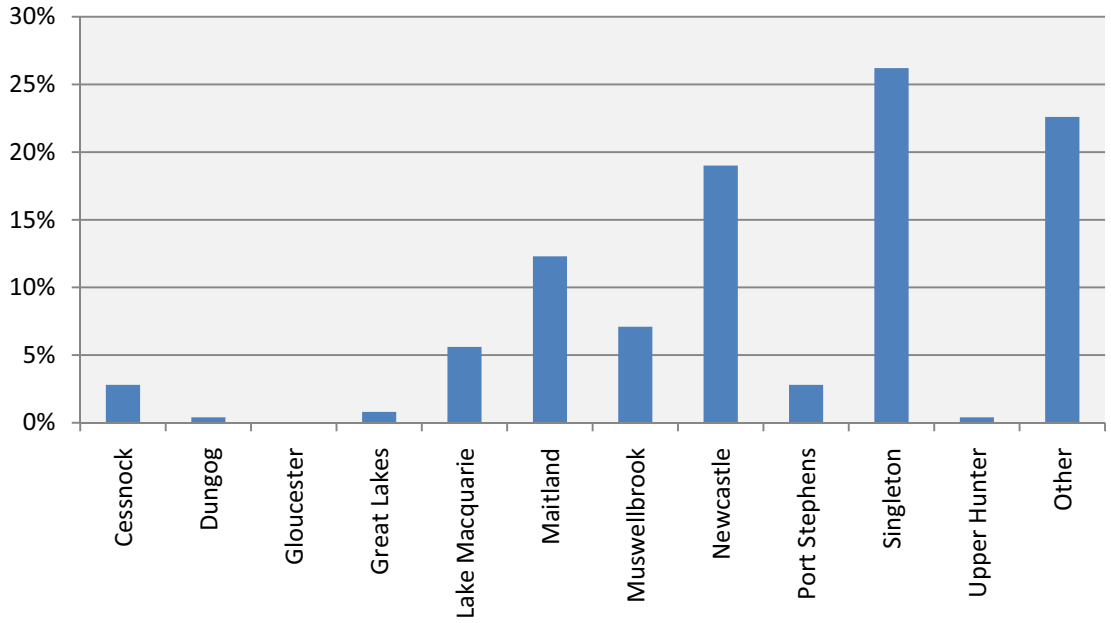

Figure A.14 LGA for main regional office

The main suburbs for each of the three major LGAs for office location included:

Singleton LGA (26.2 per cent of total responses): Singleton (35.9 per cent), Mt Thorley (26.6 per cent), Maison Dieu (17.2 per cent).

Newcastle LGA (19.0 per cent of total responses): Beresfield (20.8 per cent), Warabrook (10.4 per cent).

Maitland LGA (12.3per cent of total responses): Rutherford (9.4 per cent), Thornton (9.4 per cent).

When asked how many employees currently work at this local/ regional office, two-thirds of all respondents indicated that 20 or less employees (66.4 per cent) worked at the office (<5 employees (21.3 per cent); 6-10 employees (19.7 per cent); 11-20 employees (25.4 per cent), whilst a further 18 per cent indicated that the office had between 21 and 30 employees (see Figure A.15).

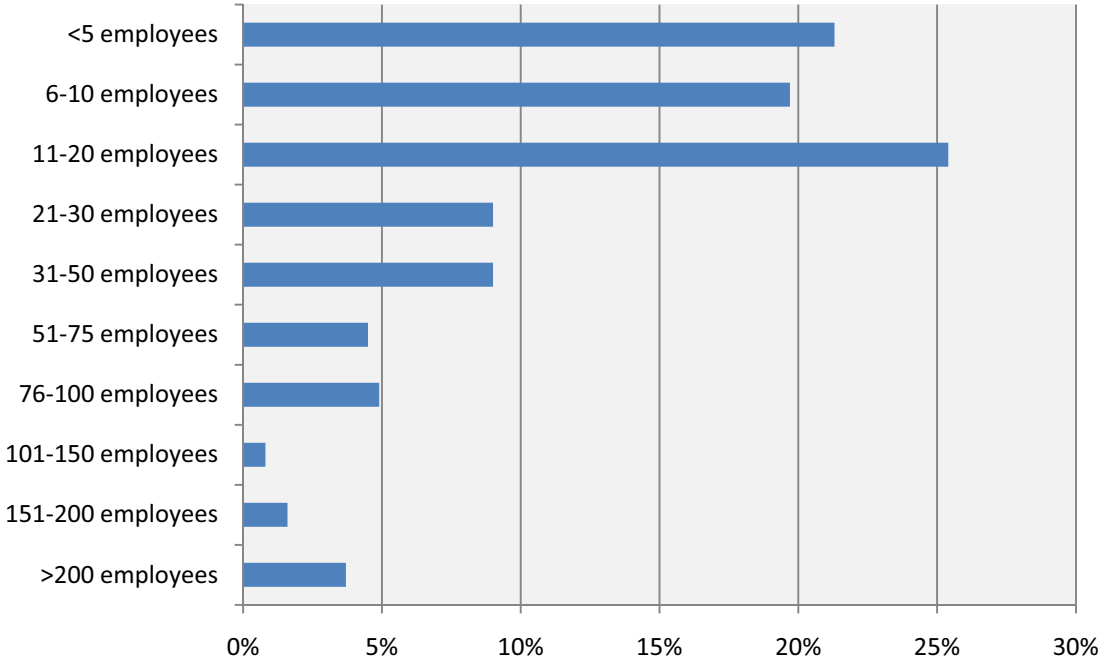

Figure A.15 How many employees currently work at this local/regional office?

The survey then asked participants to specify the value of their supplier relationship with MTW in the last financial year (total amount spent by MTW on their goods and/ or services in 2012/13). The average value of responses was $1.194 million, with the aggregate value for the 214 respondents to the question standing at $255.516 million. Respondents were then asked to estimate how much of their annual business expenditure (including wages and all other outlays) is spent in the LGA of their main local/ regional office [see Figure A.16]. Estimates were reasonably evenly spread across the deciles, with the most prominent quintiles being the 30 per cent - 40 per cent and 70 per cent - 90per cent bands. Estimates for percentage spend in the Hunter region as a whole tended to fall in the 70 per cent - 100 percentile (see Figure A.17).

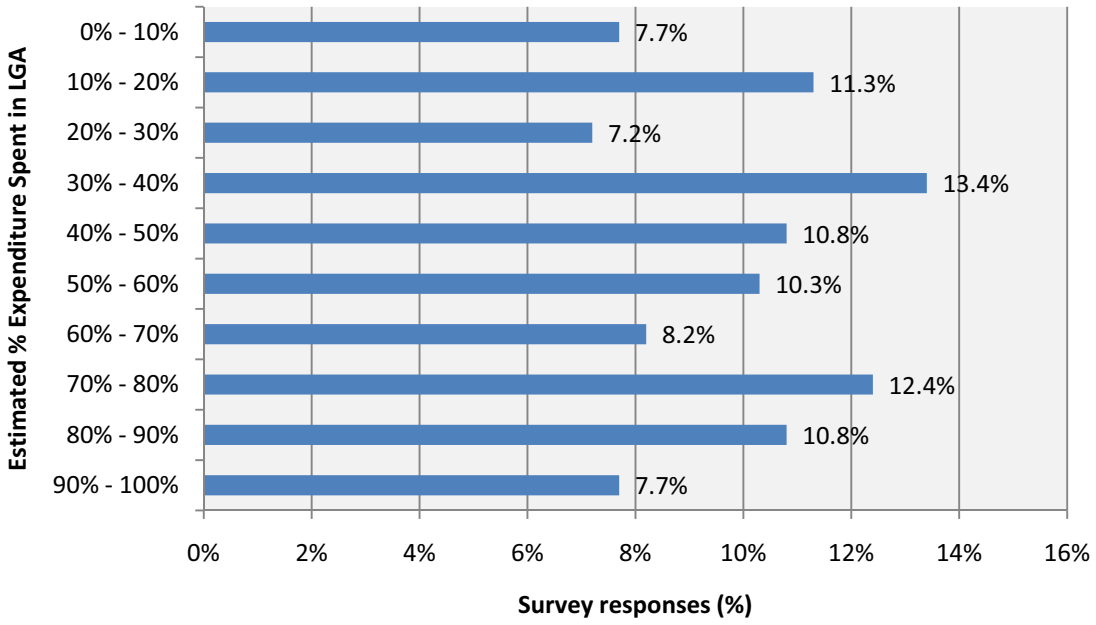

Figure A.16 What percentage of your total business expenditure do you estimate is spent in your LGA?

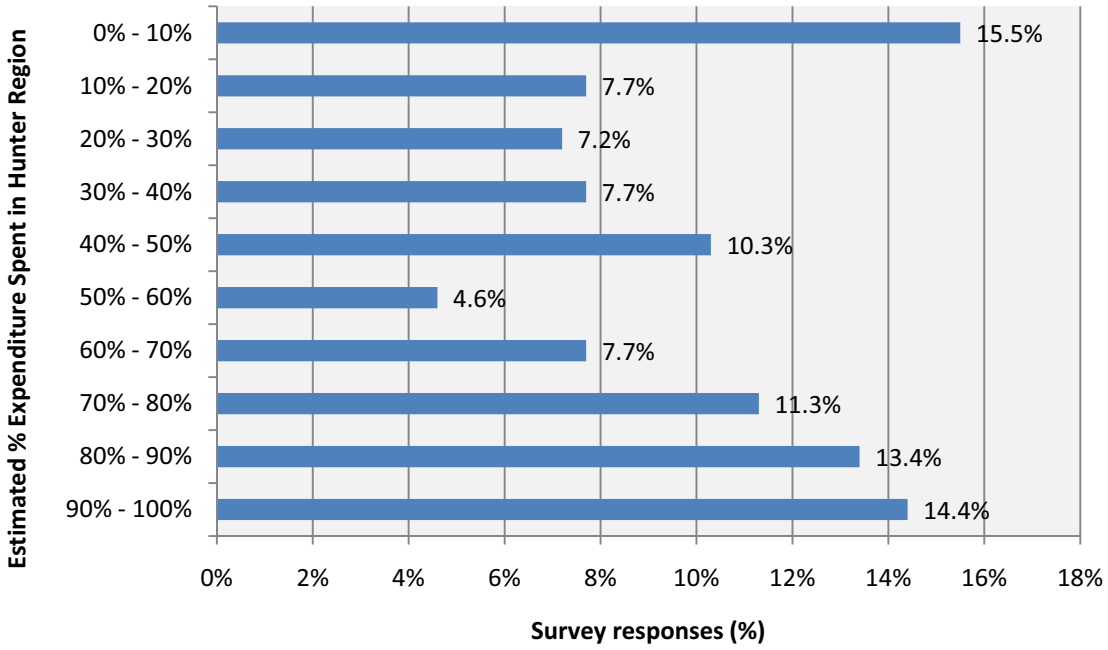

Figure A.17 What percentage of your total business expenditure do you estimate is spent in the Hunter Region?

The survey then sought to get an indication of the degree to which respondent organisations were reliant on MTW, with respondents asked to provide an estimate of their total annual business revenue that is directly related to MTW. Over 60 per cent of respondents indicated that less than 10 per cent of their revenue was directly related to MTW, with nearly 90 per cent indicating that less than 30 per cent of their revenues were directly attributable to MTW (see Figure A.18).

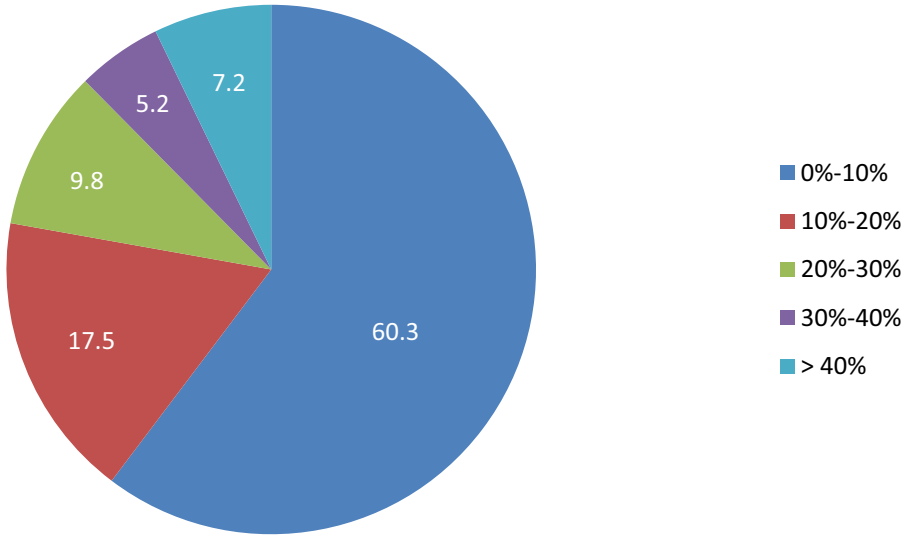

Figure A.18 What percentage of your total annual business revenue do you estimate is directly related to MTW?

In relation to corporate contributions to community organisations (e.g. charities, community services, health care) in the Hunter Region, 75 per cent of participants indicated that they make direct financial contributions. There was reasonable diversity in the types of organisations to which these financial contributions were made, including sporting (84 responses), welfare (65 responses), emergency services (55 responses), education (42 responses) and health (41 responses) organisations (see Figure A.19). The total financial contribution to these community organisations for the past 12 months was generally estimated to be between $500 - $25,000, with the primary band being $1,001 - $10,000 (see Figure A.20).

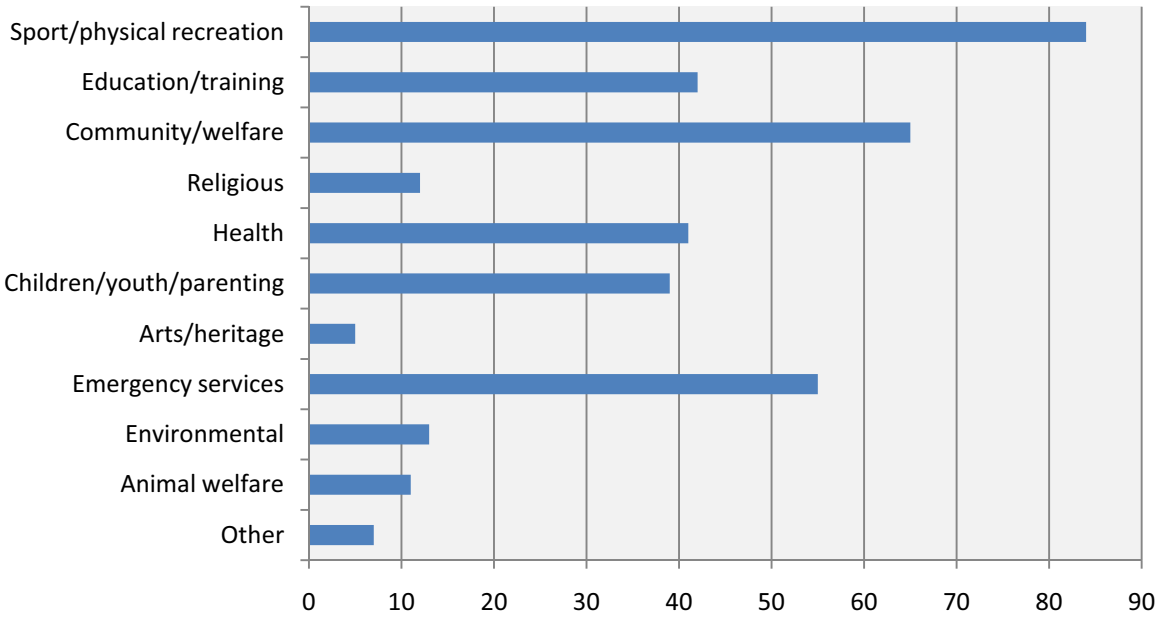

Figure A.19 **What type of community organisations in the Hunter Region did your company make financial contributions to?**

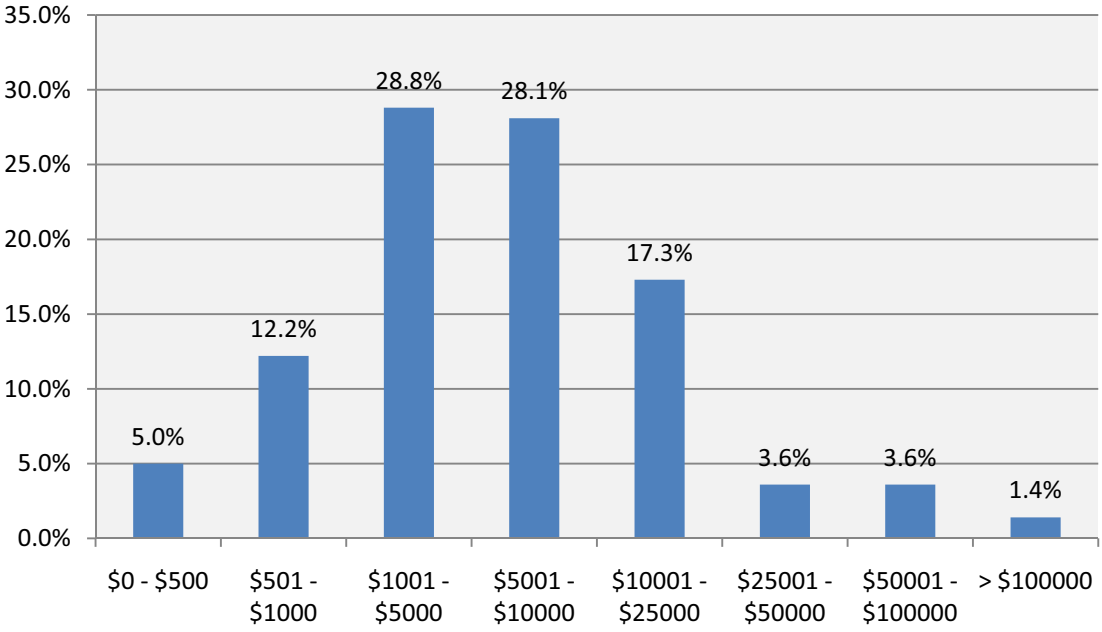

Figure A.20 **Total financial contributions to community organisations in the past 12 months**

When asked to think about the community organisation that receives the highest financial contribution, the primary LGAs where those organisations generally operated included Singleton LGA (33.8 per cent). Newcastle LGA (25.9 per cent) and Maitland LGA (12.2 per cent) (see Figure A.21).

