Department of Planning and Environment

Thomas Mitchell Drive Contributions Study

May 2015

Executive summary

This study has been commissioned by the NSW Department of Planning and Environment (DP&E) to establish a contributions framework and allocate funding to the upgrade and ongoing maintenance of Thomas Mitchell Drive. The study has not been commissioned to establish whether or not contributions should be made, and if that premise exists.

GHD utilised recent and past traffic data to establish the use of Thomas Mitchell Drive by each of the Mangoola, Bengalla, Mount Arthur and Drayton mines. This data was used to develop a contributions framework that logically established a basis for allocating whole of life funding contributions.

User pays and baseline models (referencing standards) were developed with all models presenting varying degrees of relevance in application. On balance and in consideration of a variety of factors, we believe a hybrid model outlined in Section 3.5 is the most appropriate to be applied. Our basis for this is as follows:

- This is *most* consistent with current road funding models in that the road network is primarily provided to facilitate transport and economic activity. The road network is indirectly funded through general road user access charges (e.g. registration) and general revenues (e.g. rates, taxation, royalties, etc.).
- The mines are operating entities. It is most reasonable to seek direct funding for public (off-site) infrastructure at the time of project approval and construction.
- The mines contribute to general revenue through rates, taxes, royalties, VPAs, etc.
- The employees and businesses that live and operate within the LGA contribute to general revenues. We acknowledge not all traffic is generated from within the LGA.
- We fully acknowledge that Council revenue sources (both internal and external) may not be adequate to fully cover the impact of mining activity on the road network within MSC.
- Precedent applied on Ulan Road as developed by ARRB.
- The addition of pavement depth helps account for the direct impact of mine traffic.

Although there were a range of contributions calculated by each model, the outcomes were reasonably consistent on average. The allocation to the mines was estimated to be 39.1% of capital and recurrent costs. This was based on:

- Reference to a baseline standard of road cross section that would be provided with and without mining activity.
- Estimated pavement depth required to accommodate mine traffic as part of the whole upgrade pavement design.
- Equivalent Standard Axles kilometres travelled to establish use by each mine and other traffic. This accounts for traffic composition and distance travelled.

In 2013 dollar terms, the proposed allocations to each mine are as follows:

	Contribution (%)	Upgrade ($M)	Reseal (x2) ($M)	Rehabilitation ($M)	Total ($M)
Mangoola	2.8	0.57	0.06	0.21	0.84
Bengalla	6.2	1.24	0.14	0.46	1.84
Mount Arthur	25.4	5.05	0.59	1.88	7.53
Drayton	4.7	0.93	0.11	0.35	1.39
Total	*39.1*	*7.79*	*0.91*	*2.90*	*11.60*

It is proposed contributions be made at the time works are to be undertaken. This means:

- Work is correctly funded, rather than attempting to estimate future works in 2013 dollars
- New developments, expanded or ceased operations can be included in the contributions model
- Funding is used for the intended purpose

The above figures do not consider current or past funding agreements for Thomas Mitchell Drive or other Council assets.

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1. Introduction

1.1 Purpose of this report

This study has been commissioned by the NSW Department of Planning and Environment (DP&E) to establish a contributions framework and allocate funding to the upgrade and ongoing maintenance of Thomas Mitchell Drive. Specifically, the study has been tasked with establishing contributions by the Drayton, Mount Arthur, Bengalla and Mangoola mines, who are the primary mines who utilise Thomas Mitchell Drive for access.

The study has not been commissioned to establish whether or not contributions should be made, and if that premise exists.

1.2 Status

This report is currently at **final draft** and is issued for final consideration by DP&E and with stakeholders.

Revisions from previous versions include:

- Updated (higher) traffic volumes for Mount Arthur Coal have been incorporated to the modelling from the previous revision.
- Recalculation of the cross section using minimum cross sections as the basis for the hybrid model. This was done in consideration of previous Muswellbrook Shire Council approvals of road upgrades relating to mining projects.
- Incorporation of existing pavement assets to the project cost, in recognition that the existing pavement material contributes cost savings to the pavement upgrade.
- Minor adjustment of ESAkm calculations following identification of a calculation error.

1.3 Background

In 2013, GHD completed the upgrade design for Thomas Mitchell Drive. Our client for this work was Mount Arthur Coal (MAC) but the design was commissioned on behalf of Muswellbrook Shire Council (MSC). MSC were involved in the review and approval of the works.

The upgrade was undertaken in accordance with Austroads standards with minor geometric non-compliances required to satisfy the site’s environmental and topographical constraints. All were deemed acceptable under the extended design domains allowed under Austroads.

The pavement was designed to accommodate accepted growth rates anticipated for the road network. The pavement predominantly comprised rehabilitation of the existing pavement with new pavement for shoulders and areas where the existing pavement had completely deteriorated and was deemed unsuitable for reuse. The rehabilitated pavement incorporates modified road materials in accordance with accepted industry practice.

1.4 Site description

Thomas Mitchell Drive connects the New England Highway to Denman Road and is located within Muswellbrook Shire. It is approximately 10.6 km long and has a sign posted speed of 100 km/h, with 80 km/h through the industrial area. The road is shown in Figure 1-1.

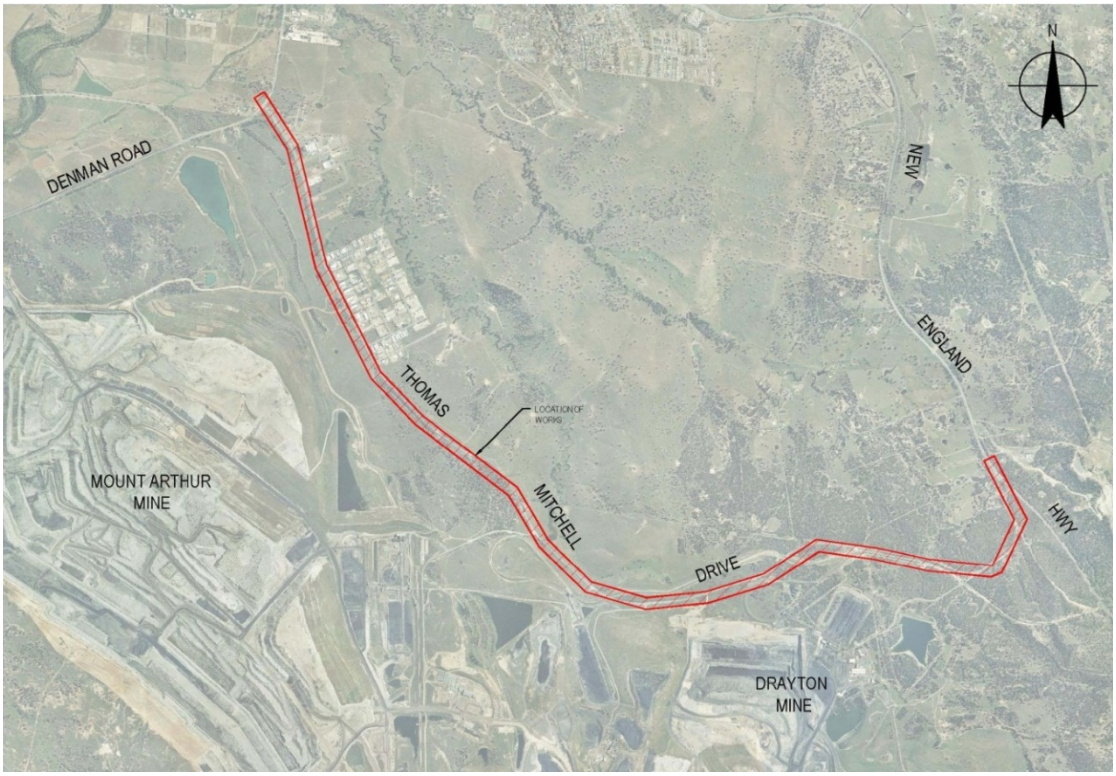

Figure 1-1 Locality plan

1.5 Stakeholders

The stakeholders related to this study include:

- DP&E as commissioner of the study
- MSC as asset owner
- Drayton mine
- Mount Arthur mine
- Bengalla mine
- Mangoola mine

2. Traffic modelling

2.1 September 2013 survey data

Survey data was collected by Northern Transport Planning & Engineering (NTPE) between 18 September and 25 September 2013. Specifically, the surveys consisted of:

Turning counts surveys on 18 September 2013, between 06:00 and 17:30 at the following locations:

1. Drayton Mine Access
2. Mount Arthur Mine Access *
3. Bengalla Mine Access
4. Mangoola Mine Access

* - note that the Mt Arthur Coal Mine survey was not complete on Wednesday 18 September and was repeated on Thursday 19 September.

