Ground floor, 20 Chandos Street
St Leonards NSW 2065
PO Box 21
St Leonards NSW 1590

T 02 9493 9500
E info@emmconsulting.com.au

www.emmconsulting.com.au

31 July 2019

James Wearne
Group Manager Approvals
Centennial Coal
100 Miller Road
Fassifern NSW 2283

Re: J190135 - Clarence Colliery - Modification to DA 504-00 - Response to request for information

Dear James,

This letter summarises the results and recommendations following the three additional traffic investigations undertaken in response to NSW Department of Planning, Industry and Environment's (DPIE's) requests for additional information in relation to the proposed modification to Clarence Colliery's development consent (DA 504-00) to increase the approved total road coal haulage.

As noted in Section 7.2.4 of the Statement of Environmental Effects (SEE), the maximum daily number of trucks transporting coal from Clarence Colliery would increase on the days when both the eastern and western routes are operating, from 25 trucks per day (ie 50 movements) to 40 trucks per day (ie 80 movements). On these days, the maximum hourly number of trucks dispatched may increase to about eight loads per hour, for the duration of the proposed modification.

Intersection of Great Western Highway and Darling Causeway (Station Street) at Mount Victoria

Comment from DPIE

> At the intersection of Great Western Highway (HW5) and Darling Causeway (Station Street) traffic signals, GHD (2013) identified using SIDRA analysis that the southbound right turn onto Great Western Highway post-development was at Level of Service D, with 22 turn movements in the AM peak hour and 28 turn movements in the PM peak hour. What are the SIDRA results at this intersection if the maximum hourly movements increase by +3?

Response

At this intersection, updated intersection traffic surveys were undertaken during both the actual afternoon peak hour (4:45 pm–5:45 pm on Monday 22 July 2019) and the actual morning peak hour (7:45 am–8:45 am on Tuesday 23 July 2019). The updated intersection traffic surveys were undertaken to account for any changes in the existing locality baseline traffic volumes since 2013 and used the same peak hourly periods for the intersection which were identified in the 2013 traffic surveys.

For most of the surveyed July 2019 traffic movements (Table 1), there were reductions in traffic volumes compared to the 2013 baseline peak hour traffic volumes.

However, during the 2019 survey, there was minimal coal transport by road occurring between Clarence Colliery and Mount Piper Power Station (MPPS) during either the morning or afternoon peak traffic survey periods . Therefore, the 2019 baseline traffic volumes (Table 1) represent baseline volumes with no coal haulage traffic occurring at the intersection.

Table 1 Intersection of Great Western Highway and Station Street peak hour surveys

Peak hourly time period surveyed	Great Western Hwy (westbound through)	Great Western Hwy (eastbound through)	Great Western Hwy (eastbound left turn)	Great Western Hwy (westbound right turn)	Station Street (southbound left turn)	Station Street (southbound right turn)
7:45 am–8:45 am	350/46	323/45	13/0	4/3	1/0	11/9
4:45 pm–5:45 pm	348/26	345/29	15/1	2/0	2/1	15/0

Note: Numbers presented as light vehicles/heavy vehicles.

The revised SIDRA outputs for each movement type and the modelled intersection layout are included as Appendix A. A summary is provided in Table 2. The actual intersection cycle time was difficult to determine as there were many 'missed cycles' during both the morning and afternoon traffic peak hours when there was no arriving traffic on Station Street or pedestrians crossing the Great Western Highway to trigger the traffic signals. However, the effective minimum intersection cycle time when the traffic signals changed over consecutive cycles was observed to be approximately 60 seconds during the morning peak hour and 70 seconds during the afternoon peak hour.

Table 2 Great Western Highway/Station Street SIDRA intersection results

Time period	Assessed traffic scenario	Demand vehicles	Degree of saturation	Average vehicle delay (seconds)	Level of service	Average delay/level of service for right turn
AM peak hour	Baseline	847	0.444	7.9	A	34.9/C
	+5 trucks per hour	858	0.453	8.2	A	35.4/C
	+8 trucks per hour	864	0.459	8.3	A	35.7/C
PM peak hour	Baseline	825	0.388	6.9	A	39.1/C
	+5 trucks per hour	836	0.396	7.2	A	40.2/C
	+8 trucks per hour	842	0.401	7.4	A	40.6/C

The overall intersection operation is at level of service (LOS) A for all scenarios considered during the morning and afternoon peak hours.

The 'worst case' average intersection delays for right turn traffic movements from Station Street onto the Great Western Highway have also been considered. These delays result in LOS C during both the morning and afternoon peak hours (Table 2).