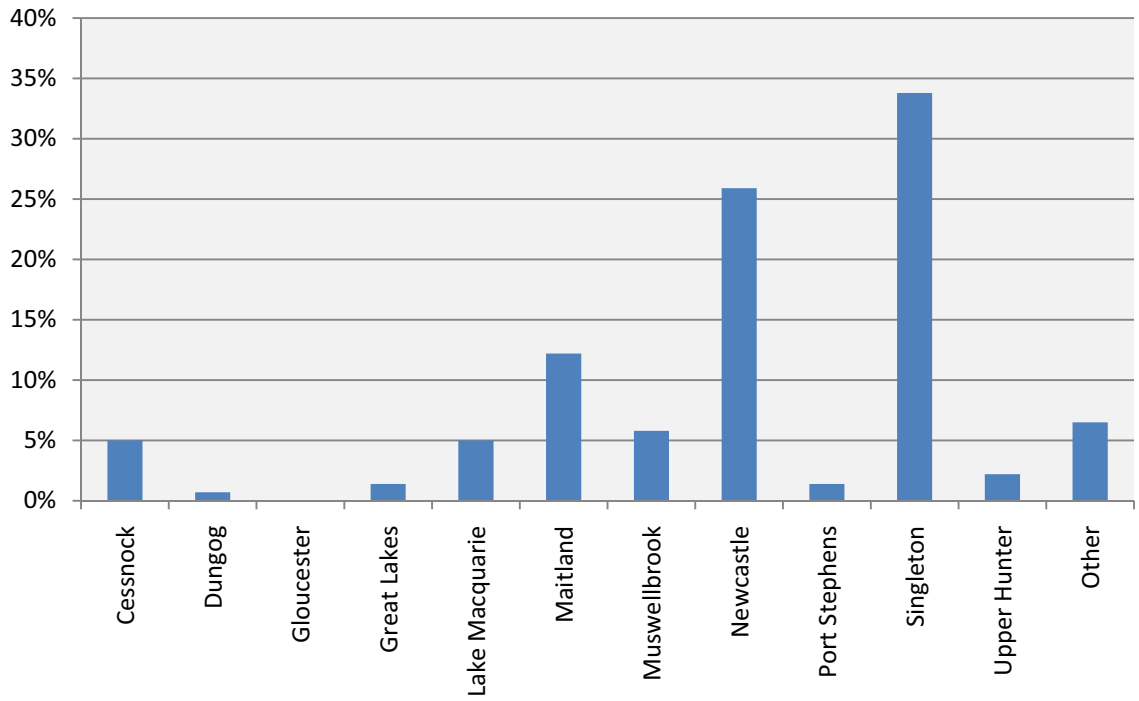

Figure A.21 LGA for community organisation with highest financial contribution

Participants were also asked whether they made any non-financial contributions (e.g. donating equipment, company resources, use of facilities) to community organisations in the Hunter Region, with 52.2 per cent of respondents indicating that their organisation makes these types of contributions. Community organisations receiving non-financial contributions included sporting (50 responses), community welfare (35 responses), education (27 responses), youth (21 responses) and emergency services (20 responses) organisations (see Figure A.22). The primary types of non-financial contribution made included donation of new/ used equipment (48 responses), allowing employees time off work to contribute (44 responses), use of company facilities or services at no cost (42 responses), advisory services at no cost (26 responses) and training at no cost (24 responses) (see Figure A.23).

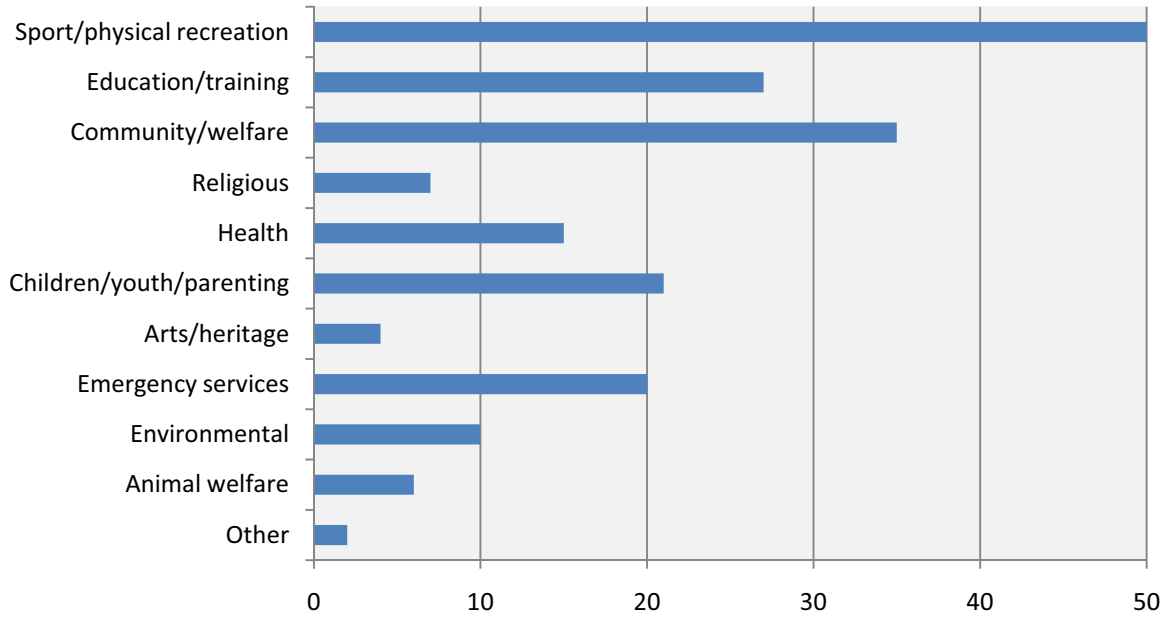

Figure A.22 **What type of community organisations in the Hunter Region did your company make non-financial contributions to?**

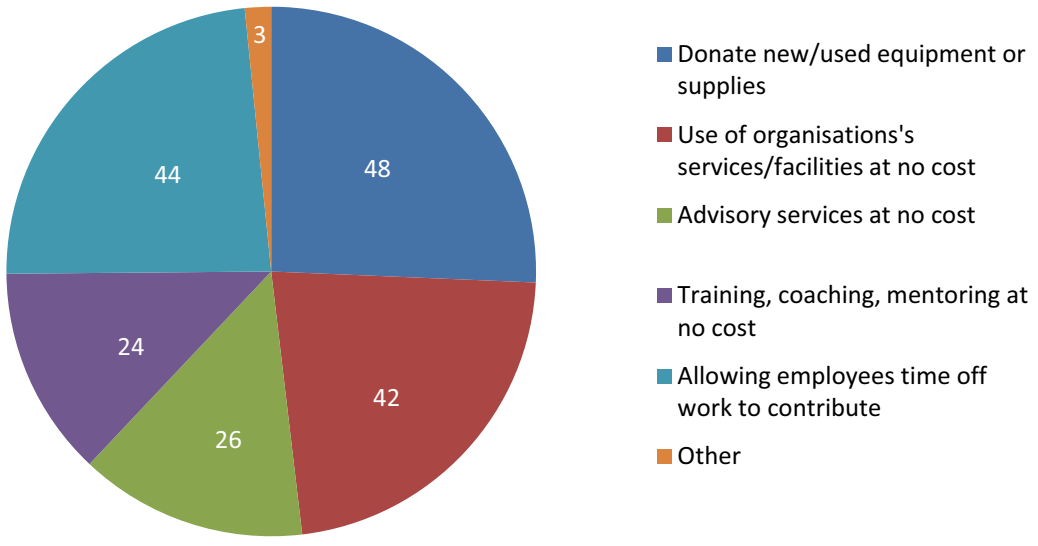

Figure A.23 **What type of non-financial contributions does your company make to community organisations?**

Finally, suppliers were asked to think about the community organisation that receives the most substantial non-financial contribution from their company and to indicate in which LGA that organisation generally operates—as with the financial contributions, Singleton (38.5 per cent), Newcastle (19.8 per cent) and Maitland (10.4 per cent) LGAs dominated responses (see Figure A.24).

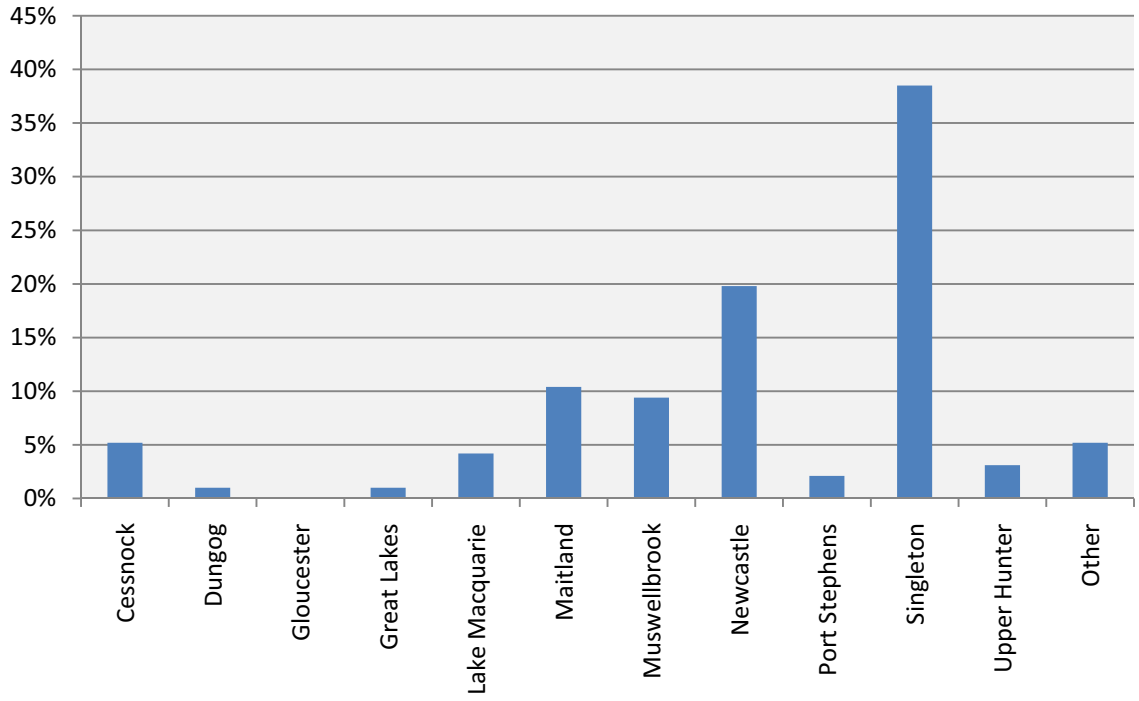

Figure A.24 **LGA for community organisation that receives the most substantial non-financial contribution**

Appendix B

Social and community profile

B.1 Family and ethnicity

The assessment area generally had a higher proportion of family households than the NSW average in 2011, particularly in Bulga SSC where nearly all households were characterised as family households. The exception to this was in Muswellbrook and the Upper Hunter Shire, which had proportionally higher single or lone person households (this was also the case in Singleton SSC). Generally, group households were at or below the NSW average, except for Broke SSC (see Table B.1).

The distribution of household types across all areas generally shifted closer to NSW distributions between 2006 and 2011, while still maintaining a slightly higher overall proportion of families and a slightly lower overall proportion of lone and group households. Other key characteristics include: the relative dominance of nuclear families (couples with children and no other relatives) in Singleton and Maitland; an above-average proportion of lone person households in Upper Hunter Shire (with its older age profile); and a relatively high incidence of single parent families in Cessnock (HVRF 2013b).

Overall, the greatest contributor to net growth in the number of households in both NSW and the assessment area has been an increase in the number of lone households, followed by households consisting of a sole couple with no children. Growth in these household types has historically been associated with ageing of the population. However, the data highlights substantial differences within the assessment area, consistent with the influx of young working adults into mining areas. Muswellbrook experienced a relatively rapid growth of lone person households, contributing 81 per cent to the net growth in the number of households in the LGA between 2006 and 2011, combined with a substantial decline (24 per cent) in the number of couple family households with children. Singleton LGA experienced a similar, although less marked, growth of lone person households and a small decrease in the number of couple families with children, while growth in the number of couple families with no children was also a major contributor to net growth in the number of households. Multiple family households grew much faster in Cessnock LGA than elsewhere. Cessnock and Upper Hunter Shire LGAs were also notable for growth in the number of single parent families. The differential patterns for multiple family and single-parent households may in part reflect availability of more affordable housing in these LGAs (HVRF 2013b).

The assessment area experienced relatively little change between 2006 and 2011 in the ethnic and cultural mix of the population (based on ancestry and country of birth). This relative stability reflected the dominance of Australian-born people (steady at 87.6 per cent) and those of British heritage. The main exception to this was Muswellbrook LGA, where the proportion of residents who nominated Australia as their country of birth fell marginally from 87.9 per cent in 2006 to 86.4 per cent in 2011. The assessment area experienced small growth of residents born in Asia (particularly the Philippines) and Sub-Saharan Africa (primarily South Africa), although the very small numbers involved had only a minor impact on the overall distribution. The actual number of residents born in Southern and Eastern Europe (primarily Italy and Poland) fell between 2006 and 2011, possibly reflecting the ageing of this immigrant cohort (HVRF 2013b).

Table B.1 Socio-demographic data Family and ethnicity indicators

	Bulga SSC	Broke SSC	Singleton SSC	Singleton LGA	Maitland LGA	Cessnock LGA	Muswellbrook LGA	Upper Hunter Shire LGA	NSW
Household types 2011 (per centof all households)									
Family households	94.5 per cent	79.0 per cent	66.6 per cent	76.7 per cent	76.1 per cent	73.6 per cent	71.1 per cent	69.8 per cent	71.9 per cent
Single (lone) person households	5.5 per cent	16.8 per cent	29.9 per cent	20.7 per cent	21.5 per cent	23.8 per cent	25.6 per cent	27.2 per cent	24.2 per cent
Group households	0 per cent	4.2 per cent	3.4 per cent	2.6 per cent	2.4 per cent	2.6 per cent	3.3 per cent	3.0 per cent	3.8 per cent
Family composition 2011 (per centofpersons in occupied private dwellings)									
Couple family without children	43.4 per cent	44.4 per cent	36.0 per cent	36.1 per cent	35.7 per cent	36.6 per cent	37.0 per cent	42.6 per cent	36.6 per cent
Couple family with children	44.3 per cent	46.2 per cent	43.3 per cent	49.3 per cent	46.1 per cent	41.8 per cent	44.7 per cent	42.5 per cent	45.5 per cent
One parent family	12.3 per cent	7.1 per cent	19.6 per cent	13.7 per cent	17.1 per cent	20.3 per cent	16.5 per cent	14.1 per cent	16.3 per cent
Other family	0.0 per cent	2.4 per cent	1.2 per cent	0.9 per cent	1.2 per cent	1.2 per cent	1.7 per cent	0.9 per cent	1.7 per cent
Top 3 countries of birth 2011 (per centofpopulation)									
	Australia 86.6per cent	Australia 82.8 per cent	Australia 87.1 per cent	Australia 87.1 per cent	Australia 87.8 per cent	Australia 87.8 per cent	Australia 86.4 per cent	Australia 88.0 per cent	Australia 68.6 per cent
	New Zealand 3.1per cent	England 3.0 per cent	New Zealand 2.4 per cent	New Zealand 2.2 per cent	England 2.0 per cent	England 2.0 per cent	England 1.6 per cent	England 1.7 per cent	England 3.3 per cent
	England 2.8 per cent	South Africa 0.8 per cent	England 1.8 per cent	England 1.8 per cent	New Zealand 1.0 per cent	New Zealand 1.0 per cent	New Zealand 1.4 per cent	New Zealand 1.5 per cent	China 2.3 per cent

Notes: The data table does not display 'inadequately described' or 'not stated' categories of Census data. Data sourced from: ABS Census, Community Profiles 2011.

