13 Rail transport

13.1 Assessment objectives

The DGRs specific to the rail transport aspects of the EA are:

- Detailed assessment of the potential impacts of the Project on the capacity, safety and efficiency of the:
  - Local and regional rail network having regard to the strategic objectives and cumulative impacts for the passenger and freight rail network, and
  - impacts of coal trains on level crossing operations.
- Details of the mine to port or other domestic customer transport movements, train path availability, and any required rail infrastructure works.
- A detailed description of the measures that would be implemented to maintain and/or improve the capacity, efficiency and safety of the rail networks in the surrounding area over the life of the Project.

This chapter addresses the above requirements except for the air quality and noise impacts of coal train movements, which are reported in Chapters 14 and 16 respectively. The detailed rail transport assessment is given in Appendix L. Both the chapter and appendix consider the whole rail network affected by the Project, that is, the section managed by the Australian Rail Track Corporation (ARTC) from Cobbora to Newcastle, and the RailCorp section from Newcastle to power stations on the Central Coast.

13.2 Assessment guidelines

There are no nominated standards or guidelines in the DGRs for the assessment of rail system capacity, operating efficiency or operational safety. However, relevant guidance is available from the two network managers (ARTC and RailCorp) and the Independent Transport Safety and Reliability Regulator (ITSRR 2009) which has been used for the assessments required.

13.2.1 Rail network capacity

At full production, which will occur after 2020, the power station customers will typically require four return train trips per day (eight train movements) seven days per week from the mine. There will also typically be one additional export coal or spot domestic market coal train return trip to the Upper Hunter Valley or Newcastle area each day. Around 20% of these trains will deliver coal to the two Hunter Valley power stations (Bayswater and Liddell), while the remainder will travel on to the port of Newcastle (one return train trip per day typically) or to power stations on the Central Coast (three return train trips per day typically).

The ARTC has policies and procedures in place for estimating the coal transport capacity of the Hunter Valley lines (ARTC 2012). The primary criterion is that no more than 70% of the theoretical number of coal train paths on any section of ARTC's Hunter Valley network can be formally allocated to coal transport operators. The ARTC uses this capacity limit to determine future rail infrastructure requirements for the network (ARTC 2012) and it is used here to estimate future infrastructure requirements for the Project.

On the dual and multiple track sections of ARTC's network, the capacity for coal trains travelling on the same track in the same direction is primarily determined by the required limiting headway. This is normally 10 minutes between each train but this figure applies generally and needs to be longer where trains are operating on steep gradients.

On single-track sections the capacity for coal trains is determined by the length and spacing of the passing loops along the line. These determine the size of trains that can operate and the frequency at which trains travelling in opposite directions can pass each other.

RailCorp manages the Central Coast section of the network, which will be used to deliver coal to power stations. A variety of coal and other freight train paths are defined by RailCorp in the weekday and weekend timetables, including spare coal and freight train paths which are not allocated to an existing operator. The spare and under-utilised coal and freight train paths currently, represent the available capacity for use by additional coal or other freight transport trains. Most are allocated to Pacific National, which operates an average of three, but occasionally up to ten return coal train trips per day from Teralba and Newstan collieries. Some of these paths could be used by the Project if Pacific National was the haulier used.

13.2.2 Rail network efficiency

The efficiency of the rail system is largely determined by its capacity. When there is little spare capacity, freight operators have less flexibility to use their preferred times and train numbers. This generally leads to increased delays and costs, particularly at the beginning and end of journeys, and at waiting points along the route where trains would mostly be delayed. Delays can greatly increase the effective transport costs for rail freight customers and, in the case of time-sensitive freight transport, encourage potential customers to use road transport in preference to rail (DoTARS 2006).

13.2.3 Level crossing safety

Operational safety issues on the rail network are most evident at level crossings where there is a potential collision risk between trains, road transport vehicles and also pedestrians. The existing and potential future collision risks at level crossings that are affected by the Project has been quantified using the results of ITSRR research (ITSRR 2009). The assessment also considers the daily road and rail traffic volumes at a crossing, the type of crossing control and whether there are any improved level crossing safety features or increased accident risk factors for road and rail traffic on the approaches to the crossing.

The NSW government guideline, *Development Near Rail Corridors and Busy Roads* (DoP 2008), states that new level crossings are to be avoided wherever possible and alternative access arrangements should always be explored. All existing level crossings have a risk profile that can be defined on the basis of the following factors:

- visibility — how well motorists can see on-coming trains;
- existing protection at the crossing;
- frequency of trains passing over the crossing;
- the number of tracks;
- the volume and type of road traffic over the crossing;
- nearby road geometry; and

- the likelihood that motorists will queue over the crossing.

Wherever a proposed development will generate additional traffic or change the composition of traffic using a level crossing, the predicted changes to the risk profile must be taken into account.

13.2.4 Level crossing waiting times

Typical delays motorists experience at crossings from all freight and passenger train movements have been quantified using a recent (March 2012) five-day survey of the St James Road, Adamstown level crossing. This allows determination of the delays from individual train movements and the total daily duration of delays on a typical weekday. The data has be used to estimate all delays at level crossings that will be experienced along the length of rail network affected by the Project.

13.2.5 Future coal transport demand

Future coal transport demand from the Project has been quantified when the mine is at full production in the years after 2020. Coal transport from the Project and all other export or domestic coal production from mines in the Hunter and New England regions has been estimated for the years 2017 and 2021 in the latest *Hunter Valley Corridor Capacity Strategy* (ARTC 2012) which enables a cumulative assessment to be made of the capacity impacts of the coal transport on the ARTC and RailCorp networks in future years.

13.3 Assessment method

13.3.1 Rail capacity

In response to the strategic economic importance of the Hunter Valley coal train operations to the economy of NSW and Australia, the ARTC is currently implementing a number of major rail corridor infrastructure improvements for the Hunter Valley network including the Muswellbrook to Ulan line.

The coal transport capacity of the Muswellbrook to Hexham route will be significantly improved to meet the predicted future coal transport demand in the years 2017 and 2021 by the identified improvements, primarily the Nundah Bank, Minimbah to Maitland and Drayton Junction improvements.