Automatic Traffic Count (ATC) survey between 18 September and 25 September at the following location:

- Thomas Mitchell Drive between Denman Road and the Industrial Estate

Origin-destination surveys for traffic entering and leaving the Bengalla and Mangoola mines in order to understand the proportion of mine traffic using Thomas Mitchell Drive, specifically traffic coming from and going to:

- Thomas Mitchell Drive Industrial Estate
- The New England Highway via Thomas Mitchell Drive

The locations of the surveys are shown in Figure 2-1.

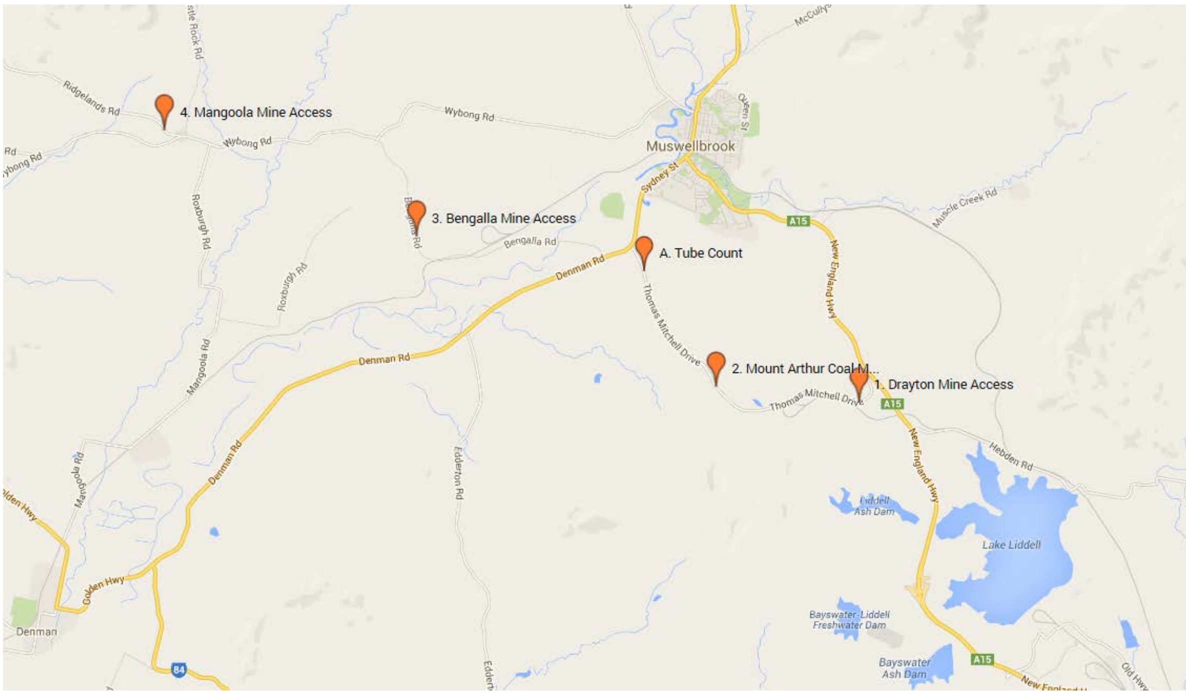

Figure 2-1 September 2013 survey locations

Mapping source: Google Maps

Roadworks are currently underway on two sections of Thomas Mitchell Drive, both south (east) of the Mount Arthur entrance. The sections of roadworks are controlled with traffic signals. Thomas Mitchell Drive was driven on Tuesday 15 October and stop signals were encountered at both locations. The time to drive the road was measured at 17 minutes under these conditions which would be considered a worst case. The normal travel time for the length of Thomas Mitchell Drive is 8 minutes.

An alternative route along the New England Highway and Denman Road is available. This travel time was measured at 11 minutes. Therefore, it is expected that a large portion of Mangoola and Bengalla traffic may not be using Thomas Mitchell Drive at the time of the traffic surveys. This may also affect traffic to Drayton and the industrial area.

Our modelling considers this issue and is considered to be suitable for assessment of contributions for upgrade costs. Should new or expanded mine activity occur in the future, it is recommended new surveys and traffic modelling be undertaken at that time to establish ongoing contributions for recurrent costs such as resealing.

2.2 Historical survey data

A series of data collected for previous studies has also been used in developing the traffic forecasts. These include the most recent planning applications to DP&E made by each of the four mines.

Turning count surveys at the following locations were collected on 13 October 2011, between 06:00-09:00 and 16:00-19:00:

1. Denman Road/Thomas Mitchell Drive
2. New England Highway/Thomas Mitchell Drive

Turning count surveys at the following locations were collected on 18 October 2011, between 06:00-09:00 and 16:00-19:00:

1. Denman Road/Thomas Mitchell Drive
2. Blakefield Road/Thomas Mitchell Drive (Industrial Estate)
3. Carramere Road/Thomas Mitchell Drive (Industrial Estate)
4. Glen Munro Road/Thomas Mitchell Drive (Industrial Estate)

Automatic Traffic Count (ATC) surveys have been collected for a full week in October 2011 and again in February 2013 at the following location:

- Thomas Mitchell Drive between the Industrial Estate and Mt Arthur Coal Mine

The locations of these surveys are shown in Figure 2-2.

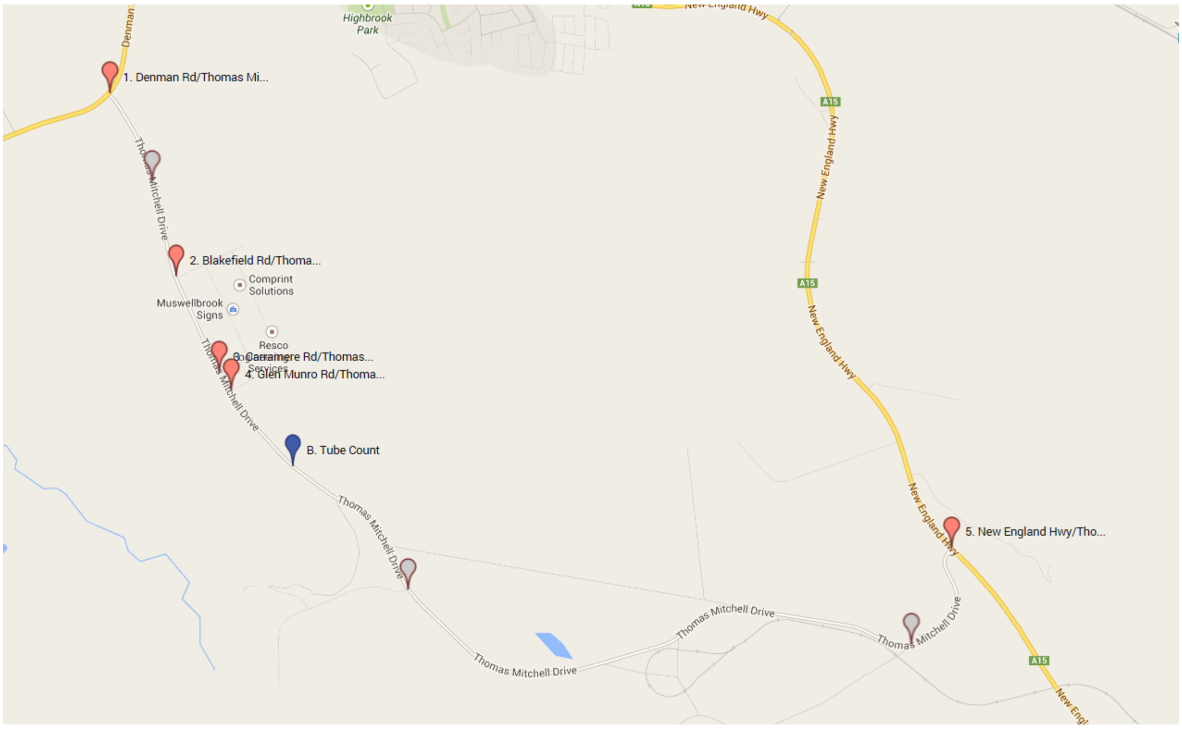

Figure 2-2 Historical survey locations

Mapping source: Google Maps

Automatic Traffic Count (ATC) surveys were also collected for a full week from 27 March 2012 to 2 April 2012 on the MAC access road.