B.2 Disadvantage

The Socio-Economic Index for Areas (SEIFA) provides a basis for comparison of the level of socio-economic advantage and disadvantage between LGAs. The SEIFA scores are calculated on the basis of Census data on key variables for all residents within an LGA; the LGAs are then RATED from the lowest to the highest score within the respective state and the nation, where the lowest score indicates the LGA with the greatest overall level of disadvantage for that Index. The SEIFA includes the Index of Relative Socio-Economic Disadvantage(IRSD) which comprises only disadvantage measures (eg low income), and the Index of Relative Socio-economic Advantage and Disadvantage (IRSAD),which includes both relative advantage (eg high incomes, levels of education) and disadvantage measures. A low score indicates relatively greater disadvantage and a lack of advantage in general (ABS 2011b).

The SEIFA rankings for LGAs in the assessment area are shown in Table B.2 for the 153 LGAs in NSW. Key trends include:

- Cessnock is one of the most disadvantaged LGAs in NSW. Although its rank improved marginally between 2006 and 2011, it remained well below that of all other LGAs and did not improve when both advantage and disadvantage measures are included.
- Maitland RATED above the median in 2006 and experienced a substantial improvement in its ranking between 2006 and 2011 on both indices. This indicates both a relatively lower level of disadvantage and a relative increase in the level of advantage.
- Singleton had the highest SEIFA scores of any of the LGAs in the assessment area, ranking among the top quarter of LGAs in NSW on both indices in 2011. While there was minimal change in ranking between 2006 and 2011, Singleton LGA measured an increased level of relative advantage, reflecting increased levels of personal and household incomes.
- Muswellbrook's ranking maintained a median level of both disadvantage and advantage within NSW, with a marginal improvement between 2006 and 2011.
- Upper Hunter Shire showed a substantial increase in its SEIFA rankings, particularly in terms of its relative level of advantage, which rose from well below to well above the median for NSW.

Table B.2 SEIFA rankings of advantage and disadvantage

LGA	**Index of Relative Socio-Economic Disadvantage** (rank out of 153 LGAs in NSW)		**Index of Relative Socio-Economic Advantage and Disadvantage** (rank out of 153 LGAs in NSW)	
	2011 rank	**2006 rank**	**2011 rank**	**2006 rank**
Cessnock	33	30	28	29
Maitland	106	99	107	98
Singleton	118	119	116	110
Muswellbrook	76	73	78	76
Upper Hunter Shire	94	81	86	69

Notes: Adapted from HVRF (2013b) Hunter Valley Socio-economic Baseline. Data sourced from: ABS Socio-economic Indexes for Areas 2006 and 2011. The lower the ranking, the greater the level of disadvantage based on SEIFA measures.

B.3 Crime

The NSW Bureau of Crime Statistics and Research (BOCSAR) collects data on the reported incidence (number and rate per 100,000 population) of major offences by LGA. The published data include LGA rankings in a similar way to the SEIFAs, where the LGA with the highest incidence (rate) of each offence is assigned the lowest rank.

The 2012 rankings are shown in Table B.3. The rankings indicate a relatively high rate of reported criminal activity across much of the assessment area, particularly in Cessnock. Rates of crime against property, particularly motor vehicle theft and stealing from motor vehicles, were among the highest in the state in Cessnock, Singleton and Muswellbrook LGAs. The rate of reported break and enters to dwellings also increased over most of the LGAs except Maitland. The rate of reported indecent assaults had also increased in Cessnock, and to a lesser extent Maitland.

The incidence of reported crime was generally lower in the Upper Hunter Shire when compared to the other LGAs, with the exception of sexual assault and break and enter offences. The Upper Hunter also experienced increases in break and enters and stealing from a vehicle. Incidents of violent crime in the assessment area were also lower than NSW averages. Across the assessment area there were improvements in rates of malicious damage to property (Cessnock, Singleton, Muswellbrook), assault (non-domestic) (Singleton and Cessnock), and stealing from a dwelling (Maitland).

Table B.3 BOCSAR LGA rankings

LGA	Cessnock		Maitland		Singleton		Muswellbrook		Upper Hunter	
	2012 rank	60 month trend	2012 rank	60 month trend	2012 rank	60 month trend	2012 rank	60 month trend	2012 rank	60 month trend
Assault-domestic	29	Stable	49	Stable	86	Stable	51	Stable	115	Stable
Assault-non-domestic	57	-5.4 per cent	67	Stable	97	-9.1 per cent	53	Stable	73	Stable
Sexual assault	46	Stable	57	Stable	79	NA	50	NA	35	NA
Indecent assault	NA	9.4 per cent	NA	0.8 per cent	NA	NA	NA	NA	NA	NA
Break & enter dwelling	29	4.3 per cent	55	Stable	61	9.6 per cent	11	17.2 per cent	46	21.4 per cent
Vehicle theft	3	Stable	30	Stable	4	Stable	19	Stable	100	NA
Steal from vehicle	11	11 per cent	20	Stable	13	Stable	4	22.6 per cent	58	30.6 per cent
Steal from dwelling	40	Stable	70	-12.1 per cent	46	Stable	31	Stable	90	Stable
Malicious damage	46	-4.0 per cent	40	Stable	68	-4.0 per cent	28	-7.0 per cent	74	Stable

Notes: Adapted from HVRF (2013b) Hunter Valley Socio-economic Baseline. Data sourced from: BOCSAR NSW Crime Statistics 2008-2012. Trend information has not been calculated if there were less than 20 incidents in any 12-month period. Data highlighted in orange indicates increased rates of crime over a 60-month period.

B.4 Volunteering and caring

Cessnock LGA had the lowest rate of volunteering (12.5 per cent) and the Upper Hunter Shire had the highest share of volunteers (22.9 per cent). This in part reflects the greater proportion of older residents in the Upper Hunter Shire and the greater propensity to volunteer amongst older persons and retirees (HVRF 2013b). Most of the LGAs had rates of volunteering above the NSW average, with the exception of the LGAs of Maitland (14.8 per cent) and Cessnock (12.5 per cent) (Table B.4). Bulga had the highest rate of all areas, with 23.3 per cent of those aged over 15 years undertaking voluntary work. Across all the LGAs, rates of volunteering were lower for males than females, in line with state-wide trends (HVRF 2013b).

The proportion of persons providing care for those needing assistance was higher than the NSW average (11.4 per cent) in Bulga SSC (13.3 per cent), Cessnock LGA (12.8 per cent) and Maitland LGA (12.4 per cent); however, the remaining areas were lower than the state average (Table B.4).

Table B.4 Unpaid work: volunteering and caring

Location	Proportion (per cent) who provided unpaid assistance to a person with a disability (last two weeks) 2011, persons aged 15 yrs and over	Proportion (per cent) who did voluntary work through an organisation or group (last 12 months) 2011, persons aged 15 yrs and over
Bulga SSC	13.3	23.3
Broke SSC	10.5	21.8
Singleton SSC	10.1	17.6
Cessnock LGA	12.8	12.5
Maitland LGA	12.4	14.8
Singleton LGA	10.8	19.0
Muswellbrook LGA	10.0	17.0
Upper Hunter Shire LGA	10.9	22.9
NSW	11.4	16.9

Notes: Adapted from HVRF (2013b) Hunter Valley Socio-economic Baseline. Data sourced from: ABS Census Community Profile 2011.

B.5 Perceptions of community amenity

Perception surveys conducted regularly by the HVRF[7] (2013b) reveal a number of trends in the perceptions of key aspects of community life in the region, as summarised below:

- Social harmony in the local area was rated about the same across the five LGAs, between 2008 and 2013 surveys.
- Visual pleasantness also rated, on balance, as about the same across the five LGAs. The mean ratings mask significant differences, with Cessnock and Maitland residents rating it as somewhat better on balance, while perceptions in Singleton and Muswellbrook were polarised, with over 25per cent of respondents in both these mining-associated LGAs rating it as better and a slightly higher proportion rating it as worse.

[7]HVRF conduct a regular 'point-in-time' interview (2008 and 2013) with a random selection of community members, stratified to ensure a minimum of 200 completed interviews within each of the five LGAs (Cessnock, Maitland, Singleton, Muswellbrook and Upper Hunter Shire). A bias is included in the programming of random respondent selection to ensure a sufficient number of younger adults, aged 18 to 40.

- Sense of community safety was perceived as worse on balance, significantly more so in Muswellbrook and Cessnock than the neighbouring LGAs, where over 50per cent of respondents perceived deterioration in safety.

- Just over 60 per cent of respondents identified a positive change in the area compared with five years ago. The most positive changes identified over the last five years included: more/better shops - most frequently nominated in Singleton and Maitland, and significantly less often in Muswellbrook and Upper Hunter Shire LGAs; better services and/or facilities - most frequently nominated in Muswellbrook, and to a lesser extent Upper Hunter Shire and Singleton; the F3 link -most frequently nominated positive change in Cessnock; improvements related to housing - cited significantly more often in Maitland and Muswellbrook than in Singleton.

- More than 80 per cent of respondents were aware of some negative changes in their area. When compared with the identification of positive changes, this implies that perceptions of negative impacts outweighed perceptions of positive impacts within the community. Mining expansion was the most frequently cited negative change in the mining impacted areas.

- There was generally a high level of satisfaction with access to services and facilities, although this varied across LGAs: there was high satisfaction recorded for sport and recreation facilities across the LGAs, although less so in Cessnock; the level of satisfaction with activities and services for older people was second highest across these areas but significantly lower, and bordering on dissatisfied, in Muswellbrook LGA; there was moderate satisfaction with education and training opportunities for young people across all five LGAs.

B.6 Health services and facilities

The assessment area is part of the Hunter New England Local Health District (LHD) region of NSW Health and the Hunter Medicare Local region of Australian Medicare Local Alliance. The following NSW government health facilities, including three multipurpose services (MPS), provide services within the area (MPSs are jointly funded by the Commonwealth and NSW Health; HVRF 2013b):

- Rural referral hospitals: Maitland (Maitland LGA).

- District hospitals: Cessnock and Kurri Kurri hospitals (Cessnock LGA); Singleton hospital (Singleton LGA), Muswellbrook hospital (Muswellbrook LGA), Scone hospital (Upper Hunter Shire LGA).

- Community hospitals: Murrurundi (Upper Hunter Shire LGA).

- Multipurpose services (MPS): Denman and Muswellbrook MPS (Muswellbrook LGA), Merriwa (Upper Hunter Shire LGA) (HNELHD 2014).

- Mental health hospitals: there are none located in the assessment area, although inpatient mental health services are provided at Maitland Hospital. The nearest hospital and mental health services are in or surrounding Newcastle LGA.

- Private hospitals: Maitland Private Hospital (Maitland LGA).

- Residential aged care: is predominantly provided by the private sector, with a number of these facilities located in the assessment area.

- Community health services: Hunter New England Health (HNE Health) also provides a broad range of community health services, including but not limited to: audiometry, community nursing, child and family health nursing, counselling, carer support, dietetics, drug and alcohol, health promotion programs, hospital in the home, immunisation, mental health, occupational therapy, oral health, palliative care, physiotherapy, podiatry, psychology, rehabilitation, sexual assault, social work, speech therapy, women's health and youth health. These services are provided through a range of community health facilities across the HNELHD. In the assessment area, community health services are provided at community health centres in Maitland and East Maitland (Maitland LGA), Cessnock and Kurri Kurri (Cessnock LGA), Singleton (Singleton LGA), Muswellbrook and Denman (Muswellbrook LGA), and Scone, Merriwa and Murrrundi (Upper Hunter Shire LGA).

The relatively high number and extensive distribution of health services and facilities across the region is also reflected in GP access data. Almost nine out of 10 residents in the broader Hunter Medicare Local region (87.8 per cent) had a regular GP, with Cessnock (95.6 per cent) and Maitland (90.7 per cent) having a significantly greater proportion of the population with a regular GP compared to the Upper Hunter (74.2 per cent) and Muswellbrook (63.5 per cent) (Hunter Medicare Local 2012; HVRF 2013b). For the majority of residents in the region who have a regular GP (70.9 per cent), it takes less than 15 minutes to travel from their home to the GP practice. However, this was not the case in the Upper Hunter and Muswellbrook where many residents had to travel over an hour to a GP. Nearly a quarter of Hunter Medicare Local residents reported barriers to accessing a GP. The LGAs of Muswellbrook (38.7 per cent) and Upper Hunter Shire (39.2 per cent) both had rates above the assessment area average (29.4 per cent), and were significantly greater than in Cessnock (17.8 per cent). Of the residents reporting barriers to accessing GPs, the main barrier was the inability to get an appointment at the time required (Hunter Medicare Local 2012; HVRF 2013b).

Despite a universal public health system, roughly half of the adult Australian population also carries private health insurance, the main benefit of which is more timely access to medical services and hospital treatment (HVRF 2013b). However, the rate of private health cover is much lower in non-metropolitan areas as a result of a general lack of private health facilities, which means residents still need to travel to access specialist treatment (HVRF 2013b). In the assessment area, rates of private health cover are similar to the non-metropolitan NSW average (40.6 per 100 people) with the exception of Singleton that had a rate of 50.3 per 100 (see Table B.1).

Table B.5 Private health insurance

GA	Private health insurance, rate per 100, persons aged 15 yrs and over, 2007-08
Cessnock	37.7
Maitland	45.3
Singleton	50.3
Muswellbrook	39.6
Upper Hunter Shire	40.1
Non-metropolitan NSW	40.6

Notes: Adapted from HVRF (2013b) Hunter Valley Socio-economic Baseline. Data sourced from Social Health Atlas of Australia 2011. The Public Health Information Development Unit (PHIDU), University of Adelaide. Data is highlighted in orange where it indicates a possible health risk.

More broadly, the changing demographic profile of the region, reflected nationally in a growing and ageing population, will place significant and growing pressures on governments to meet new healthcare service and infrastructure requirements. This trend will enhance the already dominant health service sector in the region, now representing about 7.7 per cent of the regional economy and projected to expand around 8.4 per cent of the Hunter economy by 2036 (Deloitte Access Economics 2013).

B.7 Hospitalisations

All LGAs in the assessment area were generally characterised by above average rates of hospitalisation (see Table B.2). This may indicate a lack of primary healthcare services and a need for more health promotion work (HVRF 2013b). Singleton and the Upper Hunter Shire LGAs have significantly more hospitalisations per capita overall than the NSW average and all five LGAs also have a significantly higher proportion of potentially preventable hospitalisations than NSW (HVRF 2013b). Hospitalisations for preventable lifestyle diseases and risk factors are also of concern. All LGAs,except for Singleton, have a significantly higher proportion of hospitalisations for coronary heart disease and for diabetes, and all LGAs except for the Upper Hunter Shire have higher than state average rates of high body mass related hospitalisations. The most positive results were for alcohol-attributable hospitalisations, which was on par with the state average in Singleton and the Upper Hunter Shire and below the average in the remainder of the assessment area.

Table B.6 Hospitalisation indicators

	Hospitalisations						
LGA	**Hospitalisat-ions by LGA**	**Potentially preventable**	**Coronary heart disease**	**Diabetes***	**Alcohol attributable**	**High body mass**	**Smoking related**
Cessnock	0	++	++	++	--	++	++
Maitland	0	++	++	++	--	++	++
Singleton	++	++	0	0	0	++	+
Muswell-brook	0	++	++	++	-	++	++
Upper Hunter Shire	++	++	+	++	0	0	++

Notes: *Adapted from HVRF (2013b) Hunter Valley Socio-economic Baseline. Data sourced from NSW Admitted Patient Data Collection and ABS population estimates (SAPHaRI). Centre for Epidemiology and Evidence, NSW Ministry of Health. Data is highlighted in orange where it indicates a possible health risk.*

+ This indicates that the estimated LGA figure is significantly higher than the state average at the 1per cent level of significance.

++This indicates that the estimated LGA figure is significantly higher than the state average at the 5per cent level of significance.

0 This indicates that the LGA figure is not significantly different to the state average.

- This indicates that the LGA figure is significantly lower than the state average at 5per cent level of significance.

-- This indicates that the LGA figure is significantly lower than the state average at the 1per cent level of significance.

** Includes Diabetes Type 1, type 2 and gestational diabetes.*

B.8 Potentially avoidable deaths

Overall, the five LGAs reflect state averages with regards to smoking and alcohol-related deaths and all potentially avoidable deaths (except for Cessnock). However, Singleton, Muswellbrook and the Upper Hunter Shire have significantly more deaths attributable to being overweight or obese than NSW overall (see Table B.3; HVRF 2013b).

Table B.7 Potentially avoidable deaths

LGA	Potentially avoidable deaths	Alcohol attributable deaths	High body mass attributable deaths	Smoking attributable deaths
Cessnock	+	0	0	0
Maitland	0	0	0	0
Singleton	0	0	++	0
Muswellbrook	0	0	++	0
Upper Hunter Shire	0	0	++	0

Notes: *Adapted from HVRF (2013b) Hunter Valley Socio-economic Baseline. Data sourced from ABS mortality data and population estimates (SAPHaRI). Centre for Epidemiology and Evidence, NSW Ministry of Health. Data is highlighted in orange where it indicates a possible health risk.*

+ This indicates that the estimated LGA figure is significantly higher than the state average at the 1per cent level of significance.

++This indicates that the estimated LGA figure is significantly higher than the state average at the 5per cent level of significance.

0 This indicates that the LGA figure is not significantly different to the state average.

- This indicates that the LGA figure is significantly lower than the state average at 5per cent level of significance.

-- This indicates that the LGA figure is significantly lower than the state average at the 1per cent level of significance.