Eleven more passing loops or extensions of existing passing loops are now identified by ARTC to be constructed on the Ulan line, mainly on the central Wilpinjong to Mangoola section. These works are included in the list of required projects in the current ARTC strategy. This works program (ARTC 2012), which is summarised in Table 13.1, will significantly increase capacity on all the capacity constrained sections of the Muswellbrook to Ulan and Ulan, Gulgong and Tallawang lines by 2017.

Table 13.1 Summary of Ulan line rail corridor upgrade work

Ulan Line rail corridor works location	Proposed works for contracted tonnage growth, maximum demand 48.5 Mtpa (all works by 2017)	Proposed works for contracted and prospective tonnage growth, maximum demand 59.5 Mtpa (all works by 2017)
296.15 km	Bengalla Loop extension west (to 296.15 km)	
299.1 km		Bengalla loop extension west (to 299.1 km)
310.5 km		Mangoola west extension (to 310.5 km)
324 km	Additional passing loop (324 km)	
337 km		Additional passing loop (337 km) Baerami East
345 km		Baerami west extension (345 km)
353 km	Additional passing loop (353 km) Widden Creek	
374.1 km	Murrumbo west loop extension (to 374.1 km)	
377 km		Bylong east extension (to 377 km)
386.7 km	Bylong west loop extension (to 386.7 km)	
400.7 km		Coggan Creek west extension (to 400.7 km)
Gulgong area	Gulgong loop	
Gulgong–Tallawang	Gulgong to Tallawang CTC	
Gulgong–Tallawang	Gulgong to Tallawang track upgrade	

Source: (ARTC 2012).

The current capacity improvement works in the Northern Sydney Freight Corridor Strategy for RailCorp's Sydney to Newcastle route are all located south of Gosford as this is the most capacity constrained section of the route. The main RailCorp tracks from Newcastle to Vales Point Junction, south of Morisset, are currently rated for 30 tonne axle load capacity for coal haulage, but the existing passing loops and sidings along this route at Broadmeadow, Sulphide Junction and Awaba are generally not similarly rated and may have environmental or other operational constraints which restrict their improvement.

By 2015, additional improvements works (two new passing loops) are also proposed to be implemented by RailCorp on the line between Gosford and Newcastle, at Awaba North. RailCorp have advised these loops are required by 2015, to accommodate the predicted combined future corridor growth in demand for passenger, coal and other types of freight transport.

13.3.2 Level crossing safety

A major investigation of the accident history of a large sample of railway level crossings in NSW was completed in August 2009 (ITSRR Safety Research Unit 2009) using data from 1989 to 2009. The investigation evaluated the combined accident history data from 1,371 level crossings where 258 collisions had occurred over 20 years. The calculated overall average accident frequency rate was one accident per level crossing every 106 years or 0.01 per year.

A more detailed analysis of accident rates at 68 busy level crossings revealed typical rates in the range 0.04 to 0.08 per year (one accident every 12 to 25 years at each crossing). At most busy crossings, safety improvements have been progressively made which have resulted in the three main types of level crossing generally having similar annual collision risk rates from 0.04 to 0.08. The data are summarised in Table 13.2.

Table 13.2 Average accident frequency rates at busier level crossings

Type of crossing	Average accident frequency rate per year	Number of crossings in analysed sample
Active - barrier control	0.035	13
Active - flashing lights and bells	0.079	10
Passive - give way or stop signs	0.038	45
All types of crossing	**0.043**	**68**

Source: (ITSRR Safety Research Unit 2009).

The analysis produced three collision risk prediction charts for varying levels of daily road and train traffic at each crossing type. The data sample included level crossings on both single and multiple track lines, so the influences of the number of railway tracks and varying train traffic volumes were also accounted for.

The data for crossings controlled by half-boom gate barriers shows the accident rate initially rises with both road and train traffic levels but then drops off at the highest combined levels of road and rail traffic. There is, in effect, a high risk traffic combination for these crossings when the road traffic volumes are in the range of 3,000 to 10,000 vehicles daily and there are 30 to 100 daily train movements. When the road and rail traffic volumes both increase above these levels, the accident collision risk reduces.

For crossings controlled by lights and bells, the data show the expected pattern of consistently increasing accident risk as road and train traffic increase, with no drop off in risk at the higher traffic levels.

For the passive controlled crossings a high risk daily road traffic level was found, generally around 3,000 vehicles per day, above which the collision risk rate dropped off, but there was no corresponding high risk train traffic level above which there was a drop off in the collision risk rate. For these types of crossings, protection depends on road traffic complying with the give way or stop sign instruction, which, for habitual users of such crossings, is often poorly observed in locations where there is low train traffic.

Transport authorities in NSW (LCSC 2009) recently have targeted the closure of minor public and private level crossings as a safety improvement measure. A total of 15 minor public and private level crossings were closed on the Muswellbrook to Ulan line during 2008–9.

13.3.3 Level crossing waiting times

From the March 2012 survey at the St James Road Adamstown crossing, the average level crossing closure time per train (including the closures for multiple train movements) was 3 minutes and 20 seconds. The average closure times for each type of train movement was calculated from the data as follows:

- 2 minutes 40 seconds for scheduled CityRail or Countrylink passenger trains;
- 4 minutes 37 seconds for interstate or general freight trains;
- 7 minutes 32 seconds for loaded coal trains;
- 5 minutes 40 seconds for empty coal trains; and
- 3 minutes for single locomotives, empty passenger trains or track maintenance services.

There were also six instances of multiple train movements resulting in a combined closure time of over 10 minutes (over 14 minutes in the worst case).

The resulting changes to level crossing closures each day, as a result of the additional coal train movements from the Project, have been calculated as the change to the typical probability of any individual vehicle being delayed by a train when crossing the railway line at a level crossing. The estimates are also influenced by whether there are alternative traffic routes available at any of the affected level crossings and the additional detour distances. If the likelihood of delay at the affected level crossings increases significantly, it is more likely vehicles will use detour routes.

13.4 Existing environment

13.4.1 Rail network

The existing rail network is shown in Figures 13.1 and Figure 13.2. Figure 13.1 identifies the route for Project trains to use as follows:

- the new rail spur line to the mine, from the Gulgong to Dunedoo rail line at Tallawang, 28 km in length, including balloon loop;
- ARTC Tallawang to Ulan line, 45 km;
- ARTC line, Ulan to Sandgate, Port Waratah (Port of Newcastle) and Woodville Junctions, 275 km to 280 km; and
- the RailCorp line from Woodville Junction to Eraring and Vales Point, 45 km (refer to Figure 13.2).