The additional coal haulage traffic movements (at a maximum rate of eight trucks per hour) will only result in minimal increases to the average right turn traffic delay (approximately 0.3–0.4 seconds per vehicle) when compared with the previously assessed and approved coal haulage traffic movements (ie five trucks per hour).

When compared with the baseline (ie no coal haulage traffic movements), the additional coal haulage traffic movements (at a maximum rate of eight trucks per hour) will only result in increases of 0.8-1.5 seconds per vehicle to the average right turn traffic delay.

These increased traffic delays are considered to be acceptable for the proposed rate of coal haulage traffic movements (ie eight trucks per hour) and there will be very little additional traffic delay impacts for any other traffic movements in the Mount Victoria locality as a result of the proposed modification.

Intersection of Castlereagh Highway and Wallerawang Power Station Haul Road

Comment from DPIE

> At the intersection of Castlereagh Highway and Wallerawang Power Station Haul Road, the northbound right turn onto Castlereagh Highway would also increase by +3 movements per hour. Please confirm that available gap acceptance times and safety of the intersection in catering for this movement will remain acceptable.

Response

This intersection is currently an unsignalised intersection with 'Give Way' traffic control and there is a sign posted speed limit of 80 km/hr on the Castlereagh Highway, which changes to 100 km/hr approximately 100 m east of the intersection.

The baseline traffic volumes presented in GHD (2013) report have been used for the updated SIDRA intersection traffic analysis, as follows:

- Castlereagh Highway eastbound through traffic (am peak hour) = 182 vehicles (13.2% trucks);
- Castlereagh Highway westbound through traffic (am peak hour) = 195 vehicles (13.2% trucks);
- Castlereagh Highway eastbound through traffic (pm peak hour) = 253 vehicles (6.8% trucks); and
- Castlereagh Highway westbound through traffic (pm peak hour) = 203 vehicles (6.8% trucks).

The baseline turning movements for all four turning movements at the intersection, with no coal haulage traffic operating, were assumed to be one light vehicle per hour for each turning movement which is the minimum traffic level required for the SIDRA program to operate.

The revised SIDRA outputs for each movement type and the modelled intersection layout are included as Appendix B. A summary of the SIDRA results for each scenario of the unsignalised intersection operation is presented in Table 3.

Table 3 Castlereagh Highway/Wallerawang Power Station Haul Road SIDRA intersection results

Time Period	Assessed Traffic Scenario	Demand vehicles	Degree of saturation	Average vehicle delay (seconds)	Level of service	Average delay/level of service for right turn
AM peak hour	Baseline	401	0.114	0.1	A	8.5/A
	+5 trucks per hr	412	0.114	0.4	A	13.6/A
	+8 trucks per hr	418	0.114	0.6	A	14.1/A

Table 3 Castlereagh Highway/Wallerawang Power Station Haul Road SIDRA intersection results

Time Period	Assessed Traffic Scenario	Demand vehicles	Degree of saturation	Average vehicle delay (seconds)	Level of service	Average delay/level of service for right turn
PM peak hour	Baseline	484	0.114	0.1	A	9.2/A
	+5 trucks per hr	495	0.114	0.3	A	15.4/B
	+8 trucks per hr	501	0.114	0.5	A	16.2/B

For an unsignalised intersection, the normal assessment procedure is to consider the 'worst case' average intersection delays for the right turn traffic movement from the minor road (ie Wallerawang Power Station Haul Road) to the major road (ie Castlereagh Highway) (Table 3).

For the proposed coal haulage traffic movements (at a maximum rate of eight trucks per hour), there will be only minimal increases in the average right turn traffic delays of approximately 0.5–0.8 seconds per vehicle when compared with the previously assessed and approved coal haulage traffic movements (ie five trucks per hour). When compared with the baseline (ie no coal haulage traffic movements), the delay increases will be greater at between 5.6–7.0 seconds per vehicle; however, these increased delays will only be affecting the proposed coal haulage traffic and there will be no additional traffic delay impacts for any other traffic movements in the locality as a result of the proposed.

The future intersection LOS will be A in the morning peak hour and B in afternoon peak hour. These levels of service are considered to be acceptable for the proposed increase in coal haulage and there will be very little additional locality traffic delay or traffic safety impacts from the proposed modification.

The intersection traffic safety sight distance has been reviewed, based on an inspection on 23 July 2019, in accordance with the current Austroads requirements for Safe Intersection Sight Distance (SISD), which is the normal traffic safety requirement for rural intersections. This review is provided in Appendix C and concludes that with some minor additional trimming of vegetation on the southern side of the Castlereagh Highway to the east of the intersection, the intersection traffic safety will meet the Austroads SISD requirements.