B.9 Other key causes of death

Cancer is now the largest cause of disease in Australia, recently surpassing cardiovascular disease (Cancer Institute NSW 2014). The most recent available data indicate that the overall cancer death rate was higher in Muswellbrook LGA (94.0 per 100,000 people) and lower in Singleton LGA (68.0 per 100,000 people) than in non-metropolitan NSW (82.4 per 100,000 people) (see Table B.8).

Table B.8 Cancer death rates

LGA	Average annual rate per 100,000 population, 15-64 years 2003-2007
Cessnock	83.1
Maitland	80.2
Singleton	68.0
Muswellbrook	94.0
Upper Hunter Shire	79.5
Non-metropolitan NSW	82.4

Notes: *Adapted from HVRF (2013b) Hunter Valley Socio-economic Baseline. Data sourced from Social Health Atlas of Australia 2011. The Public Health Information Development Unit (PHIDU), University of Adelaide. Data is highlighted in orange where it indicates a possible health risk.*

Deaths from **respiratory disease** are associated with a number of factors, including risk factors such as smoking, obesity and age. The most recent data (2003-2007) indicates that death rates from respiratory disease in the assessment area were lower than in non-metropolitan NSW (9.7 per 100,000 people), with the exception of Muswellbrook LGA which was slightly higher (10.0 per 100,000 people) (see Table B.9).

Table B.9 Respiratory disease death rates

LGA	Average annual rate per 100,000 population, 15-64 years 2003-2007
Cessnock	8.3
Maitland	8.9
Singleton	8.6
Muswellbrook	10.0
Upper Hunter Shire	NA
Non-metropolitan NSW	9.7

Notes: Adapted from HVRF (2013b) Hunter Valley Socio-economic Baseline. Data sourced from Social Health Atlas of Australia 2011. The Public Health Information Development Unit (PHIDU), University of Adelaide. Data for the Upper Hunter Shire LGA was not available. Data is highlighted in orange where it indicates a possible health risk.

The impacts of mining and coal dust on respiratory health of those living close to mining areas and coal transport corridors has been an issue of significant public, government and media concern (eg Higginbotham et al. 2010). The issue was discussed in detail in the report of the 2013 Australian Senate Committee of Enquiry into the 'impacts on health of air quality in Australia' (Commonwealth of Australia 2013), which made recommendations including, amongst others:

- buffer zones be used to protect populated areas from large point-source emitters;
- pollution monitoring should accurately capture population exposure for communities and homes proximate to pollution point sources;
- providing monitoring and real-time data of air quality be a condition of environmental approvals issued by the Australian Government unless an operator can demonstrate that air pollution created by the development will not impact upon human health;
- states and territories require industry to implement covers on all coal wagon fleets;
- the Commonwealth develop and implement a process for assessing cumulative impacts of coal mine developments that take into account other mines in the region and their impact on resident health; and
- health impact assessments be required as part of the assessment process for all new developments.

The most recent air quality and health study in the Hunter Region used general practice data relating to respiratory problem management or related prescriptions in the region between 1998-2010 (Merritt et al. 2013). The study found no evidence of significantly elevated respiratory issues for residents in the region when compared with the rest of rural NSW[8]. However, it was recommended that respiratory problem management over time be further explored as comparisons between 1998-2004 datasets on the management rates of respiratory problems with datasets for the period 2005–2010 demonstrated no significant change in the Hunter Region despite a significant decrease for the remainder of rural NSW over this period (Merritt et al. 2013). In addition, a recent review of emergency department data found higher rates for asthma and respiratory disease presentations in this region when compared with Sydney residents; however, higher rates were also noted for a number of rural communities with no potential mining or power generation exposures (NSW Health 2012).

Road traffic accident deaths are significantly higher in the assessment area than for the remainder of non-metropolitan NSW. There is no data available for Muswellbrook or Upper Hunter Shire LGAs; however, both Cessnock (10.5 deaths per 100,000 people) and Singleton (9.7 deaths per 100,000 people) have much higher rates than non-metropolitan NSW (7.6 deaths per 100,000 people) (see Table B.10).

Table B.10 Road traffic death rates

LGA	Average annual rate per 100,000 population, 0-74 years 2003-2007
Cessnock	10.5
Maitland	7.2
Singleton	9.7
Muswellbrook	NA
Upper Hunter Shire	NA
Non-metropolitan NSW	7.6

Notes: Adapted from HVRF (2013b) Hunter Valley Socio-economic Baseline. Data sourced from Social Health Atlas of Australia 2011. The Public Health Information Development Unit (PHIDU), University of Adelaide. Data is highlighted in orange where it indicates a possible health risk.

Overall, the median age at death for all five LGAs was broadly similar to non-metropolitan NSW with Muswellbrook LGA being the lowest at 77 years and Upper Hunter Shire the highest at 81 years (HVRF 2013b).

[8] It is important to note a number of limitations in the dataset and sample as detailed in the study, including: the limited size of the Hunter Region sample, the higher proportion of younger patients and fewer Health Care Card holders in the sample (although weighting was applied to account for these limitations), the lower rates of GP check-ups in the sample, and that the data relies on a sample of patient encounters from a sample of randomly selected GPs (in this sample, there were 18 GPs from 7 practices). Smoking was not considered to impact on these findings, as comparable rates of smoking were evident between the sample and the rest of rural NSW (Merritt et al. 2013).

B.10 Health status, health risk behaviours and mental health

Data relating to **maternal and child health** provides important indicators of the health and well-being of the population. For example, smoking during pregnancy is associated with a range of adverse health effects including low birth weight, which may affect the child's health later in life (HVRF 2013b). Data for the assessment area indicates that the two LGAs with the highest proportion of women who smoke during pregnancy, namely Cessnock (27.2 per cent) and Muswellbrook (23.7 per cent), also had the highest proportion of low birth weight babies (7.9 per cent and 8.2per cent respectively) (see Table B.11). Of particular concern in the assessment area are the very high infant and child mortality rates in Cessnock and the Upper Hunter Shire, which are well above the non-metropolitan NSW average. On a positive note, immunisation rates in the LGA are high, with more than 9 in 10 children in each of the LGAs immunised, which is also similar to the rate for non-metropolitan NSW (HVRF 2013b).

Table B.11 Child and maternal health indicators

LGA	per cent low birth weight 2006-08	per cent smoking during pregnancy 2006-08	per cent children immunised at 12-15 months, 2008	Average annual infant death rate per 1,000 live births, 2003-07	Average annual child mortality rate under 5 years per 100,000, 2003-07
Cessnock	7.9	27.2	90.4	8.9	174.8
Maitland	6.1	17.5	92.5	4.9	98.1
Singleton	6.0	18.6	93.5	4.8	143.2
Muswellbrook	8.2	23.7	92.1	6.0	126.1
Upper Hunter Shire	7.1	19.4	90.9	8.2	178.2
Non-metropolitan NSW	6.5	22.0	91.6	5.9	123.0

Notes: Adapted from HVRF (2013b) Hunter Valley Socio-economic Baseline. Data sourced from Social Health Atlas of Australia 2011. The Public Health Information Development Unit (PHIDU), University of Adelaide. Data is highlighted in orange where it indicates a possible health risk.

Lifestyle risk factors include smoking, alcohol consumption, physical activity, fruit/vegetable intake and rates of obesity, which are all important indicators for chronic and acute illness, disease and death. The relevant statistics for the assessment area are summarised below:

- For physical activity, the national guidelines recommend less than 5 days of at least 30 minutes of moderate-intensity physical activity per week. Generally, over two thirds of residents in the assessment area did not meet this recommended level, particularly in Cessnock and the Upper Hunter Shire (Table B.8).

- Smoking is the single most preventable cause of poor health and mortality in Australia (HVRF 2013b). Cessnock had the highest rates of smoking, with the remainder of the LGAs similar to rates for non-metropolitan NSW average (Table B.8).

- Excessive alcohol consumption also has many adverse long-term effects on health. With the exception of Maitland, all of the LGAs in the assessment area have higher rates of risky alcohol consumption levels than the non-metropolitan NSW average, with the highest rates in the mining-associated areas of Singleton and Muswellbrook.

- The National Health and Medical Research Council (NHMRC) recommends at least two serves of fruit and five serves of vegetables per day (NHMRC 2006). Maitland, Singleton and Muswellbrook LGAs had consistently high rates of inadequate fruit and vegetable consumption, while Cessnock and the Upper Hunter showed high rates of inadequate fruit consumption only. Overall, the fruit and vegetable consumption in the assessment area is inadequate.

- Being overweight or obese are health concerns which affect increasing numbers of Australian adults and are a major contributor to the burden of disease and injury (AIHW 2012). Based on self-reported weight and height, the assessment area as a whole generally has higher proportions of people who are overweight or obese. These proportions are particularly high in Singleton and Cessnock. HVRF (2013B) reports that rates of overweight and obese individuals increase with age and are significantly associated with those with no post-school qualifications or certificate level qualifications.

Table B.12 Lifestyle risk factors

LGA	Physical inactivity, rate per 100 15 yrs and over, 2007-08	Smoking daily or occasionally, rate per 100, 18 yrs and over, 2007-08	High risk alcohol consumption, rate per 100, aged 18 yrs and over, 2007-08	per cent inadequate vegetable intake, 18 yrs and over, 2007-08 (less than 5 serves per day)	per cent inadequate fruit intake, 18 yrs and over, 2007-08 (less than 2 serves per day)	per cent overweight/ obese, 18 yrs and over, 2007-08
Cessnock	40.2	25.5	8.3	85.9	58.5	67.2
Maitland	34.0	22.6	5.8	94.1	56.1	63.9
Singleton	33.4	21.5	9.2	92.0	52.8	67.3
Muswellbrook	35.2	23.4	9.3	93.7	55.6	66.3
Upper Hunter Shire	39.1	23.5	8.5	91.0	57.4	64.4
Non-metropolitan NSW	36.4	23	7.7	NA	NA	NA
NSW	NA	NA	NA	91.8	49.4	61.2

Notes: Adapted from HVRF (2013b) Hunter Valley Socio-economic Baseline. Data sourced from: Social Health Atlas of Australia 2011. The Public Health Information Development Unit (PHIDU), University of Adelaide. Data is highlighted in orange where it indicates a possible health risk.

Mental health is a key indicator of the health status of a population. Using a screening tool (the *K6 brief screening scale*), a study by Hunter Medicare Local found that almost 3per cent of Hunter residents had a K6 score that indicated high levels of psychological distress (HVRF 2013b). Almost one in every six (15 per cent) Hunter Medicare Local area residents reported that they needed to access mental health services within the last 12 months. The LGAs of Cessnock and Upper Hunter Shire had higher than average rates of access to mental health services (see Table B.9). Of the Hunter Region residents who needed to access mental health services, 20.3per cent reported barriers to accessing services, which were highest in Singleton (47.1 per cent) and Maitland (35.7 per cent). The most frequently reported barriers to services were: inability to get to an appointment at the time that suited the person, the cost of services, and services not being available in the local area (HVRF 2013b). The most frequently accessed service in the assessment area was: psychologists (39.0 per cent); general practitioners (32.6 per cent); psychiatrists (12.6 per cent); counsellors (6.8 per cent); community mental health teams (2.4 per cent). The reliance on GPs for mental health services remains quite high in the assessment area, and particularly high in the Upper Hunter Shire and Cessnock, indicating a traditional reliance on GPs but also a lack of allied health services in these LGAs (HVRF 2013b).

Table B.13 Mental health indicators

LGA	Proportion (per cent) of people needing access to mental health services, aged 18 yrs and over	Proportion (per cent) of people needing access to mental health services reporting barriers to accessing services, aged 18 yrs and over
Cessnock	20.1	17.9
Maitland	14.9	35.7
Singleton	12.3	47.1
Muswellbrook	12.8	26.9
Upper Hunter Shire	16.1	19.5
Hunter Medicare Local region	15.0	20.3

Notes: Adapted from HVRF (2013b) Hunter Valley Socio-economic Baseline. Data sourced from: Hunter Medicare Local (2012) Health Needs Analysis of Hunter Residents. Data is highlighted in orange where it indicates a possible health risk.

Self-reported health status is another useful indicator of the health and well-being of the population. The HVRF conduct a survey known as 'Well-being Watch', which assesses the self-reported health of residents of the Hunter Region (HVRF 2013d). In 2012, approximately 60 per cent of the adult population in the region reported being in good to very good health, and a further 18 per cent reported excellent health (HVRF 2013d). Just 16 per cent of residents reported fair health and a further 5 per cent indicated poor health. This suggests that approximately four out of five Hunter residents were in good to excellent health in 2012. There has been no significant change in health status over time (since 2006). Age is one of the most significant indicators of self-reported health, with the proportion of Hunter residents experiencing good to excellent health decreasing with age (HVRF 2013d).

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Appendix Q

Rehabilitation performance/completion criteria

Appendix Q — Rehabilitation performance/completion criteria

Q

Extract from MTW Mining Operations Plan June 2014

MOUNT-THORLEY WARKWORTH	
Mining Operations Plan	
Name of Mine	Mount Thorley Warkworth Operations
MOP Commencement Date	1 June 2014
MOP Completion Date	31 December 2016
Mining Authorisations (Lease / Licence No.)	CL 219, CCL 753, ML 1412, ML 1590
Name of Authorisation / Title Holder(s)	CL 219 Mount Thorley Operations Pty Ltd CCL 753 Warkworth Mining Limited ML 1412 Warkworth Mining Limited ML 1590 Warkworth Mining Limited
Name of Mine Operator (if different)	Coal & Allied Operations Pty Ltd
Name and Contact Details of the Mine Manager (or equivalent)	Mark Rodgers General Manager Mount Thorley Warkworth Operations Coal & Allied Operations Pty Limited PO Box 267 SINGLETON NSW 2330 Ph: 02 6570 1501 Fax: 02 6570 1599 Email: mark.rodgers@riotinto.com
Name and Contact Details of Environmental Representative	Bill Baxter Environmental Specialist Rehabilitation Coal & Allied Operations Pty Limited PO Box 315 SINGLETON NSW 2330 Ph: 02 6570 1717 Fax: 02 6570 1576 Mob: 0488 400958 Email: bill.baxter@rtca.riotinto.com.au
Name of Representative(s) of the Authorisation Holder(s)	David Bennett
Title	Manager - Mine Technical Services Mt Thorley Warkworth
Signature	
Date	

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1.0 Performance Criteria, Measures and Indicators

The performance criteria, measures and associated indicators have been developed in accordance with the range of project related documentation i.e. EA (EMGA Mitchell McLennan, 2013), EIS (ERM, 2002), Director General's Report and the Project Approval. The performance or completion criteria are objective target levels or values that can be measured to quantitatively demonstrate the progress and ultimate success of a biophysical process. These criteria have been developed for each phase of the rehabilitation so that the rehabilitation success can be quantitatively tracked throughout the life of the mine.

The performance measures quantify the rehabilitation and land management program in terms of efficiency or effectiveness and establish the indicative timeframes for completion. The performance indicators are used to define and evaluate the program, typically in terms of making progress towards the development of sustainable ecosystems whilst also providing a framework for the implementation of key activities. These indicators provide the basis for the procedural context of the site work practices. The performance indicators are attributes of the biophysical environment e.g. pH, slope, that can be used to approximate the progression of a biophysical process and can be measured to demonstrate and track the progress of an aspect of rehabilitation towards a desired completion criteria (NSW Trade & Investment September 2013).

The criteria, measures and indicators which provide the framework for this MOP are underpinned by a range of documents which relate to land management. These include industry standards, Rio Tinto Standards and C&A Procedures. The ongoing development of these documents will provide the basis for the review of this MOP with resultant amendments being recorded in documents such as the MTW AEMR.

There is an element of risk attached to the development of completion or performance criteria, in that it is impossible to predict all of the variables that might influence the recovery or otherwise of those lands which are rehabilitated post mining. Many variables operate at catchment or regional scales, such as river flows and pest outbreaks. Other factors that operate at continental or even global scales, such as climatic influences (including droughts or floods brought about by La Niña and El Niño events), could significantly influence the long-term sustainability of the vegetated lands encompassed by Mt Thorley Warkworth. To this end, the performance measures and associated indicators have been designed to provide an appropriate benchmark or guide against which to assess the management of project lands and the resulting improvements.

