APPENDIX P

Appendix P - Traffic Impact Assessment

This page has been left blank intentionally.

TRAFFIC IMPACT ASSESSMENT

FOR

TAHMOOR SOUTH

PROJECT

Ref. 18156r
Final Report
19 November 2018

Prepared By

TRANSPORT & URBAN PLANNING PTY LTD
Traffic Engineering, Transport Planning
Road Safety & Project Management Consultants
5/90 Toronto Parade
P.O. Box 533
SUTHERLAND NSW 2232
Tel: (02) 9545-1411
Fax: (02) 9545-1556
Email: terry@transurbanplan.com.au

CONTENTS

EXECUTIVE SUMMARY

1.0 INTRODUCTION 1

1.1 Background 1
1.2 Authority Requirements 1
1.3 Structure of this Report 2

2.0 EXISTING TAHMOOR MINE OPERATION AND PROPOSED PROJECT 3

2.1 Existing Tahmoor Mine Operation 3
2.2 The Proposed Development 3

3.0 EXISTING AND FUTURE CONDITIONS 6

3.1 Principal Road Network 6
3.2 Description of Existing Roads and Intersections 6
3.2.1 Remembrance Driveway 6
3.2.2 Hume Highway 7
3.2.3 Avon Dam Road 7
3.2.4 Tahmoor Mine Access Road and Other Local Roads 7
3.3 Existing Traffic Conditions on the Road Network 8
3.3.1 Existing Traffic Volumes 8
3.3.2 Daily Volumes on Road Network 8
3.3.3 Daily Volumes Generated by Tahmoor Mine 11
3.3.4 Weekday AM and PM Peak Hour Traffic Volumes 12
3.4 Road Safety 13
3.4.1 Remembrance Driveway 13
3.4.2 Avon Dam Road between Hume Highway at Pheasant Nest and Remembrance Driveway at Bargo 14
3.5 Bus Routes 14

4.0 ASSESSMENT OF TRAFFIC IMPACTS OF PROJECT 15

4.1 Improvements to Remembrance Driveway/Tahmoor Mine Access Road Intersection 15
4.2 Traffic Generation in Operational Phase from Tahmoor Mine 15
4.3 Other Construction Traffic 17
4.3.1 Additional Facilities within Tahmoor Mine Compound 17
4.3.2 Construction of Vent Shafts 17
4.4 Traffic Impacts During Operational Phase 17
4.6 Construction Traffic Impacts 27
4.6.1 Associated Surface Infrastructure 27
4.6.2 Vent Shafts 28
4.6.3 Increase in Heavy Vehicles 28
4.7 Road Safety 29
4.8 Parking Changes 30

5.0 CONCLUSIONS 31

ILLUSTRATIONS

Figure 1 Location
Figure 2 Existing Surface Facilities Areas Infrastructure
Figure 3 Existing Tahmoor Approved Mining Area and Mining Tenements
Figure 4A Surface Facility Upgrades
Figure 4B Proposed Tahmoor Mine Plan and Vent Shafts
Figure 5 Road Network
Figure 6 Remembrance Driveway/Tahmoor Mine Access Road
Figure 7 Weekday and Daily Traffic Volumes
Figure 8 Existing AM Peak Hour Traffic Volumes
Figure 9 Existing PM Peak Hour Traffic Volumes
Figure 10 Proposed Intersection Treatment Remembrance Driveway/Tahmoor Mine Access Road
Figure 11 Additional Traffic from the Project in the AM (Tahmoor Mine) Peak Hour in 2020
Figure 12 Additional Traffic from the Project in the PM (Tahmoor Mine) Peak Hour in 2020
Figure 13 Projected 2020 Traffic Volumes at Critical Intersection in the AM Tahmoor Mine Peak Hour
Figure 14 Projected 2020 Traffic Volumes at Critical Intersection in the PM (Tahmoor Mine) Peak Hour

REFERENCES

APPENDICES

1. SIDRA Traffic Modelling

GLOSSARY

AADT	Annual Average Daily Traffic, based on annual data collection
ADT	Average Daily Traffic, based on weekly data collection and often annualised
AUL	Auxiliary left turn lane treatment
AUR	Auxiliary right turn lane treatment
AVD	Average vehicle delay per vehicle in seconds
BAL	Basic left turn treatment
BAR	Basic right turn treatment
CHR	Channelised right treatment/lane
DP&E	Department of Planning and Environment
DS	Degree of Saturation, a measure of intersection performance based on the ratio of demand flow to capacity
Light Vehicles	Austroads 1 and 2 vehicle classifications and motorbikes
LS	Level of Service, a measure of intersection performance based on vehicle delay
Heavy Vehicles	Austroads 3-12 vehicle classifications
Project	Tahmoor South Project
RMS	Roads and Maritime Services, NSW (previously RTA)
RTA	Roads and Traffic Authority (now RMS)
SEARS	Secretary's Environmental Assessment Requirements
SIDRA	SIDRA Intersection Traffic Model
SSD	State Significant Development
vpd	Vehicles per day
vph	Vehicles per hour
WSC	Wollondilly Shire Council
95^{th}% queue	95^{th} percentile queue length in metres

EXECUTIVE SUMMARY

This report documents the assessment of the traffic impacts of a continuation of mining at Tahmoor Mine, extending underground operations and associated infrastructure south, within the Bargo area. The proposed development seeks to extend the life of underground mining at Tahmoor Mine until approximately 2035, depending upon geological and mining parameters.

As part of the project, the Mine's access intersection with Remembrance Driveway will be upgraded to improve potential road safety and additional parking will be provided at the Mine, as part of the upgrading of the surface infrastructure of the Mine. The intersection upgrade will be designed and constructed to Austroad Standards.

Tahmoor Mine currently employs some 390 employees/contractors and operates 24 hours 7 days utilising 3 main shifts on weekdays.

Weekdays are the busiest days in terms of the traffic generation of the Mine.

As part of the Project total employment at the Mine is expected to increase from 390 persons in 2018 to a peak of 510 persons in 2020 before reducing to 422 persons in 2023.

As part of the project Tahmoor Coal proposes to transport up to 200,000tpa of coal products to / from the mine on a campaign basis. This equates to 79 truck loads per day and 8 truck loads per hour.

The assessment has found that at peak employment in 2020 the mine's access intersection in Remembrance Driveway will have a satisfactory to good operation in terms of level of service and vehicle delay, with a Level of Service A/B operation during the AM and PM Mine peak hours.

On the wider road network the additional traffic generated by the Project is relatively small in real terms and will have minimal impact on road capacity and or intersection capacity and vehicle delay at adjacent intersections.

The construction impacts of the upgrading of the Mine's access intersection with Remembrance Driveway and the construction of vent shafts for the Mine will be managed through separate Construction Traffic Management Plans which will be prepared following approval of the Project. Both RMS and Wollondilly Shire Council will be consulted as appropriate during the preparation of the Construction Traffic Management Plans. Any minor upgrading works and the required traffic management for vehicle access to the vent shaft sites will be detailed in the Construction Traffic Management Plans for these sites.

The Project is not expected to have any negative impact on road safety. The proposed upgrading of the Mine's access intersection in Remembrance Driveway will improve potential road safety at this intersection. Road Safety during the construction phase will be managed by Construction Traffic Management Plans.

1.0 INTRODUCTION

1.1 Background

Tahmoor Mine, as shown on **Figure 1,** is an underground coal mine operated by Tahmoor Coal Pty Ltd (Tahmoor Coal), approximately 80 km south of Sydney in New South Wales.

Tahmoor Mine currently uses continuous miners and longwall extraction methods to produce a Run of Mine (ROM) output of approximately 3 Mtpa.

Tahmoor Coal is seeking approval for the Tahmoor South Project (the Project), which is for the continuation of mining at Tahmoor Mine, extending underground operations and associated infrastructure south within the Bargo area. The Project seeks to extend the life of underground mining at Tahmoor Mine until approximately 2035, depending upon geological and mining parameters.

The proposed Project is a State Significant Development (SSD) as defined under the *State Environmental Planning Policy (State and Regional Development) 2011* and requires development consent under Division 4.1, Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

1.2 Authority Requirements

As part of the preparation of the Traffic Impact Assessment for the Project consideration was given to the requirements of the Secretary's Environmental Assessment Requirements (SEARS) of the Department of Planning and Environment, as well as correspondence from Roads and Maritime Services (RMS) and Wollondilly Shire Council (WSC), particularly in relation to traffic and road transportation. Table 1.1 shows the traffic and transport issues raised by the authorities and where it is addressed in this report.

Authority / Issue	Comments
SEARS The SEARS include: *Transport – including an assessment of the likely transport impacts of the development on the capacity, condition, safety and efficiency of the rail network and the local and State road network; and*	 Sections 2, 3, and 4
RMS The RMS requirements for the Traffic Impact Assessment include: *The preparation of a Traffic Impact Study. As a guide Table 2.1 of the RTA's Guide to Traffic Generating Developments outlines the key issues that may be considered in preparing the Traffic Impact Study (TIS). The TIS, in addition to the above, must address the following:* *a) Details on road transport routes to be used to provide access to/from the site. This including vehicles travelling along the Hume Highway and Remembrance Driveway, wishing to travel to and from the development site;* *b) Details on existing movements along the road network and likely additional movements to and from the development site onto the Hume Highway, including the types of vehicles, peak hour movements and maximum daily movements;* *c) The existing traffic volumes (based on survey) using the junction of the Tahmoor Colliery site access with Remembrance Driveway and the junction of Remembrance Driveway and Avon Dam Road. The traffic study needs to consider the likely impact of the additional traffic associated with the proposed development including the suitability of the existing junctions against Austroad standards, the associated need for upgrades and interruptions to traffic flow on the Hume Highway;*	 Section 3 and Figure 5 Section 3 and 4 Section 3.3 and Figures 8 and 9 Section 4

TRANSPORT AND URBAN PLANNING

TRAFFIC, TRANSPORT & PROJECT MANAGEMENT CONSULTANTS

5/90 Toronto Parade, Sutherland NSW 2232
Phone 02 9545 1411 Fax 02 9545 1556

www.transurbanplan.com.au

N

NOT TO SCALE

FIGURE 1

TAHMOOR COAL
TAHMOOR SOUTH PROJECT EIS

SITE LOCATION

JOB NO. 18156 12/11/18

Authority / Issue	Comments
d) *Clarification of the sight distance available at the existing/proposed accesses to the development. It should be noted that RMS requires sight distance to comply with the safe intersection sight distance in accordance with Austroads Guide to Road Design – Part 4a: Unsignalised and Signalised Intersections Table 3.2, in both directions. Landscaping and fencing shall not restrict vehicular sight lines on Remembrance Driveway; and*	Section 3.2 and 4.1
e) *The identification of suitable infrastructure required to ameliorate any traffic impacts and safety impacts associated with the development including the provision of supporting plans.*	Section 4.1 and Figure 10
(ii) *Modelling – intersections: the requirement to undertake intersection modelling using SIDRA for the junction of the development site with Remembrance Driveway and the junction of Remembrance Driveway and Avon Dam Road (on the assumption that vehicles accessing the site will use the above intersections.) This is required to demonstrate that an acceptable level of service is maintained at the intersections used as well as to assist in determining what intersection upgrade works are required. The intersection modelling needs to give consideration to the following:* • *Full development of the site.* • *AM and PM peak volumes and Saturday peak volumes.* • *Existing traffic volumes with and without development and 10 year projected volumes with and without the development.* • *The base SIDRA models must be calibrated with on-site observations in the AM and PM peak. This can be done by measuring existing queue lengths and delays; and* • *Electronic copies of all SIDRA files needs to be provided to RMS for review.*	Section 4.4 and Appendix 1 NB. Saturday volumes are lower than weekdays and therefore not modelled. SIDRA files will be made available to RMS.
<u>Wollondilly Shire Council</u> Wollondilly Shire Council did not have any specific matters relating to traffic and road transportation.	

1.3 Structure of this Report

This report documents the assessment of the impacts of the Project with respect to traffic and road conditions. As noted above, the SEARS and RMS requirements are addressed in the body of the report and in particular Sections 2, 3, and 4 of this report.

The remaining sections of this report cover the following:

- Section 2 describes the existing Tahmoor Mine operation and provides details of the Tahmoor South Project with respect to traffic;
- Section 3 examines the existing and future road network and traffic conditions;
- Section 4 assesses the traffic impacts of the Project on the road network and assesses the parking requirements of Tahmoor Mine with the Project; and
- Section 5 presents conclusions.

2.0 EXISTING TAHMOOR MINE OPERATION AND PROPOSED PROJECT

2.1 Existing Tahmoor Mine Operation

Tahmoor Mine currently uses continuous miners and longwall extraction methods to produce a ROM coal output of approximately 3 Mtpa.

The coal is processed at Tahmoor Mine's CHPP and transported by rail to Port Kembla.

The existing surface facilities and infrastructure is shown on **Figure 2** and includes offices, control room, co-generation plant, gas plant, bath houses, workshops, three vent shafts, stores, three car parks, product stockpile areas, water treatment ponds, the reject office/compound and the reject emplacement area.

The main vehicle access to Tahmoor Mine is from a T junction intersection in Remembrance Driveway. This provides vehicle access to the Tahmoor Mine's infrastructure and compound.

Vehicle access to the reject emplacement area and reject office/compound is from Charlies Point Road, via Rockford Road.

Operations are undertaken 24 hour 7 days, with 3 shifts generally operating.

Total employment at Tahmoor Mine in 2012 was 442 persons but current employment in 2018 has been reduced to 390 persons.

Figure 3 shows the existing approved mining areas and mining tenements.

2.2 The Proposed Development

Tahmoor Coal is seeking development consent for the continuation of underground mining at Tahmoor Mine, extending underground operations and associated infrastructure south, within the Bargo area.

The proposed development will use longwall mining to extract coal from the Bulli seam within the bounds of CCL 716 and CCL 747. Coal extraction of up to 4 million tonnes (Mt) of ROM coal per annum is proposed as part of the development, with extraction of up to 48 Mt of ROM coal over the life of the project. The majority of product coal produced will be coking coal, with a small secondary thermal coal product.

Once the coal has been extracted and brought to the surface, it will be processed at Tahmoor Mine's existing Coal Handling and Preparation Plan (CHPP) and coal clearance facilities, and then transported via the existing rail loop, the Main Southern Railway and the Moss Vale to Unanderra Railway to Port Kembla and Newcastle (from time to time) for Australian and international markets.

The proposed development will utilise the existing surface infrastructure at the Tahmoor Mine surface facilities area. Some upgrades are proposed to facilitate the extension. The proposed development also incorporates the planning for rehabilitation and mine closure once mining ceases.

The proposed development will make use of three ventilation shafts currently being used for the operations at Tahmoor North, being one upcast (T2) and two downcast shafts (T1 and T3). The two additional vent shafts proposed for the Tahmoor South Project will be located in the Central Domain as follows:

TRANSPORT AND URBAN PLANNING

TRAFFIC, TRANSPORT & PROJECT MANAGEMENT CONSULTANTS

5/90 Toronto Parade, Sutherland NSW 2232
Phone 02 9545 1411 Fax 02 9545 1556

www.transurbanplan.com.au

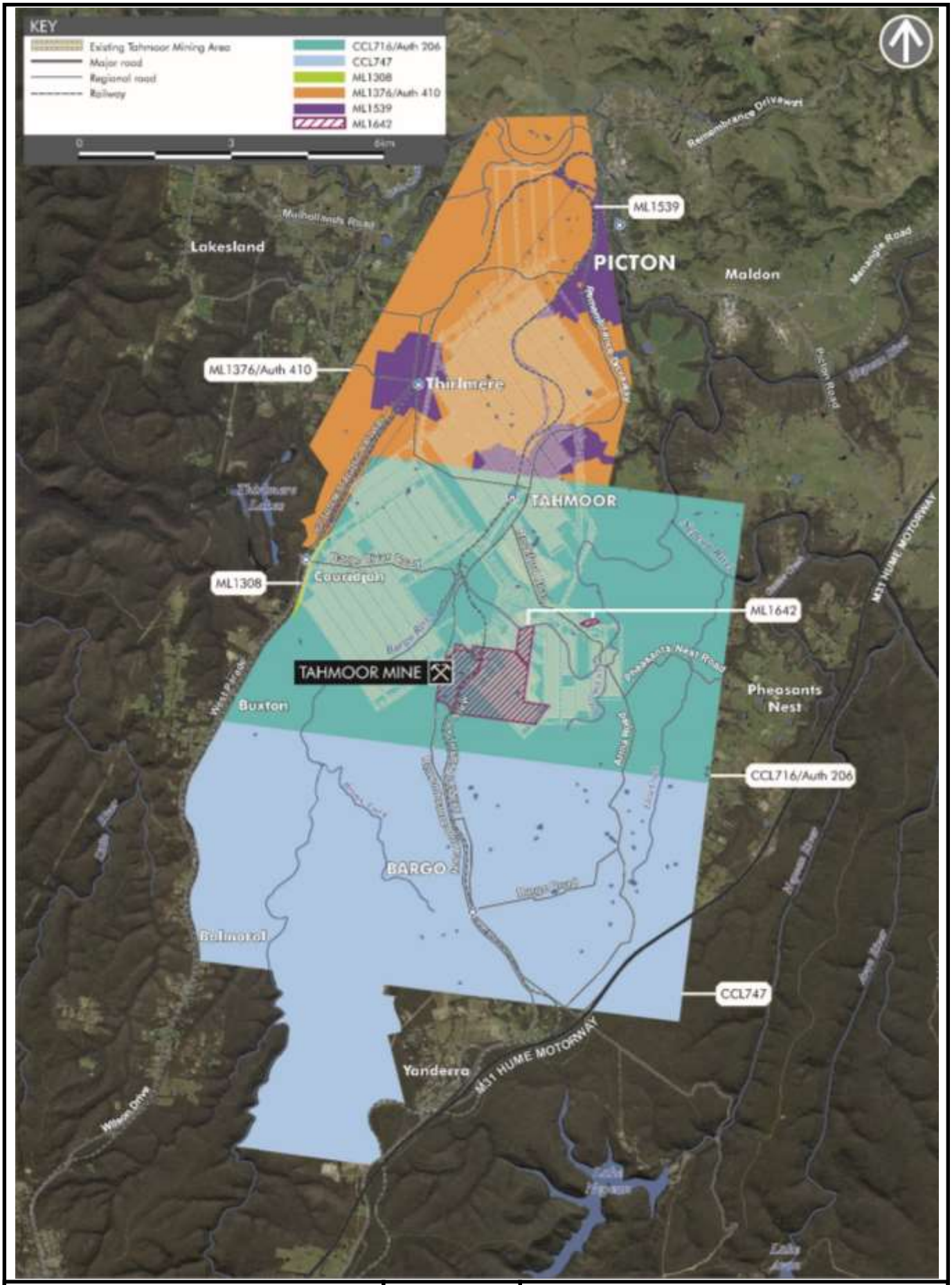
N

NOT TO SCALE

FIGURE 2

TAHMOOR COAL
TAHMOOR SOUTH PROJECT EIS
EXISTING SURFACE FACILITIES AREA INFRASTRUCTURE

JOB NO. 18156 12/11/18



TRANSPORT AND URBAN PLANNING

TRAFFIC, TRANSPORT & PROJECT MANAGEMENT CONSULTANTS

5/90 Toronto Parade, Sutherland NSW 2232
Phone 02 9545 1411 Fax 02 9545 1556

www.transurbanplan.com.au

N

NOT TO SCALE

FIGURE 3

TAHMOOR COAL
TAHMOOR SOUTH PROJECT EIS
EXISTING TAHMOOR MINING AREAS AND MINING TENEMENTS

JOB NO. 18156 12/11/18

- TSC1: an upcast ventilation shaft that will be located on Tahmoor Coal's Charlies Point Road property; and

- TSC2: a downcast ventilation shaft that will be located on Crown Land adjacent to Tahmoor Coal's Charlies Point Road property.