Yours sincerely

Tim Brooker
Associate Transport Planner
tbrooker@emmconsulting.com.au

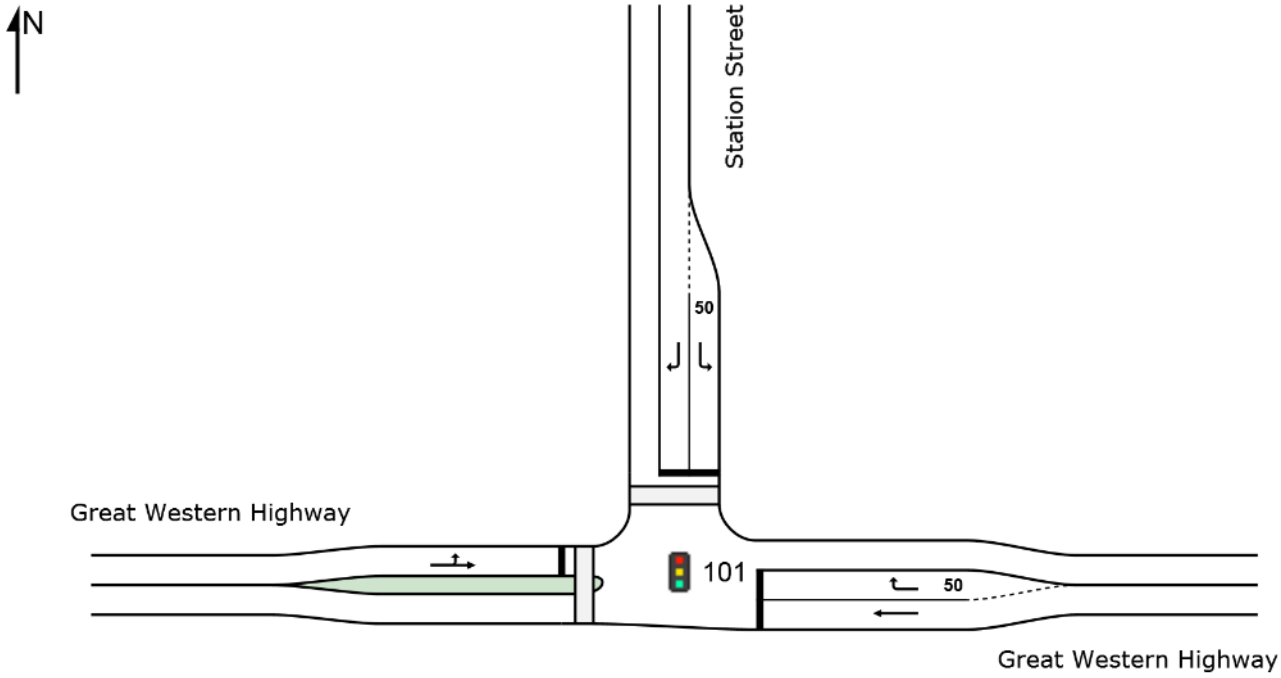
Appendix A

SIDRA results – Great Western Highway and Station Street intersection

SITE LAYOUT

Site: 101 [GWH Station Street Intersection AM Peak Baseline]

1 Existing Intersection
Site Category: (None)
Signals - Fixed Time Isolated



MOVEMENT SUMMARY

Site: 101 [GWH Station Street Intersection AM Peak Baseline]

1 Existing Intersection
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 60 seconds (Site User-Given Cycle Time)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
East: Great Western Highway												
5	T1	417	11.6	0.328	3.8	LOS A	4.7	36.5	0.42	0.37	0.42	56.5
6	R2	7	42.9	0.016	12.7	LOS A	0.1	0.9	0.55	0.64	0.55	47.1
Approach		424	12.2	0.328	3.9	LOS A	4.7	36.5	0.42	0.37	0.42	56.3
North: Station Street												
7	L2	1	0.0	0.002	21.2	LOS B	0.0	0.1	0.71	0.59	0.71	43.6
9	R2	21	45.0	0.150	34.9	LOS C	0.6	5.9	0.94	0.71	0.94	36.4
Approach		22	42.9	0.150	34.2	LOS C	0.6	5.9	0.93	0.70	0.93	36.7
West: Great Western Highway												
10	L2	14	0.0	0.444	16.0	LOS B	7.6	58.8	0.69	0.60	0.69	49.8
11	T1	387	12.2	0.444	10.5	LOS A	7.6	58.8	0.69	0.60	0.69	51.0
Approach		401	11.8	0.444	10.7	LOS A	7.6	58.8	0.69	0.60	0.69	51.0
All Vehicles		847	12.8	0.444	7.9	LOS A	7.6	58.8	0.56	0.49	0.56	52.9