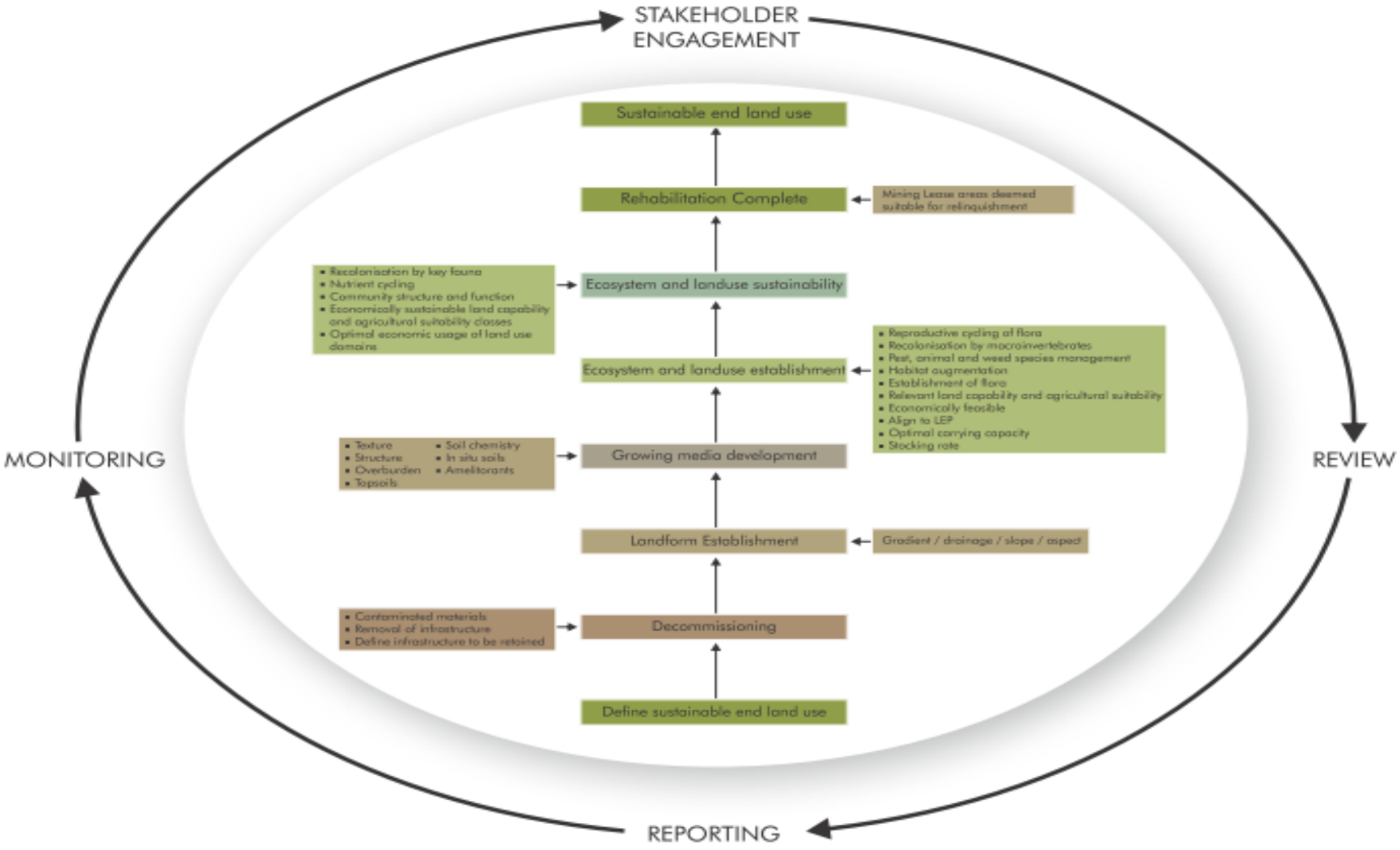
The performance measures and indicators in this MOP are designed to form the basis of the Performance Criteria and provide the ability to track the development of sustainable ecosystems through a series of conceptual stages which are presented in Section 1.1.

1.1 Rehabilitation Phases

The ultimate rehabilitation objective for MTW is the development of sustainable ecosystems across the site and in connection with the surrounding landscape. This will be achieved through a series of conceptual stages which are shown diagrammatically in Figure 1 and described as:

- Stage 1: Decommissioning – removal of hard stand areas, buildings, contaminated materials, hazardous materials;
- Stage 2: Landform Establishment – incorporates gradient, slope, aspect, drainage, substrate material characterisation and morphology;
- Stage 3: Growing Media Development – incorporates physical, chemical and biological components of the growing media and ameliorants that are using to optimise the potential of the media in terms of the preferred vegetative cover;
- Stage 4: Ecosystem and Landuse Establishment – incorporates revegetated lands and habitat augmentation; species selection, species presence and growth together with weed and pest animal control / management and establishment of flora; and
- Stage 5: Ecosystem and Landuse Sustainability – incorporates components of floristic structure, nutrient cycling recruitment and recovery, community structure and function which are the key elements of a sustainable landscape.
- Stage 6 – Rehabilitation Complete – landuse and landscape is deemed as suitable to be relinquished from the Mining Lease.

Figure 1 Conceptual Stages of Sustainable Ecosystem Development



1.2 Decommissioning

In the context of this MOP, decommissioning is the formal process to remove some facet of the mining operation from its active status. The Criteria, Performance Measures and Indicators together with the justification source for this data as it relates to the decommissioning stage are provided in Table 1.

It should be noted that this phase will particularly apply to those domains where the risk of hazardous materials may exist and as such may not apply to some of the domains.

Table 1 Decommissioning

Criteria	Performance Measure	Performance Indicator	Reference / Source
Infrastructure Areas			
The process of decommissioning may occur throughout the life of the mine as infrastructure and facilities progressively become redundant.	Progressive and final decommissioning may include the following: • Disassemble, demolish and remove structures. • Stabilisation of any loose materials on unstable slopes if required. • Installation of interim drainage management if required. • Remove concrete pads and footings. • Reuse or recycle materials (e.g. steel and concrete) where practicable, or dispose of appropriately. • Disconnect and terminate services. • Preparation of Decommissioning Plan.	Certificates for removal and disposal of hazardous materials present.	C&A Environmental Procedure *4.1 – Closure Planning Guidelines* C&A Environmental Procedure *13.1 – Site Contamination Prevention and Control* Rio Tinto Environmental Performance Standard *E5 – Hazardous Material and Contamination Control* Decommissioning Plan[1]
Undertake a hazardous material assessment of infrastructure to identify the potential health and environmental risks associated with demolition of the infrastructure.	Inventory showing location and quantities of: • Asbestos-containing materials (ACMs). • Lead paints. • Synthetic mineral fibre (SMF). • Polychlorinated biphenyls (PCBs). Decommissioning Plan to include hazardous materials management.	Decommissioning Plan to include hazardous materials management. Certificates for removal and disposal of hazardous materials present if required. Detailed investigation if required.	
	Management of hydrocarbon soil contamination.	Onsite treatment at the bioremediation area until the soil can be safely disposed in the spoil dump.	

[1] The decommissioning Plan is to be developed within 5 years of the cessation of mining.

Criteria	Performance Measure	Performance Indicator	Reference / Source
Undertake a contamination assessment to determine the risk of contamination.	Contamination assessment. Identify areas of high risk for further evaluation.	Assessment of contamination and / or remediation requirements if required.	
	Where contamination triggers specific handling and management requirements, develop a remedial action plan to provide a framework for the appropriate management, remediation and validation of contaminated soils if required.	Implementation of Remedial Action Plan. Certificates/audit statements showing remediation of soils.	
Tailing Storage Facility			
Decommissioning of TSF.	Establish a procedure to decommission, inspect and monitor TSF.	Performance of the TSF as per procedure.	Requirements of the Dam Safety Committee Rio Tinto Environmental Performance Standard *E7 – Non Mineral Waste Management* C&A Environmental Procedure *6.2 – Coarse Rejects and Tailings Disposal*
Removal of tailings infrastructure.	Removal of pipelines and pumps and related tailings infrastructure.	Development of Decommissioning Plan.	
Water Management Area			
Management of Water Management Area.	Decommissioning may include: • Removal of infrastructure. • Installation of interim drainage management if required. • Disconnect and terminate services.	Development of Decommissioning Plan.	Rio Tinto Environmental Performance Standard *E10 – Water Use and Quality Control* C&A Environmental Procedure *7.2 – Water Management*
	Where contamination triggers specific handling and management requirements, develop a Remedial Action Plan to provide a framework for the appropriate management, remediation and validation of contaminated soils if required.	Development of Remedial Action Plan. Implementation of Remedial Action Works. Certificates/audit statements showing remediation/ management of soils.	Remedial Action Plan – to be developed

Criteria	Performance Measure	Performance Indicator	Reference / Source
Overburden Emplacement			
Minimise risk of spontaneous combustion.	Undertake a spontaneous combustion assessment of previous stockpile areas where applicable.	If required and where practical monitoring for heat haze, smoke and odour, may include the use of thermal imagery.	C&A Environmental Procedure *8.3 – Spontaneous Combustion*
Final Void			
Management of the final void during mine decommissioning.	Incorporation of void infrastructure and facilities within the Decommissioning Plan.	Development of Decommissioning Plan.	C&A Environmental Procedure *4.1 – Closure Planning Guidelines* C&A Environmental Procedure *13.1 – Site Contamination Prevention and Control* Rio Tinto Environmental Performance Standard *E5 – Hazardous Material and Contamination Control* Decommissioning Plan

1.3 Landform Establishment

In the context of this MOP, Landform Establishment are the processes involved to achieve stable landforms including slopes, erosion controls, and drainage lines with integrated landscape features, which are compatible with surrounding landforms, whilst ensuring also ensuing that the rehabilitated areas of native vegetation link with undisturbed native vegetation.

The Criteria, Performance Measures and Indicators, together with the justification source which describe structures and method for this data, as relate to the Landform Establishment Stage are provided in Table 2 and address:

- Stabilising landforms;
- Minimising erosion;
- Preventing water pollution;
- Preventing access to open pits or other hazardous locations;
- Enhancing visual amenity; and
- Site user, stock and fauna safety.

The final landform and rehabilitation domain types for MTW during the life of the MOP are shown on **Maps 3A** – **3C** inclusive.

Table 2 Landform Establishment

Criteria	Performance Measure	Performance Indicator	Justification / Source
All Domains			
The final landforms, batter slopes, drainage and benching will be designed to ensure the long term stability of the landform.	Design to enable the agreed end landuse (determined as part of the broader mine closure program) to be established.	Absence of slope failure or uncontrolled erosion. Provide an assessment of the number of gullies or rills occurring in a 50m transect and that these are limited and stabilising. Provide an assessment of the extent of soil loss due to gully and rill erosion and that it is limited and/or is stabilising. No areas of active gully erosion. Sediment control features are assessment in accordance with the relevant management plan	C&A Environmental Procedure *10.1 – Visual Management* C&A Environmental Procedure *8.3 – Spontaneous Combustion*
Landforms to be established during rehabilitation will be constructed to match surrounding landforms, as much as possible.	Elements such as drainage paths, contour drains, ridgelines, and emplacements will be shaped, where possible, in undulating informal profiles in keeping with natural landforms of the surrounding environment.	Landform is generally compatible within the context of the local topography. The landform is to be shaped to ensure slopes are 10 degrees or less unless otherwise agreed. Avoidance of straight lines and angular corners in profiles of final landforms. Drainage lines to be self-sustaining and predominantly constructed of natural materials (e.g. minimise concrete).	
Minimisation of constructed slopes greater than 10 degrees – low walls, ramps and drainage structures.	Identify the exceptions where angles of 10 degrees are necessary and are permitted to be constructed. Obtain regulator's approval if greater than 18 degrees.	Approvals in place for slopes >18 degrees.	
Minimise risk of spontaneous combustion.	Exposed coal seams will be covered with benign materials to prevent spontaneous combustion where practical.	Absence of carbonaceous material on the surface of the rehabilitation and no active spontaneous combustion areas.	

Criteria	Performance Measure	Performance Indicator	Justification / Source
		Details on location of spontaneously combustible materials are contained in the AEMR.	
Final Void			
The final landforms, batter slopes, drainage and benching will be designed to ensure the long term stability of the landform.	Exposed coal seams will be covered	Exposed coal seams will be covered with five metres of inert materials to prevent spontaneous combustion where practical.	
	Cover materials	Acceptable cover material for capping.	
Overburden Emplacement			
Encapsulation	Problematic materials will be capped.	Problematic coarse rejects will be disposed amongst non-carbonaceous overburden materials and covered with 5 metres of inert materials.	Rio Tinto Environmental Performance Standard *E3 – Acid Rock Drainage Prediction and Control* Rio Tinto Environmental Performance Standard *E8 – Mineral Waste Management* C&A Environmental Procedure *12.1 – Acid Mine Drainage Prevention and Control* C&A Environmental Procedure *6.2 Coarse Rejects and Tailings Disposal*
		Net acid generating materials will be managed in accordance with the relevant EMS Procedure and / or site specific Standard.	
		Carbonaceous material will be managed in accordance with the relevant EMS Procedure and / or site specific Standard.	
Surface rocks	Rock on rehabilitated lands	Rocks > 200mm are removed from rehabilitated lands.	C&A Environmental Procedure *5.1 – Disturbance and Rehabilitation*

Criteria	Performance Measure	Performance Indicator	Justification / Source
Tailings Storage Facility			
Operation of TSF.		Performance as per procedure.	Rio Tinto Environmental Performance Standard *E7 – Non Mineral Waste Management* C&A Environmental Procedure *6.2 – Coarse Rejects and Tailings Disposal*
The potential subsidence of materials deposited into the TSF will also be taken into account when designing the final landform.	TSF design and management to allow for progressive reshaping of the surface as settlement occurs. TSF design and management to allow for initial overfilling of the covering material to compensate for expected settlement.	Engineering inspection/TSF audit.	
Problematic materials will be capped.	Tailings storage facilities are capped with overburden and rehabilitated after consolidation of tailings.	TSF design documentation.	

1.4 Growing Media Development

In the context of this MOP Growing Media Development incorporates the processes involved to achieve a soil which is capable of supporting a sustainable plant community. It includes consideration of the chemical, physical and biological properties of the media and takes into account issues such as the specialist requirements, e.g. soil ameliorants aligned to the revegetation of the disturbed areas, whilst also incorporating consideration of landuse that may deviate from the traditional post mining landuse.

1.4.1 Overburden characterisation

At MTW, overburden material varies in physical and geochemical properties, in accordance with the geology of the area and the extent of exposure to weathering.

Chemical analyses of MTW spoil materials indicate that, in general, the overburden is slightly sodic and alkaline, but within acceptable ranges for use as a plant growth medium.

1.4.2 Soil types and suitability

Data derived from the EA demonstrates the suitability of the soils of the project area in terms of the suitability of these soils for use as top dressing and the stripping depth. The distribution of each soil type across MTW and the suitability of these soils for use as topsoil dressing and the stripping depth are presented in Section 0.

Industry experience gained from the use of topsoil derived from pasture and returning to native plant communities has demonstrated the potential for these soils to incur land management issues such as erosion and weed incursions. To address these issues the areas returning to native plant communities will, in the main, be based on “enhanced growing media”, the basis being overburden and appropriate ameliorants i.e. organic fertilisers, gypsum and organic matter.

Soil management is fundamental in successful rehabilitation management at MTW. The key objectives for managing the soil landscape (in context of vegetative cover and soil stability) include:

- Minimising bare soil patches, which would be affected by wind and water movement and the introduction and transportation of resources into and out of the system; and
- Favourable nutrient, infiltration and stability characteristics for the nominated vegetation communities.

The Criteria, Performance Measures and Indicators together with the justification source which describe structures and method for this data as relate to the growing media development stage is provided in Table 3.

Table 3 Growing Media Development

Criteria	Performance Measure	Performance Indicator	Justification / Source
Rehabilitation Areas			
Soil properties are suitable for the establishment and maintenance of selected vegetation species	Tests assessing the growing media's physical properties – texture, structure and Emerson Aggregate assessment. Tests assessing the growing media's chemical properties – pH, salinity, nitrogen, potassium and phosphorous. Tests assessing the growing media's biological properties – organic content, presence of an A-horizon.	pH of replaced topsoil to be broadly within the range suitable for targeted species growth. Electrical Conductivity of replaced topsoil to be broadly within the range suitable for plant growth. Runoff water quality to be broadly trending towards less than 1,000µS/cm after 5 years. Soil Phosphorous levels to be trending towards the range suitable for plant growth . Soil Nitrate levels to be trending towards the range suitable for plant growth. Organic carbon levels are typical of that of the surrounding landscape, increasing or fall within desirable ranges provided by the agricultural industry. Cation Exchange Capacity is typical of that of the surrounding landscape or fall within desirable ranges provided by the agricultural industry. Exchangeable Sodium Percentage (a measure of sodicity) is typical of that of the surrounding landscape or fall within desirable ranges provided by the agricultural industry.	Rio Tinto Environmental Performance Standard *E9 – Land Use Stewardship* C&A Environmental Procedure *5.1 – Disturbance and Rehabilitation* C&A Environmental Procedure *7.1 – Water Management* Warkworth Rehabilitation Strategy (2011)

Topsoil spreading	Topsoil is spread appropriately in a way that will ensure optimum ecosystem establishment.	Topsoil is re-spread directly onto reshaped landforms where possible. Topsoil is spread to an average depth of 10cm. The location of areas where topsoil is respread is recorded on the site GIS.	Rio Tinto Environmental Performance Standard *E9 – Land Use Stewardship* C&A Environmental Procedure *10.3 – Ground Disturbance Permit* C&A Environmental Procedure *5.1 – Disturbance and Rehabilitation* Warkworth Rehabilitation Strategy (August 2011) EA (2010)
Soil ameliorants	Where topsoil has been deemed insufficient to sustain plant growth, or if topsoil is not available soil growth media amelioration may be required.	Soil ameliorants such as gypsum, wood and hay mulch, biosolids, municipal waste composts and other organic wastes are utilised based on availability of supply or Waste Regulation 1996 guidelines. Soil ameliorants are incorporated into the growth medium. The location of areas where soil ameliorants are used is recorded on the site GIS Soil data and plant growing requirements provides the premise for ameliorant and fertiliser application rates. All vegetation up to ~0.2 m diameter will be mulched onsite. Resultant mulch product is spread across the soil surface and incorporated during topsoil stripping.	