2.3 Baseline traffic modelling

2.3.1 Methodology

The available survey data, as described in Section 2.1 was used to develop an understanding of traffic flows along the length of Thomas Mitchell Drive, between the New England Highway to the east and Denman Road to the west.

This was carried out for the 'Daytime' period, defined as 06:00 – 17:30. This was the time period for which the origin-destination and turning count surveys were carried out.

The traffic flows were segmented by light and heavy vehicles.

The following steps were undertaken for both light and heavy vehicles to achieve an assessment of the baseline traffic conditions:

1. Summarise daytime traffic flow data (Appendix A Figures A-1 to A-3)
2. Comparison of traffic count data with historical count data
3. Amalgamation of historical and September 2013 surveys (Appendix A Figures A-4 to A-6) to:
    a. Provide the fullest possible picture of traffic movements in the study area
    b. Ameliorate the effect of roadworks being undertaken during the September 2013 surveys
    c. Normalisation of traffic flows (matching flows between entry and exit from the link)

4. Calculation of mine traffic (Appendix A Figures A-7 to A-9), including:
   a. Adjusting to account for the roadworks being undertaken during the September 2013 surveys
5. Calculation of the proportion of overall traffic flows that are attributable to each of the four mines (Appendix A, Tables A-10 to A-13).

2.3.2 Assumptions

The methodology outlined in Section 2.3.1 necessitated a series of assumptions to provide a consistent traffic flow 'baseline' along the length of Thomas Mitchell Drive:

Vehicle categorisation

The ATC data is broken down into 13 vehicle categories. It has been assumed that vehicle types 1, 2 and 13 are light vehicles. The rest are heavy vehicles. This is based on Austroads vehicle categorisation (with 13 assumed to be motorcycle/bicycle).

Further, it is assumed that this categorisation is consistent with the categorisation used in the turning count survey results.

ATC data 24 hour to daytime conversion

The ATC data is presented in hourly segments. Therefore, in order to produce 'daytime' flows it is assumed that the traffic flow is uniform between 17:00 and 18:00. This enables the ATC daytime flow to be calculated in the following way:

$$ATC\_Flow_{daytime} = ATC\_Flow_{06:00-17:00} + ATC\_Flow_{17:00-18:00}/2$$

Baseline traffic calculation

A comparison of the October 2011 and February 2013 ATC count data south of the Industrial Estate revealed no substantial difference in traffic flows between these dates, as shown in Figure 2-3 which compares the hourly traffic volumes for an average weekday.

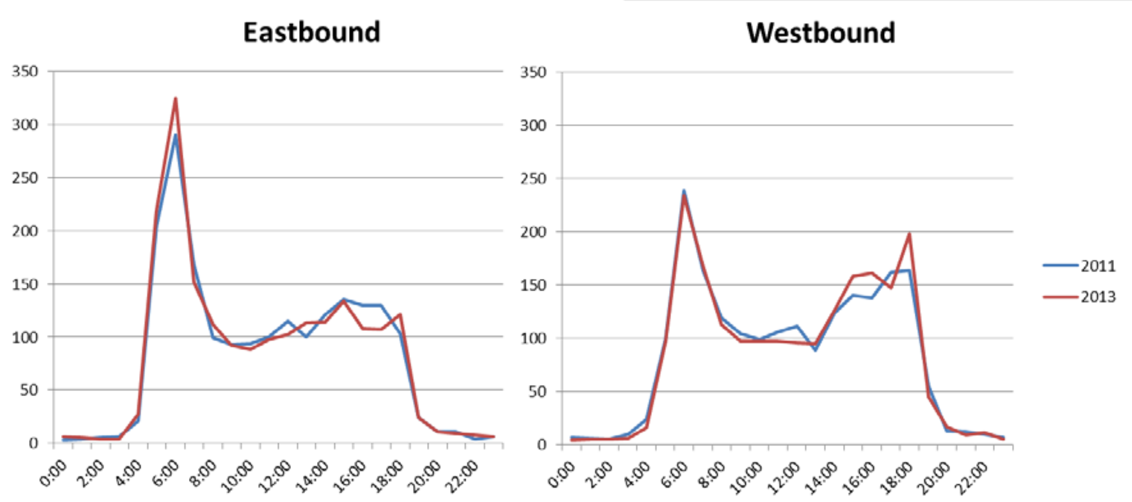

Figure 2-3 Comparison of October 2011 and February 2013 ATC survey

This analysis suggests that it is a valid approach to amalgamate the traffic survey data collected in October 2011 with the data collected in February and September 2013 for the purposes of producing a robust estimate of traffic flows as possible. This approach also provides an opportunity to explore the difference in flow caused by the current roadworks and produce a baseline that effectively removes the impact of the roadworks on traffic flows.

The analysis estimates that the approximate reduction in vehicle kilometres on Thomas Mitchell Drive attributable to the roadworks is 10,000 veh-km (29%), per day (06:00 – 17:30).

A number of steps were undertaken to produce the robust baseline traffic flows:

Factoring of October 2011 peak period counts to represent 06:00 – 17:30 for consistency with September 2013 counts, using ATC count profile:

1. Summation of total movements in and out of the Industrial estate (October 2011 surveys)
2. Comparison with the turn counts at Denman Rd, the New England Highway and the ATC counts (October 2011)
3. Adjustment of trips in and out of the Industrial estate for consistency with the turn counts at Denman Rd, the New England Highway and the ATC counts (October 2011). This is carried out on the basis that:
   a. Intra-Industrial estate movements that use Thomas Mitchell Drive
   b. The factoring from peak periods to daytime is likely to overestimate the proportion of turning vehicles
4. Calculation of Thomas Mitchell Drive traffic by section, using the mine traffic associated with the Mt Arthur and Drayton Mine Accesses

Mine traffic

The following assumptions have been made to adjust the observed mine traffic movements to account for the roadworks:

- For Mt Arthur and Drayton the roadworks will have no effect.
- The proportions of mine traffic from the respective EIS for Mangoola (16.2%) and Bengalla (27%) that use Thomas Mitchell Drive are applied to the turning counts observed at these sites.
- The trips to/from the industrial estate as recorded in the September 2013 OD surveys for Mangoola and Bengalla mines are additional to the EIS proportions, on the basis that the EIS proportions were calculated based on the home location of employees and therefore would not account for trips to and from the Industrial Estate.

2.3.3 Outcomes

Table 2-1 provides a summary of the calculated proportion of the total traffic on Thomas Mitchell Drive that is attributable to each of the mines in the vicinity. This calculation is based on the calculation of vehicle km for four sections of Thomas Mitchell Drive.