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate
P3	North Full Crossing	5	24.3	LOS C	0.0	0.0	0.90	0.90
P4	West Full Crossing	11	24.3	LOS C	0.0	0.0	0.90	0.90
All Pedestrians		16	24.3	LOS C			0.90	0.90

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: 101 [GWH Station Street Intersection AM Peak +5 Trucks Hr]

1 Existing Intersection
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 60 seconds (Site User-Given Cycle Time)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
East: Great Western Highway												
5	T1	417	11.6	0.328	3.8	LOS A	4.7	36.5	0.42	0.37	0.42	56.5
6	R2	7	42.9	0.016	12.7	LOS A	0.1	0.9	0.55	0.64	0.55	47.1
Approach		424	12.2	0.328	3.9	LOS A	4.7	36.5	0.42	0.37	0.42	56.3
North: Station Street												
7	L2	1	0.0	0.002	21.2	LOS B	0.0	0.1	0.71	0.59	0.71	43.6
9	R2	26	56.0	0.198	35.4	LOS C	0.8	8.0	0.95	0.72	0.95	36.0
Approach		27	53.8	0.198	34.9	LOS C	0.8	8.0	0.94	0.71	0.94	36.2
West: Great Western Highway												
10	L2	19	27.8	0.453	16.4	LOS B	7.8	60.5	0.69	0.61	0.69	48.8
11	T1	387	12.2	0.453	10.6	LOS A	7.8	60.5	0.69	0.61	0.69	51.0
Approach		406	13.0	0.453	10.8	LOS A	7.8	60.5	0.69	0.61	0.69	50.9
All Vehicles		858	13.9	0.453	8.2	LOS A	7.8	60.5	0.56	0.49	0.56	52.7

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate
P3	North Full Crossing	5	24.3	LOS C	0.0	0.0	0.90	0.90
P4	West Full Crossing	11	24.3	LOS C	0.0	0.0	0.90	0.90
All Pedestrians		16	24.3	LOS C			0.90	0.90

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: 101 [GWH Station Street Intersection AM Peak +8 Trucks Hr]

1 Existing Intersection
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 60 seconds (Site User-Given Cycle Time)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
East: Great Western Highway												
5	T1	417	11.6	0.328	3.8	LOS A	4.7	36.5	0.42	0.37	0.42	56.5
6	R2	7	42.9	0.016	12.7	LOS A	0.1	0.9	0.55	0.65	0.55	47.1
Approach		424	12.2	0.328	3.9	LOS A	4.7	36.5	0.42	0.37	0.42	56.3
North: Station Street												
7	L2	1	0.0	0.002	21.2	LOS B	0.0	0.1	0.71	0.59	0.71	43.6
9	R2	29	60.7	0.227	35.7	LOS C	0.9	9.3	0.95	0.72	0.95	35.8
Approach		31	58.6	0.227	35.2	LOS C	0.9	9.3	0.95	0.72	0.95	36.0
West: Great Western Highway												
10	L2	22	38.1	0.459	16.6	LOS B	7.9	61.6	0.69	0.61	0.69	48.4
11	T1	387	12.2	0.459	10.6	LOS A	7.9	61.6	0.69	0.61	0.69	50.9
Approach		409	13.6	0.459	10.9	LOS A	7.9	61.6	0.69	0.61	0.69	50.8
All Vehicles		864	14.5	0.459	8.3	LOS A	7.9	61.6	0.57	0.50	0.57	52.6

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate
P3	North Full Crossing	5	24.3	LOS C	0.0	0.0	0.90	0.90
P4	West Full Crossing	11	24.3	LOS C	0.0	0.0	0.90	0.90
All Pedestrians		16	24.3	LOS C			0.90	0.90

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: 101 [GWH Station Street Intersection PM Peak Baseline]

1 Existing Intersection
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 70 seconds (Site User-Given Cycle Time)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
East: Great Western Highway												
5	T1	394	7.0	0.284	3.1	LOS A	4.3	32.2	0.35	0.31	0.35	57.1
6	R2	2	0.0	0.003	11.0	LOS A	0.0	0.2	0.47	0.61	0.47	49.4
Approach		396	6.9	0.284	3.2	LOS A	4.3	32.2	0.35	0.31	0.35	57.0
North: Station Street												
7	L2	3	33.3	0.008	26.8	LOS B	0.1	0.7	0.76	0.63	0.76	40.2
9	R2	16	0.0	0.099	39.1	LOS C	0.5	3.7	0.95	0.69	0.95	35.6
Approach		19	5.6	0.099	37.1	LOS C	0.5	3.7	0.92	0.68	0.92	36.3
West: Great Western Highway												
10	L2	17	6.3	0.388	14.5	LOS A	7.7	57.6	0.59	0.52	0.59	50.7
11	T1	394	7.8	0.388	8.9	LOS A	7.7	57.6	0.59	0.52	0.59	52.2
Approach		411	7.7	0.388	9.1	LOS A	7.7	57.6	0.59	0.52	0.59	52.1
All Vehicles		825	7.3	0.388	6.9	LOS A	7.7	57.6	0.48	0.42	0.48	53.8