1.5 Ecosystem and Landuse Establishment

In the context of this MOP, Ecosystem and Landuse Establishment incorporates the requirements for:

- The management and control of fire, weed and vertebrate pest species;
- Correct flora species selection in terms of the revegetation programmes - refer Section 0 for details on species lists;
- Management of the derived grasslands of the Central Hunter Grey Box–Ironbark Woodland and/or Central Hunter Ironbark–Spotted Gum–Grey Box Forest EECs with a view to establishing the defined EEC's;
- Development and implementation of techniques that focus on the re-establishment of the Central Hunter Grey Box-Ironbark Woodland and/or Central Hunter Ironbark-Spotted Gum – Grey Box Forest EECs;
- The development of systems to enhance opportunities for nutrient cycling and the development and enhancement of habitat for key fauna species; and
- The optimal use of onsite resources, e.g. woody debris, rock, mulch.

Table 4 summarises the threatened species, populations and ECCs that are to be managed in accordance with the Project Approval.

Table 4 Threatened species, populations and ECCs recorded or considered likely to occur within MTW extension area

Threatened fauna species	TSC Act	EPBC Act
Brown Treecreeper (*Climacteris picumnus*)	V	-
Grey-crowned Babbler (*Pomatostomus temporalis*)	V	-
Speckled Warbler (*Chthonicola sagittata*)	V	-
Hooded Robin (*Melanodryas cucullata*)	V	-
Diamond Firetail (*Stagonopleura guttata*)	V	-
Glossy Black-cockatoo (*Calyptorhynchus lathami*)	V	-
Regent Honeyeater (*Anthochaera phrygia*)	E	E
Swift Parrot (*Lathamus discolour*)	E	E
Little Lorikeet (*Glossopsitta pusilla*)	V	-
Spotted Harrier (*Circus assimilis*)	V	-
Varied Sittella (*Daphoenositta chrysoptera*)	V	-
Eastern Bent-wing Bat (*Miniopterus schreibersii oceanensis*)	V	-
Large-eared Pied Bat (*Chalinolobus dwyeri*)	V	V
Eastern Free-tail Bat (*Mormopterus norfolkensis*)	V	
Little Bent-wing Bat (*Miniopterus australis*)	V	
Large-footed Myotis (*Myotis macropus*)	V	
Squirrel Glider (*Petaurus norfolcensis*)	V	-
Endangered Ecological Communities		
Warkworth Sand Woodlands	E	-
Central Hunter Grey Box–Ironbark Woodlands	E	-
Central Hunter Ironbark–Spotted Gum–Grey Box Forest	E	-

V= Vulnerable; E = Endangered

Additional threatened flora species and ECCs are known to occur within the Warkworth extension area, however none of these species/populations are located within the proposed disturbance area and would therefore not be impacted by mining activities. As such, they have not been included in this assessment.

This information has provided the framework for the development of the Criteria, Performance Measures and Indicators for Ecosystem and Landuse Establishment which are provided in Table 5.

Table 5 Ecosystem and Landuse Establishment

Criteria	Performance Measure	Performance Indicator	Justification/Source
All Domains			
Weed Control	Weeds are controlled to appropriate levels.	The amount of weeds present is comparable to reference sites or baseline survey. Annual inspections of Mine lands are undertaken to identify areas requiring the implementation of weed management measures. Implementation of appropriate weed management measures which may include mechanical removal, application of approved herbicides and biological control. Recording of areas where weed control has been conducted in a GIS database which is regularly maintained. Follow-up inspections to assess the effectiveness of the weed management measures implemented and the requirement for any additional management measures.	Rio Tinto Environmental Performance Standard *E9 – Land Use Stewardship* C&A Environmental Procedure *5.1 – Disturbance and Rehabilitation* *Noxious Weeds Act 1993* Australian and NSW Weed Strategies TSC Act – Key Threatening Processes
Pest animal species	Pest animal control for any declared pest animal species known on the project lands.	Mandatory pest control for any declared pests known to occur on Mine owned land. Use of a range of appropriate pest control measures as determined (e.g. the destruction of habitat, trapping, targeted shooting programs and baiting). Follow-up inspections to assess the effectiveness of control measures implemented and the requirement for any additional control measures.	Rio Tinto Environmental Performance Standard *E9 – Land Use Stewardship* C&A Environmental Procedure *5.1 – Disturbance and Rehabilitation* *Rural Lands Protection Act 1998* TSC Act – Key Threatening Processes
Bushfire preparedness and risk mitigation	Vegetation is managed to control fire.	Implementation of actions as per the Bushfire Management Plan .	Mount Thorley Warkworth Bushfire Management Plan

Criteria	Performance Measure	Performance Indicator	Justification/Source
			Rural Fires Act 1997
Seed collection and utilisation	Data on seed utilisation.	Data on seed utilisation is collated via the use of GIS data including: - Date of seeding - Species mix used. - Viability data – where available.	Rio Tinto Environmental Performance Standard *E9 – Land Use Stewardship* C&A Environmental Procedure *5.1 – Disturbance and Rehabilitation* C&A Environmental Procedure *10.2 – Flora and Fauna* Warkworth Rehabilitation Strategy (August 2011)
Rehabilitation Area			
Establishment and germination of vegetation.	Tube stock planting	Woodland/grassland seed and tubestock supply will preferentially be of local provenance. Seed and tubestock supplied from outside sources will be preferentially of Hunter provenance or from an area within NSW of similar climatic conditions to the Singleton area or as research defines. Tubestock is to be watered the day before and immediately prior to planting. Tubestock is to be planted with water soluble polymer (tree gel). Seedlings are hardened off before they are planted.	C&A Environmental Procedure *5.1 – Disturbance and Rehabilitation* C&A Environmental Procedure *10.2 – Flora and Fauna* Warkworth Rehabilitation Strategy (August 2011) Hunter Ironbark Research Programme CSIRO Methodology for Ecosystem Function Analysis (EFA) (Tongway, 2004).
	Revegetation works aligned to seasonality of rainfall, evaporation and temperature.	Warm season grasses are seeded late spring to autumn. Cool season perennial grasses are planted late autumn-early spring. Tree planting to be undertaken in autumn (between April and August) and after first rains to provide adequate soil moisture.	

Criteria	Performance Measure	Performance Indicator	Justification/Source
	The vegetation is developing in structure and complexity comparable to that of the local remnant vegetation	Based on key physical, biological and chemical characteristics the LFA Stability Index provides an indication of the site's stability and that it is comparable to or trending towards that of analogue sites (%). Based on key physical, biological and chemical characteristics the LFA Infiltration Index provides an indication of the site's infiltration capacity and that it is comparable to or trending towards that of analogue sites (%). Based on key physical, biological and chemical characteristics the LFA Nutrient Recycling Index provides an indication of the site's ability to recycle nutrients and that it is comparable to or trending towards that of analogue sites (%). The Landscape Organisation Index provides a measure of the ability of the site to retain resources and that it is comparable to or trending towards that of analogue sites (%).	
	Predation by herbivores	All plantings at risk of foraging by fauna (rabbits, hares, wallabies and kangaroos) are protected by the pre planting application of deterrent spray, and/or tree guards and/or exclusionary fencing wherever practical.	
Minimise site impact in terms of compaction of soil, the spread of weeds and disturbance to vegetation	No uncontrolled entry of livestock or vehicles.	Vehicle access is restricted to defined access pathways for use by authorised vehicles. The main arterial tracks are maintained in good condition.	C&A Environmental Procedure *10.3 – Ground Disturbance Permit*
	Signage	Key habitat and rehabilitation areas will be fenced or signposted where appropriate to prevent the uncontrolled entry of livestock and to minimise vehicular traffic during the establishment phase.	
Habitat augmentation	Coarse Woody Debris and rocks	Horizontal placement of hollow logs or small piles of timber and rocks are installed across the site creating cavities for habitat for small ground dwelling mammals and reptiles.	C&A Environmental Procedure *5.1 – Disturbance and Rehabilitation* Biodiversity Management
	Drainage depression (frog ponds) creation	Habitat is developed using common native rushes /sedges in unshaded locations, free from predatory fish, nearby grassland and	

Criteria	Performance Measure	Performance Indicator	Justification/Source
	providing riparian and aquatic habitat	sheltering sites of vegetation and rocks.	Plan (2012) Warkworth Rehabilitation Strategy (August 2011)
	Plant species selection.	Plant species are used which create suitable habitat for woodland birds e.g. flaky bark, production of small and large sized woody debris, diversity of flowering time. Plant prickly species (e.g. Native Boxthorn) that provide critical habitat for certain species.	
	Provide diversity of habitats to improve biodiversity.	Create areas of open woodland where trees and shrubs are not planted too densely (create "patchiness") and provide relatively large patches of grassland with scattered trees. Create patchwork of dense thickets of shrubs.	
Rehabilitation Areas – Grassland			
Species Selection	Establishment of 1,129 ha grassland communities with a native component on the residual disturbed mining areas.	1,129ha of grassland established on rehabilitated mine lands. Create an additional north/south wildlife corridor providing connectivity to other habitat.	Rio Tinto Environmental Performance Standard *E9 – Land Use Stewardship* C&A Environmental Procedure *5.1 – Disturbance and Rehabilitation* C&A Environmental Procedure *10.2 – Flora and Fauna* Biodiversity Management Plan (2012) Warkworth Rehabilitation Strategy (August 2011)
	Species used are compatible with agricultural outcomes.	Species sown are based on those recommended species list from (Diversity Native Seeds Scope of Services). The number of grass species comprising the vegetation community is comparable to that of analogue sites (no. species/area).	
Rehabilitation Areas – Woodland Other			

Criteria	Performance Measure	Performance Indicator	Justification/Source
Species Selection	Establishing approximately 2,067 ha of trees over grassland areas, but not necessarily conforming to any particular vegetation community	2,067ha of trees over grassland established on rehabilitated mine lands. The number of tree species comprising the vegetation community is comparable to that of analogue sites (no. species/area). The number of grass species comprising the vegetation community is comparable to that of analogue sites (no. species/area). The density of trees is comparable to that of analogue sites (no./area). Species sown are based on those recommended species list from .	Rio Tinto Environmental Performance Standard *E9 – Land Use Stewardship* C&A Environmental Procedure *5.1 – Disturbance and Rehabilitation* C&A Environmental Procedure *10.2 – Flora and Fauna* Biodiversity Management Plan (2012) Warkworth Rehabilitation Strategy (August 2011)
Rehabilitation Areas – Woodland EEC			
Species Selection	Establishment of 32ha of Central Hunter Grey Box-Ironbark Woodland and / or Central Hunter Ironbark-Spotted Gum-Grey Box Forest on rehabilitated mine lands.	32ha of Central Hunter Grey Box-Ironbark Woodland and / or Central Hunter Ironbark-Spotted Gum-Grey Box Forest established on rehabilitated mine lands. Create an additional north/south wildlife corridor providing connectivity to other habitat. The number of tree species comprising the vegetation community is comparable to that of analogue sites (no. species/area). The number of shrub species comprising the vegetation community is comparable to that of analogue sites (no. species/area). The number of grass species comprising the vegetation community is comparable to that of analogue sites (no. species/area). The number of subshrub species and understorey species (other than grasses) comprising the vegetation community is comparable to that	Rio Tinto Environmental Performance Standard *E9 – Land Use Stewardship* C&A Environmental Procedure *5.1 – Disturbance and Rehabilitation* C&A Environmental Procedure *10.2 – Flora and Fauna* Biodiversity Management Plan (2012) Warkworth Rehabilitation

Criteria	Performance Measure	Performance Indicator	Justification/Source
		of analogue sites (no. species/area). The native plant species richness is within 50-100% or exceeds that of analogue sites (no. species/area). The density of trees is comparable to that of analogue sites (no./area). Species sown are based on those recommended species list from .	Strategy (August 2011)
	Species used are compatible with agricultural or native biodiversity conservation outcomes. Revegetation focusing on reinstating endemic woodland ecological communities utilising flora species which provide a range of canopy, mid and understorey species.	Species sown are based on those recommended species list from industry lead practice and the Hunter Ironbark Research Programme.	

1.6 Ecosystem and Landuse Sustainability

In the context of this MOP, Ecosystem and Landuse Sustainability incorporates the:

- Development of profiles in the growing media aligned to the nominated EECs;
- Sustainable development of the nominated areas of the EECs;
- Vegetation communities capable of withstanding catastrophic events, e.g. bushfire and extensive drought;
- Nutrient cycling;
- Species diversity and abundance for both flora and fauna; and
- Recolonisation of the sites by key indicator species.

The Criteria, Performance Measures and Indicators together with the justification source which describe structures and method for this data as they relate to the Ecosystem and Landuse Sustainability Stage is provided in Table 6.

Table 6 Ecosystem and Landuse Sustainability

Criteria	Performance Measure	Performance Indicator	Justification/Source
Rehabilitation Areas			
Ecosystem resilience	Monitoring of the placement and utilisation of habitat features and artificial roosting/nesting boxes.	Nest boxes will be installed to supplement arboreal habitat. Data on the location and species specificity of each nest box is collected and collated via Geographical Information System (GIS). Record utilisation of nest boxes.	Rio Tinto Environmental Performance Standard *E9 – Land Use Stewardship* C&A Environmental Procedure *5.1 – Disturbance and Rehabilitation* CSIRO Methodology for Ecosystem Function Analysis (Tongway, 2004) Warkworth Rehabilitation Strategy (August 2011) Rehabilitation Management Plan (2012) Biodiversity Management Plan (2012) EA (2010)
Ecosystem Connectivity	Vegetation communities in areas of rehabilitation have been designed to enhance connectivity across the site and to adjoining landscape.	Align vegetation communities on areas of rehabilitation to adjacent landscape. GIS data reflects connectivity of vegetation communities.	
Rehabilitation Area - Grassland			
Ecosystem resilience	Weed management and control	Weed plant cover (calculated as a percentage of total ground cover) is comparable to that of analogue sites. (% Cover)	Rio Tinto Environmental Performance Standard *E9 – Land Use Stewardship* C&A Environmental Procedure *5.1 –*
Ecosystem health	The ecosystem is in a condition comparable to the vegetation of the analogue site.	Total groundcover is the sum of protective ground cover components (dead and live plant material, rocks and logs) and is comparable to that of analogue sites (% Cover).	

Criteria	Performance Measure	Performance Indicator	Justification/Source
Ecosystem health		The abundance of understorey species (non-weed) per square metre, averaged across the site, provides an indication of the heterogeneity of the site and that the number of non-weed species is comparable to analogue sites (no. species/m2).	*Disturbance and Rehabilitation* CSIRO Methodology for Ecosystem Function Analysis (Tongway, 2004) Warkworth Rehabilitation Strategy (August 2011) Rehabilitation Management Plan (2012) Biodiversity Management Plan (2012) EA (2010)
Rehabilitation Area – Woodland Other			
Ecosystem resilience	Weed management and control	Weed plant cover (calculated as a percentage of total ground cover) is comparable to that of analogue sites. (% Cover)	Rio Tinto Environmental Performance Standard *E9 – Land Use Stewardship* C&A Environmental Procedure *5.1 – Disturbance and Rehabilitation* CSIRO Methodology for Ecosystem Function Analysis (Tongway, 2004) Warkworth Rehabilitation Strategy (August 2011) Rehabilitation Management Plan (2012) Biodiversity Management Plan (2012)
Ecosystem health	The ecosystem is in a condition comparable to the vegetation of the analogue site.	Total groundcover is the sum of protective ground cover components (dead and live plant material, rocks and logs) and is comparable to that of analogue sites (% Cover).	
		The diversity of maturing trees and shrubs with a stem diameter greater than 5cm is comparable to that of analogue sites (no./area).	
		The percentage of maturing trees and shrubs with a stem diameter greater than 5cm that are local endemic species is comparable to analogue sites.	
		The density of maturing trees and shrubs with a stem diameter greater than 5cm is comparable to analogue sites (no./area).	
		Average trunk diameter (dbh) of the tree population provides a measure of age and growth rate and that it is trending towards that of analogue sites (cm).	

Criteria	Performance Measure	Performance Indicator	Justification/Source
		The percentage of the tree population which are in healthy condition and that the percentage is comparable to analogue sites.	EA (2010) Biobanking Assessment Methodology (2008)
		The percentage of the tree population which are in a medium health condition and that the percentage is comparable to analogue sites.	
		The percentage of the tree population which are in a state of advance dieback and that the percentage is comparable to analogue sites.	
Ecosystem health	The ecosystem is in a condition comparable to the vegetation of the analogue site.	The presence of reproductive structures such as buds, flowers or fruit on trees and shrubs provides evidence that the ecosystem is maturing, capable of recruitment and can provide habitat resources and that the % population is comparable to that of analogue sites.	
		The proportion of over-storey species occurring as regeneration is within 50-100% or exceeds that of analogue sites.	
Rehabilitation Area – Woodland EEC			
Ecosystem health	The ecosystem is in a condition comparable to the vegetation of the analogue site.	The percentage of native over storey cover is within 50-100% or exceeds that of analogue sites.	Rio Tinto Environmental Performance Standard *E9 – Land Use Stewardship* C&A Environmental Procedure *5.1 – Disturbance and Rehabilitation* CSIRO Methodology for Ecosystem Function Analysis (Tongway, 2004) Warkworth Rehabilitation
		The percentage of native mid storey cover is within 50-100% or exceeds that of analogue sites.	
		The percentage of native ground cover (grasses) is within 50-100% or exceeds that of analogue sites.	
		The percentage of native ground cover (shrubs) is within 50-100% or exceeds that of analogue sites.	
		The percentage of native ground cover (other) is within 50-100% or exceeds that of analogue sites.	