An additional 50 -175 personnel will be required for the Tahmoor South Project development works, which may occur concurrently with the ongoing mining operations at Tahmoor North. Additional site amenities, including bath houses and additional onsite car parks will be required to accommodate the increased workforce during the transition period from mining operations at Tahmoor North and the Tahmoor South Project's development works.

In 2012 there was a total workforce of 442 people, before reducing to 366 persons in 2017 and increasing to 390 people in 2018. If approved, the Project would increase Tahmoor Mine's workforce from 390 persons in 2018 to 510 persons in 2020 before gradually reducing to 422 persons in 2023.

In summary, the key components of the proposed development comprise:

- longwall mining in the Central Domain;

- mine development including underground redevelopment, ventilation shaft construction, pre-gas drainage and service connection;

- upgrades to the existing surface facilities area including:

    - upgrades to the CHPP;

    - expansion of the existing REA;

    - additional mobile plant for coal handling;

    - additions to the existing bathhouses, stores and associated access ways; and

    - upgrades to offsite service infrastructure, including electrical supply.

- rail transport of product coal to Port Kembla, and Newcastle (from time to time);

- mine closure and rehabilitation; and

- environmental management.

Additionally, Tahmoor Coal is proposing to transport into and out of the mine coal products and reject material up to 200,000tpa by road, on a campaign basis with up to 3,000 tonnes per day using quad dog (ie. 19 metre articulated trucks) with a 38 tonne pay load.

This equates to 79 truck loads per day 79 in / 79 out and an average of 8 trucks per hour (ie. 8 in / 8 out) based on 10 hours of transportation.

The material to be transported by road includes:

- Product Coal out – potential end users without rail access such as Berrima cement works (no rail unloading capability) and other smaller industrial users. This coal would head south from site to Hume Highway.

- ROM Coal In – ROM potentially Wollongong Coal or South 32 from Wongawilli Seam so that Tahmoor Mine can make a blend with its Bulli seam coal. This ROM coal would come along the Hume Highway from the north.

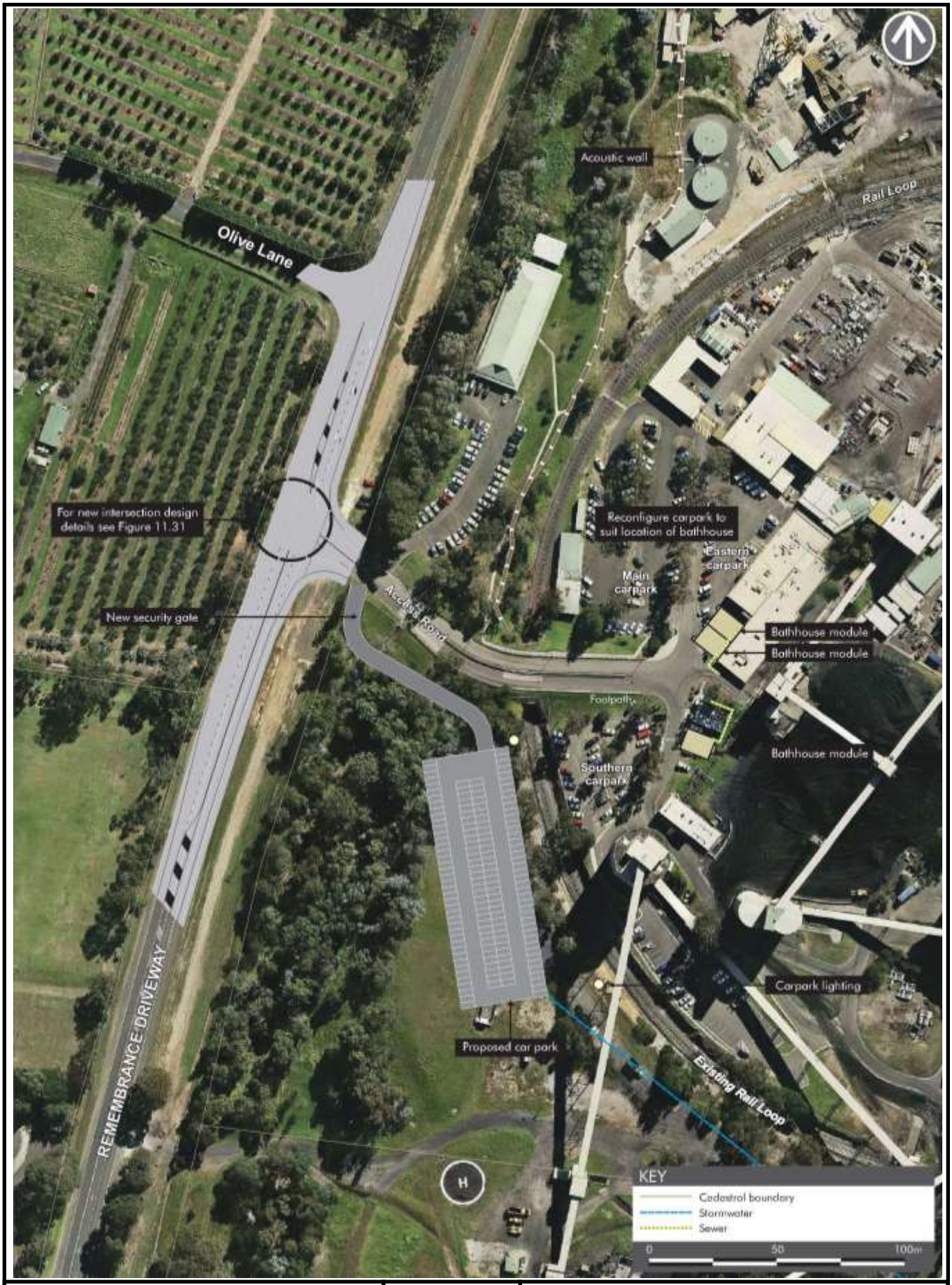
- Rejects Out – alternative to disposal in REA – potential markets for use in brickmaking material. The rejects would travel north to Sydney brickworks.

If approved, construction is expected to commence in 2020.

Construction works will include an upgrade to Tahmoor Mine's access intersection in Remembrance Driveway as well as the additions listed above including the bathhouses, stores, additional parking and associated accessways. These are expected to be undertaken between 2020 and 2021. **Figure 4A** shows the proposed upgrades to the Surface Facilities at the mine.

The construction of the proposed 2 new vent shafts which are expected to be undertaken between 2021 and 2024.

Figure 4B shows the proposed Tahmoor South Mine Plan and proposed new vent shafts.



TRANSPORT AND URBAN PLANNING

TRAFFIC, TRANSPORT & PROJECT MANAGEMENT CONSULTANTS

5/90 Toronto Parade, Sutherland NSW 2232
Phone 02 9545 1411 Fax 02 9545 1556

www.transurbanplan.com.au

N

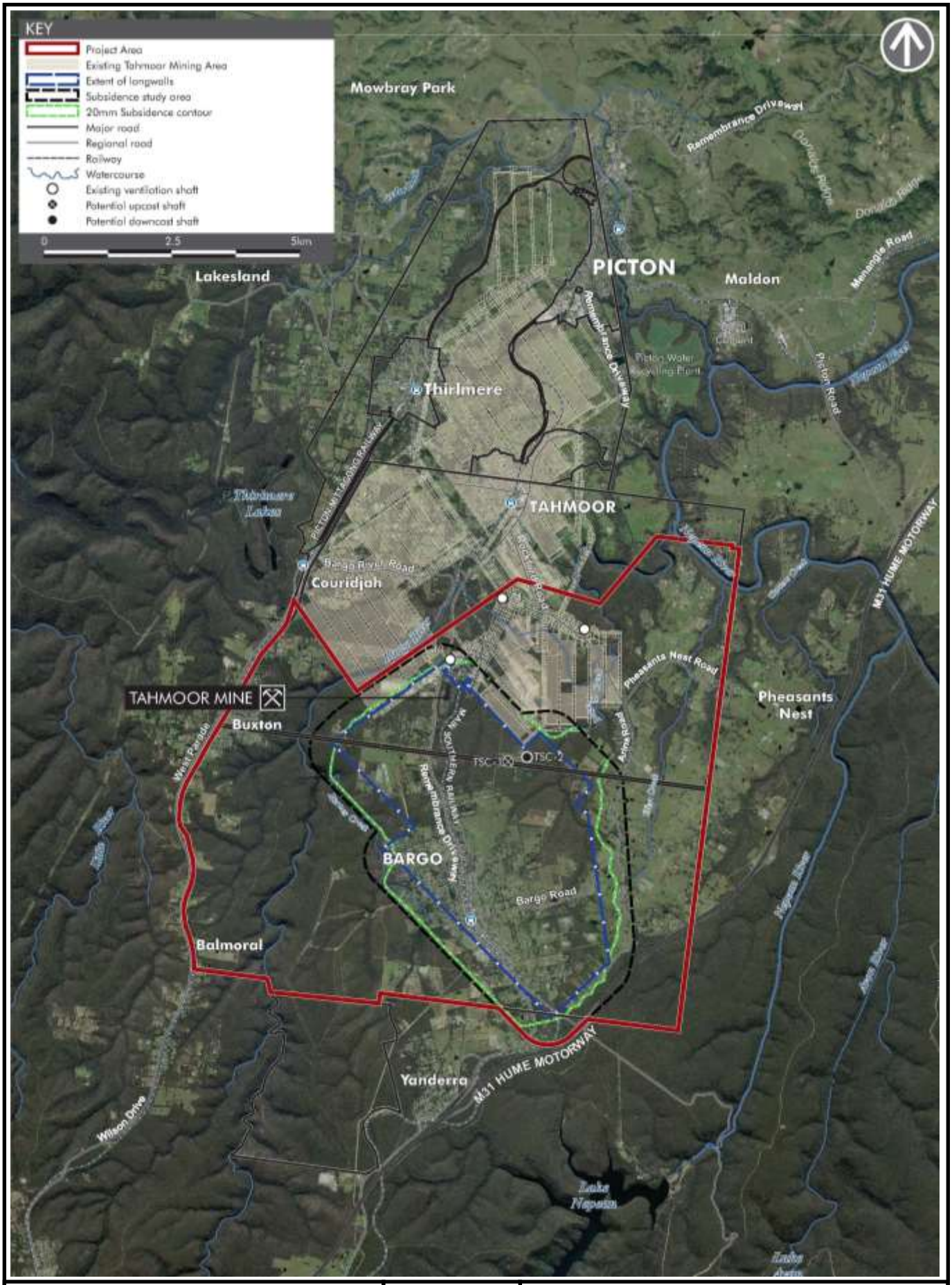
NOT TO SCALE

FIGURE 4A

TAHMOOR COAL
TAHMOOR SOUTH PROJECT EIS

SURFACE FACILITY UPGRADES

JOB NO. 18156 12/11/18



TRANSPORT AND URBAN PLANNING

TRAFFIC, TRANSPORT & PROJECT MANAGEMENT CONSULTANTS

5/90 Toronto Parade, Sutherland NSW 2232
Phone 02 9545 1411 Fax 02 9545 1556

www.transurbanplan.com.au

N

NOT TO SCALE

FIGURE 4B

TAHMOOR COAL
TAHMOOR SOUTH PROJECT EIS

PROPOSED MINE PLAN AND VENTILATION SHAFTS

JOB NO. 18156 12/11/18

3.0 EXISTING AND FUTURE CONDITIONS

3.1 Principal Road Network

The principal road network that services the Tahmoor Mine (**Figure 5**) includes:

- Remembrance Driveway;
- Hume Highway;
- Avon Dam Road; and
- Tahmoor Mine Access Road and other local roads that provide access to the eastern side of the Tahmoor Mine site.

3.2 Description of Existing Roads and Intersections

3.2.1 Remembrance Driveway

Remembrance Driveway is a state road that connects between Camden, Picton, Tahmoor and Bargo, thereafter joining Picton Road north of Mittagong.

Remembrance Driveway links to the Hume Highway at Yanderra with interchange ramps for traffic travelling to/from the south in the Hume Highway.

The interchange ramps are also provided at Avon Dam Road for traffic travelling to and from the north to/from Sydney to join or exit the Hume Highway.

The section of Remembrance Driveway between the towns of Bargo and Tahmoor is predominantly a two lane road with auxiliary lanes provided at several intersections with major local roads.

The speed limit in this section varies between 60km/h and 80km/h with the lower speed limit of 60km/h in the townships.

In the section of Remembrance Driveway adjacent Tahmoor Mine, the speed limit is 80km/h, with a 40km/h school zone limit operating at school times just south of the Tahmoor Mine Access Road adjacent the Wollondilly Anglican School.

Intersections in this section, adjacent Tahmoor Mine, include;

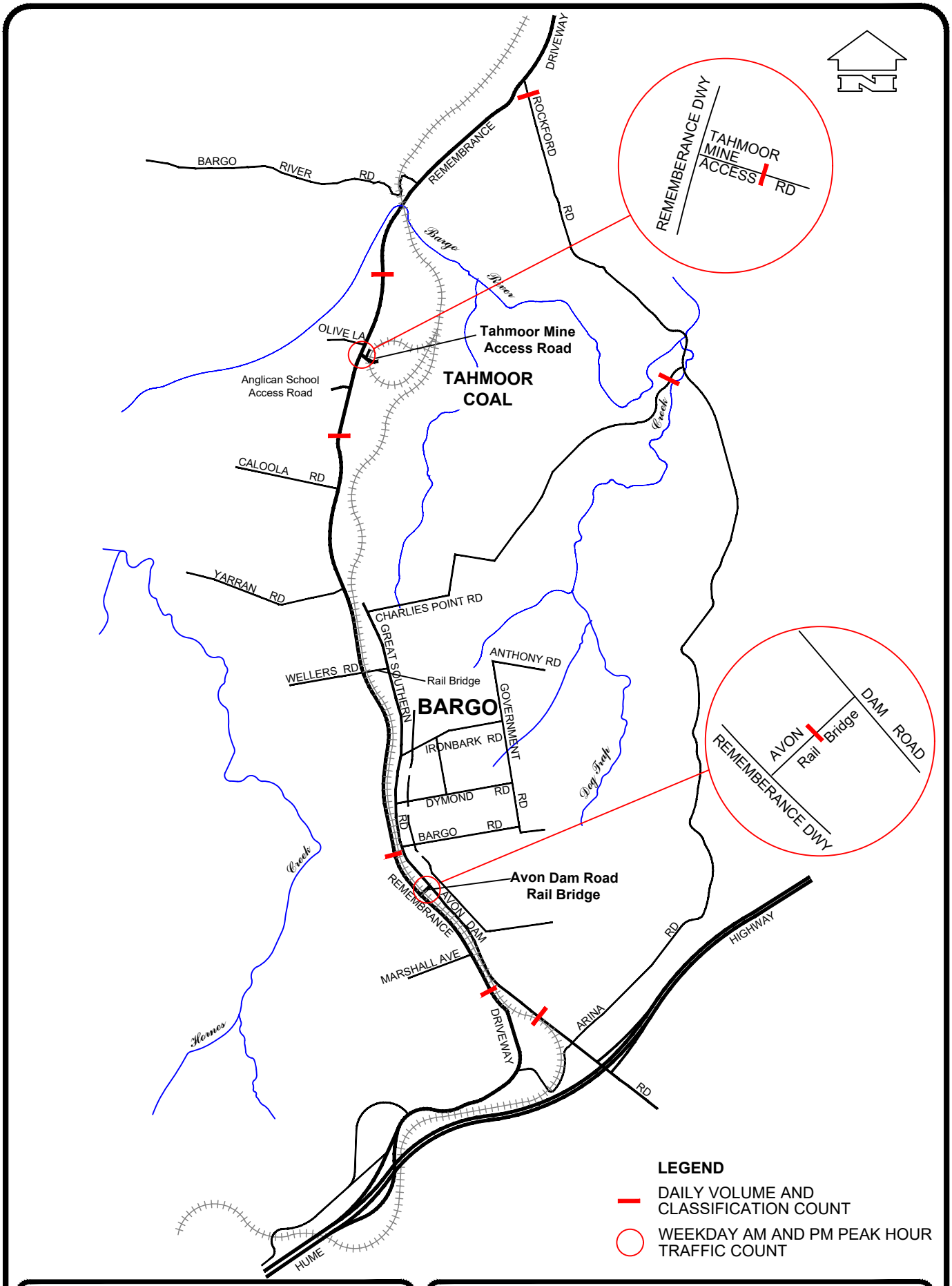
- Tahmoor Mine Access Road – a T junction intersection with an AUR and AUL channelisation and priority control on Tahmoor Mine Access Road. **Figure 6** shows the intersection's channelisation;

- Wollondilly Anglican School Access Road – a T junction intersection with a CHR and AUL channelisation and priority control on the School Access Road which is located approximately 330 metres south of Tahmoor Mine Access Road; and

- Olive Grove Lane – a minor T junction intersection with a BAL and BAR treatment, which is located 95 metres north of Tahmoor Mine Access Road.

The available sight distance at these intersections is satisfactory and meets Austroad requirements for sight distance for the posted speed limit and the estimated vehicle operating speeds in Remembrance Driveway.