The ARTC rail network's capacity for coal transport increases progressively east of the mostly single track Muswellbrook to Ulan line. Three additional passing loops on this section of line have been built recently, giving a total of twelve passing loops, spaced at about 10 km to 15 km intervals. On the double track sections of the network east of Muswellbrook, more tracks are now provided on some steeper gradients and on the busier sections near Maitland, giving extra capacity closer to the port of Newcastle.

Currently, the limiting capacity of sections of the route for coal transport in 2012, are defined by (ARTC 2012) as follows:

- Bylong to Mangoola: current capacity is 14 coal train paths per day, current average utilisation is 11 coal trains per day in each direction (79%);
- Bengalla to Muswellbrook: current capacity is 21 coal train paths per day, current average utilisation is 16 coal trains per day in each direction (76%);
- Muswellbrook to Antiene: current capacity is 47 coal train paths per day, current average utilisation is 24 coal trains per day in each direction (51%); and
- Newcastle Ports: current capacity is 103 coal train paths per day, current average utilisation is 67 coal trains per day in each direction (65%).

On the RailCorp lines south of Woodville Junction, the network carries a wide range of freight, including, before 2007, some coal to the Eraring and Vales Point power stations.

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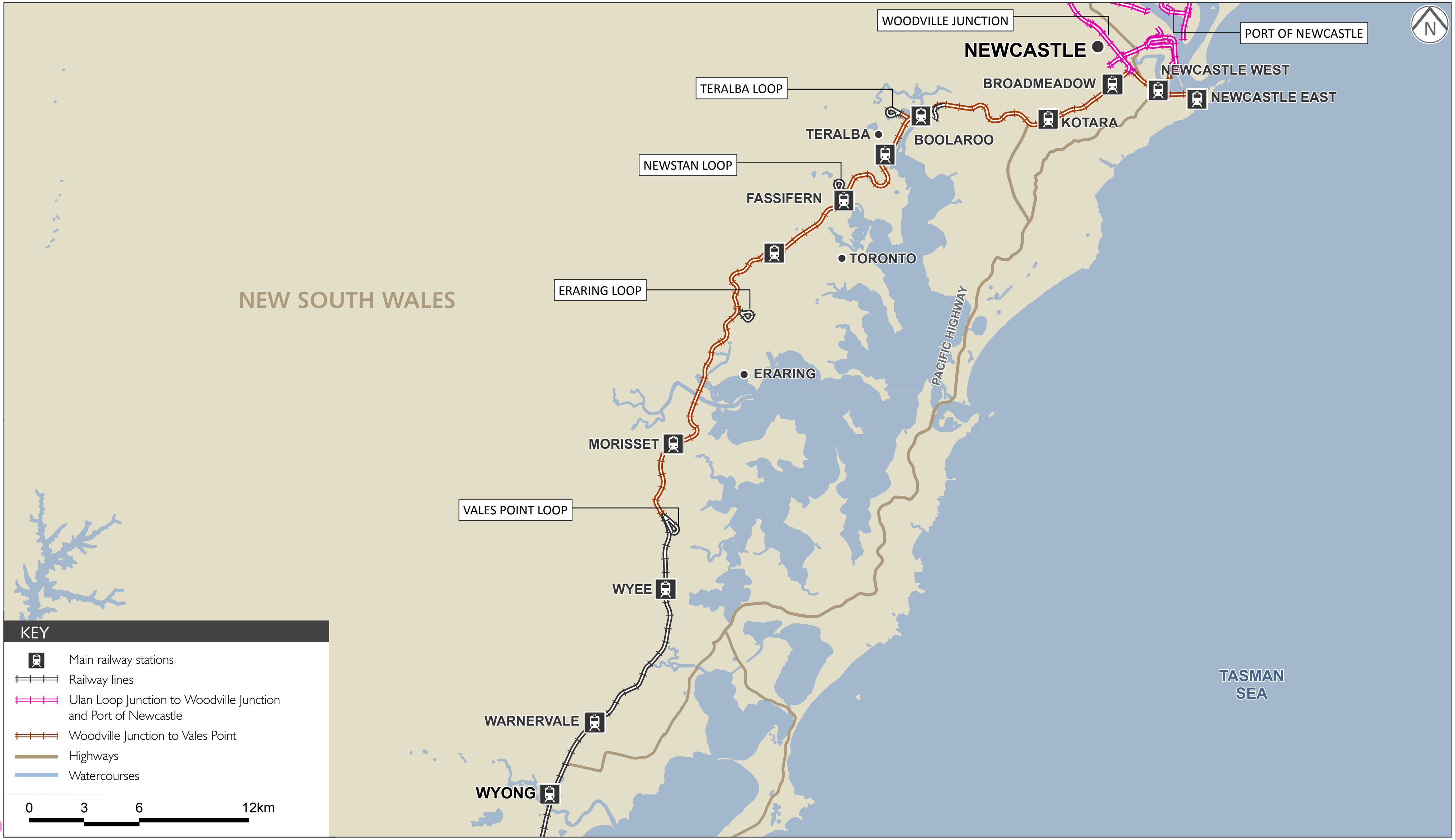
Coal Transport Route