Criteria	Performance Measure	Performance Indicator	Justification/Source
		Exotic plant cover (calculated as a percentage of total ground cover and mid storey cover) is within 5-33% or less than that of analogue sites.	Strategy (August 2011) Rehabilitation Management Plan (2012) Biodiversity Management Plan (2012) EA (2010) Biobanking Assessment Methodology (2008)
		Total groundcover is the sum of protective ground cover components (dead and live plant material, rocks and logs) and is comparable to that of analogue sites (% Cover).	
		The abundance of native understorey species per square metre, averaged across the site, provides an indication of the heterogeneity of the site and that the number of native species is comparable to analogue sites (no. species/m2).	
Ecosystem health	The ecosystem is in a condition comparable to the vegetation of the analogue site.	The diversity of maturing trees and shrubs with a stem diameter greater than 5cm is comparable to that of analogue sites (no./area).	
		The percentage of maturing trees and shrubs with a stem diameter greater than 5cm that are local endemic species is comparable to analogue sites.	
		The density of maturing trees and shrubs with a stem diameter greater than 5cm is comparable to analogue sites (no./area).	
		Average trunk diameter (dbh) of the tree population provides a measure of age and growth rate and that it is trending towards that of analogue sites (cm).	
		The percentage of the tree population which are in healthy condition and that the percentage is comparable to analogue sites.	
		The percentage of the tree population which are in a medium health condition and that the percentage is comparable to analogue sites.	
		The percentage of the tree population which are in a state of advance dieback and that the percentage is comparable to analogue sites.	

Criteria	Performance Measure	Performance Indicator	Justification/Source
		The presence of reproductive structures such as buds, flowers or fruit on trees and shrubs provides evidence that the ecosystem is maturing, capable of recruitment and can provide habitat resources and that the % population is comparable to that of analogue sites.	
		The proportion of over-storey species occurring as regeneration is within 50-100% or exceeds that of analogue sites.	
Ecosystem health	Provide fauna habitat features comparable to that of the analogue site.	The total length of fallen logs is within 50- <100% or exceeds that of analogue sites.	Biobanking Assessment Methodology (2008)
		The number of hollows / nesting sites is within 50- <100% or exceeds that of analogue sites.	

Appendix R

Waste management strategy information

Appendix R — Waste management strategy information

R

EP6.02
COARSE REJECTS AND TAILINGS DISPOSAL

1. Purpose

To ensure that coarse rejects and tailings are adequately managed, handled and disposed of in a manner that will minimise the potential impacts to the surrounding environment.

2. Scope

This Procedure applies to all CNA managed mines, infrastructure and any associated activity.

3. Definitions

Co-disposal:	The mixing of coarse and fine waste streams to produce a waste material with superior physical handling properties to either of the constituent wastes.
Coarse Reject Material:	A mixture of coarse stone and carbonaceous material that does not satisfy the specification for product coal. Also described as chitter, reject or coarse reject material.
Reject Cell:	An area prepared with windrows of overburden to contain reject in areas designated for reject placement. Reject cells shall not be located in the cut i.e. beneath low walls and or high walls. (Bengalla only).
Tailings:	A wet mixture of fine clay, silt and fine carbonaceous material that does not satisfy the specification for product coal and is approximately 70% aqueous. Also described as fine reject or fine reject material.
MOP	Mining Operations Plan. A detailed mining, environmental and rehabilitation plan approved under Mining Lease.
Emplacement Permit	Approval under Coal Mine Health & Safety Act 2002 (s102) to construct an emplacement area.
Dam Safety Certificate	A certificate issued under the under the Dam Safety Act 1978 to show that the dam has been constructed in accordance with the design drawings and specifications.
ARD	Acid rock drainage

4. Actions

4.1 Coarse Reject

Reject material must be:

- Disposed of amongst non-carbonaceous overburden material.
- Placed into the overburden emplacements in a manner that must ensure adequate mixing with the overburden material and minimise potential instability.
- Covered with overburden material to a depth of at least: one (1) metre at HVO & MTW; five (5) metres at Bengalla; or as otherwise specified from time to time by site MOPs or Environmental Impact Statements. Where a risk of spontaneous combustion and/or acid generation is identified, the coarse rejects shall have a cover designed in accordance with procedures EP 8.3 Spontaneous Combustion and EP 12.1 Acid Rock Drainage Prediction and Control.

4.2 Tailings

4.2.1 Design and Construction

Tailings Dams must be designed by a suitably qualified, competent, and independent dam engineer. Similarly, a suitably qualified and competent design engineer must design associated pump systems.

Before commencing construction, the dam design must be submitted to:

- The Dam Safety Committee for review. The Committee will determine if the dam should be prescribed under the NSW Dam Safety Act 1978.
- The Department of Primary Industries as part of an application for approval under Section 102 of the Coal Mine Health & Safety Act 2002..

Selected locations for tailings impoundments must take into account topography including the location of surface water drainage lines, the location of groundwater and infrastructure in the area, particularly downstream. In-pit locations are preferred.

Topsoil located in the vicinity of proposed tailings dams must be stripped for use in rehabilitation, in accordance with procedure EP 5.1 Rehabilitation.

The walls of the tailings dam must be constructed using suitably competent materials.

Dams must be designed and operated with enough freeboard to contain the maximum rainfall runoff from a 1:100 Average Recurrence Interval storm.

The dam spillway level must be at least 1 metre above the water level from the 1:100 Annual Exceedance Probability flood in adjacent watercourses.

4.2.2 Disposal

Wet Disposal

Tailings must be pumped to the tailings impoundment using a system of pipes and pumps.

Pipes must be located or bunded to ensure that tailings will not discharge off-site, into watercourses or into the site clean water management system in the event of a leak.

The pipes must be inspected daily for leaks and failures. Where indicated by risk assessment, the pipe system must be fitted with an automatic cut-off system that activates if flow rates at the pump and outfall differ by specified amounts.

Operation of all tailings dams and tailings pipelines must be in accordance with the applicable Tailings Facility Operations and Maintenance Manuals and construction approval conditions.

Co-Disposal (Bengalla)

Tailings must be dewatered, mixed with coarse reject and disposed of in the overburden emplacements in accordance with Section 4.1 of this procedure.

Rejects will be safely block tipped into a suitable reject cell, with a barrier of sufficient height and strength to prevent rear dump trucks passing through or over it. Reject **will not be tipped** over a face or in the cut under any circumstances.

4.2.3 Inspections and Monitoring

Each active tailings dam must:

- Prior to placing tailings, have an Operations & Maintenance Manual prepared by an experienced tailings dam engineer. The manual must set out accountabilities, inspection and operational requirements.
- Be operated in accordance with the Tailings Dam Operations & Maintenance Manual.
- Be inspected regularly in accordance with the inspection schedule set out in the Operations & Maintenance Manual.

Additional inspections may be performed under local site procedures.

Employees who perform inspections must be appropriately trained to a level of competence to perform the inspections.

Prescribed dams under the Dam Safety Act must be inspected in accordance with any additional requirements set out by the NSW Dam Safety Committee, and surveillance reports must be prepared as described in the Tailings Dam Operations Manual. Tailings impoundments must be inspected according to the established inspection regime for potential overtopping.

An independent, appropriately qualified and experienced engineering

specialist must be engaged to:

- Review the records of regular inspections on a quarterly basis.
- Perform structural and geotechnical inspections annually. The frequency should be bi-annual for the first two years of a new facility.
- Prepare a written report annually for each tailings facility. The report must meet Dam Safety Committee and construction approval inspection and reporting requirements. The report shall address performance against the operations and maintenance manual for each dam.

Independent , appropriately qualified engineering specialists must inspect tailings impoundments at least every two years to confirm correct operation, review past performance and structure stability and identify any potential failure. These inspections are required to meet Rio Tinto inspection requirements.

The decant water chemistry must be monitored from all tailings dams that contain material identified as potentially acid forming.

Groundwater monitoring must be undertaken down slope of tailings dams where the need is identified by a risk assessment.

4.2.4 Closure

Designs for the installation of tailings impoundment must include a design plan for closure. The closure plan must include obtaining regulatory approval to close the tailings impoundment. Tailings impoundments that are "life of mine" must be included in the Closure Plan for the site.

The closure design must address: tailings containment; minimisation of leaching into ground and surface waters; the final landform; surface drainage to protect the final landform and prevent erosion; minimising post-closure maintenance; contamination through surface dusting; and any identified ARD risks.

The closure design must include monitoring plans for landform stability and acid generation that are commensurate with the risk.

Rehabilitation must involve capping with at least 2m of inert material; covering with topsoil; and planting appropriate vegetation commensurate with any identified stability or ARD concerns.

4.3 Monitoring of Materials and Keeping of Records

- Although coarse and fine reject at Coal & Allied active operations are generally non-acid forming, there is a quantifiable risk that acid generating materials will be placed near the surface. To manage this risk a sampling programme must be implemented as defined in procedure EP 12.1 Acid Rock Drainage Prediction and Control.
- A programme of targeted, routine sampling of coarse and fine reject streams shall be developed and conducted in accordance with procedures EP 8.3 Spontaneous Combustion and EP 12.1 Acid Rock Drainage

Prediction and Control. Potential acid forming and combustible material must be managed in accordance with the requirements of the above procedures.

- Records of the volume, disposal location and hazards of identified high risk material must be kept and managed in accordance with the requirements of the above procedures.
- The stability of overburden emplacements containing dumped reject material that is at risk of acid generation or of spontaneous combustion must be monitored. Monitoring records must be kept. Any potential stability problem must be managed in accordance with the requirements of the above procedures.

4.4 Facilities

4.4.1 Hunter Valley Operations

Tailings storage facilities at Hunter Valley Operations are:

- Bobs Dump Tailings Dam (West Pit)
- Howick Tailings Dam (West Pit)
- Centre Tailings Dam (North Pit)
- South East Tailings Dam (North Pit)
- North Pit Void Tailings Dam (North Pit)
- Lemington No. 5 (Cheshunt Pit)

4.4.2 Mount Thorley Warkworth Operations

Tailings storage facilities at Hunter Valley Operations are:

- Tailings Dam 1 (North Pit)
- Tailings Dam 2 (North Pit)
- Centre Ramp Tailings Dam (South Pit)
- Interim Tailings Dam (North Pit)
- The Mini-Strip (South Pit)

4.4.3 Bengalla Mine

Bengalla Mine utilises a co-disposal controlled waste operation.

5. Responsibilities

Manager Coal Preparation Plant	• Day-to-day operation and management of all tailings impoundments and tailings pipelines. • Design, installation, operation, decommissioning and

	closure of all tailings impoundments located within the mining lease. • Ongoing structural inspections, technical review of, maintenance and repairs to the tailings impoundments.
Manager Mining	• Placement and disposal of coarse reject inside the mining lease.
Manager Mine Planning	• Short term mine planning and scheduling to provide adequate volume for storage of fine reject at the selected tailings storage facility. • Scheduling of selected material for timely construction of embankments.
Manager Resource Planning	• Develop and maintain a Tailings Strategy consistent with all regulatory approvals. • Long term site selection and feasibility designs. • Maintain and update the capital budget for tailings storage facilities. • Communicate the Tailings Strategy to Managers CPP, Mine Planning and Project Approvals.
Manager Environmental Services (RTCA)	• Perform audits against construction approvals and Rio Tinto Standards. • Review the environmental aspects of the designs for installation and closure for tailings impoundments and pipelines.

6. Attachments

PRO-0259 Reject Handling When Mining Operations Are Not Being Carried Out

7. References

Environmental Procedures

EP 5.1 Rehabilitation

EP 8.3 Spontaneous Combustion

EP 12.1 Acid Mine Drainage Prevention and Control

Other Mandatory Documents

Construction approvals for each active tailings dam.

Tailings Facility Operations and Maintenance Manuals.

Mining Operations Plans for each Pit.

Coal Leases for each Pit.

Development Consents for each Pit

Environmental Management Plans for each pit.

Guidelines

Tailings Management Handbook, DRET Leading Practice Sustainable Development Program for the Mining Industry

Revisions

Number	Date	Description of Change
1	24/09/2003	First draft released for general comment
2	9/8/2005	Reviewed and updated by BMC, MTW and HVO
3	15/8/05	Released as final version 1.1
4	4/9/07	Revised to include DPI MR requirement for 2m cap of inert material on tailings dams and released for general comment
5	10/9/07	Reviewed and updated by BMC, MTW and HVO
6	25/10/07	Released as final version 1.2

CNA-10-EWI-SITE-E7-008
NON-MINERAL WASTE MANAGEMENT

1. Purpose

To ensure that:

- Non-mineral waste management and disposal meets all regulatory requirements and relevant Rio Tinto standards;
- appropriate segregation, collection, handling, transport and disposal of waste is undertaken which minimises the impacts on the environment;
- planning, process design and purchasing will result in the maximum reuse and recycling of materials.

2. Scope

This Environmental Work Instruction applies to all CNA managed mines, infrastructure and any associated activity. The management of contaminated water and mineral wastes are addressed elsewhere in other CNA's environmental work instructions.

3. Definitions

Waste	Any material whether solid, liquid or gas resulting from an activity, operation or process for which the mine has no further use. Wastes are classified under the Department of Environment's Waste Classification Guideline. These waste classifications are broken into six waste classes, Special waste, Liquid waste, Hazardous waste, Restricted waste, General Solid waste (putrescible and non-putrescible).
Special Waste	'Special waste' is a class of waste that has unique regulatory requirements. It includes clinical waste, asbestos waste, and waste tyres.
Liquid Waste	Liquid waste means any waste that: • Has an angle of repose of less than 5 degrees, or • Becomes free flowing at or below 60 degrees Celcius or when it is transported, or • Is not generally capable of being picked up by spade or shovel
General Waste	Broken windscreens, food scraps, plastic food wrap, treated timber pallets, plasterboard, drained rubber hoses, waste rubber, waste rope, damaged air filters, lightly contaminated rags (no free oil), styrofoam cups, fibreglass, floor sweepings.
Restricted Waste	Restricted solid waste would only include wastes assessed and classified as restricted solid waste in accordance with Waste Classification Guidelines.
Hazardous waste	Waste that has properties that are potentially harmful to people or the environment, including: • waste with a pH less than or equal to 2.0 or greater than or equal to 12.5 • containers that have not been cleaned and that contained dangerous goods

	within the meaning of the Australian Code for the Transport of Dangerous Goods by Road and Rail • lead-acid or nickel-cadmium batteries, being waste generated or separately collected by activities carried out for business, other commercial or community services purposes • lead paint waste other than solely from residential premises or educational or child care institutions any mixture of waste referred to above.
Recyclable material	Material that can be used as a raw material in the production of other materials or in another process, including scrap metals, paper and cardboard, most plastics, and woodchip.
Reusable materials	Material that can be reused in its present form, including but not limited to pallets, timber, conveyor belting, metals, air filters and office toner cartridges
Primary Waste Contractor (PWC)	The contractor awarded the contract for the collection, transport and disposal of wastes from the relevant CNA site in accordance with regulatory requirements. The primary waste contractor may engage qualified sub-contractors to manage individual waste streams.

4. Actions

4.1 Planning

Minimising resource usage and potential for the generation of waste must be an important consideration in:

- the redesign of equipment;
- the modification of processes; and
- the introduction of new or alternative processes.

Authorized contractors will undertake the removal of waste from Coal & Allied sites in a manner consistent with regulatory, Rio Tinto Standard and contractual requirements. Disposal or treatment of waste must only be carried out in engineered and approved facilities and in accordance with established operational procedures. The Primary Waste Contractor (PWC) will maintain records of all wastes collected. A verification assessment of PWC and their facility will be carried out every two years. Where the PWC uses sub-contractors, the PWC is to carry out a verification assessment of their contractors (used on CNA sites) annually.

4.2 Purchasing

Personnel ordering or purchasing materials or equipment will:

- give preference to products that are recyclable or reusable over products that are either not recyclable or reusable, or have a lower potential for recycling or reuse;
- avoid products that, because of their characteristics, require complex handling procedures or generate wastes that are hazardous or are difficult and expensive to dispose of;
- give preference to products that have the minimum of packaging and/or packaging which is reusable or recyclable.

All contracts for the provision of goods and services to Coal & Allied will place on contractors and suppliers a duty of care in regard to waste management.

4.3 Waste Segregation

Waste facilities will be clearly signed for clear identification.

When handling waste materials all personnel shall ensure that the necessary safe working procedures are followed and that appropriate personal protective equipment is used. The following wastes shall be required to be placed in the respective storage bins.

4.3.1 General waste

General Waste Bins

The general waste bins are colour coded green and are clearly labelled to accept the following materials:

- Food scraps (putrescible waste)
- Food wrappers
- Non-recyclable plastics (cling wrap, plastic adhered to another material)
- Rope
- Rubber (Note: hydraulic hoses to be drained of oil)
- Polystyrene cups
- Green plant waste
- Damaged pallets or wooden products
- Rubber bands, metal clip binders, pens
- Damaged air filters
- Lightly soiled rags and absorbents containing diesel, oil or grease

Note: Items such as any solvents, <u>saturated</u> oily rags or absorbents should not be placed in these bins

Pallets

- Used wooden pallets no longer needed are required to be stored at the Waste Management Facility or Supply compound for collection by CNA's Primary Waste Contractor (PWC)
- To reduce the risk of fire hazards and improve housekeeping, no more than 50 pallets shall be stored at this facility at any one time
- Pallets and other wooden products will be taken off-site by the PWC.