Other principal intersections along Remembrance Driveway, between Bargo and Tahmoor include;



TRANSPORT AND URBAN PLANNING

TRAFFIC, TRANSPORT & PROJECT MANAGEMENT CONSULTANTS

5/90 Toronto Parade, Sutherland NSW 2232

Phone 02 9545 1411 Fax 02 9545 1556

www.transurbanplan.com.au

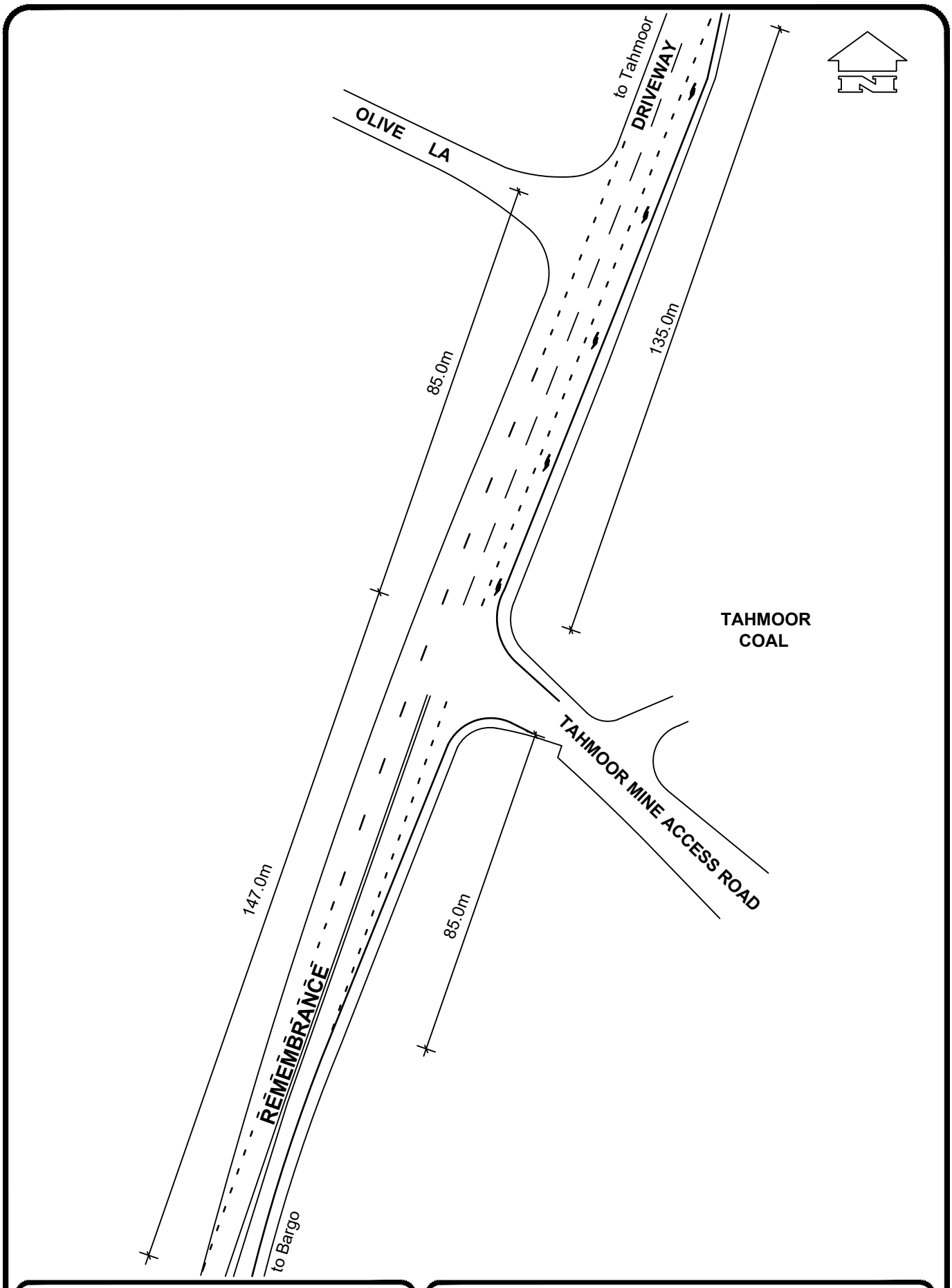
FIGURE 5

TAHMOOR COAL

TAHMOOR SOUTH PROJECT EIS

ROAD NETWORK

JOB NO.18156 12/11/18



TRANSPORT AND URBAN PLANNING

TRAFFIC, TRANSPORT & PROJECT MANAGEMENT CONSULTANTS

5/90 Toronto Parade, Sutherland NSW 2232
Phone 02 9545 1411 Fax 02 9545 1556
www.transurbanplan.com.au

FIGURE 6

TAHMOOR COAL
TAHMOOR SOUTH PROJECT EIS

EXISTING TRAFFIC MANAGEMENT AT REMEMBRANCE DWY AND TAHMOOR MINE ACCESS RD INTERSECTION

JOB NO.18156 12/11/18

- Avon Dam Road – a T junction intersection and railway crossing with a BAL and BAR treatment and priority control on Avon Dam Road (railway crossing), which is located at the southern end of the Bargo township; and

- Wellers Road – a cross junction intersection with BAL and BAR treatment and stop sign control on Wellers Road. Wellers Road provides another railway crossing at the northern end of the Bargo township. The rail bridge has a 20 tonne load limit.

The Avon Dam Road/Remembrance Driveway intersection is located in a 60km/h speed zone area. The sight distance at this intersection is satisfactory and meets Austroad requirements for the posted speed limit.

The Wellers Road/Remembrance Driveway intersection is located in an 80km/h speed zone area. The available sight distance at this intersection is considered to be satisfactory.

3.2.2 Hume Highway

The Hume Highway is a national highway that connects Sydney to Canberra and Melbourne.

In the Southern Highlands area the Hume Highway is the principal high speed road link to Sydney and to the south to Goulburn and Canberra.

In the section generally between Campbelltown to the Southern Highlands, it is a four lane road with a divided road carriageway with a 110km/h speed limit constructed to a high standard.

As noted above in Section 3.2.1 ramps to travel to and from the north towards Sydney using the Hume Highway are located at Avon Dam Road and to and from the south at Yanderra, which are located some 8.0 to 9.0 km south of Tahmoor Mine Access Road.

3.2.3 Avon Dam Road

Avon Dam Road is a major local road that provides the link between Remembrance Driveway at Bargo and the Hume Highway interchange at Yanderra for traffic travelling to and from Sydney along the Hume Highway.

Avon Dam Road, in this section, is a two lane road with a speed limit of 60km/h.

Avon Dam Road runs on the eastern side of the railway line and intersects with Remembrance Driveway via a rail overbridge, south of the Bargo township.

3.2.4 Tahmoor Mine Access Road and Other Local Roads

The main vehicle access to Tahmoor Mine is from Remembrance Driveway via a T junction intersection described above in Section 3.2.2 and shown in **Figure 6**.

Vehicle access to the eastern section of Tahmoor Mine site including the vent shafts is via several local roads, namely Rockford Road and Charlies Point Road, which are located north east of Tahmoor Mine Access Road and near the Tahmoor township.

Rockford Road is a two lane road that forms a T junction intersection with Remembrance Driveway on the southern side of Tahmoor township. Charlies Point Road intersects with Rockford Road some 3.3km south of Remembrance Driveway as a T junction.

The speed limit in Rockford Road is 50km/h and 80km/h and in Charlies Point Road the speed limit is 80km/h.

3.3 Existing Traffic Conditions on the Road Network

3.3.1 Existing Traffic Volumes

Daily volumes including vehicle classification counts were undertaken on the adjacent road network to Tahmoor Mine between 17-23 October 2018.

The volumes and vehicle classification count locations included Remembrance Driveway at several locations, Avon Dam Road Rail Overbridge and Avon Dam Road, Rockford Road and Charlies Point Road. Daily volume and classification counts were also undertaken in the Tahmoor Mine Access Road.

Figure 5 shows the count locations and **Figure 7** shows a summary of daily volume and vehicle classification counts.

In addition, weekday AM and PM peak period intersection counts were undertaken at the principal intersections of;

- Remembrance Driveway/Tahmoor Mine Access Road; and
- Remembrance Driveway/Avon Dam Bridge Road.

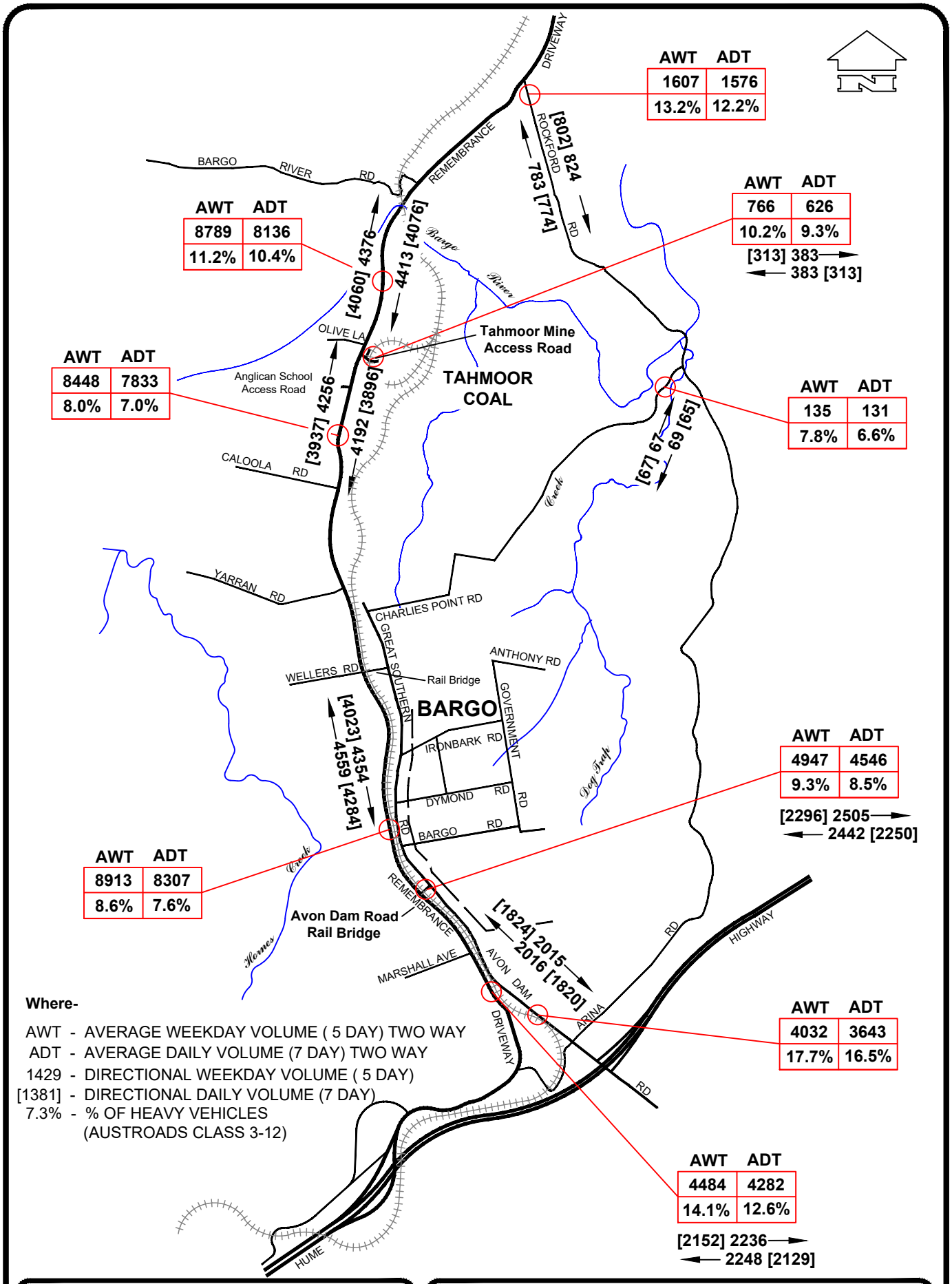
Weekdays have the highest number of employees working at the mine and represent the days when the mine has the highest traffic generation. Weekdays also have higher volumes using the road network at Tahmoor, than Saturdays and Sundays.

The peak period AM and PM intersection counts were undertaken on Tuesday 15 August 2017 between 6.00am and 9.30am and 2.00pm and 6.00pm. These hours cover the major shift change times at the mine in the AM and PM periods.

3.3.2 Daily Volumes on Road Network

Tables 3.1 and 3.2 show the daily traffic volumes and the proportion of heavy vehicles using Remembrance Driveway, north of Tahmoor Mine Access Road and south of the Anglican College Access Road.

Reference to Table 3.1 shows that on a typical weekday (5 day average) Remembrance Driveway north of Tahmoor Mine carries two way traffic volumes of 8789 vehicles per day (vpd). Heavy vehicles (Austroad Classes 3 to 12) represent around 11.2% of the total volumes using this section of Remembrance Driveway on an average weekday.



Where-

AWT - AVERAGE WEEKDAY VOLUME (5 DAY) TWO WAY
ADT - AVERAGE DAILY VOLUME (7 DAY) TWO WAY
1429 - DIRECTIONAL WEEKDAY VOLUME (5 DAY)
[1381] - DIRECTIONAL DAILY VOLUME (7 DAY)
7.3% - % OF HEAVY VEHICLES (AUSTROADS CLASS 3-12)

TRANSPORT AND URBAN PLANNING

TRAFFIC, TRANSPORT & PROJECT MANAGEMENT CONSULTANTS

5/90 Toronto Parade, Sutherland NSW 2232

Phone 02 9545 1411 Fax 02 9545 1556

www.transurbanplan.com.au

FIGURE 7

TAHMOOR COAL

TAHMOOR SOUTH PROJECT EIS

EXISTING DAILY VOLUMES AND VEHICLE CLASSIFICATION

JOB NO.18156 12/11/18

TABLE 3.1

REMEMBRANCE DRIVEWAY NORTH OF TAHMOOR MINE ACCESS ROAD 5 DAY AVERAGE AND 7 DAY AVERAGE TRAFFIC VOLUMES AND VEHICLE CLASSIFICATION

Direction of Travel	5 Day Average (Weekday)	7 Day Average (ADT)
North	4376	4060
South	4413	4076
Total	8789	8136
Proportion of [1]Heavy Vehicles	11.2%	10.4%

Source: Traffic Counts 17-23 October 2018

[1]Heavy Vehicles – Austroads 3-12 vehicle classifications

Reference to Table 3.2 shows that on a typical weekday (5 day average) Remembrance Driveway south of the Anglican College Access Road carries two way traffic volumes of 8448 vehicles (vpd). Heavy vehicles (Austroad Classes 3 to 12) represent around 8.0% of the total volumes using this section of Remembrance Driveway on an average weekday.

TABLE 3.2

REMEMBRANCE DRIVEWAY SOUTH OF ANGLICAN COLLEGE ACCESS ROAD 5 DAY AVERAGE AND 7 DAY AVERAGE TRAFFIC VOLUMES AND VEHICLE CLASSIFICATION

Direction of Travel	5 Day Average (Weekday)	7 Day Average (ADT)
North	4192	3896
South	4256	3937
Total	8448	7833
Proportion of [1]Heavy Vehicles	8.0%	7.0%

Source: Traffic Counts 17-23 October 2018

[1]Heavy Vehicles – Austroads 3-12 vehicle classifications

Table 3.3 and 3.4 shows the daily volumes and the proportion of heavy vehicles using Remembrance Drive north of Avon Dam Road Rail Bridge and south of Marshalls Avenue (ie. south of Avon Dam Road Rail Bridge).

Reference to Table 3.3 shows that on a typical weekday (5 day average) Remembrance Drive north of Avon Dam Road Rail Bridge carries two way traffic volumes of 8,913vpd. Heavy vehicles (Austroad Classes 3 to 12) represent around 8.6% of total volumes.

TABLE 3.3

REMEMBRANCE DRIVEWAY NORTH OF AVON DAM ROAD RAIL BRIDGE 5 DAY AVERAGE AND 7 DAY AVERAGE TRAFFIC VOLUMES AND VEHICLE CLASSIFICATION

Direction of Travel	5 Day Average (Weekday)	7 Day Average (ADT)
North	4559	4284
South	4354	4023
Total	8913	8307
Proportion of [1]Heavy Vehicles	8.6%	7.6%

Source: Traffic Counts 17-23 October 2018

[1]Heavy Vehicles – Austroads 3-12 vehicle classifications

Reference to Table 3.4 shows that on a typical weekday (5 day average) Remembrance Drive south of Marshalls Avenue carries two way traffic volumes of 4,484vpd. Heavy vehicles (Austroad Classes 3 to 12) represent around 14.1% of total volumes.

TABLE 3.4

REMEMBRANCE DRIVEWAY SOUTH OF MARSHALLS AVENUE 5 DAY AVERAGE AND 7 DAY AVERAGE TRAFFIC VOLUMES AND VEHICLE CLASSIFICATION

Direction of Travel	5 Day Average (Weekday)	7 Day Average (ADT)
North	2248	2129
South	2236	2152
Total	4484	4282
Proportion of [1]Heavy Vehicles	14.1%	12.6%

Source: Traffic Counts 17-23 October 2018

[1]Heavy Vehicles – Austroads 3-12 vehicle classifications

Table 3.5 shows the daily traffic volumes including heavy vehicles using Avon Dam Road (Rail Bridge), east of Remembrance Driveway. This rail bridge links Remembrance Driveway to Avon Dam Road at Bargo and provides the most direct route to the Hume Highway to travel to/from Sydney.

Reference to Table 3.5 shows that on a typical weekday (5 day average) Avon Dam Road Rail Bridge carries two way traffic volumes of 4947 vehicles per day (vpd). Heavy vehicles (Austroad Classes 3 to 12) represent around 9.3% of the total volumes using Avon Dam Road Rail Bridge on an average weekday.

TABLE 3.5

**AVON DAM ROAD RAIL BRIDGE
EAST OF REMEMBRANCE DRIVEWAY
5 DAY AVERAGE AND 7 DAY AVERAGE TRAFFIC VOLUMES
AND VEHICLE CLASSIFICATION**

Direction of Travel	5 Day Average (Weekday)	7 Day Average (ADT)
North	2442	2250
South	2505	2296
Total	4947	4546
Proportion of [1]Heavy Vehicles	9.3%	8.5%

Source: Traffic Counts 17-23 October 2018

[1]Heavy Vehicles – Austroads 3-12 vehicle classifications

Table 3.6 shows the daily traffic volumes including heavy vehicles using Avon Dam Road north of Arina Road. Avon Dam Road links to the Hume Highway when travelling to and from Sydney.

Reference to Table 3.6 shows that on a typical weekday (5 day average) Avon Dam Road Rail Bridge carries two way traffic volumes of 4032 vehicles per day (vpd). Heavy vehicles (Austroad Classes 3 to 12) represent around 17.7% of the total volumes using Avon Dam Road on an average weekday.

TABLE 3.6

**AVON DAM ROAD
NORTH OF ARINA ROAD
5 DAY AVERAGE AND 7 DAY AVERAGE TRAFFIC VOLUMES
AND VEHICLE CLASSIFICATION**

Direction of Travel	5 Day Average (Weekday)	7 Day Average (ADT)
North	2016	1820
South	2015	1824
Total	4032	3634
Proportion of [1]Heavy Vehicles	17.7%	16.5%

Source: Traffic Counts 17-23 October 2018

[1]Heavy Vehicles – Austroads 3-12 vehicle classifications

3.3.3 Daily Volumes Generated by Tahmoor Mine

Table 3.7 shows the daily volumes using Tahmoor Mine Access Road including heavy vehicles as recorded in the traffic counts.