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate
P3	North Full Crossing	5	29.3	LOS C	0.0	0.0	0.91	0.91
P4	West Full Crossing	11	29.3	LOS C	0.0	0.0	0.91	0.91
All Pedestrians		16	29.3	LOS C			0.91	0.91

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: 101 [GWH Station Street Intersection PM Peak +5 Trucks Hr]

1 Existing Intersection
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 70 seconds (Site User-Given Cycle Time)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
East: Great Western Highway												
5	T1	394	7.0	0.284	3.1	LOS A	4.3	32.2	0.35	0.31	0.35	57.1
6	R2	2	0.0	0.003	11.0	LOS A	0.0	0.2	0.47	0.61	0.47	49.4
Approach		396	6.9	0.284	3.2	LOS A	4.3	32.2	0.35	0.31	0.35	57.0
North: Station Street												
7	L2	3	33.3	0.008	26.8	LOS B	0.1	0.7	0.76	0.63	0.76	40.2
9	R2	21	25.0	0.156	40.2	LOS C	0.7	6.1	0.96	0.70	0.96	34.9
Approach		24	26.1	0.156	38.4	LOS C	0.7	6.1	0.93	0.69	0.93	35.5
West: Great Western Highway												
10	L2	22	28.6	0.396	14.8	LOS B	7.9	59.3	0.59	0.53	0.59	49.8
11	T1	394	7.8	0.396	8.9	LOS A	7.9	59.3	0.59	0.53	0.59	52.1
Approach		416	8.9	0.396	9.3	LOS A	7.9	59.3	0.59	0.53	0.59	52.0
All Vehicles		836	8.4	0.396	7.2	LOS A	7.9	59.3	0.49	0.43	0.49	53.5

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate
P3	North Full Crossing	5	29.3	LOS C	0.0	0.0	0.91	0.91
P4	West Full Crossing	11	29.3	LOS C	0.0	0.0	0.91	0.91
All Pedestrians		16	29.3	LOS C			0.91	0.91

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: 101 [GWH Station Street Intersection PM Peak +8 Trucks Hr]

1 Existing Intersection
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 70 seconds (Site User-Given Cycle Time)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
East: Great Western Highway												
5	T1	394	7.0	0.284	3.1	LOS A	4.3	32.2	0.35	0.31	0.35	57.1
6	R2	2	0.0	0.003	11.0	LOS A	0.0	0.2	0.47	0.61	0.47	49.4
Approach		396	6.9	0.284	3.2	LOS A	4.3	32.2	0.35	0.31	0.35	57.0
North: Station Street												
7	L2	3	33.3	0.008	26.8	LOS B	0.1	0.7	0.76	0.63	0.76	40.2
9	R2	24	34.8	0.190	40.6	LOS C	0.8	7.6	0.96	0.71	0.96	34.6
Approach		27	34.6	0.190	39.0	LOS C	0.8	7.6	0.94	0.70	0.94	35.1
West: Great Western Highway												
10	L2	25	37.5	0.401	15.0	LOS B	8.0	60.3	0.60	0.54	0.60	49.5
11	T1	394	7.8	0.401	9.0	LOS A	8.0	60.3	0.60	0.54	0.60	52.1
Approach		419	9.5	0.401	9.3	LOS A	8.0	60.3	0.60	0.54	0.60	51.9
All Vehicles		842	9.1	0.401	7.4	LOS A	8.0	60.3	0.49	0.43	0.49	53.3

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate
P3	North Full Crossing	5	29.3	LOS C	0.0	0.0	0.91	0.91
P4	West Full Crossing	11	29.3	LOS C	0.0	0.0	0.91	0.91
All Pedestrians		16	29.3	LOS C			0.91	0.91