4.3.2 Recyclable waste

General Recyclables

Recyclable waste bins are lilac in colour. Recyclable materials are able to be co-mingled in these bins and include:

- Paper—copy paper, newspaper, hand towels, phone books, envelopes
- Magazines
- Aluminium cans
- Glass bottles
- Cardboard
- Plastics which show a recyclable logo

Scrap metal

Scrap metal bins are coloured blue and are able to accept the following metal items:

- Heavy melted scrap (HMS)
- Light gauge scrap
- Aluminium
- Brass
- Lead
- Copper
- All scrap metal

Note: The safe working load for the scrap metal skip bins is no greater than 10 tonnes of material. Bins must not be overloaded.

Steel bin

Plastic Packaging

Bulk plastic frames are provided in stores areas for the recycling of plastic wrap from palletised packaging. Large plastic bags are supplied which are fitted inside the steel frames. Once the plastic bags are full they can be recycled via the 3 cubic meter recycling bins.

4.3.3 Regulated waste

Regulated waste must be tracked and recorded using DECCW approved forms and systems. These materials are required to be placed into the following colour coded and labelled storage bins.

Waste Grease and Blackjack

- Small volumes of waste liquid lubricants can be stored for disposal in closed topped 205L drums
- These are to be stored in brown 205L drums
- Disposal of materials with the grease (such as gloves, rags and plastics) should be avoided to reduce treatment costs.

Waste Grease bin

Oily Rags, Hydrocarbon Contaminated Soil, and Used Oil Absorbents

Hydrocarbon contaminated materials are to be stored in yellow wheelie bins, 205L drums or specially labelled workshop bins, and includes:

- **<u>Any</u>** absorbent material or rags containing **petrol or solvents**.
- **<u>Heavily saturated</u>** absorbent material containing **diesel, oil or grease**.

NOTE: Oily rag disposal is the most expensive form of waste disposal. ***Lightly soiled rags containing diesel, oil or grease can go in general waste bins.***

- Hydrocarbon contaminated soil should only be placed in bins if the site does not have a bioremediation area

Oily rags and absorbent

Oily Filters

- Oil filters only—all types

Bengalla blue bins – CNA yellow bins

Degreaser and Other Solvents

- The nominated supplier or service agent for CNA's parts washing machines is required to transport and dispose of waste degreaser or solvents and report on this as per section 4.5.

Hydraulic Hoses

- Hoses should be drained first and then stored in the general waste bin. Metal couplings should be docked and disposed in the scrap steel bin. This is a less expensive method of disposal than using hydraulic hose bins (provided for MTW and HVO).

Waste oil and oily water

- Waste oils shall be evacuated and stored in the operation's bulk waste oil storage tanks. These facilities are required to be bunded and compliant with AS1940 (includes the requirement for impermeable bund wall and floor; bunded area shall contain no less than 110% capacity of the largest tank)
- 205L drums of waste oil are to be evacuated to the bulk waste oil storage tanks, unless the oil is known to be incompatible with other oils.
- Waste oil must be collected and transported by the PWC
- Oily water shall be treated on site (as far as practicable) and stored within bulk oily water storage tanks for collection and treatment by the PWC

Bulk waste oil storage facility (fully bunded)

Waste coolant

Used coolant is required to be stored at the bulk fuel facility for collection by the PWC. The collection and frequency of pickups shall be determined by the Maintenance Department in consultation with the PWC.

20, 60 & 205 Litre Drums

- Used oil drums are required to be drained of all hydrocarbon based residues and taken to the Waste Management Compound for temporary storage
- Drums must be stored on honeycomb pallets or in a bunded area
- The PWC will arrange for the pick-up, crushing and recycling of these drums on an as required basis

Used drums stored in bunded areas prior to collection and disposal

Lead acid batteries

- At Bengalla used batteries are stored inside DG rated Battery storage unit on pallets.
- At HVO and MTW used batteries are stored on pallets in designated bunded areas.
- The area owner will inspect bunded pallets weekly and arrange for collection of any contaminated liquid by the PWC. It is the area owners responsibility to ensure batteries are stored appropriately for collection (on pallets stacked no more than two high).
- The PWC will arrange for the pick-up, packaging and transport of batteries to a licensed scrap metal merchant
- Light vehicle batteries not able to be recharged are returned to site to enable reconciliation prior to disposal by the PWC

Used batteries are stored inside DG rated Battery storage unit on pallets

4.3.4 Other Waste

Conveyor belting

- Used conveyor belt is required to be placed at either the designated waste management facility or supply compound
- The conveyor belt is required to be rolled into manageable lengths and strapped for ease of collection (no more than 2 kilometres of conveyor belting shall be stored at the Bengalla compound)
- The PWC shall be responsible for the collection and recycling of conveyor belt
- If there is no recycling or reuse market available, the strapped rolls will be treated in accordance with the heavy vehicle tyre procedure

Conveyor belting ready for collection

Toner cartridges

Office printer, photocopier and fax toner cartridges are required to be either

- placed back in their boxes and taken to the stationary storage area at HVO or MTW, from where they will be collected by the stationery supplier for reuse/recycling/disposal, or
- placed in the Planet Ark boxes located at Bengalla's Commercial and Technical Services Departments for collection by the PWC.

Tyres

Light Vehicle

Unserviceable light vehicle tyres, including medium truck tyres, must be:

- placed at a designated collection point at the store or maintenance area;
- removed from site by the contracted tyre supplier for repair, reprocessing or disposal.

Heavy Earthmoving

Where possible, heavy earthmoving tyres must be re-used for other purposes such as road markers or other delineation.

Each mine site shall maintain a tyre tracking system. The tyre register will include, as a minimum, the following information:

- Tyre serial number
- Supplier
- Purchase date
- Disposal date
- GPS location (eastings, northings) of tyre disposal area in-pit
- RL of tyres placed in-pit

The responsible department will be required to liaise with the Mine Surveyors to obtain the required survey information.

Heavy earthmoving tyres that are to be scrapped shall be temporarily stored at an approved centralised location.

No more than 100 tonnes (equivalent to about 30 heavy vehicle tyres) will be stored at any one time on each site. Refer to site specific Tyre Management Plans for additional storage requirements.

The Mine/Production Department is responsible for the final placement and disposal of tyres in-pit. Tyres must be:

- spread out across the pit floor and buried as deeply as practicable, but, covered by at least 20 metres of inert overburden beneath the final rehabilitated surface; and
- placed at least 10 metres away from coarse reject material to reduce the risk of fire from spontaneous combustion.

4.3.5 Dragline or excavator maintenance and shutdowns

During designated maintenance shutdown periods for the dragline and/or excavators, contractors and mine personnel are required to place waste items into the labelled receptacles.

Waste handling facilities must be taken to the field servicing sites prior to the commencement of any works.

The Maintenance Department is required to notify the PWC of when and where the waste facilities are to be located.

A typical skid-mounted waste handling unit

4.4 Supply and removal of bins

The PWC will supply all bins. The PWC will be responsible for checking the capacity of the bins. When the industrial bins are full, the PWC will collect and dispose of the waste, or arrange for additional bins to be supplied in consultation with the Supply and Environmental Departments.

4.5 Waste Tracking and Recording

Regulated Waste must be Tracked

All regulated wastes must be managed strictly in accordance with regulatory and CNA requirements. To ensure the adequate tracking of waste the PWC will be required to provide suitable waste transport certificates to the site Supply Department. The waste transport certificates are uploaded electronically to DECCW by the PWC and a hard copy of the completed form returned to the Supply Department.

The tracking certificate shall include:

- details of the waste producer (Consignor) indicating the address and contact details of the CNA operation and nominated representative
- details about the waste including waste code, description, form, contaminants and classification.
- details about the physical nature of the regulated waste (liquid, solid, sludge), its volumes and proposed treatment
- details about the collection of the waste including the time and date of its collection
- details about the waste transporter which includes the name of the person who took delivery of the waste and the registration numbers of the licensed vehicles
- details about the proposed destination (waste Consignee)
- evidence that the waste was received at the disposal or recycling facility

Tracking and recording systems will be followed implicitly for those wastes that are regulated by authorities:

- waste records will be maintained accurately and kept up to date at all times;
- records will be available for audit at any time;

Waste records must not be destroyed. Coal & Allied is required to keep them in secure storage for at least five (5) years.

5. Responsibilities

All Employees	• All employees are responsible for using the correct bins for the disposal of waste in accordance with this environmental work instruction.
Area Supervisor	• The work area supervisor is responsible for ensuring the correct bins are located in the work area and that personnel are aware of CNA's waste disposal system.
Supply Officer	• Checking and recording Waste Transport Certificates.
Manager Mining (HVO) **Manager Maintenance (MTW and BMC)**	• Allocate responsibility to manage the heavy equipment tyre tracking system for the site
Environmental Specialist Operations / Bengalla Environmental Specialist	• Manage waste management contract
Primary Waste Contractor	• Supply of all bins • Monitoring the capacity of bins • Manage and dispose of wastes in accordance with the requirements of this environmental work instruction and government regulations • Maintenance of waste tracking database and reporting system

6. References

NSW Legislation

Protection of the Environment Operations Act, 1997

Protection of the Environment Operations (Waste) Regulation, 2005

NSW Guidelines

Waste Classification Guidelines

Australian Standards

AS1940 – 2004 The Storage and Handling of Flammable and Combustible Liquids

Rio Tinto Environment Standards

E7 Non-Mineral Waste Management

Non-Mineral Waste Guidance Note

Document Control

	Name	Position	Signed	Date
Originator:	Sarah Poynton	Environmental Graduate		24/07/2010
Checked By	Carmen Dyer	Environmental Specialist - Systems		24/07/2010
Owner:	Andrew Speechly	Environmental Specialist - Operations		24/07/2010
Authorised By:	Andrew Speechly	Acting Manager Environmental Services		24/07/2010

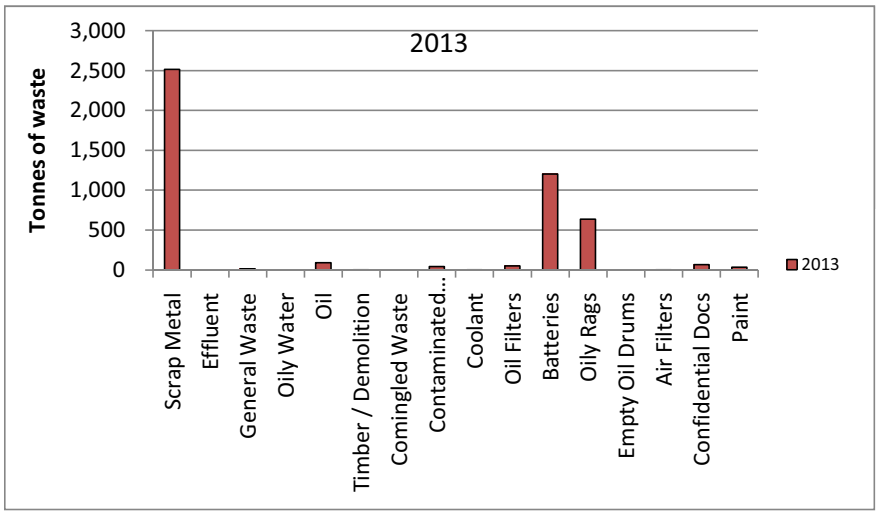
Revisions

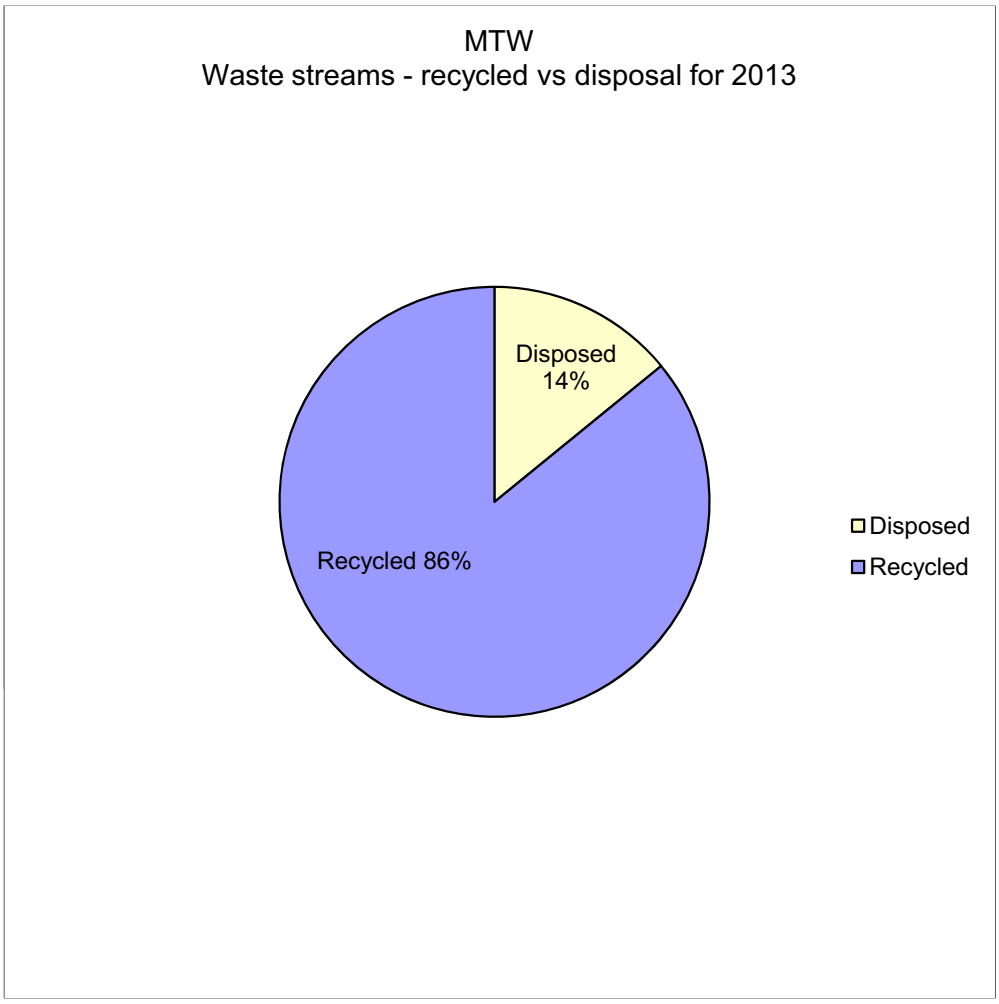
Ver	Date	Revision Description	By	Approved By
1.1	22/08/2003	Initial Release	-	-
1.2	16/11/2003	Improved formatting, update to tyre disposal	-	-
1.3	02/12/2003	Added photo of second type of oil filter disposal bin	-	-
1.4	14/04/2005	Remove need for PWC to chip pallets; add need to return light vehicle batteries to site for reconciliation prior to PWC disposal; better define who maintains tyre tracking system; add extra photos.	-	-
2.0	07/07/2009	Major Review. Incorporate changes made under the Protection of the Environment Operations Amendment (Scheduled Activities and Waste) Regulation 2008, address observation made in Bengalla RT HSE Standards audit, incorporate CNA Waste Management Standard (to be deleted), revise HME tyre storage, revise hydraulic hose disposal and revise waste tracking procedure.	Andrew Speechly	Rod Cameron
2.1	24/07/2010	CNA-10-EWI-SITE-E7-008 - Minor review and modified for site document register. Minor review to remove ATT6.1.1 Completing a Waste Data Form as superseded by DECCW online tracking process.	Sarah Poynton	Andrew Speechly

MTW	2013
Effluent On Site	1,259,000
Oily Water On Site	428,300
Washbay Sludge	15,000
Contained Total	**1,702,300**
Aerosols	349
Waste Oil	91,958
Contaminated Grease	44,503
Pallecon	15,177
Waste Batteries	1,203,625
Recycle HAZ Total	**1,355,612**
%	**27.24%**
Air Filters	2,312
Capacitor	0
Comingled Waste	65,210
Confidential Docs	1,302
Coolant	118,131
Effluent Off site	0
Empty Oil Drums	7,421
Oil Filters	103,170
Oily Water Off Site	15,500
Scrap Metal - G.E.T	49,630
Scrap Metal Oversize	0
Scrap Metal	2,515,160
Printer Cartridges	0
Timber / Demolition	35,480
Wate Oil Treatment	3,725
E-Waste	1,200
Recycle NonHAZ Total	**2,918,241**
%	**58.64%**
Air Filters - End of Life	14,609
Hydraulic Hose	8,635
General Waste	637,311
Tyre Disposal	5,885
Oily Rags	35,940
Disposal Total	**702,380**
%	**14.11%**
Total Recycling	4,273,853
%	85.89%
Total Volume	**4,976,233**

Waste Stream	2013
Scrap Metal	2,515
Effluent	0
General Waste	15
Oily Water	0
Oil	92
Timber / Demolition	1
Comingled Waste	0
Contaminated Grease	45
Coolant	1
Oil Filters	50
Batteries	1,204
Oily Rags	637
Empty Oil Drums	0
Air Filters	2
Confidential Docs	65
Paint	36

	Disposed	Recycled
MTW	14%	86%




MTW
Waste streams - recycled vs disposal for 2013
Disposed 14%
Recycled 86%
Disposed
Recycled

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