Reference to Table 3.7 shows that on a typical weekday (5 day average) Tahmoor Mine generates two way traffic volumes of 766 vehicles per day (vpd). Heavy vehicles (Austroad Classes 3 to 12) total 78 vpd. Heavy vehicles represent around 10.2% of the total volumes generated by Tahmoor Mine. Weekend volumes generated by Tahmoor Mine are lower than for weekdays, as staffing levels on weekends are lower than for weekdays and there are also lower numbers of heavy vehicles generated by the mine.

TABLE 3.7

TAHMOOR MINE ACCESS ROAD
5 DAY AVERAGE AND 7 DAY AVERAGE TRAFFIC VOLUMES
AND VEHICLE CLASSIFICATION

Direction of Travel	5 Day Average (Weekday)			7 Day Average (ADT)		
	Light[1]	Heavy[2]	Total	Light[1]	Heavy[2]	Total
East	344	39	383	284	29	313
West	344	39	383	284	29	313
Total	688	78	766	568	58	626
Proportion of Total	89.8%	10.2%	100%	90.7%	9.3%	100%

Source: Traffic Counts 17-23 October 2018

[1]Light Vehicles – Austroads 1 and 2 vehicle classification and motorbikes
[2]Heavy Vehicles – Austroads 3-12 vehicle classifications

3.3.4 Weekday AM and PM Peak Hour Traffic Volumes

AM Peak Hour

Figure 8 shows the 2017 AM peak hour traffic volumes at the principal intersection in Remembrance Driveway on the road network at Bargo and Tahmoor including:

- Remembrance Driveway/Tahmoor Mine Access Road; and
- Remembrance Driveway/Avon Dam Road Rail Bridge.

The AM peak hour occurred between 7.45am – 8.45am at the Tahmoor Mine Access Road intersection between 7.30am – 8.30am at the Remembrance Driveway/Avon Dam Road intersection.

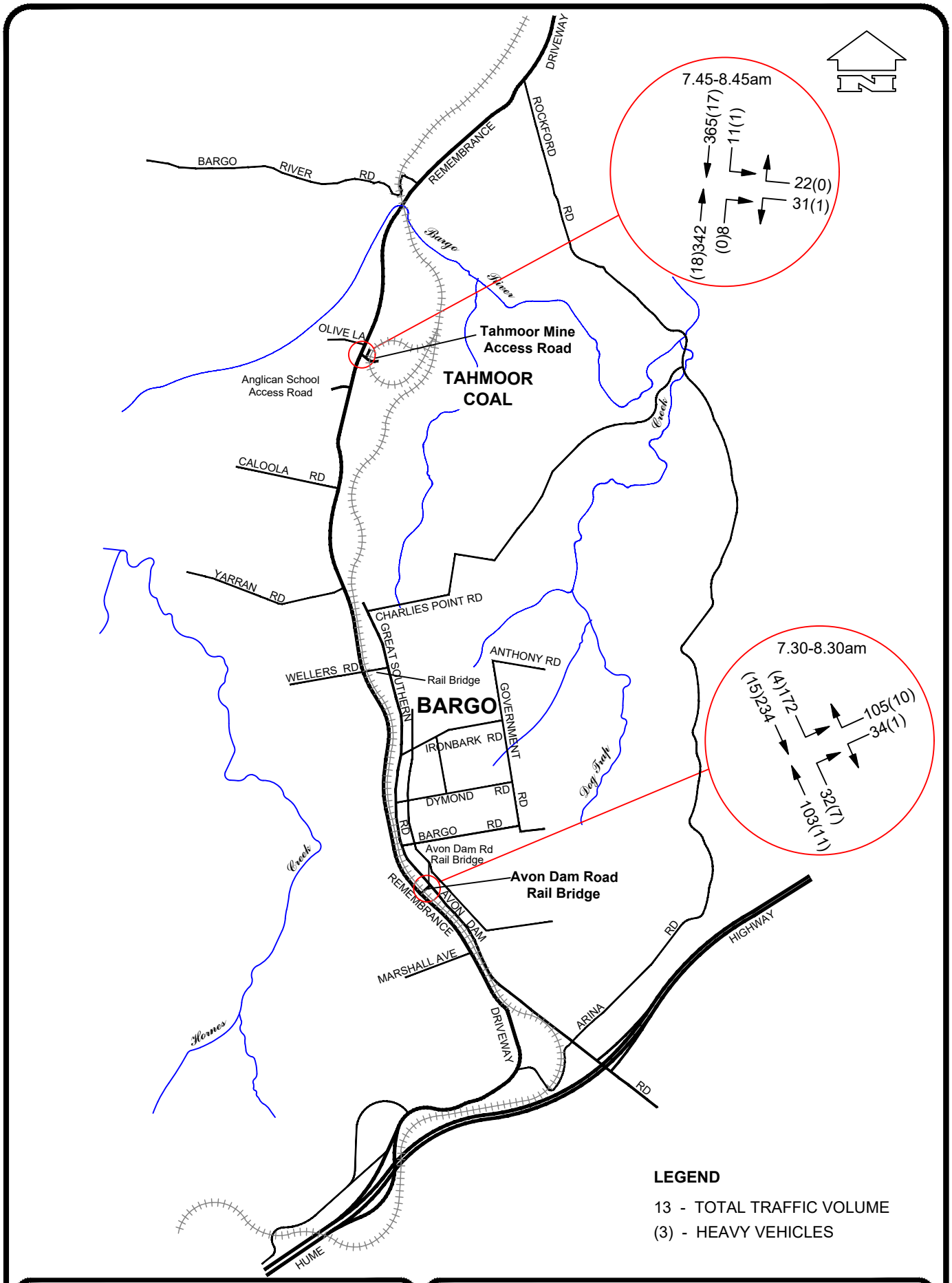
Reference to **Figure 8** shows that during the AM peak hour at the Tahmoor Mine Access Road intersection:

- Northbound and southbound through volumes using Remembrance Driveway numbered 342vph and 365vph respectively;
- Entry and exit movements to and from Tahmoor Mine numbered 19vph and 53vph respectively.

At the Remembrance Driveway and Avon Dam Road intersection;

- Northbound and southbound through volumes in Remembrance Driveway numbered 135vph and 234vph respectively;
- The left and right turn movements into Avon Dam Road Rail Bridge numbered 172vph and 32vph respectively; and
- The left and right turn movements out of Avon Dam Road Rail Bridge numbered 34vph and 105vph respectively.

The highest traffic generation of Tahmoor Mine in the AM peak period occurs before the 7am – 9am commuter peak times.



TRANSPORT AND URBAN PLANNING

TRAFFIC, TRANSPORT & PROJECT MANAGEMENT CONSULTANTS

5/90 Toronto Parade, Sutherland NSW 2232
Phone 02 9545 1411 Fax 02 9545 1556
www.transurbanplan.com.au

FIGURE 8

TAHMOOR COAL
TAHMOOR SOUTH PROJECT EIS

EXISTING AM PEAK HOUR TRAFFIC VOLUMES

JOB NO.18156 12/11/18

PM Peak Hour

Figure 9 shows the 2017 PM peak hour traffic volumes using the principal intersections which occurred between 3.30pm to 4.30pm at both intersections.

Reference to **Figure 9** shows that;

- Northbound and southbound through volumes at the Remembrance Driveway/Tahmoor Mine Access Road intersection numbered 362vph and 313vph respectively;

- Entry and exit movements from Tahmoor Mine numbered 6vph and 79vph respectively. The left turn out of Mine Access Road was the highest movement at 50vph;

- Northbound and southbound through volumes at the Remembrance Driveway/Avon Dam Road Rail Bridge intersection numbered 197vph and 130vph respectively;

- The left and right turn into Avon Dam Road Rail Bridge numbered 165vph and 35vph respectively; and

- The left and right turn out of Avon Dam Road Rail Bridge numbered 36vph and 249vph respectively.

The peak traffic generation of Tahmoor Mine in the PM peak period occurs before the commuter peak hours between 3pm and 6pm.

3.4 Road Safety

Road crash statistics were provided by the RMS for sections of the road network adjacent to Tahmoor Mine for the 5 year period from 1 October 2011 to 30 September 2016.

A summary of the analysis of these statistics is outlined below.

3.4.1 Remembrance Driveway

Remembrance Driveway between Hume Highway Yanderra and Thirlmere Way Tahmoor

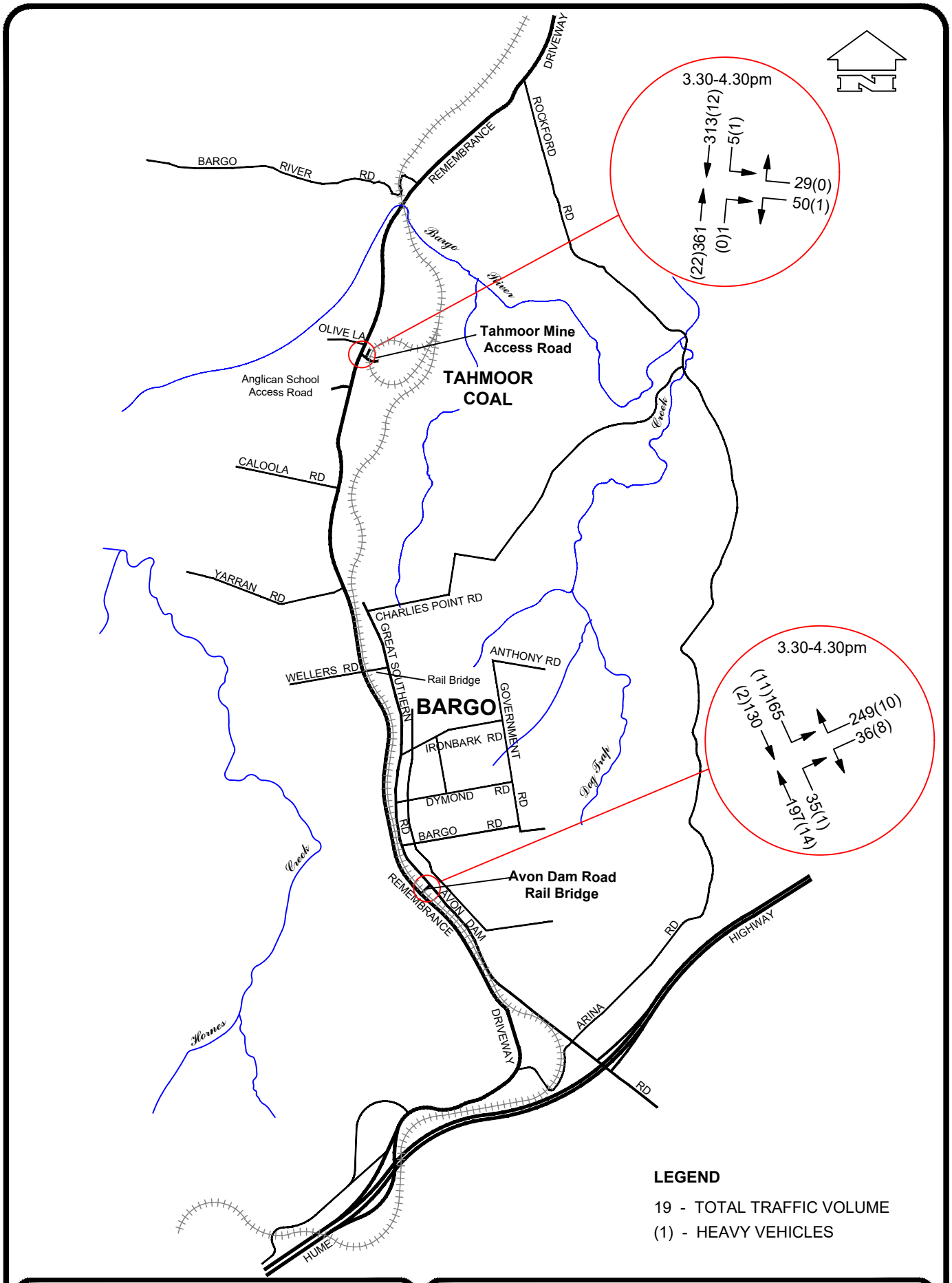
There were a total of 39 crashes over the 5 year period over the 12.2 kilometre length of road.

This included:

- 1 fatal crash (2 fatalities);
- 20 injury crashes (28 injured); and
- 18 non-casualty (i.e. property damage) crashes.

Single vehicles were involved in 11 of the crashes with multi vehicle (i.e. more than one) involved in 28 crashes.

The fatal crash was a head on crash that occurred 200 metres to the south of Tahmoor Mine Access Road in Remembrance Driveway. It occurred in an area, that at the time was a 100km/h speed zone, which has now been reduced to 80km/h.



LEGEND

19 - TOTAL TRAFFIC VOLUME

(1) - HEAVY VEHICLES

TRANSPORT AND URBAN PLANNING

TRAFFIC, TRANSPORT & PROJECT MANAGEMENT CONSULTANTS

5/90 Toronto Parade, Sutherland NSW 2232

Phone 02 9545 1411 Fax 02 9545 1556

www.transurbanplan.com.au

FIGURE 9

TAHMOOR COAL

TAHMOOR SOUTH PROJECT EIS

EXISTING PM PEAK HOUR TRAFFIC VOLUMES

JOB NO.18156 12/11/18

Some 17 of the crashes occurred at or near intersections in Remembrance Driveway.

At the intersection of Remembrance Driveway and Tahmoor Mine Access Road there were a total of two crashes involving a right turn vehicle waiting to turn into Tahmoor Mine and a following northbound vehicle. Both of these crashes were injury crashes. The proposed upgraded channelisation to provide a dedicated right turn bay in the southern approach of Remembrance Driveway should address this safety issue.

The other intersection accidents were spread over a number of intersections in Remembrance Driveway including at Wellers Road, (3 crashes) Avon Dam Road (2 crashes) and Yarran Road (2 crashes), as well as one (1) crash at a number of other intersections. There is no identifiable crash pattern at these intersections.

The reduction of the speed limit in recent years from 100km/h to 80km/h in the section of Remembrance Driveway near Tahmoor Mine should result in an improvement in road safety outcomes in Remembrance Driveway.

3.4.2 Avon Dam Road between Hume Highway at Pheasants Nest and Remembrance Driveway at Bargo

There were a total of 12 crashes over the 5 year period along this 2.6km section of Avon Dam Road.

This included:

- 3 injury crashes (5 injured); and
- 9 non casualty (i.e. property damage) crashes.

Single vehicles were involved in four of the crashes with multi vehicles (i.e. more than one vehicle) involved in 8 crashes.

Crashes at intersections (i.e. within 10 metres of intersection) accounted for 7 crashes with non intersection type crashes, accounting for 5 crashes.

All 7 of the intersection crashes occurred at the intersection of Anna Road/Avon Dam Road/Lupton Road. Four (4) of the total were cross intersection accidents and there were three other crashes including a vehicle overtaking and two single vehicle crashes.

It is noted that a roundabout has been constructed at the intersection in recent times and that the speed limit in the section of Avon Dam Road between the Hume Highway and the edge of the township has been reduced to 60km/h. These measures would assist in reducing the number of crashes in this section of Avon Dam Road.

3.5 Bus Routes

Picton Bus Lines operates two bus routes (the 911 and 912 services) along Remembrance Driveway between Yanderra/Bargo and Picton on weekdays and on Saturday. Seven (7) services a day operate on weekdays and two (2) services operate on Saturday.

County Transport also operates a bus service along Remembrance Driveway between Picton and Bargo on weekdays (4 services) and Saturday (2 services).

4.0 ASSESSMENT OF TRAFFIC IMPACTS OF PROJECT

4.1 Improvements to Remembrance Driveway/Tahmoor Mine Access Road Intersection

Tahmoor Coal are proposing to upgrade the Tahmoor Mine's access intersection with Remembrance Driveway as part of the Project, to improve potential road safety at the intersection, particularly with regard to rear end collisions involving vehicles turning right from Remembrance Driveway to Tahmoor Mine and following northbound through vehicles.

A concept of the proposed intersection upgrade is shown on **Figure 10** and includes:

- A CHR right turn treatment (right turn bay) in the southern approach of Remembrance Driveway (for the right turn into Tahmoor Mine) together with a northbound through lane and a left turn lane into Olive Grove Lane;
- An AUL auxiliary left turn lane in the northern approach of Remembrance Driveway for the left turn into Tahmoor Mine;
- Widening of Tahmoor Mine Access Road to provide two approach lanes at the intersection.

The concept has been designed to Austroad Standards for a design speed greater than 80km/h and to accommodate a 19 metre articulated vehicle turning into and out of Tahmoor Mine Access Road.

4.2 Traffic Generation in Operational Phase from Tahmoor Mine

Light Vehicles

The employment at Tahmoor Mine (i.e. employees and contractors) is expected to vary from 2012 levels, with the peak year for employment occurring in 2020. After 2020 employment levels will reduce. Table 4.1 shows the actual employment numbers between 2011 and 2018 and the forecasted levels from 2019 to 2035.