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

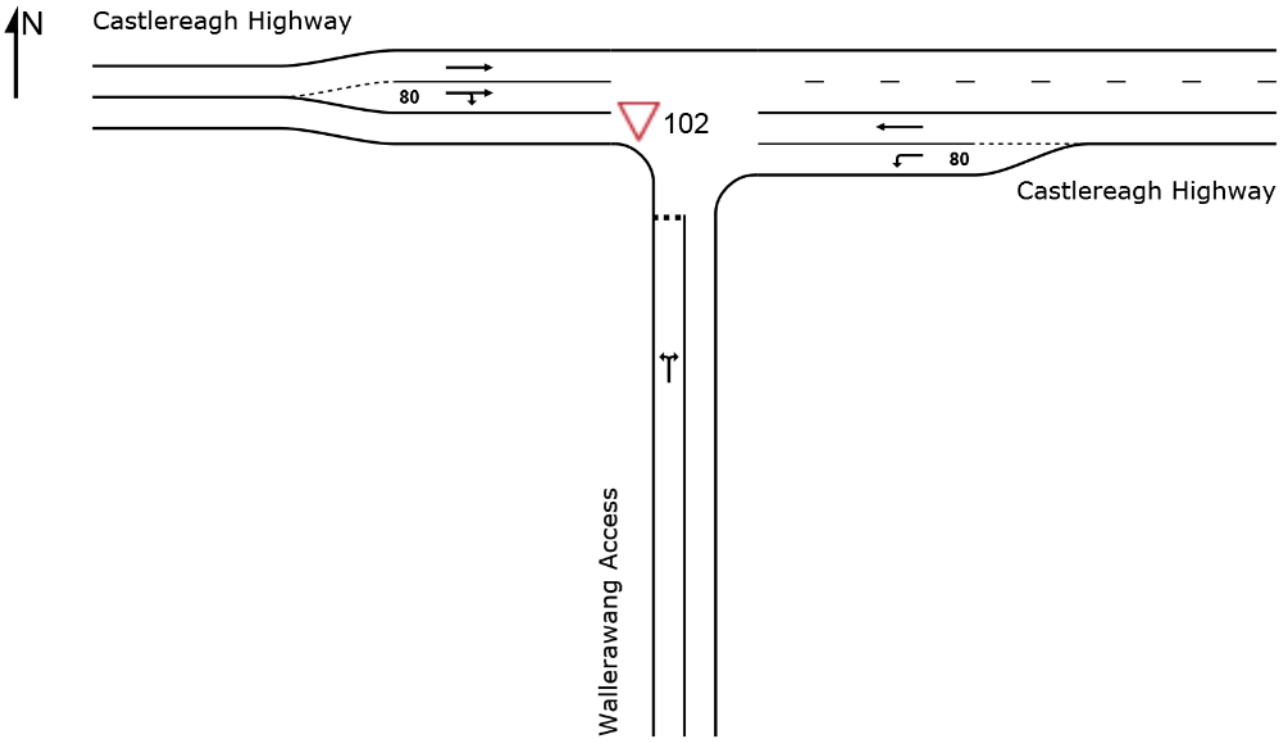
Appendix B

SIDRA results – Castlereagh Highway and Wallerawang Power Station Haul Road intersection

SITE LAYOUT

Site: 102 [Castlereagh Hwy Wallerawang Access AM Peak Baseline]

Existing Give Way Intersection
Site Category: (None)
Giveway / Yield (Two-Way)



MOVEMENT SUMMARY

Site: 102 [Castlereagh Hwy Wallerawang Access AM Peak Baseline]

Existing Give Way Intersection
Site Category: (None)
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Wallerawang Access												
1	L2	1	0.0	0.003	6.3	LOS A	0.0	0.1	0.38	0.56	0.38	57.0
3	R2	1	0.0	0.003	8.5	LOS A	0.0	0.1	0.38	0.56	0.38	56.9
Approach		2	0.0	0.003	7.4	LOS A	0.0	0.1	0.38	0.56	0.38	56.9
East: Castlereagh Highway												
4	L2	1	0.0	0.001	6.9	LOS A	0.0	0.0	0.00	0.63	0.00	65.4
5	T1	205	13.3	0.114	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	80.0
Approach		206	13.3	0.114	0.0	NA	0.0	0.0	0.00	0.00	0.00	79.9
West: Castlereagh Highway												
11	T1	192	13.2	0.054	0.0	LOS A	0.0	0.1	0.00	0.00	0.00	79.9
12	R2	1	0.0	0.054	7.5	LOS A	0.0	0.1	0.01	0.01	0.01	65.6
Approach		193	13.1	0.054	0.1	NA	0.0	0.1	0.00	0.00	0.00	79.8
All Vehicles		401	13.1	0.114	0.1	NA	0.0	0.1	0.00	0.01	0.00	79.7

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
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 is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 102 [Castlereagh Hwy Wallerawang Access AM Peak +5 Trucks Hr]