Cobbora Coal Project - Environmental Assessment

Figure 13.1

EMM

Cobbora Holding Company Pty Limited



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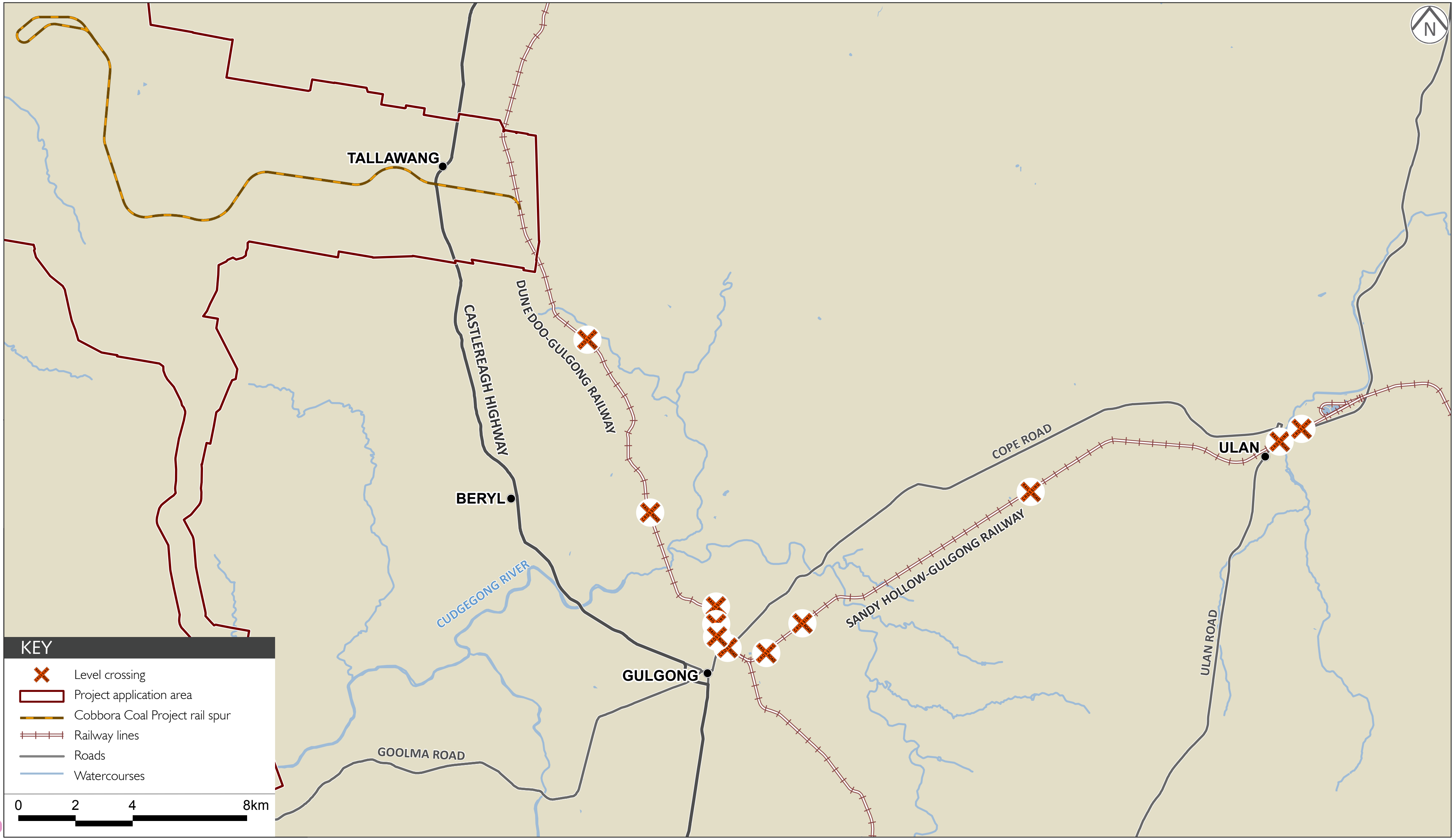
EMM

Cobbora Holding Company Pty Limited

Railcorp Network Lines South of Newcastle

Cobbora Coal Project - Environmental Assessment

Figure 13.2



Location of Ulan-Gulgong-Tallawang Area Level Crossings

Cobbora Coal Project - Environmental Assessment

Figure 13.3

The future capacity of the RailCorp lines for coal transport has been assessed based on normal weekdays. It is assumed that because fewer passenger trains operate on weekends, wherever there is spare capacity on weekdays, there will also be spare capacity on weekends.

There are 25 to 26 general freight train paths daily in each direction on weekdays (RailCorp 2012). These general freight train paths all operate over the full length of the route from Enfield/Chullora in Sydney to Woodville Junction in Newcastle. A maximum of 15 to 16 (63%) in each direction are normally occupied on weekdays. Although spare general freight train paths cannot ordinarily be used by coal trains due to different operating characteristics, they are indicative of spare capacity in the rail network generally.

For coal transport from Newcastle to the Central Coast , there are 11 to 12 more coal train paths (in each direction) allocated in the RailCorp timetable for freight working on weekdays (RailCorp 2012). The average annual usage of these paths each weekday is three loaded coal trains per day (25%) although up to 10 loaded coal trains per day can operate at peak times.

13.4.2 Level crossing safety

The existing and future collision safety risk and the road traffic delay (waiting time) performance of railway level crossings on the coal transport route has been assessed at:

- railway level crossings in the Newcastle urban area which are located on the coal transport route, eg at Clyde Street Islington and St James Road Adamstown;
- existing level crossings on major traffic routes on the Muswellbrook to Ulan line between Mangoola and Ulan; and
- all level crossings on public roads in the Ulan, Gulgong and Tallawang areas, where the existing rail freight traffic is light and will increase significantly in proportional terms in the future, with additional coal trains from the Project. They are shown in Figure 13.3.

There will be no additional coal train traffic as a result of the Project at the other level crossings on railway lines further to the west at Birriwa on the Castlereagh Highway and at Dunedoo and Beni (east of Dubbo) on the Golden Highway. However, there will be more road traffic, including numerous extra truck traffic movements during the peak of Project construction.

The level of traffic safety at these level crossings is considered to be generally good with no recent reported accidents; the existing level of control at each level crossing (flashing lights) is appropriate for level crossings that have good traffic visibility on both the major road approaches. As the level of rail traffic activity at these level crossing is very low (a maximum of one to two train movements daily), and will not increase as a result of Project related coal trains, the future combined road/rail traffic safety collision risk at these level crossings will not change significantly from increased road traffic alone. Thus detailed further investigation of the safety of these highway level crossings is not required according to Project DGRs.

ITSRR research data (2009) have been used to determine collision risk rates for all these actively and passively protected level crossings. These estimates include provision for other safety risk factors, such as road geometry, surface condition deficiencies, or improved level crossing protection, and are summarised in Table 13.3.