TABLE 4.1

TOTAL ESTIMATED EMPLOYMENT NUMBERS* AT TAHMOOR MINE BETWEEN 2011 AND 2035

Year	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Total Employment*	423	442	378	347	327	334	366	390	450	510

Year	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Total Employment*	470	460	422	422	422	422	422	422	422	422

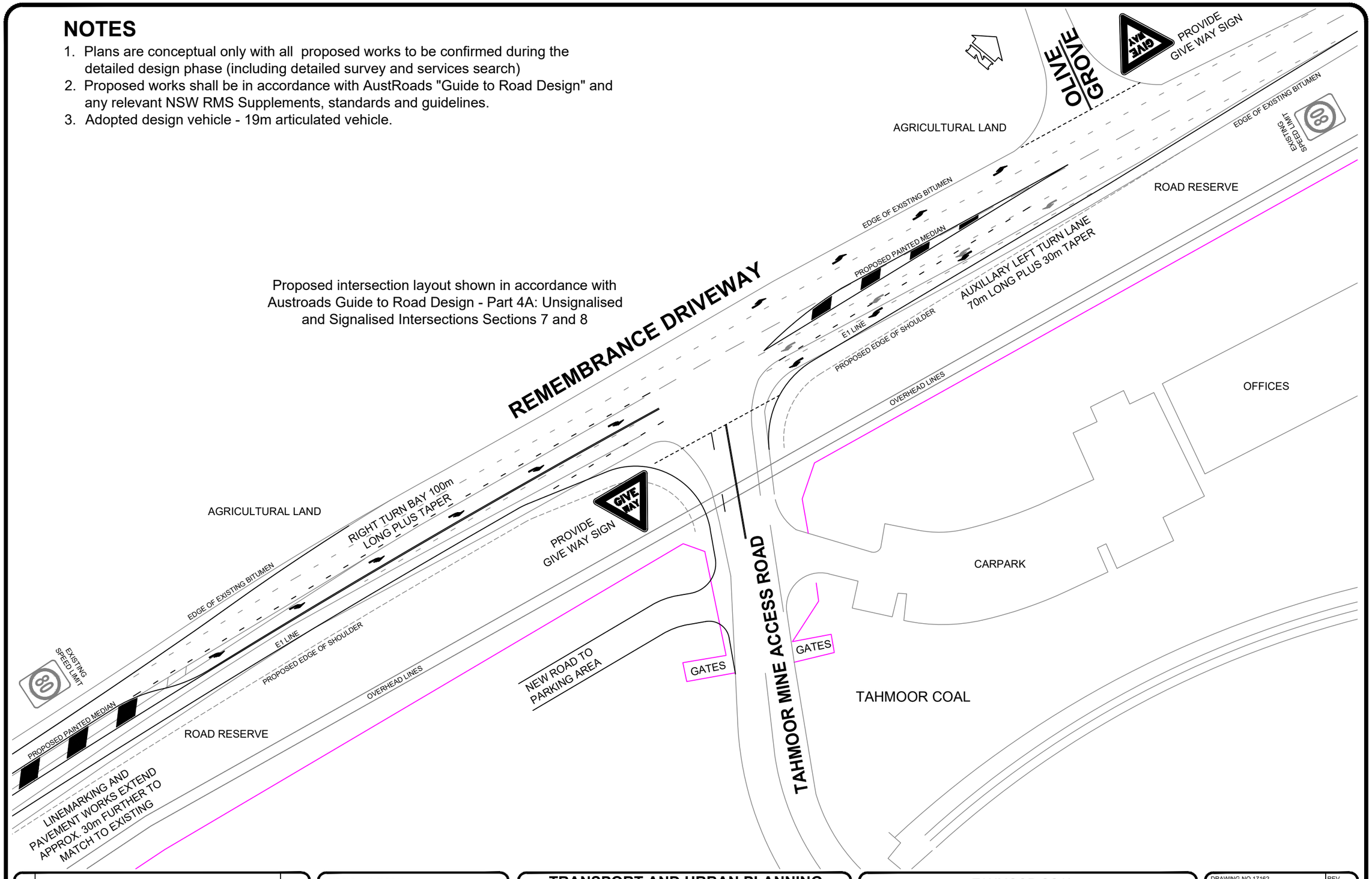
Year	2031	2032	2033	2034	2035
Total Employment*	422	422	422	422	422

**includes employees and contractors*

NOTES

1. Plans are conceptual only with all proposed works to be confirmed during the detailed design phase (including detailed survey and services search)
2. Proposed works shall be in accordance with AustRoads "Guide to Road Design" and any relevant NSW RMS Supplements, standards and guidelines.
3. Adopted design vehicle - 19m articulated vehicle.

Proposed intersection layout shown in accordance with Austroads Guide to Road Design - Part 4A: Unsignalised and Signalised Intersections Sections 7 and 8



REV.	DETAILS OF REVISIONS	DATE

CAD FILE:	18156-FIG 10.dwg
JOB NO.	18156
DESIGNED:	LT
DRAWN:	TL
DATE:	08.08.17

TRANSPORT AND URBAN PLANNING
TRAFFIC, TRANSPORT & PROJECT MANAGEMENT CONSULTANTS
5/90 Toronto Parade, Sutherland NSW 2232
Phone 02 9545 1411 Fax 02 9545 1556
www.transurbanplan.com.au

TAHMOOR COAL
Concept Design for proposed intersection improvements
Remembrance Drwy and Tahmoor Mine Access Rd, Tahmoor
PROPOSED INTERSECTION TREATMENT

DRAWING NO.17162
FIGURE 10
REV. **A**
SCALE: 1:500@A2

The increase in employment will be proportional across all the shifts worked at Tahmoor Mine and therefore the increase in the traffic generation over the day including at peak times (i.e. shift changeover times) would also be expected to be proportional.

Weekdays have the highest number of employees and traffic generation from Tahmoor Mine. Shift times for Tahmoor Mine are:

9 Day Fortnight (10 hours)

- 6.00am to 4.00pm;
- 2.00pm to 12.00am; and
- 10.00pm to 8.00am.

Monday to Friday Roster (8 hours)

- 6.00am - 2.00pm;
- 2.00pm - 10.00pm; and
- 10.00pm – 6.00am.

The majority of staff work across the above shift times, with a small number working 5.00am to 5.00pm and 5.00pm to 5.00am.

The RMS suggested that the traffic generation and traffic impacts of Tahmoor Mine should be examined for the existing (2017/2018) situation, as well as for a future timeframe of 10 years (i.e. 2028).

Based on this the intersection analysis has been undertaken for 2020 which represents the peak year for employment as well as for 2028.

The change in employment between 2017 and 2020 represents a 39% increase and between 2017 and 2028 a 15% increase. Based on a corresponding increase in the traffic generation, weekday volumes generated by Tahmoor Mine during the AM and PM peak hour periods for 2020 and 2028 is shown in Table 4.2.

TABLE 4.2

EXISTING AND PROJECTED TRAFFIC GENERATION OF TAHMOOR MINE IN 2020 DURING WEEKDAY AM AND PM PEAK HOUR

Hourly Period	2017		2020		Increase*		2028		Increase*	
	In	Out	In	Out	In	Out	In	Out	In	Out
7.45am – 8.45am	19	53	27	74	+8	+21	22	61	+3	+8
3.30pm – 4.30pm	6	79	9	110	+3	+31	7	91	+1	+12

**Increase from 2018 volumes*

Weekday and daily traffic generation of light vehicles associated with employees and visitor trips would also be expected to peak in 2020 with estimated weekday and daily volumes (of light vehicles) in the order of 478 in / 478 out and 395 in / 395 out respectively. Weekday and daily volumes generated by Tahmoor Mine would reduce after 2020, as employment levels reduce.

Heavy Vehicles

As part of the proposal up to 79 truck loads of coal material will be transported to/from the mine per day on a campaign basis (ie. 79 in / 79 out).

This will add an additional 8 truck loads per hour (ie. 8 in / 8 out) accessing the mine in the AM and PM peak hours.

These heavy vehicles would arrive and depart the mine to and from the south along Remembrance Drive and travel to/from the Hume Highway and travel either north or south.

4.3 Other Construction Traffic

4.3.1 Additional Facilities within Tahmoor Mine Compound

The construction of the additional facilities at Tahmoor Mine including the bathhouses, stores, parking area and associated accessways (**Figure 4A**), as well as the upgrading of Tahmoor Mine access intersection in Remembrance Driveway (**Figure 10**) will require additional construction workers on site between 2020 and 2021. Up to 30 workers could be on site at any one time during this period generating a maximum of 30 trips into and out of the Tahmoor Mine during the start times of 6.00am to 7.00am and finish times of 4.00pm – 6.00pm.

Additional heavy vehicle movements would also occur associated with delivery of materials, concrete pours, asphalting etc, although these would spread over the day.

4.3.2 Construction of Vent Shafts

The Project will also require the construction of two vent shafts (TSC1 and TSC2) which are located in Charlies Point Road (See **Figure 4B**).

These will be constructed between 2021 and 2024. Construction would occur over 24 hours, 6 days a week based on 12 hour day and night shifts and each vent shaft would require 18 months to 2 years to complete.

For each shaft location, 40 semi trailer loads of materials would be delivered over several (three) weeks at the site establishment phase.

A similar number of semi trailers (i.e. 40 loads) would be required at demobilisation at the conclusion of construction.

During the construction of the vent shafts an average 1-2 heavy vehicles would make deliveries to the site each day, except when concrete pours are required. At these times 7-8 heavy vehicles would make deliveries to the site each day.

The maximum number of workers on site at each shaft location would be 9 workers on the day shift and 4 workers on the night shift, generating a maximum 13 inbound and 13 outbound trips per day.

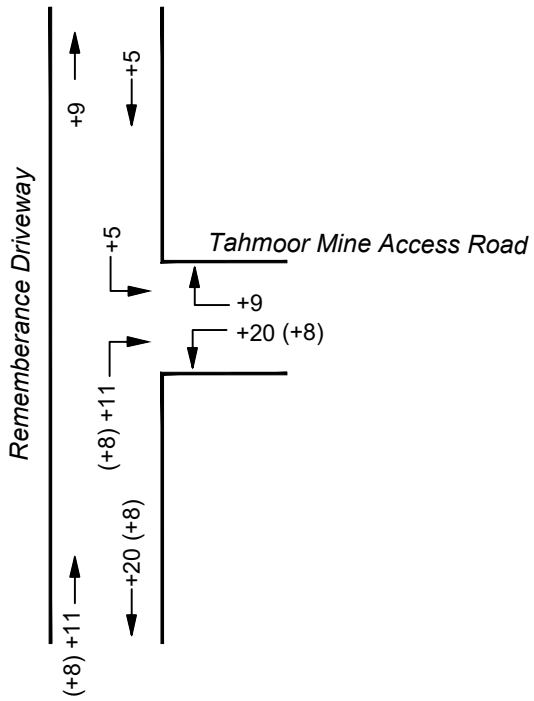
The vent shafts would be constructed one at a time with TSC1 first followed by TSC2.

The construction impacts of the vent shafts are further discussed in Section 4.6.1.

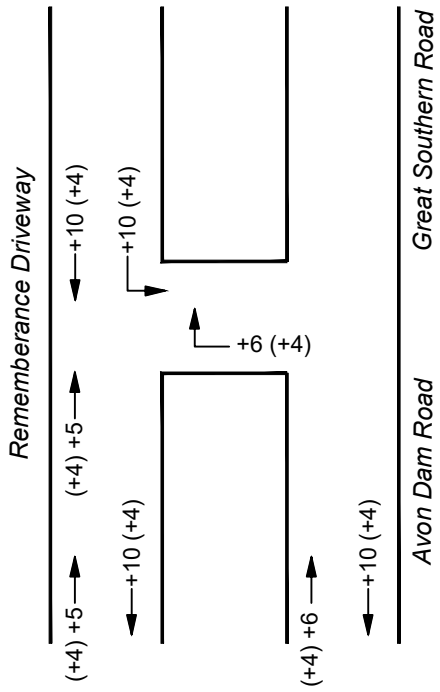
4.4 Traffic Impacts During Operational Phase

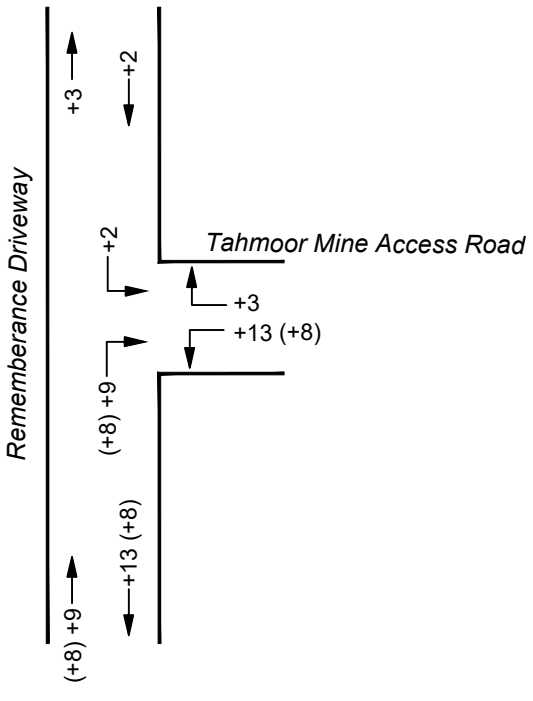
As noted in Section 4.2, the peak traffic volumes generated by the Project will occur in 2020 during the 7.45am – 8.45am period and the 3.30pm – 4.30pm on weekdays.

Figures 11 and **12** shows the additional volumes assigned to the road network during these periods for 2020 and 2028 based on the existing traffic patterns.

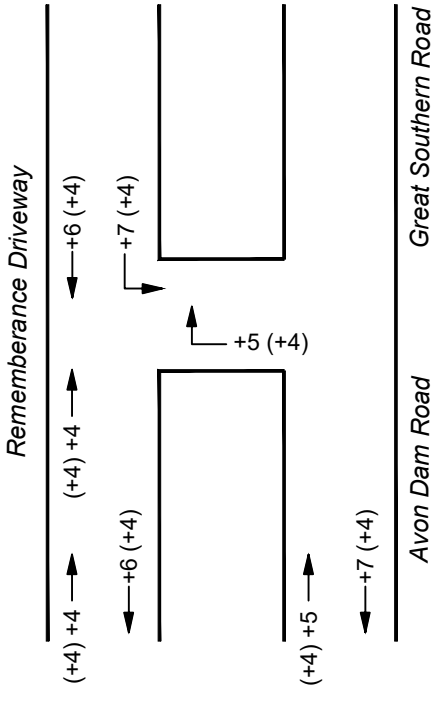


2020





2028



LEGEND

+8 - INCREASE FROM EXISTING 2017 VOLUMES

(+4) - INCREASE IN HEAVY VEHICLES

TRANSPORT AND URBAN PLANNING

TRAFFIC, TRANSPORT & PROJECT MANAGEMENT CONSULTANTS

5/90 Toronto Parade, Sutherland NSW 2232

Phone 02 9545 1411 Fax 02 9545 1556

www.transurbanplan.com.au

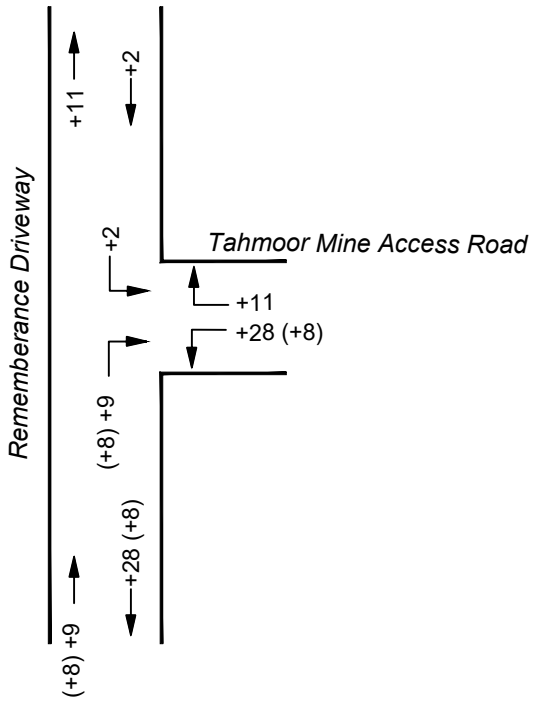
FIGURE 11

TAHMOOR COAL

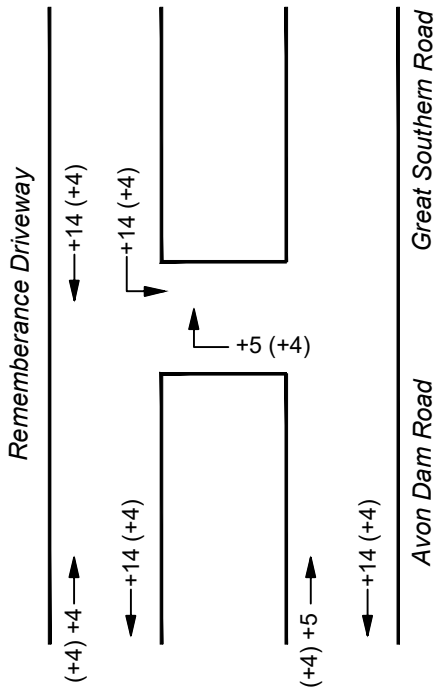
TAHMOOR SOUTH PROJECT EIS

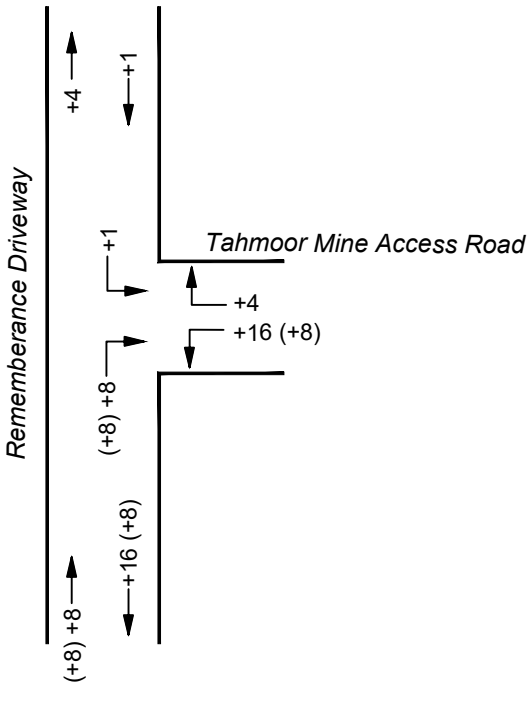
ADDITIONAL TRAFFIC FROM THE PROJECT IN THE AM PEAK HOUR IN 2020 & 2028 WITH TRUCKS

JOB NO.18156 12/11/18

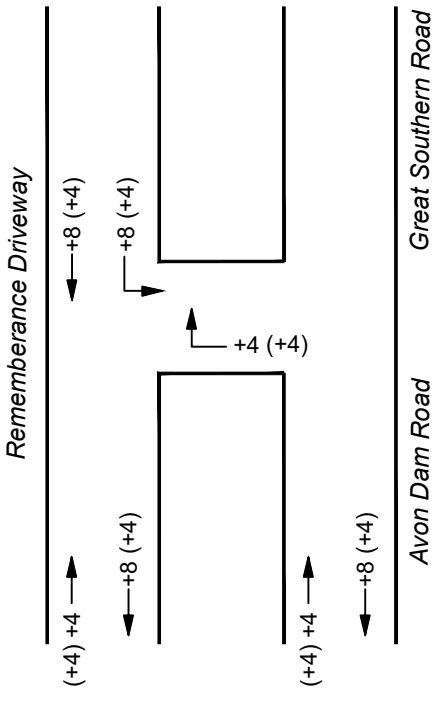


2020





2028



LEGEND

+8 - INCREASE FROM EXISTING 2017 VOLUMES

(+4) - INCREASE IN HEAVY VEHICLES

TRANSPORT AND URBAN PLANNING

TRAFFIC, TRANSPORT & PROJECT MANAGEMENT CONSULTANTS

5/90 Toronto Parade, Sutherland NSW 2232

Phone 02 9545 1411 Fax 02 9545 1556

www.transurbanplan.com.au

FIGURE 12

TAHMOOR COAL

TAHMOOR SOUTH PROJECT EIS

ADDITINAL TRAFFIC FROM THE PROJECT IN THE PM PEAK HOUR IN 2020 & 2028 WITH TRUCKS

JOB NO.18156 12/11/18

From **Figure 11** the additional traffic from the Project during the AM peak period in 2020 would be as follows:

- The increase in Remembrance Driveway north of Tahmoor Mine Access Road would be 14vph with 9 northbound vehicles and 5 southbound vehicles.

- The increase south of Tahmoor Mine Access Road would be 31vph with 11 northbound vehicles and 20 southbound vehicles.

Reference to **Figure 12** shows that during the PM peak hour period the increase in traffic volumes in 2020 due to the Project would be:

- 13vph in Remembrance Driveway north of Tahmoor Mine Access Road with 11 northbound vehicles and 2 southbound vehicles; and
- 37vph in Remembrance Driveway south of Tahmoor Mine Access Road with 9 northbound vehicles and 28 southbound vehicles.