Table 2-1 Proportion of traffic volume attributable to each mine (Baseline)

	Total traffic (veh-km)	Mangoola	Bengalla	Mount Arthur	Drayton	Total Mine Traffic
Lights	33,728	3%	6%	32%	4%	45%
Heavies	3,862	3%	7%	37%	8%	55%
All	37,589	3%	6%	33%	4%	46%

The data in Table 2-1 and Appendix A (Tables A-10 (specifically) to A-13) show that:

- Approximately 46% of all traffic on Thomas Mitchell Drive is attributable to the mines. The proportion of heavy vehicles on Thomas Mitchell Drive that is attributable to the mines is higher (55%).
  It should be noted, however, that due to road works, the model under-represents the total number and proportion of heavy vehicles when compared to the pavement design. This exaggerates the heavy vehicle attributable to the mines. This anomaly is outlined further in Section 2.5 and is addressed in Section 3.
- The most heavily trafficked part of Thomas Mitchell Drive is to the west of the Industrial estate.
- The section of Thomas Mitchell Drive with the highest proportion of mine traffic is between the Industrial Estate and Mt Arthur Mine.
- Of all the mines, Mount Arthur contributes most traffic volumes to Thomas Mitchell Drive. This is partly because this mine produces more traffic than each of the other mines and partly because its location near the centre of Thomas Mitchell Drive means that vehicles to/from the mine must travel further on Thomas Mitchell Drive, whereas other mines have alternative routes available.

2.4 Growth scenarios

2.4.1 Assumptions

A forecast scenario for 2018 was developed to assess the proportion of traffic volume attributable to each mine once operations have increased.

The analysis is founded on the baseline traffic volumes and assumptions as described in Section 2.3. In addition the growth assumptions are based on a review of the relevant EIS documents for each mine operation. The following assumptions were used in the forecast assessment:

- Background traffic growth (non-mine traffic) is assumed to be 1.5% per annum from 2013 to 2018. This is consistent with the RMS regional traffic model and has been approved by RMS. Note, current EIS submissions have used 2.5% and the pavement design used 2%.
- Drayton mine - no growth (the new mine is replacing existing facility like for like)[1]
- Mt Arthur - This assessment has assumed that daily volumes will all occur within the 'Daytime' - so is likely to be overestimating the change. However, the increase is very small, as most of the increase in vehicle movements is projected to use Edderton Road instead of Thomas Mitchell Drive. The expected change has been interpreted as a 2-way flow[2].
- Bengalla -increase of a factor of 1.3375 in traffic - in direct proportion to the increase from 8 to 10.7mtpa[3].
- Mangoola - increase of a factor of 1.5 in traffic - in direct proportion to the increase from 300 to 450 full time workers[4].

Traffic volumes for the 2018 scenario are shown in Appendix A, Tables A-10 and A-11.

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[1] Drayton South Coal Project - Traffic and Transport Impact Assessment (August 2012)
[2] Mt Arthur Coal - Appendix K - Road Transport Assessment, Table 5.2 (December 2012)
[3] Bengalla Mining Company Pty Limited - Continuation of Mining Project - Traffic and Transport Impact Assessment (September 2013)
[4] Mangoola Coal Project Modification 6 - Traffic and Transport Assessment (May 2013)

2.4.2 Outcomes

Table 2-2 provides a summary of the calculated proportion of the total traffic on Thomas Mitchell Drive that is attributable to each of the mines in the vicinity incorporating the growth assumptions is Section 2.4.1. This calculation is based on the calculation of vehicle km for four sections of Thomas Mitchell Drive and is based on *7-day average traffic volumes*.

Table 2-2 Proportion of traffic volume attributable to each mine (2018 Forecast)

	Total traffic (veh-km)	Mangoola	Bengalla	Mount Arthur	Drayton	Total Mine Traffic
Lights	36,334	3%	7%	28%	4%	42%
Heavies	4,160	4%	9%	38%	7%	58%
All	40,494	3%	8%	29%	4%	44%

The data in Table 2-2 and Appendix A (Tables A-10 to A-13) shows that:

- 44% of traffic on Thomas Mitchell Drive is attributable to the mines, which is a reduction from 46% for the baseline scenario. This reduction occurs because the assumed background growth of 1.5% per annum is greater than the assumed traffic impacts of an increase in the scale of each mine operation.
- The overall observations for the baseline remain true for the 2018 forecast, namely:
  - The most heavily trafficked part of Thomas Mitchell Drive is to the west of the Industrial estate.
  - The section of Thomas Mitchell Drive with the highest proportion of mine traffic is between the Industrial Estate and Mt Arthur Mine.
  - Of all the mines, Mount Arthur contributes most traffic volumes to Thomas Mitchell Drive.

2.5 Future data requirements

The above findings are based on traffic surveys supplemented with previously published information. This is appropriate to be used for estimating contributions for upgrade costs. To accurately establish future contributions from each mine, new traffic surveys should be undertaken at the time of assessment.

As mentioned in Section 2.1, current road works at the time of modelling are likely to direct Mangoola, Bengalla and Industrial Area traffic through Muswellbrook, rather than along Thomas Mitchell Drive. This may misrepresent traffic distribution. Specifically, the following has been identified:

- The % of heavy vehicles from the 2013 traffic surveys is in the order of 9%. Traffic surveys undertaken in 2011 for the pavement design identified % heavy vehicles of around 18%. This does effect calculation of ESA and ESAkm for Model 2 in Section 3.3.3, however it does not change the outcome as:
  - The model references the pavement design ESA and ESAkm and this is not affected by the road works. That is, uses the 18% proportion.
  - Heavy vehicles proportions for the mines is consistent with historical values being approximately 12% for each mine.

- There is a high proportion (25%) of heavy vehicles within Drayton's traffic from the west, which generates relatively high levels of ESA. This seems consistent with Drayton's access being primarily from the New England Highway, and heavy vehicles from the industrial area simply being a higher proportion of relatively low traffic from the west.

Should re-assessment of this model be required prior to a new mining project assessment being submitted, an appropriate timing for new traffic counts would be approximately 3 months after completion of road works on Thomas Mitchell Drive.

2.6 Classification

Thomas Mitchell Drive is classified as a local road, being funded and managed by MSC. We suggest discussions be commenced with RMS for the road to be classified as a state road in accordance with the Roads Act, 1993, or declared as a regional road. This is on the basis that:

- The high traffic volumes and high proportion of heavy vehicles is unusual for a rural local road.
- There is anecdotal evidence that the Thomas Mitchell Drive/Bengalla link Road/Wybong Rd route is attracting inter-regional traffic and hence may be operating as an arterial road.
- The importance of the road in supporting the mining industry, with its direct benefits to the State economy.

In essence it would seem the function of Thomas Mitchell Drive is inconsistent with Council's ability to fund the road from direct revenue sources available to it, i.e. their rate base.

Road classifications are re-assessed on a state-wide basis. The timing of the next road classification review has not been set, however based on past timing RMS estimate the next review would be undertaken in 4 to 5 years' time.

3. Contributions framework

This section considers the basis to establish funding contributions for the upgrade and ongoing costs associated with Thomas Mitchell Drive.

3.1 Traffic sources

There are six primary groups associated with traffic use on Thomas Mitchell Drive. These are:

- General Muswellbrook Shire Council traffic including residents, through traffic and other traffic not associated with the mines
- The Thomas Mitchell Drive Industrial Area
- Mangoola Mine
- Bengalla Mine
- Mount Arthur Coal
- Drayton

3.1.1 Industrial area

The Department of Planning and Environment (DP&E) has indicated Council's position that the Industrial Area is mining focused and traffic generated from it should be attributed to each mine. The Industrial Area is a significant traffic generator as indicated by the volume of traffic at the western (north) end of Thomas Mitchell Drive.

There is a mix of mining and non-mining related businesses in the Industrial Area. It is not considered feasible to attribute Industrial Area activity to any particular mine, nor the mix of mining or non-mining services without significantly extensive traffic and business surveys. It is assumed the businesses within the Industrial Area would have been subject to a development consent, and are subject to land rates. Council has a suitable mechanism allowing for appropriate contributions and/or infrastructure upgrades to be made at the development consent stage, with ongoing funding via the rates system. Therefore, we believe for the purposes of funding contributions, the Industrial Estate should be considered independent of mines, even though they may be servicing the four mines nominated for this study, whether in part, or full.

It is acknowledged that the Industrial Area may not exist, either at all or on its current scale, if mining activity was not present in the locality.