Table 13.3 Generic collision risk rates for existing level crossings

Level crossing location	Type of control	Existing daily road traffic	Existing daily train traffic	Existing risk of collision per year
Clyde Street	Active - lights, bells, barriers and median	7,200	142	0.015[1]
St James Road	Active - lights, bells, barriers and median	10,800	130	0.006[1]
Golden Highway at Denman	Active - lights and bells	2,000-3,000	24	0.040[2]
Rosemount Road at Denman	Active - lights and bells	300-1,000	24	0.020
Bylong Valley Way near Sandy Hollow	Active - lights and bells	300-1,000	24	0.020
Bylong Valley Way at Bylong	Active - lights and bells	300-1,000	24	0.040[2]
Ulan-Wollar Road near Cumbo	Active - lights and bells and boom gate barriers	Less than 300	24	0.005
Ulan-Wollar Road near Wilpinjong	Passive - stop signs	Less than 300	24	0.050[2]
Ulan Mine Entrance Road	Active - lights and bells	300 - 1,000	2	0.010
Ulan Village Main Street	Active - lights and bells	690	2	0.010
Springwood Park Road	Passive - stop signs	Less than 300	2	0.040[2]
White Horse Road	Passive - stop signs	Less than 300	2	0.040[2]
Spring Creek Road	Passive - stop signs	Less than 300	2	0.020
Station Street MR 598	Active - lights and bells	1,680	2	0.020
Tallawang Street	Passive - stop signs	Less than 300	2	0.020
Black Lead Road	Passive - stop signs	Less than 300	2	0.040[2]
Barneys Reef Road	Passive - stop signs	Less than 300	2	0.040[2]
Jacksons Lane	Passive - stop signs	Less than 300	2	0.040[2]
Puggoon Road	Passive - stop signs	Less than 300	2	0.040[2]

Notes: *1. Generic collision risk is reduced by about 40% by the road median barrier.*

2. Generic collision risk is significantly increased due to additional road or rail geometry or surface condition defects at the crossing location.

The crossings at Clyde Street and St James Road have recently been upgraded to the highest level of protection that is possible (lights, bells, barriers and a central road median barrier with pedestrian safety fence). At these crossings, which have either 130 to 142 passenger and freight train movements daily, the collision risk level is generally low (0.015 annual collisions or less).

Future level crossing safety has been assessed at six crossings on major traffic routes on the Mangoola to Ulan section of the coal transport route. On the Golden Highway near Denman where there are approximately 2,000 to 3,000 vehicle movements daily, the estimated collision risk rate is approximately 0.040 per year currently.

At the other five assessed level crossings between Mangoola and Ulan, the current estimated level of collision risk varies significantly due to the differences in the current type of level crossing control and the range of daily road traffic vehicle movements. The safety risk at these level crossings is currently estimated as 0.050 collisions per year or lower.

In the Gulgong area, the crossing with the highest road traffic volume is at Station Street where the daily volume is between 1,000 to 3,000 vehicles. This crossing has active control with lights and bells but no half-boom barriers. The annual collision risk rate at this crossing is about 0.020. At the two crossings near Ulan, which have active control with lights and bells but no half-boom barriers, the daily road traffic volume is between 300 to 1,000 vehicles; the current annual collision risk rate is about 0.010.

At the eight crossings on public roads within the Ulan, Gulgong and Tallawang areas that have passive (stop sign) control, the road traffic volumes are all generally at or below 300 vehicles per day. The annual collision risk rates at these crossings are about 0.020 to 0.040, depending on whether there are any road or rail geometry or surface condition defects present.

13.4.3 Level crossing waiting times

The average number of daily train movements at the two Newcastle area level crossings was 130 and 142 in March 2012. The existing level crossing closure times as a result of these trains are around 432 minutes per day in total (30% of each day) at St James Road and around 463 minutes per day (32% of each day) at Clyde Street where there is a slightly greater number of train movements.

These total closure times indicate that each vehicle travelling on the road network has a one in three chance of delay. The closest alternative traffic routes to these two crossings typically result in an additional travel distance and time of about 2 km and three to four minutes, in comparison to the direct routes. Most of the local road traffic in each area uses the direct traffic route via the level crossing and accepts the one in three chance of being delayed for three minutes typically.

On the Muswellbrook to Ulan line, west of Mangoola, the typical level crossing waiting times due to eleven coal trains and one freight train per day in each direction (24 train movements per day) are a total of 154 minutes per day typically at each level crossing. This represents 10.7% of each day affected, with a corresponding 1 in 9.3 chance of any road vehicle being delayed by a passing train at each level crossing. For residents of the local area, the current likelihood of waiting on their journey while a train passes at a level crossing, would be approximately once every four to five days, that is one and a half times per week typically.

In the Gulgong area, the typical crossing waiting times are a total of nine minutes daily due to one daily freight train in each direction. This represents 0.6% of each day, with a corresponding one in 160 chance of any vehicle being delayed at each crossing in the area. For a typical resident of the Gulgong area who may travel across a level crossing twice per day, the likelihood of waiting on their journey while a train passes at a level crossing, would be about once every 80 days, that is typically four times per year.

13.5 Mitigation measures

13.5.1 Rail capacity

Improving rail capacity is a responsibility of the track managers, that is, ARTC and RailCorp. CHC cannot undertake works on the rail network beyond its own main line connection. However, CHC or its customers will pay network access fees as a result of its coal transport operations. It is anticipated ARTC and RailCorp will use part of the network access fees received from CHC to contribute to the costs of the following capacity improvements:

- upgrades in the ARTC and RailCorp programs described in Section 13.3.1; in particular
  - a third track from Minimbah to Maitland;

- a third track on the Nundah Bank, between Mt Owen and Camberwell;
- additional tracks and extensions to passing loops from Muswellbrook to Bengalla and from Wilpinjong to Mangoola on the Ulan Line;
- the Tallawang to Ulan Track upgrade to 30 Tonnes Axle Load (TAL) near Gulgong (ARTC Ulan+ Alliance 2009): and
- potential additional passing loops at Awaba North on the RailCorp Central Coast to Newcastle line.

13.5.2 Level crossings

Preliminary safety risk assessments were made at level crossings in Newcastle, on major traffic routes between Mangoola and Ulan and at all level crossings on public roads on the Ulan to Tallawang line which, refer to Figure 13.1. The assessments have identified the crossings where safety upgrading works are most likely to be required. Responsibility for these works lies with ARTC. CHC will encourage ARTC to address the identified increased safety risks at these crossings. The following measures will be undertaken by CHC or ARTC according to their respective responsibilities:

- the new rail spur from Tallawang to Cobbora will have no public level crossings (CHC responsibility);
- on the Golden Highway near Denman, where there are approximately 2,000 to 3,000 vehicle movements daily, additional half boom barrier control is recommended which will reduce the estimated future collision risk rate from approximately 0.080 per year to approximately 0.050 per year;
- detailed safety risk assessments of all existing level crossings on the Tallawang, Gulgong and Ulan route to will be undertaken to assess the effect of additional coal trains and accurately specify the required works (ARTC responsibility); and
- separate development approval will be required for the Tallawang to Ulan 30 TAL track upgrading and centralised train control (CTC) works, which will include a safety assessment of the increased level crossing safety risk of additional trains using the line (ARTC responsibility).