The impacts of this additional traffic on Remembrance Driveway are assessed as being relatively minor in terms of midblock capacity, as the additional volumes would be less than one vehicle every minute, north and south of Tahmoor Mine Access Road.

South of Avon Bridge Road (Rail Bridge) the increase in the AM and PM peak hour in 2020 (**Figures 11** and **12**) are estimated to be:

- 15vph in Remembrance Driveway and 16vph in Avon Dam Road in the AM peak hour; and

- 18vph in Remembrance Driveway and 19vph in Avon Dam Road in the PM peak hour.

The impacts of this additional traffic in Remembrance Driveway and Avon Dam Road in terms of midblock capacity would be relatively minor.

In 2028 the increase in traffic volumes from the Project would be less than that for the year 2020 due to reduced employment numbers. The increases in traffic volumes due to the Project would be approximately 50% of the 2020 increases noted above.

To examine the impacts of the additional traffic from the Project, on the critical intersections in Remembrance Driveway, traffic modelling has been undertaken using the SIDRA software package.

SIDRA assesses the operational performance of intersections under traffic signal, roundabout or sign control. The best criteria for assessing intersections controlled by sign control are Level of Service (LS), Degree of Saturation (DS) and Average Vehicle Delay (AVD). Table 4.3 shows the Level of Service Criteria for intersections as reproduced from the RTA's Guide to Traffic Generating Developments. The desirable design criteria for intersections is a Level of Service D or better.

For intersections controlled by Give Way/Stop signs, the Level of Service of the intersection is determined by the movement with the highest average vehicle delay and not the average vehicle delay for all vehicles using the intersection.

TABLE 4.3

LEVEL OF SERVICE CRITERIA FOR INTERSECTIONS

Level of Service	Average Delay per Vehicle (secs/veh)	Traffic Signals, Roundabout	Give Way & Stop Signs
A	<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

Source: Table 4.1 RTA Guide to Traffic Generating Developments October 2002

The modelling has been undertaken for the intersections of Remembrance Driveway with

- Tahmoor Mine Access Road; and
- Avon Dam Road (i.e. the Rail Bridge).

The modelling has been undertaken for the existing 2017 conditions and for 2020 with the additional traffic from the Project. Traffic growth of 3.3% lineal growth per year until 2020 (i.e. total of 9.9%) has been adopted to account for background traffic growth along Remembrance Driveway and Avon Dam Road. The base 2017 models for existing conditions at both intersections were calibrated against queue lengths as recorded in the traffic counts and as observed on site. The AM and PM traffic counts are shown in **Figures 8** and **9**.

Figures 13 and **14** show the projected 2020 AM and PM Tahmoor Mine peak hour traffic volumes at the intersections which includes background traffic growth and the additional traffic from the proposal.

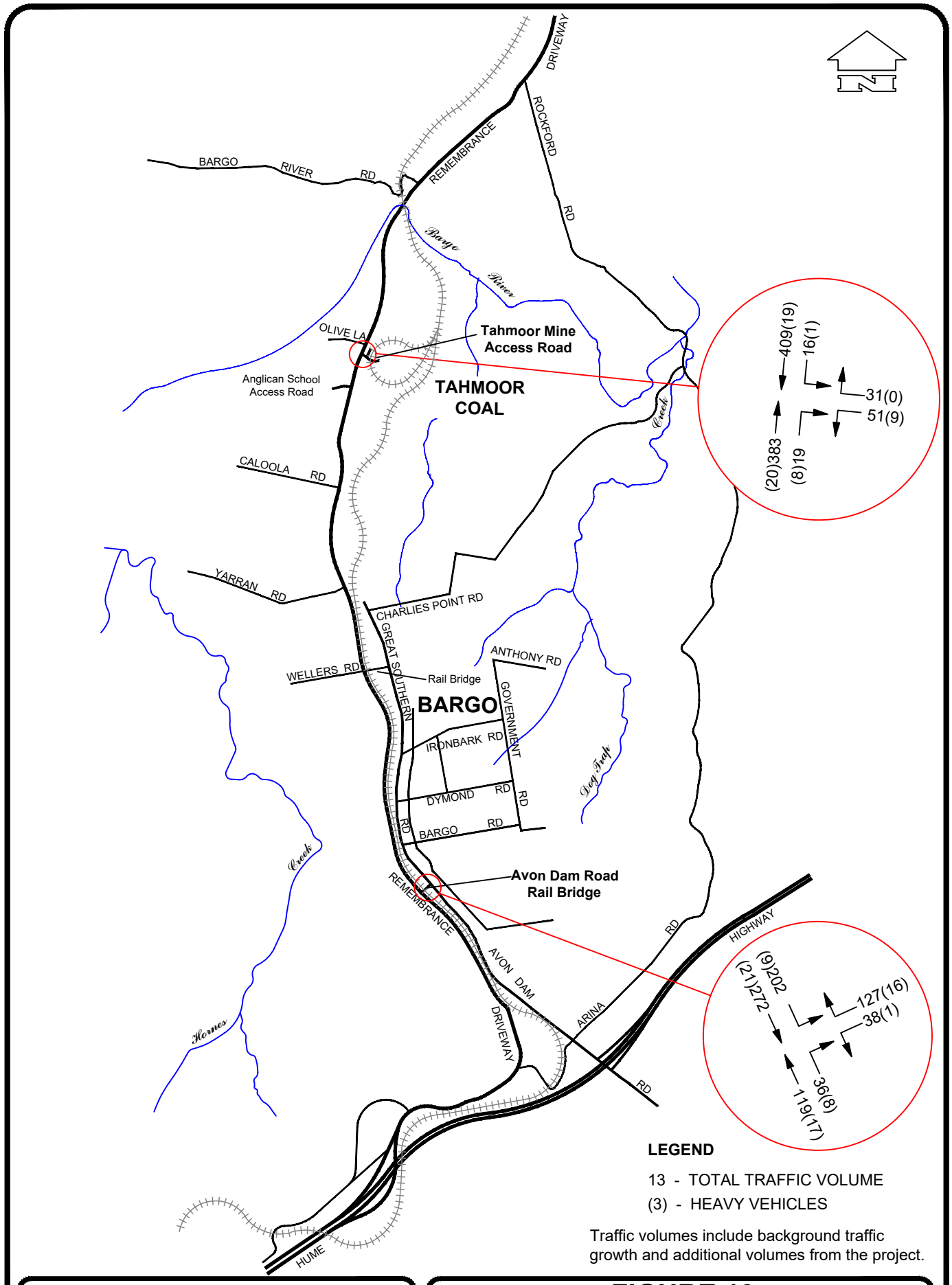
For the Remembrance Driveway/Tahmoor Mine Access Road intersection, the modelling adopted the existing channelisation for 2017 (**Figure 6**) and the proposed upgraded channelisation with the right turn bay in 2020 (**Figure 10**).

At Remembrance Driveway/Avon Dam Road (Rail Bridge) intersection, the existing traffic management has been used for the 2017 and 2020 models.

The result of the modelling are shown in Table 4.4, 4.5, 4.6 and 4.7.

Reference to Tables 4.4 and 4.5 which show the traffic modelling for the Remembrance Driveway/Tahmoor Mine Access Road intersection indicates that;

- During the AM Tahmoor Mine peak hour the intersection will retain a satisfactory to good operation (Level of Service B operation) in 2020 with a small increase in vehicle delay for the right turn movement out of Tahmoor Mine Access Road from 13.8 seconds to 16.5 seconds per vehicle.



LEGEND

13 - TOTAL TRAFFIC VOLUME

(3) - HEAVY VEHICLES

Traffic volumes include background traffic growth and additional volumes from the project.

TRANSPORT AND URBAN PLANNING

TRAFFIC, TRANSPORT & PROJECT MANAGEMENT CONSULTANTS

5/90 Toronto Parade, Sutherland NSW 2232

Phone 02 9545 1411 Fax 02 9545 1556

www.transurbanplan.com.au

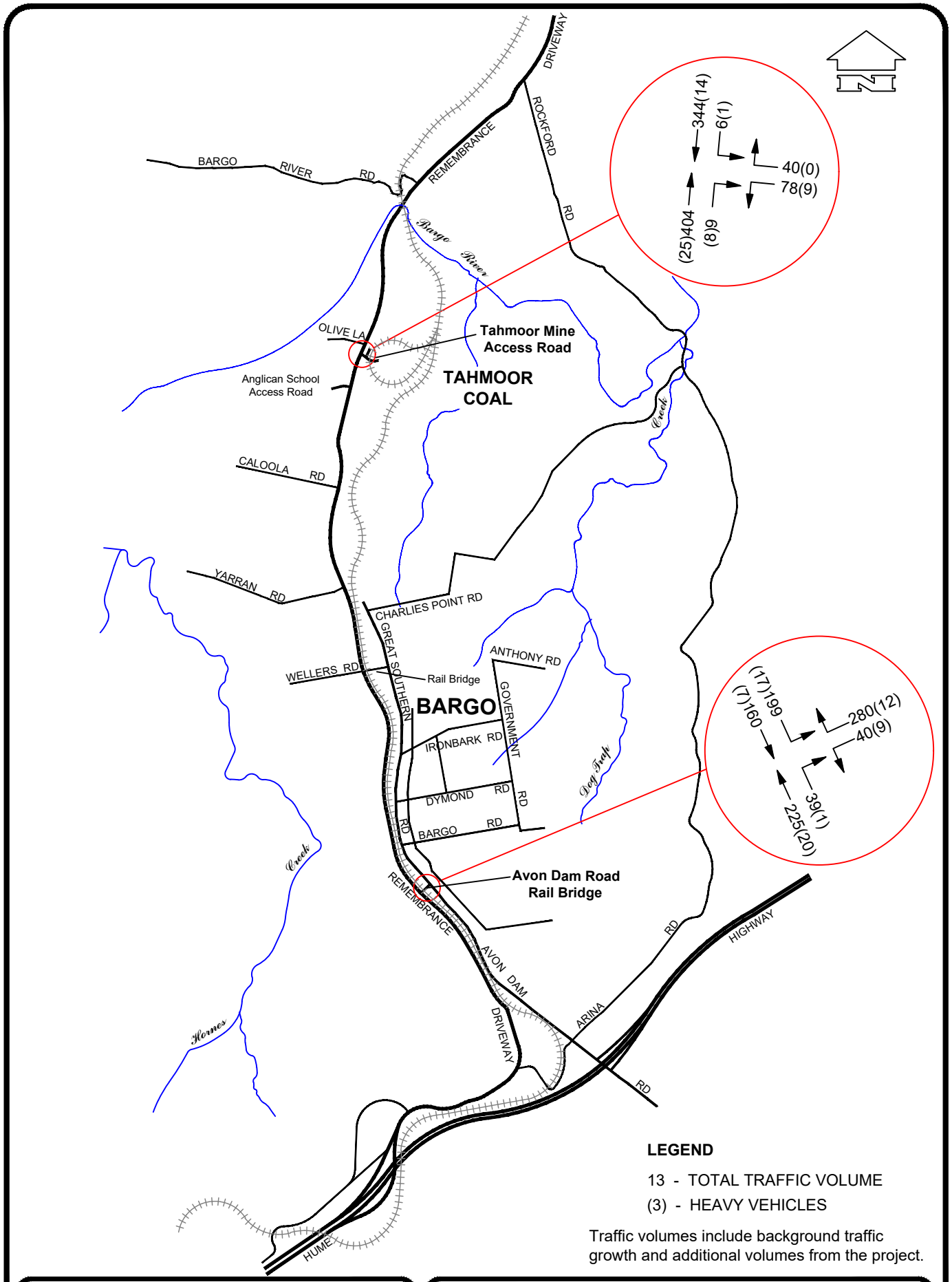
FIGURE 13

TAHMOOR COAL

TAHMOOR SOUTH PROJECT EIS

PROJECTED 2020 AM PEAK HOUR TRAFFIC VOLUMES AT CRITICAL INTERSECTIONS

JOB NO.18156 12/11/18



LEGEND

13 - TOTAL TRAFFIC VOLUME

(3) - HEAVY VEHICLES

Traffic volumes include background traffic growth and additional volumes from the project.

TRANSPORT AND URBAN PLANNING

TRAFFIC, TRANSPORT & PROJECT MANAGEMENT CONSULTANTS

5/90 Toronto Parade, Sutherland NSW 2232

Phone 02 9545 1411 Fax 02 9545 1556

www.transurbanplan.com.au

FIGURE 14

TAHMOOR COAL

TAHMOOR SOUTH PROJECT EIS

PROJECTED 2020 PM PEAK HOUR TRAFFIC VOLUMES AT CRITICAL INTERSECTIONS

JOB NO.18156 12/11/18

- During the PM Tahmoor Mine peak hour, the intersection will retain a Level of Service B operation, which is a satisfactory to good operation in 2020 with the Project. The delay for the right turn out of Tahmoor Mine Access Road increases from 12.8 seconds in 2017 to 15.4 seconds per vehicle in 2020, which represents a small increase.

TABLE 4.4

SIDRA RESULTS FOR REMEMBRANCE DRIVEWAY/TAHMOOR MINE ACCESS ROAD DURING THE AM PEAK HOUR FOR 2017 EXISTING CONDITIONS AND WITH PROJECT IN 2020

Movement	Existing				With Project			
	DS	AVD (secs)	LS	95% Queue Length (m)	DS	AVD (secs)	LS	95% Queue Length (m)
South: Remembrance Driveway								
Through	0.159	0.1	A	0.8	0.204	0.0	A	0
Right	0.159	9.2	A	0.8	0.032	9.4	A	1.3
East: Tahmoor Mine Access Rd								
Left	0.039	6.6	A	1.1	0.074	7.5	A	2.7
Right	0.067	13.8	A	1.7	0.113	16.5	B	2.8
North: Remembrance Driveway								
Left	0.006	5.6	A	0	0.009	5.6	A	0
Through	0.193	0.0	A	0	0.216	0	A	0
All Vehicles	**0.193**	**0.9**	**A**	**1.7**	**0.216**	**1.3**	**A**	**2.8**

Where:

DS	*Degree of Saturation*
AVD	*Average Vehicle Delay in Seconds*
LS	*Level of Service*
95%tile Queue Length	*95%tile Back of Queue Length in metres*

TABLE 4.5

SIDRA RESULTS FOR REMEMBRANCE DRIVEWAY/TAHMOOR MINE ACCESS ROAD DURING THE PM PEAK HOUR FOR 2017 EXISTING CONDITIONS AND WITH PROJECT IN 2020

Movement	Existing				With Project			
	DS	AVD (secs)	LS	95% Queue Length (m)	DS	AVD (secs)	LS	95% Queue Length (m)
South: Remembrance Driveway								
Through	0.161	0	A	0.1	0.216	0	A	0
Right	0.161	8.8	A	0.1	0.018	10.3	A	1.1
East: Tahmoor Mine Access Rd								
Left	0.058	6.3	A	1.6	0.100	6.8	A	3.4
Right	0.082	12.8	A	2.1	0.133	15.4	B	3.4
North: Remembrance Driveway								
Left	0.003	7.3	A	0	0.004	5.7	A	0
Through	0.165	0	A	0	0.181	0	A	0
All Vehicles	**0.165**	**1.0**	**A**	**2.1**	**0.216**	**1.5**	**B**	**3.4**

Where:

DS	*Degree of Saturation*
AVD	*Average Vehicle Delay in Seconds*
LS	*Level of Service*
95%tile Queue Length	*95%tile Back of Queue Length in metres*

Reference to Tables 4.6 and 4.7 which shows the modelling results for Remembrance Driveway/Avon Dam Road Rail Bridge intersection shows that:

- During the AM peak hour the intersection will have a satisfactory operation (Level of Service B operation) in 2020 with only a very small increase in vehicle delay.

- During the PM peak hour, the intersection will have a Level of Service B operation, which is a satisfactory to good operation in 2020, with relatively small increase in vehicle delay to Avon Dam Road Rail Bridge of around 6-7 seconds per vehicle.

TABLE 4.6

SIDRA RESULTS FOR REMEMBRANCE DRIVEWAY/AVON DAM ROAD DURING THE AM PEAK HOUR FOR 2017 EXISTING CONDITIONS AND WITH PROJECT IN 2020

Movement	Existing				With Project			
	DS	AVD (secs)	LS	95% Queue Length (m)	DS	AVD (secs)	LS	95% Queue Length (m)
South: Remembrance Driveway								
Through	0.122	1.7	A	3.8	0.128	2.0	A	4.2
Right	0.122	8.9	A	3.8	0.128	9.8	A	4.2
East: Avon Dam Rd								
Left	0.317	7.3	A	11.5	0.338	8.5	A	15.9
Right	0.317	12.8	A	11.5	0.338	15.4	B	15.9
North: Remembrance Driveway								
Left	0.229	5.6	A	0	0.259	5.6	A	0
Through	0.229	0	A	0	0.259	0	A	0
All Vehicles	**0.317**	**4.5**	**A**	**11.5**	**0.338**	**5.1**	**B**	**15.9**

Where:

DS	*Degree of Saturation*
AVD	*Average Vehicle Delay in Seconds*
LS	*Level of Service*
95%tile Queue Length	*95%tile Back of Queue Length in metres*

TABLE 4.7

SIDRA RESULTS FOR REMEMBRANCE DRIVEWAY/AVON DAM ROAD DURING THE PM PEAK HOUR FOR 2017 EXISTING CONDITIONS AND WITH PROJECT IN 2020

Movement	Existing				With Project			
	DS	AVD (secs)	LS	95% Queue Length (m)	DS	AVD (secs)	LS	95% Queue Length (m)
South: Remembrance Driveway								
Through	0.146	0.5	A	2.8	0.170	0.7	A	3.5
Right	0.146	7.3	A	2.8	0.170	7.9	A	3.5
East: Avon Dam Rd								
Left	0.561	9.4	A	32.9	0.733	14.9	B	57.1
Right	0.561	14.8	B	32.9	0.733	22.6	B	57.1
North: Remembrance Driveway								
Left	0.160	5.6	A	0	0.198	5.7	A	0
Through	0.160	0	A	0	0.198	0	A	0
All Vehicles	**0.561**	**6.6**	**B**	**32.9**	**0.733**	**9.1**	**B**	**57.1**

Where:

DS	*Degree of Saturation*
AVD	*Average Vehicle Delay in Seconds*
LS	*Level of Service*
95%tile Queue Length	*95%tile Back of Queue Length in metres*

SIDRA modelling has also been undertaken for the year 2028 at the critical intersections. Background traffic growth of 3.3% lineal average has been adopted between 2017 and 2028 (ie. 36.3% increase) to derive the base 2028 AM and PM peak hour volumes at the intersection. The Project traffic volume increases for 2028 (from 2017) are shown in **Figures 11** and **12**.

Tables 4.8 and 4.9 show the SIDRA results for Remembrance Driveway / Tahmoor Mine Access Road in 2028 for the AM and PM peak hours respectively.