3.1.2 Accounting for future development

Accounting for future development, especially new mine or other development is difficult, especially in consideration of immediate funding needs. To adjust findings in the future would require re-allocation of funding already paid by various parties. In consideration of the cost for the construction of the current upgrade, this would require as yet undeveloped mines to retrospectively pay existing mines either directly or through some indirect system. This is not considered feasible.

Therefore, any allocation model can only be based on existing or confirmed proposed development. On this basis, current costs relating to the construction of the currently underway upgrade should only be allocated to the four mines nominated as part of this study. Future costs associated with maintenance (reseals, rehabilitation) or further upgrade can be allocated against the mines or other developments operating at the time of that work being undertaken.

3.2 Contribution models

There are two broad philosophies in establishing the contributions framework:

- **User pays**: where each road user pays based on use. The most obvious user pays model is a toll road.
- **Baseline standard**: where the nexus between baseline and then the addition of mine generated traffic is considered in terms of requirements, referenced to road design standards and/or practice. This method can account for the position that public infrastructure acts to facilitate economic activity.

Both models have merit depending on any particular situation. Obviously the different parties involved will have reasonably clear preferences. A hybrid model combining the two can also be developed. These models are expanded on below.

All models presented below are based on 7-day average traffic volumes, as this better represents total traffic from the various sources.

3.3 User pays model

Under a user pays model, contribution by each party would be allocated in direct relation to use of the road. The most equitable distribution of use would be an allocation of total costs based a combination of:

- Road pavement to accommodate the volume and mix of light and heavy vehicles. This is measured by Equivalent Standard Axles (ESA), which is an industry standard parameter for the design of pavements.
- Vehicle kilometres travelled. This accounts for length of road used.

Therefore, this model would seek to estimate *ESA kilometres travelled* by the baseline traffic and each of the mines. ESA kilometres is considered more accurate as it takes into account the greater impact on a road pavement by heavy vehicles compared to light vehicles.

It is usual to base estimation of ESA on 7-day averages from traffic surveys, however as this study is only using ESA to allocate proportions, it is considered suitable for application.

3.3.1 User pays models

Using the information available, we have assessed user pays allocation in two ways. These are described and graphically represented below:

1. **Current (2013) mine traffic compared to ultimate (2043) design traffic**: This model does not account for development of new mines, expansion of existing mines beyond current proposals or other traffic generating development. 2043 represents the design life (30 years) of the pavement.
2. **Current mine traffic compared to current road traffic**: This assumes current mines will continue to generate traffic in the same proportion to current baseline traffic, regardless of baseline traffic growth. This is not considered realistic as it assumes the existing mines will continue to increase traffic over time, regardless of the number and/or extent of expansions, efficiency increases in production or technology improvements.

Each of the above models can also be assessed for sensitivity in consideration of known development plans in relation to design traffic: This at least accounts for known mine development in the foreseeable horizon.

Throughout this study, there were several discussions with Council about the sensitivity of the outcomes in relation to changes in traffic, growth rates and % heavy vehicles. The results of this sensitivity testing lie within the bounds of models 1 and 2 above and are presented in Appendix D.

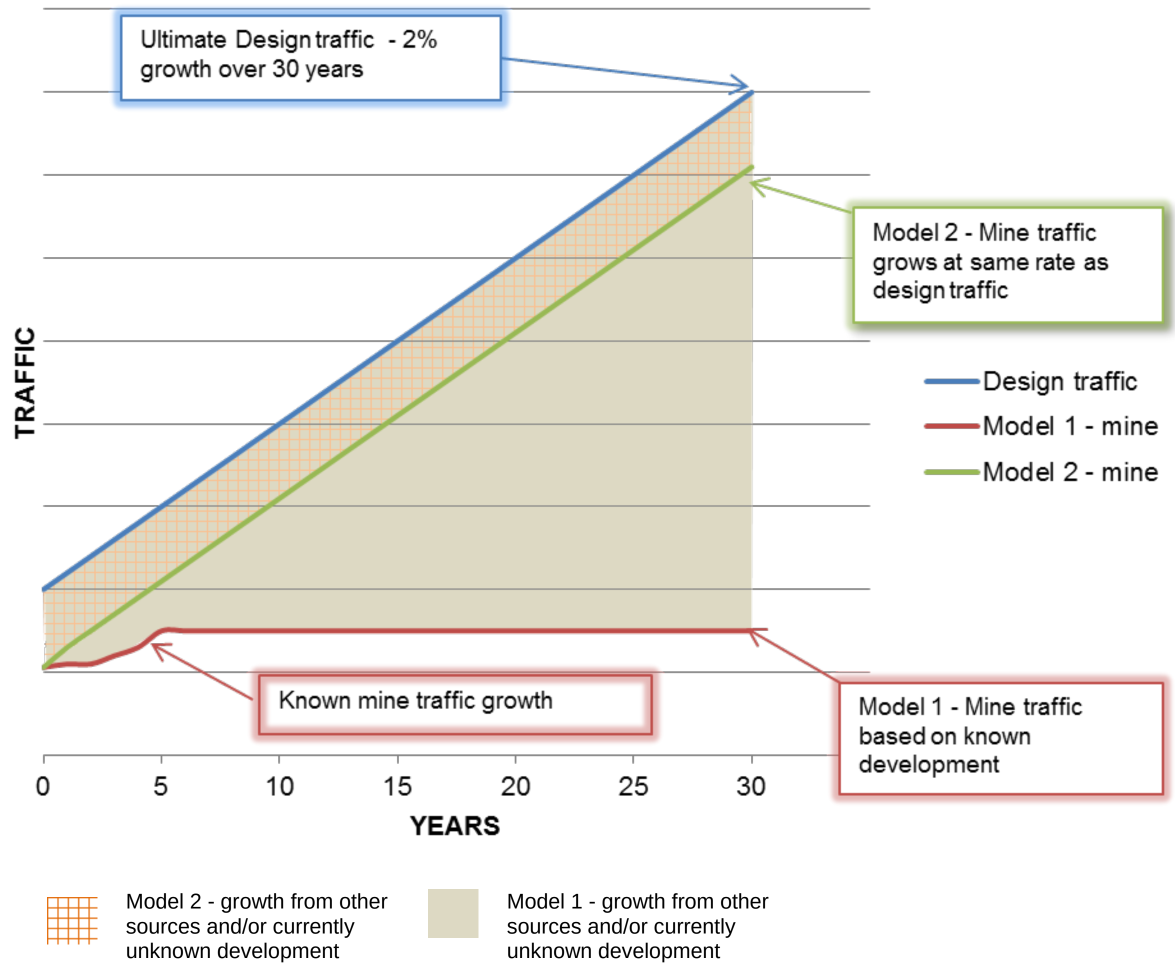

Figure 3-1 Graphical depiction of user pays models (not to scale)

Preferred model

The design of pavements incorporates traffic growth to account for a range of traffic generators including intra and inter-regional traffic as well as specific developments, e.g. mines and broader land release areas, e.g. residential, industrial or other land development.

In this context, the four subject mines are unlikely to generate a large proportion of the traffic growth accommodated within the pavement design. Therefore **Model 1**, where current traffic is compared to ultimate traffic, is more appropriate for implementation if a user pays model is adopted.

Discussion on both models is developed below. The numbers presented are based on a growth rate of 1.5%, where early report revisions used 2.5% growth.

3.3.2 Model 1 – Current (2013) mine traffic to ultimate (2043) design traffic

On the basis of traffic data presented in Section 2, we have estimated ESAs over a 30 year timeframe for each party as shown in Table 3-1. Detailed information and full calculations to support the generation of the ESA kilometres (ESAkm) travelled are attached in Appendix B.

Table 3-1 Model 1 – Current (2013) traffic to ultimate design traffic (2043)

Source	ESA	ESA km	Proportion
Non-mine	47,139,587	126,070,296	81.2%
Mangoola	606,514	1,609,997	1.0%
Bengalla	1,489,702	3,942,789	2.5%
Mount Arthur	7,595,538	19,650,143	12.7%
Drayton	1,668,660	3,982,776	2.6%
Subtotal mine	*11,360,413*	*29,185,704*	*18.8%*
TOTAL	**58,500,000**	**155,256,000**	**100%**

This finds that the four mines identified in this study should contribute 18.8% of total cost for the upgrade of Thomas Mitchell Drive.