Existing Give Way Intersection
Site Category: (None)
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Wallerawang Access												
1	L2	1	0.0	0.019	6.4	LOS A	0.1	0.8	0.53	0.63	0.53	53.4
3	R2	6	83.3	0.019	13.6	LOS A	0.1	0.8	0.53	0.63	0.53	39.0
Approach		7	71.4	0.019	12.5	LOS A	0.1	0.8	0.53	0.63	0.53	40.6
East: Castlereagh Highway												
4	L2	6	83.3	0.005	8.5	LOS A	0.0	0.0	0.00	0.63	0.00	45.4
5	T1	205	13.3	0.114	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	80.0
Approach		212	15.4	0.114	0.3	NA	0.0	0.0	0.00	0.02	0.00	78.2
West: Castlereagh Highway												
11	T1	192	13.2	0.054	0.0	LOS A	0.0	0.1	0.00	0.00	0.00	79.9
12	R2	1	0.0	0.054	7.5	LOS A	0.0	0.1	0.01	0.01	0.01	65.6
Approach		193	13.1	0.054	0.1	NA	0.0	0.1	0.00	0.00	0.00	79.8
All Vehicles		412	15.3	0.114	0.4	NA	0.1	0.8	0.01	0.02	0.01	77.6

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
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 is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 102 [Castlereagh Hwy Wallerawang Access AM Peak +8 Trucks Hr]

Existing Give Way Intersection
Site Category: (None)
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Wallerawang Access												
1	L2	1	0.0	0.029	6.4	LOS A	0.1	1.2	0.55	0.65	0.55	52.9
3	R2	9	88.9	0.029	14.1	LOS A	0.1	1.2	0.55	0.65	0.55	38.1
Approach		11	80.0	0.029	13.4	LOS A	0.1	1.2	0.55	0.65	0.55	39.2
East: Castlereagh Highway												
4	L2	9	88.9	0.008	8.6	LOS A	0.0	0.0	0.00	0.63	0.00	44.5
5	T1	205	13.3	0.114	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	80.0
Approach		215	16.7	0.114	0.4	NA	0.0	0.0	0.00	0.03	0.00	77.2
West: Castlereagh Highway												
11	T1	192	13.2	0.054	0.0	LOS A	0.0	0.1	0.00	0.00	0.00	79.9
12	R2	1	0.0	0.054	7.6	LOS A	0.0	0.1	0.01	0.01	0.01	65.6
Approach		193	13.1	0.054	0.1	NA	0.0	0.1	0.00	0.00	0.00	79.8
All Vehicles		418	16.6	0.114	0.6	NA	0.1	1.2	0.02	0.03	0.02	76.5

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
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 is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 102 [Castlereagh Hwy Wallerawang Access PM Peak Baseline]

Existing Give Way Intersection
Site Category: (None)
Giveway / Yield (Two-Way)

Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Wallerawang Access												
1	L2	1	0.0	0.003	6.3	LOS A	0.0	0.1	0.39	0.56	0.39	56.7
3	R2	1	0.0	0.003	9.2	LOS A	0.0	0.1	0.39	0.56	0.39	56.6
Approach		2	0.0	0.003	7.8	LOS A	0.0	0.1	0.39	0.56	0.39	56.6
East: Castlereagh Highway												
4	L2	1	0.0	0.001	6.9	LOS A	0.0	0.0	0.00	0.63	0.00	65.4
5	T1	214	6.9	0.114	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	80.0
Approach		215	6.9	0.114	0.0	NA	0.0	0.0	0.00	0.00	0.00	79.9
West: Castlereagh Highway												
11	T1	266	6.7	0.072	0.0	LOS A	0.0	0.1	0.00	0.00	0.00	79.9
12	R2	1	0.0	0.072	7.5	LOS A	0.0	0.1	0.01	0.01	0.01	65.6
Approach		267	6.7	0.072	0.0	NA	0.0	0.1	0.00	0.00	0.00	79.8
All Vehicles		484	6.7	0.114	0.1	NA	0.0	0.1	0.00	0.01	0.00	79.7

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
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 is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 102 [Castlereagh Hwy Wallerawang Access PM Peak +5 Trucks Hr]

Existing Give Way Intersection
Site Category: (None)
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Wallerawang Access												
1	L2	1	0.0	0.022	6.4	LOS A	0.1	0.9	0.57	0.65	0.57	52.2
3	R2	6	83.3	0.022	15.4	LOS B	0.1	0.9	0.57	0.65	0.57	38.4
Approach		7	71.4	0.022	14.2	LOS A	0.1	0.9	0.57	0.65	0.57	39.9
East: Castlereagh Highway												
4	L2	6	83.3	0.005	8.5	LOS A	0.0	0.0	0.00	0.63	0.00	45.4
5	T1	214	6.9	0.114	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	80.0
Approach		220	9.1	0.114	0.3	NA	0.0	0.0	0.00	0.02	0.00	78.2
West: Castlereagh Highway												
11	T1	266	6.7	0.072	0.0	LOS A	0.0	0.1	0.00	0.00	0.00	79.9
12	R2	1	0.0	0.072	7.6	LOS A	0.0	0.1	0.01	0.01	0.01	65.6
Approach		267	6.7	0.072	0.0	NA	0.0	0.1	0.00	0.00	0.00	79.8
All Vehicles		495	8.7	0.114	0.3	NA	0.1	0.9	0.01	0.02	0.01	78.0