13.6 Impacts

After the identified Project mitigation measures have been applied, the residual impacts of the proposed coal transport operation for the Project were assessed.

13.6.1 Proposed coal transport supply from the Project

The Project is primarily being developed to supply 9.5 Mtpa of coal to four power stations, as identified within Table 13.4, to meet coal supply contacts. It may also transport up to 2.5 Mtpa of coal to the port (Port Waratah or Kooragang) for export or to other domestic customers.

Table 13.4 Cobbora customers

Customer	Destination	Location	Distance by rail from Tallawang (km)	Typical number of loaded coal trains each day at full production
Macquarie Generation	Bayswater and Liddell	Upper Hunter Valley	205	1
Origin Energy	Eraring Power Station	Central Coast	346	2 to 3
Delta Electricity	Vales Point	Central Coast	360	0 to 1
Export coal	For export or other domestic sales	Either Port Waratah or Kooragang Island	313 (to Waratah junction)	1

The customers will select rail hauliers to transport coal from the Project to their power stations, while CHC will select hauliers to transport coal to the port. The hauliers will provide rolling stock and will operate the coal trains, including negotiating rail access agreements with ARTC and RailCorp. The boundary between the ARTC and RailCorp networks is at Woodville Junction in Newcastle, as shown on Figure 13.2.

At full production, which will occur after 2020, the power station customers typically will require four daily return train trips (eight train movements) seven days a week from the mine.

The train configuration that will be used is yet to be determined. However, the majority of trains will be of 7,800 tonnes to 8,800 tonnes loaded capacity and will be between 1,370 m and 1,550 m long. Of these trains, typically one return trip will deliver coal to the two Hunter Valley power stations (Bayswater and Liddell). The remainder will travel on either to the port of Newcastle (one daily return train trip daily) or to power stations on the Central Coast (three return train trips daily).

13.6.2 Rail network capacity impacts

The projected cumulative increase in coal trains from the Project and all other known coal projects which will be operating between 2017 and 2021, has been determined from the ARTC demand projections.

Based on these projected production volumes, the existing coal train path demand in 2012 and the projected future coal train path demand in 2017 and 2021 on each section of the rail lines are compared in Table 13.5, Table 13.6 and Table 13.7, incorporating the additional coal transport capacity from all the known ARTC infrastructure upgrades which are due to be implemented by 2017 (ARTC 2012).

Table 13.5 Existing line coal train movements per day in 2012

Line Section	Average tonnage per train (t)	Contracted volume (Mtpa)	Loaded coal trains per day for contracted volume	Daily coal train path capacity each way *	Daily coal train path capacity utilised (%)*
Bylong to Mangoola	7,759	27	11	14*	79
Bengalla to Muswellbrook	7,921	41	16	21*	76
Werris Creek to Scone	5,485	15	8	11*	73
Muswellbrook to Antiene	7,286	56	24	47*	51
Newcastle Ports	7,275	156	67	103*	65

Notes: *Source - (ARTC 2012).*

**Daily coal train paths capacity in 2012 is based on the previous ARTC (2011) strategy document.*

Table 13.6 Predicted future line coal train movements per day in 2017

Line Section	Average tonnage per train (t)	Contracted volume (Mtpa)	Contracted plus prospective volume (Mtpa)	Loaded coal trains per day for contracted volume	Loaded coal trains per day for contracted plus prospective volume	Daily coal train path capacity each way	Daily coal train path capacity utilised for contracted plus prospective volume (%)
Bylong to Mangoola	7,730	47.5	56.5	19.3	22.9	26	88
Bengalla to Muswellbrook	7,911	71	81	28.1	32.1	66	49
Werris Creek to Scone	5,825	33.5	48.5	18	26.1	32	82
Muswellbrook to Antiene	7,240	107	133	46.3	57.6	118	49
Newcastle Ports	7,187	237	273	103.3	119.1	160	74

Source: *(ARTC 2012).*

Table 13.7 Predicted future line coal train movements per day in 2021

Line Section	Average tonnage per train	Contracted volume (Mtpa)	Contracted plus prospective volume (Mtpa)	Loaded coal trains per day for contracted volume	Loaded coal trains per day for contracted plus prospective volume	Daily coal train path capacity each way *	Daily coal train path capacity utilised for contracted plus prospective volume (%)*
Bylong to Mangoola	7,730	48.5	59.5	19.7	24.1	26	93
Bengalla to Muswellbrook	7,911	72	84	28.5	33.2	66	50
Werris Creek to Scone	5,825	33.5	53.5	18	28.8	32	90
Muswellbrook to Antiene	7,240	108	144	46.8	62.3	118	53
Newcastle Ports	7,189	239	293	104.2	127.8	160	80

Notes: Source - (ARTC 2012).

**Daily coal train paths capacity in 2012 is based on the previous ARTC (2011) strategy document.*

The detailed analysis of the network coal train path demand from all mines in the region shows that the planned timetable capacity for coal train paths in the years 2017 and 2021 will generally be sufficient to meet the cumulative growth in demand from the Project and other coal projects on all sections of the rail transport route. On the ARTC sections of the route, the high short term rate of growth in the demand for coal transport, which is predicted to occur between 2012 and 2017, will generally level off after 2017, with only minimal further growth predicted in the annual coal transport volumes between 2017 and 2021.

The current Hunter Valley network upgrading strategy (ARTC 2012) is due to be implemented by 2017. This identifies all the future Hunter Valley coal transport capacity improvements on the Muswellbrook to Ulan line and between Muswellbrook to Hexham, which will be implemented by 2017 to accommodate the cumulative increased coal transport demand.

On the ARTC network, the access agreement which was negotiated between the ARTC and the Australian Competition and Consumer Commission (ACCC) guarantees future access to the Hunter Valley rail freight network for all future coal producers and consumers in the Region (HVAU 2011). The costs of the capital works program will generally be recovered through the rail user access charges which are payable to the ARTC from each coal transport operator in the region.