To test the sensitivity of this finding relative to the known growth of the mines, the ESAkm were calculated utilising the traffic estimated in each of the mines current modification submissions for traffic volumes as at 2018. The summary findings are presented below.

Table 3-2 Model 1 Sensitivity – Projected (2018) mine growth traffic to ultimate design traffic (2043)

Source	ESA	ESA km	Proportion
Non-mine	45,559,802	122,011,829	78.6%
Mangoola	909,771	2,414,995	1.5%
Bengalla	1,992,476	5,273,480	3.4%
Mount Arthur	8,369,291	21,572,920	13.9%
Drayton	1,668,660	3,982,776	2.6%
Subtotal mine	*12,940,198*	*33,244,171*	*21.4%*
TOTAL	**58,500,000**	**155,256,000**	**100%**

The incorporation of mine growth (modifications submitted to DP&E) shows a slight increase to 21.4% from 18.8%.

If this model was chosen, a contribution of 21.4% would be considered appropriate.

3.3.3 Model 2 – Current (2013) mine traffic to current (2013) “design” traffic

In consideration of current mine traffic relative to current non-mine traffic over a 30 year pavement design life, the following position was established:

Table 3-3 Model 2 – Current (2013) traffic to ultimate design traffic (2013)

Source	ESA	ESA km	Proportion
Non-mine	11,715,791	31,341,601	46.2%
Mangoola	757,824	2,011,652	3.0%
Bengalla	1,861,347	4,926,419	7.3%
Mount Arthur	9,490,442	24,552,381	36.2%
Drayton	2,084,950	4,976,383	7.3%
Subtotal mine	*14,194,563*	*36,466,835*	*53.8%*
TOTAL	**25,910,354**	**67,808,436**	**100%**

With mine traffic estimated at 54%, this is higher than the 18% to 19% established from Model 1.

When the current development proposals from the mines are incorporated to the model, the following occurs:

Table 3-4 Model 2 Sensitivity – Projected (2018) mine growth traffic to ultimate design traffic (2018)

Source	ESA	ESA km	Proportion
Non-mine	12,438,658	33,328,201	44.5%
Mangoola	1,136,737	3,017,479	4.0%
Bengalla	2,489,551	6,589,086	8.8%
Mount Arthur	10,457,228	26,954,844	36.0%
Drayton	2,084,950	4,976,383	6.7%
Subtotal mine	*16,168,466*	*41,537,792*	*55.5%*
TOTAL	**28,607,124**	**74,865,993**	**100%**

The consideration of the growth scenario realises a slight increase of the mines' contributions to the overall traffic distribution.

If Model 2 was to be adopted under a user pays scenario, a proportion of 55.5% would seem reasonable.

Note, overall ESA and ESAkm are shown lower than in Model 1 results. This is due to these being calculated on traffic survey data that has a lower %HV than the surveys undertaken at the time of the pavement design. See Section 2.5. Model 1 is compared against design ESA and ESAkm. There is no inconsistency in the resultant proportion.

3.3.4 Future development

Future development can be readily incorporated to the User Pays model. When a new mine or other development occurs, or an existing mine expands, the ESAkm can be calculated and proportional contribution made.

The challenge with this is consistent application. Are all developments subject to this or only mining? Are there thresholds where assessment commences?

3.4 Baseline standard

The baseline standard scenario is founded on the philosophy that public infrastructure, such as roads, play a role in facilitating and supporting economic development. This does mean the public purse may not directly realise financial benefit but does indirectly through the broader taxation system. This model is the basis for the current provision of the Australia's road network, with the exception of high volume toll roads in some capital cities.

This model recognises that "payment" for use of the road occurs indirectly through rates, levies, royalties and voluntary planning agreement (VPA) that users may pay. Whether this completely accounts for use is open to conjecture and is not the subject of this study.

Under this model, allocation would be established on the basis of:

- Minimum road cross section required to meet the requirement of baseline traffic. This would be the non-mine allocation.
- Additional road cross section required to accommodate the addition of mine traffic.

This was the model adopted for capital cost for allocations on Ulan Road, which was undertaken by ARRB. This model does not directly account for the pavement depth required to accommodate the mine traffic as would the user pays model. It is a simplistic model that provides for a wider pavement cross section.

Austroads standards were used in the design of Thomas Mitchell Drive and therefore are the basis for this assessment.

3.4.1 Traffic segments

Thomas Mitchell Drive comprises approximately 7.9 km of rural road and 2.7 km of semi-urbanised road through the industrial estate. The rural section of the road can be quite simply assessed against standards to establish the baseline and mine incorporated arrangements (lane and shoulder widths). The industrial area is less clear cut due to the wider road being provided to accommodate the turning of larger vehicles to properties and also the provision of parking along the shoulder on one side.

For these reasons, it seems reasonable to calculate the allocations based on the rural section of the road.

3.4.2 Road standards

Austroads Guide to Road Design: Part 3 outlines the cross sectional requirement for roads. As a comparator, the RMS's Road Design Guide was also considered to establish any variation to these standards, noting it has been broadly superseded by Austroads. On the basis of AADT of 2000 vehicles, the following cross sections are appropriate:

Table 3-5 Road standards

Source	AADT	Lane width (m)	Shoulder width (m)
Austroads	500-1,000	3.1 to 3.5	1.5
	1,000-3,000	3.5	2.0
Road Design Guide	<500	3.0	1.0 to 2.0
	500 to 2,000	3.0 to 3.5	2.0 to 3.0

The Austroads guidelines allow for reductions to the desirable standards where budget or other constraints exist. Although not desirable, there are instances of new roads and road improvements where shoulders and verges are provided at reduced width, even though this is lower than the Austroads standard. Recent examples of these within the region include the Wybong Road upgrade associated with Mangoola with 1.0 m shoulders. There are other examples on the Golden Highway (RMS) and on Broke Road (Cessnock City Council). Further, the Thomas Mitchell Drive upgrade used 2.0 m shoulders whereas the Austroads guidelines prefer 2.5 m shoulders based on traffic volumes. In light of this, and based on our experience, we also assessed a cross section incorporating a 1.0 m shoulder as a minimum.

3.4.3 Baseline traffic

Based on the traffic data outlined in Section 2, the proportion of traffic directly related to the mines has been estimated. Detailed information and figures are attached in Appendix A, specifically Figure A-6 that forms the basis of discussion below.

The traffic data, specifically Sections 2.3 and 2.4, indicates mine traffic accounting for approximately 44% to 46% of traffic along Thomas Mitchell Drive on a vehicle-kilometre basis. This is correct but heavily influenced by the high traffic volumes in the Industrial Area. When only traffic east (south) of the Industrial Area is assessed, the following traffic sources are established on a vehicle-kilometre basis for 2013 traffic:

- Mine: 50.4%
- Industrial Area: 22.2% at AADT 735 (average)
- MSC (public/other): 27.3% at AADT 900 (average)

These figures present a conundrum in the consideration of the baseline model. We stated in Section 3.1.1 that the Industrial Area was to some degree associated with mining activity but should not be attributed to the mines (individually or as a group) for the basis of cost allocation for road works.

For the Baseline Model, the baseline traffic is which MSC would need to provide should mining activity not be present. At its lowest, the baseline traffic would therefore be the MSC category above at 900 AADT, which assumes the Industrial Area would not exist.

Due to the uncertainty of estimating the mine servicing component of Industrial Area traffic we propose to use the baseline traffic as 900 AADT.

3.4.4 Cross section

On the basis of the above baseline traffic (900 AADT), the following cross sections were considered for the rural sections of Thomas Mitchell Drive.