Reference to Tables 4.8 and 4.9 show that the Tahmoor Mine Access Road intersection will retain a satisfactory to good operation in 2028 in the AM and PM peak hour with a Level of Service B operation, with the Project.

The delays for the right turn out of the Mine Access Road increases by around 1 second per vehicle with the Project as compared to the 2028 base case. This represents minimal impact.

TABLE 4.8

SIDRA RESULTS FOR REMEMBRANCE DRIVEWAY/TAHMOOR MINE ACCESS ROAD DURING THE AM PEAK HOUR FOR 2028 BASE CONDITIONS AND WITH PROJECT IN 2028

Movement	2028 Base				2028 With Project			
	DS	AVD (secs)	LS	95% Queue Length (m)	DS	AVD (secs)	LS	95% Queue Length (m)
South: Remembrance Driveway								
Through	0.214	0.1	A	1.0	0.247	0.0	A	0
Right	0.214	10.8	A	1.0	0.034	10.8	A	1.5
East: Tahmoor Mine Access Rd								
Left	0.046	7.7	A	1.2	0.074	8.6	A	2.8
Right	0.105	21.0	B	2.5	0.123	21.7	B	2.9
North: Remembrance Driveway								
Left	0.006	5.6	A	0	0.007	5.6	A	0
Through	0.263	0.0	A	0	0.263	0	A	0
All Vehicles	**0.263**	**0.9**	**B**	**2.5**	**0.263**	**1.1**	**B**	**2.9**

Where:

DS	*Degree of Saturation*
AVD	*Average Vehicle Delay in Seconds*
LS	*Level of Service*
95%tile Queue Length	*95%tile Back of Queue Length in metres*

TABLE 4.9

SIDRA RESULTS FOR REMEMBRANCE DRIVEWAY/TAHMOOR MINE ACCESS ROAD DURING THE PM PEAK HOUR FOR 2028 BASE CONDITIONS AND WITH PROJECT IN 2028

Movement	2028 Base				2028 With Project			
	DS	AVD (secs)	LS	95% Queue Length (m)	DS	AVD (secs)	LS	95% Queue Length (m)
South: Remembrance Driveway								
Through	0.219	0	A	0.1	0.262	0	A	0
Right	0.219	10.0	A	0.1	0.021	11.7	A	1.3
East: Tahmoor Mine Access Rd								
Left	0.066	7.1	A	1.8	0.095	7.6	A	3.3
Right	0.123	19.1	B	3.0	0.149	20.3	B	3.6
North: Remembrance Driveway								
Left	0.003	7.3	A	0	0.004	5.7	A	0
Through	0.224	0	A	0	0.224	0	A	0
All Vehicles	**0.224**	**1.0**	**B**	**3.0**	**0.224**	**1.3**	**B**	**3.6**

Where:

DS	*Degree of Saturation*
AVD	*Average Vehicle Delay in Seconds*
LS	*Level of Service*
95%tile Queue Length	*95%tile Back of Queue Length in metres*

Tables 4.10 and 4.11 show the SIDRA results for the intersection of Remembrance Driveway and Avon Dam Rail Bridge Road in 2028 in the AM and PM peak hours.

Reference to Table 4.10 shows that the AM peak operation will be satisfactory to good with a Level of Service B operation with the Project in place with a small increase in vehicle delay of 1-2 seconds for the right turn out of Avon Dam Road Rail Bridge.

In the PM peak hour (Table 4.11) the background traffic growth of 36.3% over the 10 year period (if realised) will increase the vehicle delay to right turn out of Avon Dam Rail Bridge Road to 51.9 seconds per vehicle (ie. equivalent to Level of Service D operation). With the Project in place the delay to the right turn movement will increase to 67.4 seconds per vehicle (ie. equivalent to Level of Service E operation). However the Project will only generate an additional 24 vehicle trips at this intersection in the PM peak hour in 2028, as compared to the existing 2017 volumes and therefore only provides a very small increase in the overall traffic volumes predicted to use this intersection in 2028. These 24 vehicles represent 2.1% of the total vehicles estimated to use the intersection in 2028 PM peak hour.

TABLE 4.10

SIDRA RESULTS FOR REMEMBRANCE DRIVEWAY/AVON DAM ROAD DURING THE AM PEAK HOUR FOR EXISTING 2028 BASE CONDITIONS AND WITH PROJECT IN 2028

Movement	2028 Base				2028 With Project			
	DS	AVD (secs)	LS	95% Queue Length (m)	DS	AVD (secs)	LS	95% Queue Length (m)
South: Remembrance Driveway								
Through	0.160	2.8	A	5.7	0.165	2.9	A	6.0
Right	0.160	10.8	A	5.7	0.165	11.1	A	6.0
East: Avon Dam Rd								
Left	0.499	10.9	A	22.4	0.539	12.0	A	25.5
Right	0.499	19.7	B	22.4	0.539	21.7	B	25.5
North: Remembrance Driveway								
Left	0.299	5.6	A	0	0.308	5.6	A	0
Through	0.299	0	A	0	0.308	0	A	0
All Vehicles	**0.499**	**6.0**	**B**	**22.4**	**0.539**	**6.4**	**B**	**25.5**

Where:

DS	*Degree of Saturation*
AVD	*Average Vehicle Delay in Seconds*
LS	*Level of Service*
95%tile Queue Length	*95%tile Back of Queue Length in metres*

TABLE 4.11

SIDRA RESULTS FOR REMEMBRANCE DRIVEWAY/AVON DAM ROAD DURING THE PM PEAK HOUR FOR EXISTING 2028 BASE CONDITIONS AND WITH PROJECT IN 2028

Movement	2028 Base				2028 With Project			
	DS	AVD (secs)	LS	95% Queue Length (m)	DS	AVD (secs)	LS	95% Queue Length (m)
South: Remembrance Driveway								
Through	0.206	0.9	A	4.8	0.210	0.9	A	5.0
Right	0.206	8.3	A	4.8	0.210	8.6	A	5.0
East: Avon Dam Rd								
Left	0.935	41.8	C	154.0	0.964	56.7	E	187.5
Right	0.935	51.9	D	154.0	0.964	67.4	E	187.5
North: Remembrance Driveway								
Left	0.218	5.6	A	0	0.230	5.7	A	0
Through	0.218	0	A	0	0.230	0	A	0
All Vehicles	**0.935**	**19.5**	**D**	**154.0**	**0.964**	**24.4**	**E**	**187.5**

Where:

DS	*Degree of Saturation*
AVD	*Average Vehicle Delay in Seconds*
LS	*Level of Service*
95%tile Queue Length	*95%tile Back of Queue Length in metres*

4.6 Construction Traffic Impacts

4.6.1 Associated Surface Infrastructure

Additional vehicle trips associated with the construction of the associated surface infrastructure would be:

- 30 inbound light vehicle trips between 6.00am – 7.00am;
- 30 outbound light vehicle trips between 5.00pm – 6.00pm; and
- An average 2-3 heavy vehicle trips per week (i.e. 2-3 in/2-3 out).

These trips would occur between 2020 and 2024 and access Tahmoor Mine via the Remembrance Driveway intersection.

These construction vehicle trips will occur at different times than the operational traffic and outside the AM and PM peak hours on the road network.

The impacts during the 2020 operational phase are assessed as satisfactory and therefore the impacts of the construction traffic for the associated surface infrastructure which will occur outside the main AM and PM peak hours on the road network, are also considered to be satisfactory.

Upgrade Works at Remembrance Driveway Intersection

Following approval of the Project, a separate Construction Traffic Management Plan will be prepared for the upgrade works to the Remembrance Driveway/Tahmoor Mine Access Road intersection, to manage the impacts during the construction works at the intersection.

The Construction Traffic Management Plan will detail any staging and will include Traffic Control Plans to manage traffic at the intersection during the intersection upgrade works.

4.6.2 Vent Shafts

There are 2 vent shafts to be constructed between 2021 and 2024. The vent shaft construction dates and the required access road for each vent shaft are detailed below.

- TSC1 - Upcast (2021-2023) - Charlies Point Road via Rockford Road
- TSC2 - Downcast (2023-2024) - Charlies Point Road via Rockford Road

As noted in Section 4.3.2 construction worker trips would be 13 light vehicle trips between 5.30am-6.30am (4 in/9 out) and 13 light vehicle trips between 5.30pm – 6.30pm (9 out/4 in). Heavy vehicles would be a maximum of 1-2 vehicles per hour (i.e. 1-2 in/1-2 out) and up to 7-8 per day (7-8 in/7-8 out) per day) on busy days.

Figure 7 shows weekday and daily volumes on the road network that will be used to access the new vent shafts.

Local Construction Transport Routes from the Hume Highway and Remembrance Driveway for TSC1 and TSC2 would be via Rockford Road and Charlies Point Road. Rockford Road near Remembrance Driveway carries between 1576-1607vpd per day/weekday. Heavy vehicles make up 12.2%-13.2% of the total. Charlies Point Road carries daily and weekday volumes of 131-135vpd with 6.8%-7.8% being heavy vehicles.

The additional 26 light vehicle trips (i.e. 13 in/13out) per day and 14-16 heavy vehicle trips (i.e. 7-8 in and 7-8 out) on busy days would not affect the capacity of these roads.

Separate Construction Traffic Management Plans will be provided for the construction of the two vent shafts to manage the impacts of the construction traffic for the vent shafts following approval of the Project.

The Construction Traffic Management Plans will detail transport routes and include any Traffic Control Plans required for construction vehicles to the vent shaft sites, as well as any works/upgrading that is required. The plan will also show the worksite layout including parking and delivery areas. Both the RMS and Wollondilly Shire Council will be consulted during the preparation of the Construction Traffic Management Plans, as appropriate, to ensure that any of their requirements are addressed in the plan.

4.6.3 Increase in Heavy Vehicles

The existing Tahmoor Mine operation generates some 39 two way heavy vehicle trips per day (i.e. 39 in/39 out). The majority of these vehicles are rigid trucks with up to 2 semi trailers per day.

If the project is approved the transportation of the 200,000tpa of coal and other products by road would generate on an average day an additional 16 truck loads (ie. 16 in / 16 out) and a maximum of 79 truck loads per day (using trucks and quad dog articulated vehicle) on a campaign basis (ie. 79 in / 79 out).

During construction, additional heavy vehicles delivering plant and equipment would be required for the construction of:

i) The extension of underground Tahmoor Mine;
ii) The associated surface facilities including the upgrading of the Remembrance Driveway intersection; and
iii) The vent shafts.

Item i) will commence from 2020 and between 2020 and 2024 will require 2-3 semi trailer deliveries per month (i.e. approximately 1 per week).

Deliveries of equipment for the Long Wall Mining will occur between 2024 and 2027 and will require 5-8 semi trailer deliveries per month (i.e. 1-2 per week).

Construction for the surface infrastructure listed in Item ii) will occur between 2020 to 2021.

On average this requires approximately 10-15 deliveries per month (i.e. 2-3 deliveries per week). These vehicles will be typically large rigid trucks and articulated semi trailer vehicles.

During construction of the new parking area/internal road and the upgrading of the Remembrance Driveway intersection, there will be some days where up to 15 heavy vehicles per day delivering materials will access the site.

Most of these vehicles would need to access Tahmoor Mine via the main intersection in Remembrance Driveway.

Transport routes for these vehicles would typically be to and from the Hume Highway via Remembrance Driveway and or Avon Dam Road as appropriate (other than for any materials sourced locally).

For Item iii) as noted in section 4.3.2 the construction of the vent shafts would require 1-2 heavy vehicle deliveries per day, except at the site establishment and demobilisation of the site and for concrete pours, when up to 7-8 heavy vehicles will be required (i.e. 7-8 in/7-8 out). On these busy days heavy vehicles would average 1-2 per hour (i.e. 1-2 in/1-2 out).

Transport routes for heavy vehicles delivering material to the vent shaft sites would typically be to/from the Hume Highway via Remembrance Driveway and Avon Dam Road as appropriate other than for any material which might be sourced locally.

Following construction of each vent shaft, an additional 15 heavy vehicle deliveries of concrete and aggregate would be required every week, once the vent shaft is operational (i.e. 2 or so deliveries per day). These materials would be sourced locally. An additional 1-2 service trucks for maintenance would also attend each vent shaft per week.

4.7 Road Safety

The Project is not expected to have any negative impacts on road safety. As part of the Project, Tahmoor Mine's access intersection with Remembrance Driveway will be upgraded which will improve potential road safety at this intersection.

SIDRA traffic modelling indicates that the intersection will have a satisfactory to good operation in terms of vehicle delay in 2020, when the project reaches its peak employment.

On the wider road network the additional traffic increases associated with the Project are relatively small in real terms.

The construction impacts of the intersection's upgrading and the proposed vent shafts which are part of the Project, will be managed through Construction Traffic Management Plans, which will be prepared after approval of the Project.

4.8 Parking Changes

Tahmoor Mine currently has three car parks with a total of 278 car spaces. As part of the Project, it is proposed to construct another car park which will incorporate another 150 parking spaces (**Figure 4A**) providing a total car parking capacity of 428 spaces.

Wollondilly Shire Council's DCP does not have a parking requirement for mines.

Parking surveys undertaken for a week in February 2013 found that the maximum parking demand at Tahmoor Mine was 262 vehicles which occurred in the morning.

This included all vehicles parked in the car parks, plus adjacent the frontage of the Tahmoor Mine site. This represents a maximum demand parking rate of 0.70 cars/spaces per employee (based on 378 employees in 2013).

Adopting this parking rate for 510 employees indicates a parking requirement of 357 spaces. As noted above, Tahmoor Mine will have a total of 428 spaces with the additional 150 car spaces and therefore will have adequate parking to accommodate its peak parking demand.

5.0 CONCLUSIONS

This report documents the assessment of the traffic impacts of a continuation of mining at Tahmoor Mine, extending underground operations and associated infrastructure south, within the Bargo area. The proposed development seeks to extend the life of underground mining at Tahmoor Mine until approximately 2035, depending upon geological and mining parameters.

Tahmoor Mine are also proposing to transport up to 200,000tpa of coal products to and from the mine by road on a campaign basis with up to a maximum of 3,000 tonnes per day.

As part of the project, Tahmoor Mine's access intersection with Remembrance Driveway will be upgraded to improve potential road safety and additional parking will be provided at the Tahmoor Mine, as part of the project.

The intersection upgrade will be designed and constructed in accordance with Austroad Standards. **Figure 10** shows a concept layout.

The assessment has found that at peak employment in 2020 Tahmoor Mine's access intersection in Remembrance Driveway will have a satisfactory to good operation in terms of level of service and vehicle delay, during the AM and PM Tahmoor Mine peak hours.

On the wider road network the additional traffic generated by the Project in 2020 is relatively small in real terms and will have minimal impact on road capacity and or intersection capacity and vehicle delay at adjacent intersections including the Remembrance Driveway / Avon Dam Road Rail Bridge intersection.

The traffic generation of the Project reduces from its peak in 2020 and by 2023 the increases associated with the Project will be 50% less than in 2020. From 2023 to 2035 employment levels at the mine will be the same as the employment level in 2011. The only additional traffic will be 8 truck loads per hour (ie. 8 in / 8 out) associated with the road transport of coal products.

The Tahmoor Mine Access intersection will maintain a good to satisfactory operation in 2028 with the Project in place.

The Remembrance Driveway / Avon Dam Rail Bridge intersection will have a good to satisfactory operation in the AM peak hour in 2028, but will have reduced capacity in the PM peak hour, due to the predicted increases in background traffic growth, (ie. 36.3% increase).

The additional traffic associated with the project in 2028 in the PM peak hour is 24vph which represents 2.1% of the total traffic estimated to use the intersection in the 2028 PM peak hour.

The construction impacts of the upgrading of Tahmoor Mine's access intersection with Remembrance Driveway and the construction of vent shafts for Tahmoor Mine will be managed through separate Construction Traffic Management Plans which will be prepared following approval of the Project. Both RMS and Wollondilly Shire Council will be consulted as appropriate during the preparation of the Construction Traffic Management Plans. Any minor upgrading works and the required traffic management for vehicle access to the vent shaft sites will be detailed in the Construction Traffic Management Plans for the two vent shaft sites.

REFERENCES

1. Austroads Guide to Road Design
2. Austroads Guide to Road Safety
3. Austroads Guide to Traffic Management
4. RTA (now RMS) Austroads Guide Supplements – Austroads Guide to Traffic Management
5. RTA (now RMS) Supplement to Austroads Guide to Road Design Parts 1-5, 6 and 8
6. RMS Supplements to Austroads Guide to Road Safety
7. RMS Southern Region – Crash Statistics for 1 October 2011 to 30 September 2016
8. RTA (now RMS) Road Design Guide

APPENDICES

1. SIDRA Traffic Modelling Results

MOVEMENT SUMMARY

▽ Site: 1 [Rem Dwy & Mine Access Rd -Ex-AM Peak]

AM Ex Peak
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: Remembrance Dr												
2	T1	342	5.3	0.159	0.1	LOS A	0.1	0.8	0.02	0.02	0.02	79.2
3	R2	8	0.0	0.159	9.2	LOS A	0.1	0.8	0.03	0.02	0.03	65.6
Approach		350	5.1	0.159	0.3	NA	0.1	0.8	0.02	0.02	0.02	78.8
East: Mine Access												
4	L2	31	3.2	0.039	6.6	LOS A	0.1	1.1	0.42	0.60	0.42	48.4
6	R2	22	0.0	0.067	13.8	LOS A	0.2	1.7	0.65	0.83	0.65	44.1
Approach		53	1.9	0.067	9.6	LOS A	0.2	1.7	0.52	0.69	0.52	46.5
North: Remembrance Dr												
7	L2	11	9.1	0.006	5.6	LOS A	0.0	0.0	0.00	0.57	0.00	53.2
8	T1	365	4.7	0.193	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	79.9
Approach		376	4.8	0.193	0.2	NA	0.0	0.0	0.00	0.02	0.00	78.8
All Vehicles		779	4.7	0.193	0.9	NA	0.2	1.7	0.05	0.06	0.05	75.2

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: 1 [Rem Dwy & Mine Access Rd -Ex-PM]

PM Ex Peak
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: Remembrance Dr												
2	T1	361	6.1	0.161	0.0	LOS A	0.0	0.1	0.00	0.00	0.00	79.9
3	R2	1	0.0	0.161	8.8	LOS A	0.0	0.1	0.00	0.00	0.00	66.1
Approach		362	6.1	0.161	0.0	NA	0.0	0.1	0.00	0.00	0.00	79.9
East: Mine Access												
4	L2	50	2.0	0.058	6.3	LOS A	0.2	1.6	0.39	0.58	0.39	48.6
6	R2	29	0.0	0.082	12.8	LOS A	0.3	2.1	0.63	0.82	0.63	44.6
Approach		79	1.3	0.082	8.7	LOS A	0.3	2.1	0.48	0.67	0.48	47.1
North: Remembrance Dr												
7	L2	5	20.0	0.003	7.3	LOS A	0.0	0.0	0.00	0.63	0.00	59.2
8	T1	313	3.8	0.165	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	99.9
Approach		318	4.1	0.165	0.1	NA	0.0	0.0	0.00	0.01	0.00	98.8
All Vehicles		759	4.7	0.165	1.0	NA	0.3	2.1	0.05	0.07	0.05	80.5

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: 1 [RT Bay - Rem Dwy & Mine Access Rd -2020 AM Peak & Project]

2020 AM Peak - RT Bay & Project
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: Remembrance Dr												
2	T1	383	5.2	0.204	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	79.9
3	R2	19	42.1	0.032	9.4	LOS A	0.1	1.3	0.42	0.66	0.42	49.2
Approach		402	7.0	0.204	0.5	NA	0.1	1.3	0.02	0.03	0.02	77.6
East: Mine Access												
4	L2	51	17.6	0.074	7.5	LOS A	0.3	2.7	0.47	0.65	0.47	47.4
6	R2	31	0.0	0.113	16.5	LOS B	0.4	2.8	0.72	0.87	0.72	42.7
Approach		82	11.0	0.113	10.9	LOS A	0.4	2.8	0.56	0.73	0.56	45.5
North: Remembrance Dr												
7	L2	16	6.3	0.009	5.6	LOS A	0.0	0.0	0.00	0.57	0.00	53.4
8	T1	409	4.6	0.216	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	79.9
Approach		425	4.7	0.216	0.2	NA	0.0	0.0	0.00	0.02	0.00	78.4
All Vehicles		909	6.3	0.216	1.3	NA	0.4	2.8	0.06	0.09	0.06	73.3

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.
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.