At least four dedicated coal train paths per day in each direction on the RailCorp network south of Newcastle will need to be defined by 2015 for use by the Project. These train paths can be provided by reviewing and reconfiguring the existing spare or unused and under-used RailCorp coal and general freight train paths. These dedicated Project coal train paths on the RailCorp network will need to be spaced at sufficient minimum two hourly intervals each day to provide sufficient turnaround time for the train unloading requirements at the Eraring and Vales Point loops.

The RailCorp lines south of Newcastle are currently serving only a limited export coal transport demand, estimated at 3.3 Mtpa from the Teralba and Newstan collieries (Engenicom 2012). The additional export and domestic coal transport demand which is predicted to occur on the RailCorp network after 2015 is an additional 5.2 Mtpa from the Teralba and Newstan mines and 7.0 Mtpa of domestic coal transport from the Project (Engenicom 2012). This additional demand will result in increased use of the existing rail network capacity for coal and other general rail freight transport south of Newcastle. However, there is currently sufficient unused and spare coal and other general freight train path capacity on the RailCorp lines south of Newcastle for this additional coal transport demand to be accommodated, with minimal capacity improvements, that is two new passing loops for freight trains in the Awaba north area.

13.6.3 Level crossing safety

Changes in the estimated collision risk rates at all level crossings in the Newcastle, Mangoola to Ulan and Ulan, Gulgong and Tallawang areas were estimated taking into account forecast train movements and other risk factors, such as road geometry or surface condition deficiencies, or improved level crossing protection. The predicted changes are given in Table 13.8.

Table 13.8 Summary of change in collision risks at level crossings

Level crossing location	Type of control	Existing daily train traffic	Proposed daily train traffic	Existing risk of collision per year	Effect of additional trains
Clyde Street	Active - lights, bells, barriers and median	142	148	0.015[1]	No change
St James Road	Active - lights, bells, barriers and median	130	136	0.006[1]	No change
Golden Highway at Denman	Active - lights and bells	24	34	0.040[2]	0.080[2]
Rosemount Road at Denman	Active - lights and bells	24	34	0.020	0.030
Bylong Valley Way near Sandy Hollow	Active - lights and bells	24	34	0.020	0.030
Bylong Valley Way at Bylong	Active - lights and bells	24	34	0.040[2]	0.060[2]
Ulan-Wollar Road near Cumbo	Active - lights and bells and boom gate barriers	24	34	0.005	No change
Ulan-Wollar Road near Wilpinjong	Passive - stop signs	24	34	0.050[2]	No change[2]
Ulan mine entrance road	Active - lights and bells	2	12	0.010	0.020
Ulan village main street	Active - lights and bells	2	12	0.010	0.020
Springwood Park Road	Passive - stop signs	2	12	0.040[2]	0.080[2]
White Horse Road	Passive - stop signs	2	12	0.040[2]	0.080[2]

Table 13.8 Summary of change in collision risks at level crossings *(Cont'd)*

Level crossing location	Type of control	Existing daily train traffic	Proposed daily train traffic	Existing risk of collision per year	Effect of additional trains
Spring Creek Road	Passive - stop signs	2	12	0.020	0.040
Station Street MR 598	Active - lights and bells	2	12	0.020	No change
Talawang Street	Passive - stop signs	2	12	0.020	0.040
Black Lead Road	Passive - stop signs	2	12	0.040[2]	0.080[2]
Barneys Reef Road	Passive - stop signs	2	12	0.040[2]	0.080[2]
Jacksons Lane	Passive - stop signs	2	12	0.040[2]	0.080[2]
Puggoon Road	Passive - stop signs	2	12	0.040[2]	0.080[2]

Notes: *1. Collision risk is reduced by about 40% by the road median barrier.*

2. Collision risk is increased significantly due to additional road or rail geometry or surface condition defects at the crossing location.

The two crossings at Clyde Street and St James Road in Newcastle were upgraded recently to the highest possible level of protection (lights, bells, barriers and a central road median barrier with pedestrian safety fence). At these crossings, which have between 130 to 142 passenger and freight train movements daily, the forecast increase in the daily train traffic due to the Project (six additional loaded or empty coal train movements daily) will have no measurable effect on the annual collision risk level, which will remain at around 0.015 collisions or less. No further safety improvements will be required at these two crossings as a result of the additional Project train traffic.

This will generally increase the estimated collision risk at the level crossings on major traffic routes on the Mangoola to Ulan line, where the additional Project train traffic will increase the current threshold of daily train movements to above 30 train movements per day.

Future level crossing safety has been assessed at six crossing locations on major traffic routes on the Mangoola to Ulan section of the proposed coal transport route. The level crossing where the estimated collision risk is potentially the greatest is the location with the highest road traffic volume movements, which is the Golden Highway near Denman. There are approximately 2,000 to 3,000 vehicle movements daily at this location. Additional half boom barrier control is recommended which would reduce the estimated collision risk rate from approximately 0.080 per year to approximately 0.050 per year.

the additional Project coal trains will not significantly change the current safety levels at any of the other five level crossings which have been assessed on the Mangoola to Ulan line. Therefore, no safety improvements at these will be warranted as a direct result of the Project.

In the Gulgong, Ulan and Tallawang area, the forecast additional daily coal train traffic due to the Project (ten more loaded or empty coal train movements daily) will increase the total movements from a maximum of two to 12 train movements per day. In Gulgong, the crossing with most traffic is at Station Street where 1,000 to 3,000 vehicles cross each day. The annual collision risk rate is around 0.020. Within this traffic range, the increase in train traffic (from two to 12 movements daily) will not change the annual collision risk level which will remain at around 0.020.

At the two level crossings near Ulan, which have active control with lights and bells but no half-boom barriers, the daily road traffic volumes are in the range 300 to 1,000 vehicles and the annual collision risk rate is around 0.010. The increase in the daily train traffic (from two to 12 movements daily) will increase the annual collision risk rate from 0.010 to around 0.020. This risk level will remain sufficiently low (one collision per 50 years) that additional active control measures (such as half-boom barriers) would not be justified.

At the eight crossings in the Ulan, Gulgong and Tallawang area, which are passively controlled (ie stop signs), the daily road traffic volumes are all generally 300 vehicles or less. The annual collision risk rate here varies from 0.020 to 0.040, depending on whether any additional road or rail geometry related risk factors apply. The increase in the train traffic due to the Project (from two to 12 movements daily) will increase the annual collision risk level to 0.040, or 0.080 where there are any additional road or rail geometry or surface condition risk factors at the crossing. The higher rate (0.080 per year or one collision per crossing every 12 years), is well above current risk levels (see Table 13.3).