Table 3-6 Comparison of standards to upgrade design

Condition	AADT	Lane width (m)	Shoulder width (m)	Total width (m)	% increase for TMD upgrade
Minimum (not to standard)	900	3.25	1.0	8.5	29.4%
Austroads	900	3.25	1.5	9.5	15.8%
RMS RDG (superseded)	900	3.25	2.0	10.5	5%
Upgrade design	2000	3.5	2.0	11.0	-

The cross section adopted for Thomas Mitchell Drive design is 3.5 m lanes with 2.0 m shoulders.

In consideration of the above, it is GHD's view that if Thomas Mitchell Drive was provided by MSC without mine or industrial area traffic, a cross section meeting the minimum, rather than the Austroads standards would have been provided.

On this basis, the addition of direct mine traffic required an additional 0.25 m of traffic lane and 1.0 m of shoulder width. Therefore, in relation to the upgraded pavement:

- Across the total pavement cross section, this results in a 29.4% increase above the baseline case.
- On travel lane this equates to 7.7% increase and a 100% increase of shoulder width.

3.4.5 Mine allocations

Based on the ESAkm generated in Section 3.3, the following allocations would apply to the road funding based on the current planned modifications to each mine (2018):

Table 3-7 Thomas Mitchell Drive traffic allocations

Traffic Source	ESAkm	% total traffic	% mine traffic	% of funding allocation
Non-mine [(1)]	122,011,829	78.6%	-	70.6
Mangoola	2,414,995	1.5%	7.3	2.1
Bengalla	5,273,480	3.4%	15.9	4.7
Mount Arthur	21,572,920	13.9%	64.9	19.1
Drayton	3,982,776	2.6%	12.0	3.5
Subtotal mine	33,244,171	21.4%	100.0	29.4

Note (1): Non-mine traffic includes the Industrial Area and baseline traffic. The ESAkm used for non-mine traffic is based on the pavement design used for the upgrade, however this does not influence the total allocation to the mines nor the proportioning between the mines.

Industrial area considerations

We have previously stated a view that the Industrial Area should be treated separate from mines when allocation of cost is considered. This position stands, even though the cross section assessment excluded Industrial Area traffic from the baseline traffic.

We acknowledge the potential inconsistency with this application but believe it logical for the funding reasons presented in Section 3.1.1.

3.4.6 Future development

Current and projected traffic, accounting for current mine proposals, puts traffic on Thomas Mitchell Drive to the cusp of 3,000 AADT. This is the guide limit in Austroads where wider shoulders than are currently designed is required.

Therefore, it could be expected that further mine development, new mines or other significant development could trigger requirement for a wider cross section.

In this instance, the assessment framework within this report could be used or reassessed to establish contributions from existing mines and new development in part or full to accommodate any change to the road that may be required.

3.5 Hybrid model

A gap in the baseline model is that it considers the cross section and not the depth of additional pavement required in other areas of the pavement to accommodate non-baseline traffic. The depth of pavement is shifting towards a user pays model, although not entirely.

Pavement design is essentially about stiffness, so, for example, a doubling of traffic does not require a doubling of pavement depth.

Figure 3-2 below outlines the principle of the hybrid model, combining the cross sectional widening and additional pavement depth required for each traffic group. Note, the figure is not to scale and shows the pavement in cross section.

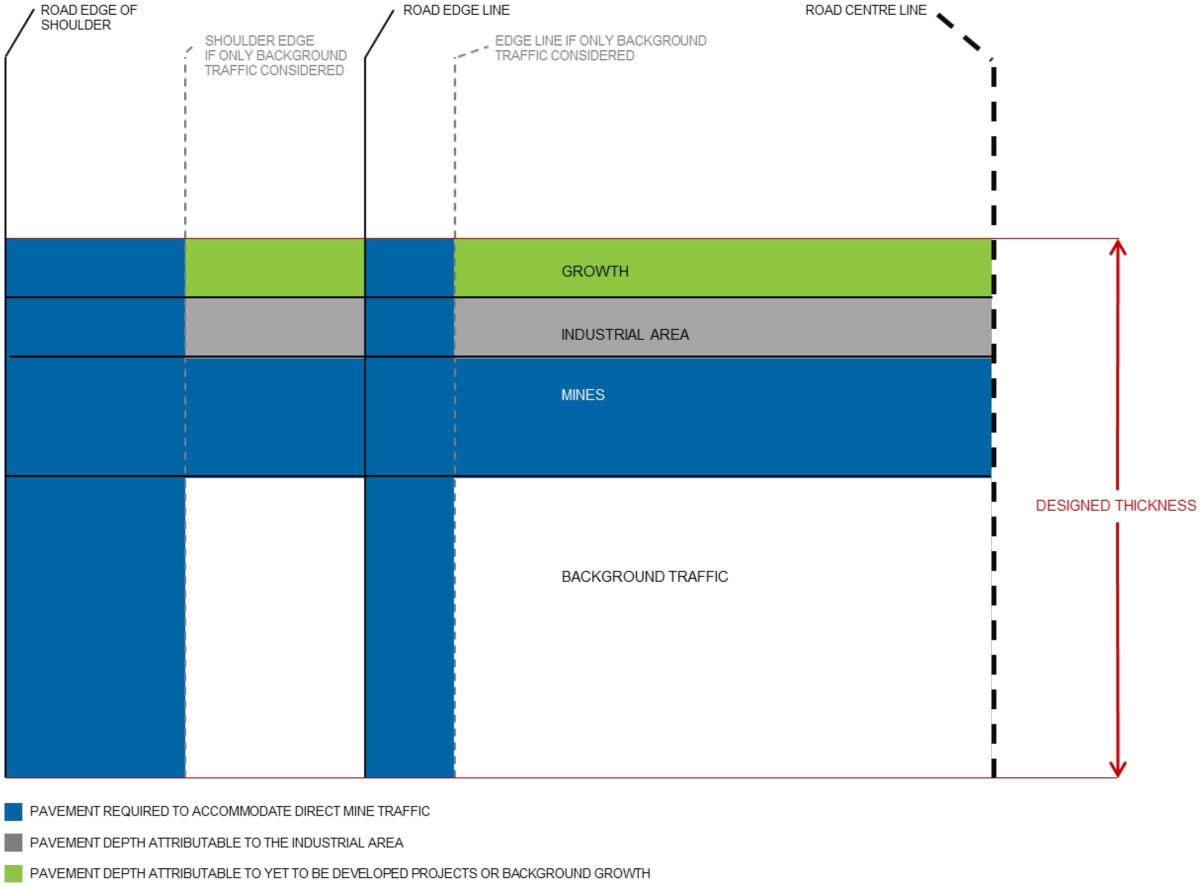

Figure 3-2 Pavement composition (not to scale)

3.5.1 Consumption

MSC presented the case for consumption of pavement to be considered rather than design. This would represent the pavement used by each party over the course of the 30 years of pavement. This model represents user pays arrangements and to apply it to this hybrid model would represent a double up in allocations to the mines. For this reason, consumption considerations were not considered appropriate.

Several consumption models using various parameters were considered and the outputs are shown in Appendix D.

3.5.2 Pavement treatments

The pavement treatments for the Thomas Mitchell Drive are complex due to the highly variable nature of the existing pavements and ground conditions. To attribute pavement depth to each traffic group, a selection of pavement treatments representing the majority of work through each segment of the road was used. Detailed calculations for the pavements attribution is enclosed in Appendix C. The pavement calculations attribute pavement depth to each group based only on the ESAkm estimates in Table 3-7 and do not account for construction tolerances such as minimum layer thickness etc. Further, for simplicity of calculation, heavy vehicle proportions were normalised across all the traffic groups. This is considered appropriate for this study.

On average, it was found that pavement depth could be broken down as follows:

Table 3-8 Average pavement depth breakdown

Source	Depth (mm)	Depth (%)
Background	270	80.6
Mines	46	13.7
Industrial Area	11	3.3
Growth	8	2.4
Total	335	100

With reference to Figure 3-2, to establish the portions attributable to each group, we need to determine the cross sectional area for each group by combining width and depth. There is some double up for the mine portion between the pavement width and depth. This is further clarified in the detailed calculations of Appendix C with outcomes confirmed below.