SIDRA INTERSECTION 8.0 | Copyright © 2000-2018 Akcelik and Associates Pty Ltd | sidrasolutions.com
Organisation: TRANSPORT AND URBAN PLANNING PTY LTD | Processed: Monday, 12 November 2018 10:09:45 AM
Project: Not Saved

MOVEMENT SUMMARY

▽ Site: 1 [RT Bay - Rem Dwy & Mine Access Rd - 2020 PM & Project]

2020 PM - RT Bay & Project
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: Remembrance Dr												
2	T1	404	6.2	0.216	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	79.9
3	R2	9	88.9	0.018	10.3	LOS A	0.1	1.1	0.40	0.63	0.40	47.3
Approach		413	8.0	0.216	0.2	NA	0.1	1.1	0.01	0.01	0.01	78.7
East: Mine Access												
4	L2	78	11.5	0.100	6.8	LOS A	0.4	3.4	0.43	0.62	0.43	48.0
6	R2	40	0.0	0.133	15.4	LOS B	0.5	3.4	0.70	0.86	0.70	43.3
Approach		118	7.6	0.133	9.7	LOS A	0.5	3.4	0.52	0.70	0.52	46.3
North: Remembrance Dr												
7	L2	6	16.7	0.004	5.7	LOS A	0.0	0.0	0.00	0.57	0.00	52.9
8	T1	344	4.1	0.181	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	79.9
Approach		350	4.3	0.181	0.1	NA	0.0	0.0	0.00	0.01	0.00	79.2
All Vehicles		881	6.5	0.216	1.5	NA	0.5	3.4	0.07	0.10	0.07	72.1

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: 1 [Rem Dwy & Mine Access Rd -2028 AM Base]

2028 AM Base
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: Remembrance Dr												
2	T1	466	4.3	0.214	0.1	LOS A	0.1	1.0	0.03	0.01	0.03	79.3
3	R2	8	0.0	0.214	10.8	LOS A	0.1	1.0	0.03	0.01	0.03	65.6
Approach		474	4.2	0.214	0.3	NA	0.1	1.0	0.03	0.01	0.03	79.0
East: Mine Access												
4	L2	31	3.2	0.046	7.7	LOS A	0.2	1.2	0.50	0.66	0.50	47.7
6	R2	22	0.0	0.105	21.0	LOS B	0.4	2.5	0.79	0.90	0.79	40.5
Approach		53	1.9	0.105	13.2	LOS A	0.4	2.5	0.62	0.76	0.62	44.4
North: Remembrance Dr												
7	L2	11	9.1	0.006	5.6	LOS A	0.0	0.0	0.00	0.57	0.00	53.2
8	T1	498	4.6	0.263	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	79.9
Approach		509	4.7	0.263	0.2	NA	0.0	0.0	0.00	0.01	0.00	79.0
All Vehicles		1036	4.3	0.263	0.9	NA	0.4	2.5	0.04	0.05	0.04	76.0

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: 1 [Rem Dwy & Mine Access Rd - 2028 PM Base]

2028 PM Base
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: Remembrance Dr												
2	T1	492	5.9	0.219	0.0	LOS A	0.0	0.1	0.00	0.00	0.00	79.9
3	R2	1	0.0	0.219	10.0	LOS A	0.0	0.1	0.00	0.00	0.00	66.1
Approach		493	5.9	0.219	0.0	NA	0.0	0.1	0.00	0.00	0.00	79.9
East: Mine Access												
4	L2	50	2.0	0.066	7.1	LOS A	0.3	1.8	0.46	0.64	0.46	48.1
6	R2	29	0.0	0.123	19.1	LOS B	0.4	3.0	0.76	0.89	0.76	41.4
Approach		79	1.3	0.123	11.5	LOS A	0.4	3.0	0.57	0.73	0.57	45.4
North: Remembrance Dr												
7	L2	5	20.0	0.003	7.3	LOS A	0.0	0.0	0.00	0.63	0.00	59.2
8	T1	427	3.7	0.224	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	99.9
Approach		432	3.9	0.224	0.1	NA	0.0	0.0	0.00	0.01	0.00	99.1
All Vehicles		1004	4.7	0.224	1.0	NA	0.4	3.0	0.05	0.06	0.05	81.8

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.
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: 1 [RT Bay - Rem Dwy & Mine Access Rd -2028 AM & Project]

2028 AM Peak - RT Bay & Project
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: Remembrance Dr												
2	T1	466	4.3	0.247	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	79.9
3	R2	17	47.1	0.034	10.8	LOS A	0.1	1.5	0.50	0.71	0.50	48.2
Approach		483	5.8	0.247	0.4	NA	0.1	1.5	0.02	0.02	0.02	78.1
East: Mine Access												
4	L2	44	20.5	0.074	8.6	LOS A	0.3	2.8	0.52	0.70	0.52	46.7
6	R2	25	0.0	0.123	21.7	LOS B	0.4	2.9	0.80	0.91	0.80	40.2
Approach		69	13.0	0.123	13.3	LOS A	0.4	2.9	0.62	0.77	0.62	44.1
North: Remembrance Dr												
7	L2	13	7.7	0.007	5.6	LOS A	0.0	0.0	0.00	0.57	0.00	53.3
8	T1	498	4.6	0.263	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	79.9
Approach		511	4.7	0.263	0.2	NA	0.0	0.0	0.00	0.01	0.00	78.9
All Vehicles		1063	5.7	0.263	1.1	NA	0.4	2.9	0.05	0.07	0.05	74.7

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: 1 [RT Bay - Rem Dwy & Mine Access Rd - 2028 PM & Project]

2028 PM - RT Bay & Project
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: Remembrance Dr												
2	T1	492	5.9	0.262	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	79.9
3	R2	9	88.9	0.021	11.7	LOS A	0.1	1.3	0.48	0.68	0.48	46.5
Approach		501	7.4	0.262	0.2	NA	0.1	1.3	0.01	0.01	0.01	78.9
East: Mine Access												
4	L2	66	13.6	0.095	7.6	LOS A	0.4	3.3	0.48	0.67	0.48	47.5
6	R2	33	0.0	0.149	20.3	LOS B	0.5	3.6	0.78	0.90	0.78	40.9
Approach		99	9.1	0.149	11.8	LOS A	0.5	3.6	0.58	0.74	0.58	45.0
North: Remembrance Dr												
7	L2	6	16.7	0.004	5.7	LOS A	0.0	0.0	0.00	0.57	0.00	52.9
8	T1	427	3.7	0.224	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	79.9
Approach		433	3.9	0.224	0.1	NA	0.0	0.0	0.00	0.01	0.00	79.4
All Vehicles		1033	6.1	0.262	1.3	NA	0.5	3.6	0.06	0.08	0.06	73.7

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: 1 [Avon Dam Rd & Rem Dwy - Ex-AM Peak]

AM Ex Peak
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: Remembrance Dr												
2	T1	114	9.6	0.122	1.7	LOS A	0.5	3.8	0.28	0.17	0.28	56.8
3	R2	39	17.9	0.122	8.9	LOS A	0.5	3.8	0.28	0.17	0.28	53.9
Approach		153	11.8	0.122	3.5	NA	0.5	3.8	0.28	0.17	0.28	56.0
East: Avon Dam Rd												
4	L2	35	2.9	0.317	7.3	LOS A	1.5	11.5	0.61	0.83	0.70	45.5
6	R2	115	8.7	0.317	12.8	LOS A	1.5	11.5	0.61	0.83	0.70	44.9
Approach		150	7.3	0.317	11.5	LOS A	1.5	11.5	0.61	0.83	0.70	45.0
North: Remembrance Dr												
7	L2	176	2.3	0.229	5.6	LOS A	0.0	0.0	0.00	0.25	0.00	56.1
8	T1	249	6.0	0.229	0.0	LOS A	0.0	0.0	0.00	0.25	0.00	57.7
Approach		425	4.5	0.229	2.3	NA	0.0	0.0	0.00	0.25	0.00	57.0
All Vehicles		728	6.6	0.317	4.5	NA	1.5	11.5	0.18	0.35	0.20	53.9

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.
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: 1 [Avon Dam Rd & Rem Dwy - Ex-PM Peak]

Ex PM Peak
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: Remembrance Dr												
2	T1	197	7.1	0.146	0.5	LOS A	0.4	2.8	0.13	0.10	0.13	58.5
3	R2	35	2.9	0.146	7.3	LOS A	0.4	2.8	0.13	0.10	0.13	56.2
Approach		232	6.5	0.146	1.5	NA	0.4	2.8	0.13	0.10	0.13	58.1
East: Avon Dam Rd												
4	L2	36	22.2	0.561	9.4	LOS A	4.5	32.9	0.68	1.01	1.09	43.4
6	R2	249	4.0	0.561	14.8	LOS B	4.5	32.9	0.68	1.01	1.09	43.6
Approach		285	6.3	0.561	14.2	LOS A	4.5	32.9	0.68	1.01	1.09	43.6
North: Remembrance Dr												
7	L2	165	6.7	0.160	5.6	LOS A	0.0	0.0	0.00	0.33	0.00	55.3
8	T1	130	1.5	0.160	0.0	LOS A	0.0	0.0	0.00	0.33	0.00	57.1
Approach		295	4.4	0.160	3.2	NA	0.0	0.0	0.00	0.33	0.00	56.1
All Vehicles		812	5.7	0.561	6.6	NA	4.5	32.9	0.27	0.50	0.42	51.4

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: 1 [Avon Dam Rd & Rem Dwy - 2020 AM Peak & Project]

2020 AM Peak & Project
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: Remembrance Dr												
2	T1	119	14.3	0.128	2.0	LOS A	0.5	4.2	0.30	0.16	0.30	56.6
3	R2	36	22.2	0.128	9.8	LOS A	0.5	4.2	0.30	0.16	0.30	53.5
Approach		155	16.1	0.128	3.8	NA	0.5	4.2	0.30	0.16	0.30	55.8
East: Avon Dam Rd												
4	L2	38	2.6	0.388	8.5	LOS A	2.1	15.9	0.65	0.91	0.87	44.2
6	R2	127	12.6	0.388	15.4	LOS B	2.1	15.9	0.65	0.91	0.87	43.5
Approach		165	10.3	0.388	13.9	LOS A	2.1	15.9	0.65	0.91	0.87	43.7
North: Remembrance Dr												
7	L2	203	4.4	0.259	5.6	LOS A	0.0	0.0	0.00	0.25	0.00	55.9
8	T1	272	7.7	0.259	0.0	LOS A	0.0	0.0	0.00	0.25	0.00	57.7
Approach		475	6.3	0.259	2.4	NA	0.0	0.0	0.00	0.25	0.00	56.9
All Vehicles		795	9.1	0.388	5.1	NA	2.1	15.9	0.19	0.37	0.24	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.
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: 1 [Avon Dam Rd & Rem Dwy - 2020 PM Peak & Project]

2020 PM Peak & Project
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: Remembrance Dr												
2	T1	225	8.9	0.170	0.7	LOS A	0.5	3.5	0.15	0.10	0.15	58.3
3	R2	39	2.6	0.170	7.9	LOS A	0.5	3.5	0.15	0.10	0.15	56.0
Approach		264	8.0	0.170	1.8	NA	0.5	3.5	0.15	0.10	0.15	57.9
East: Avon Dam Rd												
4	L2	40	22.5	0.733	14.9	LOS B	7.7	57.1	0.79	1.29	1.79	39.9
6	R2	284	5.6	0.733	22.6	LOS B	7.7	57.1	0.79	1.29	1.79	40.0
Approach		324	7.7	0.733	21.6	LOS B	7.7	57.1	0.79	1.29	1.79	40.0
North: Remembrance Dr												
7	L2	199	8.5	0.198	5.7	LOS A	0.0	0.0	0.00	0.33	0.00	55.3
8	T1	160	4.4	0.198	0.0	LOS A	0.0	0.0	0.00	0.33	0.00	57.1
Approach		359	6.7	0.198	3.1	NA	0.0	0.0	0.00	0.33	0.00	56.1
All Vehicles		947	7.4	0.733	9.1	NA	7.7	57.1	0.31	0.59	0.65	49.7

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: 1 [Avon Dam Rd & Rem Dwy - 2028 AM Base]

2028 AM Base
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: Remembrance Dr												
2	T1	140	10.7	0.160	2.8	LOS A	0.7	5.7	0.37	0.17	0.37	55.8
3	R2	44	20.5	0.160	10.8	LOS A	0.7	5.7	0.37	0.17	0.37	52.9
Approach		184	13.0	0.160	4.7	NA	0.7	5.7	0.37	0.17	0.37	55.1
East: Avon Dam Rd												
4	L2	46	4.3	0.499	10.9	LOS A	3.0	22.4	0.72	1.02	1.12	42.2
6	R2	143	9.1	0.499	19.7	LOS B	3.0	22.4	0.72	1.02	1.12	41.7
Approach		189	7.9	0.499	17.6	LOS B	3.0	22.4	0.72	1.02	1.12	41.8
North: Remembrance Dr												
7	L2	234	2.6	0.299	5.6	LOS A	0.0	0.0	0.00	0.25	0.00	56.0
8	T1	319	6.3	0.299	0.0	LOS A	0.0	0.0	0.00	0.25	0.00	57.7
Approach		553	4.7	0.299	2.4	NA	0.0	0.0	0.00	0.25	0.00	57.0
All Vehicles		926	7.0	0.499	6.0	NA	3.0	22.4	0.22	0.39	0.30	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.
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: 1 [Avon Dam Rd & Rem Dwy - 2028 PM Base]

2028 PM Base
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: Remembrance Dr												
2	T1	269	6.7	0.206	0.9	LOS A	0.6	4.8	0.17	0.10	0.17	58.0
3	R2	48	2.1	0.206	8.3	LOS A	0.6	4.8	0.17	0.10	0.17	55.8
Approach		317	6.0	0.206	2.0	NA	0.6	4.8	0.17	0.10	0.17	57.7
East: Avon Dam Rd												
4	L2	49	22.4	0.935	41.8	LOS C	20.9	154.0	0.91	2.26	4.37	30.2
6	R2	339	3.8	0.935	51.9	LOS D	20.9	154.0	0.91	2.26	4.37	30.3
Approach		388	6.2	0.935	50.7	LOS D	20.9	154.0	0.91	2.26	4.37	30.3
North: Remembrance Dr												
7	L2	225	6.2	0.218	5.6	LOS A	0.0	0.0	0.00	0.33	0.00	55.3
8	T1	177	1.7	0.218	0.0	LOS A	0.0	0.0	0.00	0.33	0.00	57.1
Approach		402	4.2	0.218	3.2	NA	0.0	0.0	0.00	0.33	0.00	56.1
All Vehicles		1107	5.4	0.935	19.5	NA	20.9	154.0	0.37	0.94	1.58	43.5

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: 1 [Avon Dam Rd & Rem Dwy - 2028 AM & Project]

2028 AM with Project
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: Remembrance Dr												
2	T1	144	12.5	0.165	2.9	LOS A	0.8	6.0	0.37	0.17	0.37	55.7
3	R2	44	20.5	0.165	11.1	LOS A	0.8	6.0	0.37	0.17	0.37	52.8
Approach		188	14.4	0.165	4.8	NA	0.8	6.0	0.37	0.17	0.37	55.0
East: Avon Dam Rd												
4	L2	46	4.3	0.539	12.0	LOS A	3.4	25.5	0.74	1.06	1.23	41.3
6	R2	147	11.6	0.539	21.7	LOS B	3.4	25.5	0.74	1.06	1.23	40.8
Approach		193	9.8	0.539	19.4	LOS B	3.4	25.5	0.74	1.06	1.23	40.9
North: Remembrance Dr												
7	L2	241	4.1	0.308	5.6	LOS A	0.0	0.0	0.00	0.25	0.00	55.9
8	T1	325	7.4	0.308	0.0	LOS A	0.0	0.0	0.00	0.25	0.00	57.6
Approach		566	6.0	0.308	2.4	NA	0.0	0.0	0.00	0.25	0.00	56.9
All Vehicles		947	8.4	0.539	6.4	NA	3.4	25.5	0.23	0.40	0.33	52.4

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: 1 [Avon Dam Rd & Rem Dwy - 2028 PM & Project]

2028 PM with Project
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: Remembrance Dr												
2	T1	273	8.1	0.210	0.9	LOS A	0.7	5.0	0.18	0.10	0.18	58.0
3	R2	48	2.1	0.210	8.6	LOS A	0.7	5.0	0.18	0.10	0.18	55.8
Approach		321	7.2	0.210	2.1	NA	0.7	5.0	0.18	0.10	0.18	57.6
East: Avon Dam Rd												
4	L2	48	22.9	0.964	56.7	LOS E	25.2	187.5	0.93	2.61	5.29	26.8
6	R2	336	5.1	0.964	67.4	LOS E	25.2	187.5	0.93	2.61	5.29	26.9
Approach		384	7.3	0.964	66.1	LOS E	25.2	187.5	0.93	2.61	5.29	26.9
North: Remembrance Dr												
7	L2	233	7.7	0.230	5.7	LOS A	0.0	0.0	0.00	0.33	0.00	55.3
8	T1	185	3.8	0.230	0.0	LOS A	0.0	0.0	0.00	0.33	0.00	57.1
Approach		418	6.0	0.230	3.2	NA	0.0	0.0	0.00	0.33	0.00	56.1
All Vehicles		1123	6.8	0.964	24.4	NA	25.2	187.5	0.37	1.04	1.86	41.1

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.

This page has been left blank intentionally.