Six of these crossings will generally be exposed to a higher collision risk level as a result of the additional coal trains. ARTC will need to make a detailed formal risk assessment study at each crossing during the design stage for the track improvements. This will determine whether improved active crossing control (lights and bells) and or improved passive crossing controls are needed (road surface, train visibility or road geometry improvements).

13.6.4 Level crossing waiting times

Three additional daily return coal train movements will occur at the Clyde Street and St James Road crossings in Newcastle as a result of the Project after 2020. The additional waiting time each day at each crossing will be about 39 to 40 minutes, bringing the total time affected to 472 minutes per day (33% of each day) and 503 minutes per day (35% of each day) at St James Road and Clyde Street respectively.

However, the typical probability of any given vehicle being delayed by a train at either crossing will remain at about one in three. Also, it is unlikely the additional coal trains will be travelling through Newcastle at the busiest times of the morning (7.00 am to 9.00 am) and afternoon (4.00 pm to 6.00 pm) so it will be largely the off-peak and night time traffic that will be affected.

There is currently approximately 154 minutes (10% of each day) of waiting time for road traffic at each level crossing on the Mangoola to Ulan line, with eleven coal trains and one freight train movement per day in each direction (24 train movements in total). The current likelihood of a typical resident of the area who may travel across a level crossing twice per day being delayed on their journey while a train passes is approximately once every four to five days, that is one and a half times per week typically.

The transport of coal from the Project will typically generate five additional return coal train movements per day across each of the Ulan line level crossings. This will increase the total length of time affected to 219 minutes per day (15% of each day typically) at each of the affected Ulan line level crossings. The likelihood of a typical resident of the Goulburn River Valley and Bylong Valley areas being delayed on their journey while a train passes will increase to approximately one and a half times per week currently to twice per week once the Project has reached full capacity.

In the Gulgong area, the current crossing waiting times are affected by the train control at the northern end of Gulgong Station, where trains can be stopped in a position where they will block the Station Street crossing. However, when the CTC is in place for this line these additional level crossing delays for road traffic will be eliminated. Currently, with one freight train movement per day in each direction (two movements in total) the waiting time is approximately nine minutes per day at each crossing. The current likelihood of a typical resident of the Gulgong area who may travel across a level crossing twice per day being delayed on their journey while a train passes at a crossing is approximately once every 80 days, that is four times per year typically.

The transport of coal from the Project will typically generate five additional return coal train movements per day across each of the Gulgong area level crossings. This will increase the total length of time affected to 74 minutes per day (5% of each day) at each crossing. The likelihood of a typical resident being delayed on their journey while a train passes will increase to approximately once every 10 days once the Project has reached full capacity.

In summary, the future increases in level crossing delays due to Project coal trains have been assessed in the Newcastle and Gulgong areas and found to be acceptable. Vehicle drivers will experience minimal impacts and delays will mostly occur outside peak periods.

13.6.5 Rail transport outcomes

At full production the Project will supply coal to customers, typically in 7,800 to 8,800 tonne capacity trains at a rate of five trainloads per day. The assessment of the likely capacity of the affected rail networks in 2015, 2017 and 2020 shows there will generally be sufficient coal train path capacity on the ARTC Hunter Valley and RailCorp networks to meet the cumulative demands from Cobbora and other identified coal projects.

However, notwithstanding the above, the following will need to occur:

- four additional coal train paths per day in each direction on the RailCorp Central Coast line will need to be defined from the existing spare or unused or underutilised coal and other freight train paths for the Project's needs;
- RailCorp have advised that two new passing loops will be needed at Awaba North on the line between Gosford and Newcastle. These are required by 2015 to accommodate the predicted future corridor growth in demand for passenger, coal and general types of freight transport movements;
- the existing rail track in the local Gulgong and Tallawang area will require upgrading to 30 tonne axle load capacity for coal haulage. An additional passing loop will be required near Gulgong and centralised train control (CTC) installed; and
- eleven additional passing loops and other improvements on the ARTC Ulan line, as identified by ARTC in 2012, will be required by 2017 to accommodate the predicted increased coal transport demand from the Project and a range of expansions of existing mines and proposed new coal mine developments along the route between Muswellbrook and Ulan.

There will be no change in the estimated existing collision risk rate at the two existing Newcastle area level crossings or at most of the active or passively controlled level crossings along the route between Mangoola and Gulgong Gulgong as a result of additional coal trains from the Project. However, the existing Golden Highway active level crossing near Denman and six of the eight passively controlled (ie stop sign only) level crossings in the Ulan, Gulgong and Tallawang area will be exposed to a significantly increased collision risk. As such, it will be necessary for ARTC to undertake detailed safety assessments for potential level crossing safety improvements at these locations when the designs of the rail upgrade works in these areas are being prepared.

Changes in level crossing delays due to Project coal trains have been investigated. In no case will there be unacceptable increases and mostly increases will be minimal and occur outside the busier periods of the day.

13.7 Monitoring

13.7.1 Rail network capacity

The following monitoring is expected to be undertaken by ARTC and RailCorp to ensure adequate transport capacity for coal transport and other train services is provided on their managed rail networks:

- cumulative coal transport tonnages from all mines using the Hunter Valley and Central Coast rail transport networks on a rolling five year basis;
- rail capacity upgrades occur as planned in the current five-year works programs, are updated each year, for both the ARTC and RailCorp sections of the network; and
- paths are provided for the Project coal trains on the Central Coast section of the network, as forecast in this EA.

13.7.2 Level crossing safety

ARTC will make a formal risk assessment of level crossings as part of the Ulan, Gulgong and Tallawang track upgrade (ARTC Ulan + Alliance 2009). The existing minor road and private road crossings should be monitored to identify opportunities for closure, subject to suitable alternative road access being available for the affected properties.

13.7.3 Level crossing waiting times

Delays at St James Road and Clyde Street crossings are expected to be continued to be monitored. The NSW rail transport authorities will continue to periodically reassess the economic viability of improvements, taking into consideration the recently identified range of options for improvements (RailCorp 2009). The next assessment should consider use of level crossings by coal trains from the Project.