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
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 is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 102 [Castlereagh Hwy Wallerawang Access PM Peak +8 Trucks Hr]

Existing Give Way Intersection
Site Category: (None)
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Wallerawang Access												
1	L2	1	0.0	0.034	6.4	LOS A	0.1	1.4	0.59	0.68	0.59	51.5
3	R2	9	88.9	0.034	16.2	LOS B	0.1	1.4	0.59	0.68	0.59	37.4
Approach		11	80.0	0.034	15.2	LOS B	0.1	1.4	0.59	0.68	0.59	38.4
East: Castlereagh Highway												
4	L2	9	88.9	0.008	8.6	LOS A	0.0	0.0	0.00	0.63	0.00	44.5
5	T1	214	6.9	0.114	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	80.0
Approach		223	10.4	0.114	0.4	NA	0.0	0.0	0.00	0.03	0.00	77.3
West: Castlereagh Highway												
11	T1	266	6.7	0.072	0.0	LOS A	0.0	0.1	0.00	0.00	0.00	79.9
12	R2	1	0.0	0.072	7.6	LOS A	0.0	0.1	0.01	0.01	0.01	65.6
Approach		267	6.7	0.072	0.0	NA	0.0	0.1	0.00	0.00	0.00	79.8
All Vehicles		501	9.9	0.114	0.5	NA	0.1	1.4	0.01	0.03	0.01	77.0

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
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 is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Appendix C

Safe intersection sight distance review

C.1 Safe intersection sight distance review for Wallerawang Power Station Haul Road and Castlereagh Highway intersection

C.1.1 Sight distance requirements (Austroads Safe Intersection Sight Distance Standard)

The speed limit on Castlereagh Highway at the Wallerawang Power Station Haul Road intersection is 80 km/hr. For this speed, the Austroads *Guide to Road Design* (2017) (Part 4A Unsignalised and Signalised Intersections – Table 3.2) recommends a minimum sight distance of either 170 m or 181 m between an approaching vehicle on the major road (ie Castlereagh Highway) and a vehicle waiting to turn either left or right from the minor road (ie Wallerawang Power Station Haul Road).

C.1.2 Actual intersection sight distance

The actual intersection sight distance has been observed and recorded on-site by EMM on 23 July 2019.

The sight distance visibility to the west is approximately as far as the Wolgan Road intersection, which is at least 500 m (refer Photograph C.1). This clearly meets the Austroads minimum sight distance requirement of 170 m–180 m.

Photograph C.1 Visibility at intersection looking west from the haul road towards Wolgan Road (23 July 2019)

The sight distance visibility to the east is currently limited to approximately 150 m–160 m by the line of roadside trees, which is located between approximately 120 m–200 m east of the intersection on the southern side of the Castlereagh Highway.

Photographs C.2 to C.6 illustrate the sight distance visibility at this intersection when looking to and from the east.

Photograph C.2 **Visibility at the intersection looking east towards Springvale Mine (23 July 2019)**

Photograph C.3 **Visibility approximately 80–90 m from the intersection when approaching from the east (23 July 2019)**

Photograph C.4 Visibility approximately 130–140 m from the intersection when approaching from the east (23 July 2019)

Photograph C.5 Visibility approximately 180–190 m from the intersection when approaching from the east (23 July 2019)

Photograph C.6 Visibility approximately 230–240 m from the intersection when approaching from the east (23 July 2019)

C.1.3 Recommendations

The actual geometric design of the roadway of both Castlereagh Highway and the Wallerawang Power Station Haul Road is considered to be adequate to meet the minimum Austroads safe intersection sight distance visibility of approximately 170 m–180 m for a major road travel speed of 80 km/hr.

However, the current intersection sight distance visibility to the east is restricted to approximately 150 m– 160 m by the existing line of roadside vegetation along the southern side of the Castlereagh Highway.

This line of roadside vegetation should be trimmed for a length of approximately 20 m–30 m to ensure the existing Austroads Safe Intersection Sight Distance 'minimum visibility standard' of approximately 170 m– 180 m for an 80 km/hr travel speed on the Castlereagh Highway is achieved. Trimming activities should commence approximately 150 m from the intersection and continue through to approximately 180 m from the intersection.