Table 3-9 Hybrid model allocations

Source	Allocation (%)
Background	56.9
Industrial Area	2.3
Mines	39.1
Mangoola	*2.8*
Bengalla	6.2
Mount Arthur	25.4
Drayton	4.7
Growth	1.7
Total	100

Therefore, the hybrid model estimates that 39.1% of cost be allocated to the four nominated mines, which is slightly higher than the baseline model at 29.4%. Based on the ESAkm from Table 3-7, the following allocations to each mine are determined:

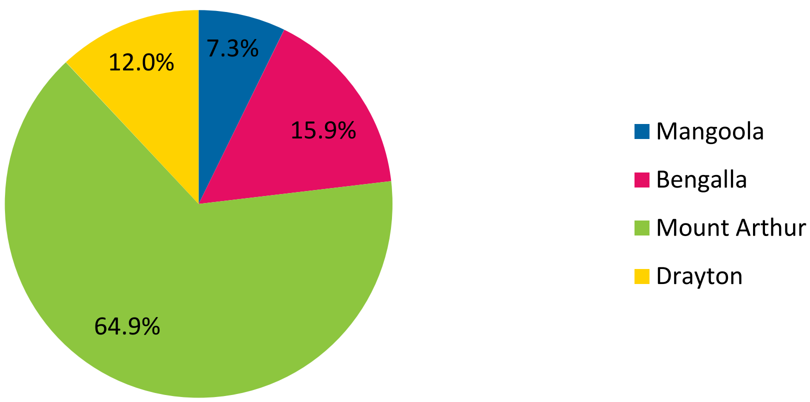

Figure 3-3 Mine allocations

Industrial area considerations

If Council's position of mines paying for the industrial traffic was adopted, the following allocations would be determined under the hybrid model:

Table 3-10 Hybrid model allocations (mines + industrial area)

Source	Allocation (%)
Background	56.9
Industrial Area	-
Mines	41.4
Mangoola	*3.0*
Bengalla	*6.6*
Mount Arthur	*26.9*
Drayton	*4.9*
Growth	1.9
Total	100

These allocations assume industrial area traffic is proportional to each mine's use of the road.

3.5.3 Future development

An advantage of the hybrid model is that it allows some consideration of future development based on direct traffic generated. In the event of a new development, the ESAkm could be established, and this used to allocate capital and maintenance funding from the *growth* group. This could apply to any expansion or new development, being mine related or not.

3.6 Preferred model

On balance and in consideration of a variety of factors, we believe the hybrid model outlined in Section 3.5 is the most appropriate to be applied. Our basis for this is as follows:

- This is *most* consistent with current road funding models in that the road network is primarily provided to facilitate transport and economic activity. The road network is indirectly funded through general road user access charges (e.g. registration) and general revenues (e.g. rates, taxation, royalties, etc.).
- The mines are operating entities. It is most reasonable to seek direct funding for public (off-site) infrastructure at the time of project approval and construction.
- The mines contribute to general revenue through rates, taxes, royalties, VPAs, etc.
- The employees and businesses that live and operate within the LGA contribute to general revenues. We acknowledge not all traffic is generated from within the LGA.
- We fully acknowledge that Council revenue sources (both internal and external) may not be adequate to fully cover the impact of mining activity on the road network within MSC.
- Precedent applied on Ulan Road as developed by ARRB.
- The addition of pavement depth helps account for the direct impact of mine traffic.

On this basis, we believe that should the mines contribute to the upgrade and ongoing maintenance of Thomas Mitchell Drive, then a reasonable proportion of costs to allocate 39.1% based on vehicle trip data and typical cross section treatments.

This proportion has been estimated on pavement width and depth. The proportion will apply to total upgrade costs and hence would include earthworks, pavements and road furniture such as barriers, signage, linemarking, etc. This reflects the fact that road features benefit all parties and is consistent with the consideration of AADT and cross section as, for example, the provision of barriers is determined in part by AADT and clear zone requirements.

We acknowledge potential inconsistencies with the baseline model upon which the hybrid model is built. However we believe it best represents the current form and function of the road network.

3.6.1 Future development

At some time in the future, it is possible there will be significant development proposals that will generate traffic on Thomas Mitchell Drive. To account for future development that has not yet commenced the formal planning process, we propose the following mechanism:

- A review of traffic data is undertaken to confirm the new development(s) is within the pavement design ESA and traffic is suitable for the current road cross section.
- If traffic is within design parameters, the future costs associated with any maintenance attributable to the mines would be allocated in proportion of ESAkm of all operating mines, at the time of assessment. The framework developed within this study would be applied with traffic data relevant to the time of assessment.

3.7 Denman Road intersection

The Denman Road and Thomas Mitchell Drive intersection requires upgrading. DP&E has requested the intersection be assessed to determine the contributions of each mine.

The assessment of intersection upgrades are typically completed on capacity rather than pavement, as was used above. In assessment of intersection capacity, the composition of light and heavy vehicles is accounted for in the calculation of queue lengths, which in turn leads to delay and then to a level of service (LoS).

The modelling of intersections is beyond the scope of this study; however assessment of AADT for each mine using the intersection will provide a guide to proportional use and hence proportional contribution from each mine.

The predominant capacity failure mode for the intersection will be turning traffic to/from Thomas Mitchell Drive, and intersection improvement works will focus on improving these turns. Therefore, when establishing the contribution of each mine to the upgrade, their traffic using Thomas Mitchell Drive at the intersection should be assessed. For the purposes of this study, we have used traffic west of the industrial estate as the traffic using the intersection.

The following allocations are established on the basis that each of the four mines are to pay for the entire upgrade of the intersection. Traffic is based on proposed mine modification currently under consideration by DP&E.

Table 3-11 Estimated Denman Road intersection use

Traffic Source	AADT west of Industrial Area	% total traffic (allocation)
Mangoola	180	8.9%
Bengalla	321	15.9%
Mount Arthur	1,437	71.3%
Drayton	78	3.9%
Total mine traffic	2,015	100%

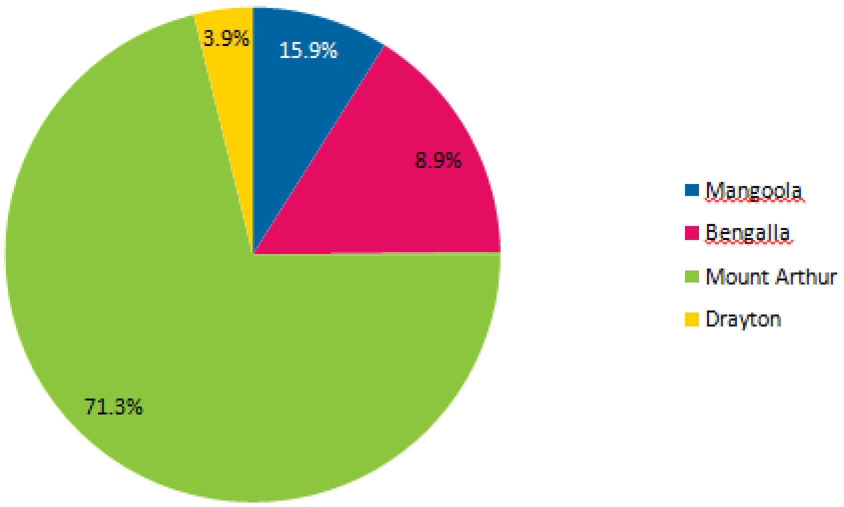

Figure 3-4 Denman Road intersection traffic distribution

It is noted that current operating conditions of the intersection are less than predicted. We recommend DP&E review timing of contributions to reflect actual timing of realised capacity constraints at the intersection

4. Apportionment

This section converts the allocations identified for each mine to dollars.

Estimates are based on figures provided by MSC, which they confirm are based on current tendered rates for Thomas Mitchell Drive road works currently underway. They include Council's management costs. GHD has not seen the detail of the estimate nor verified the headline number, however Council's confirmation is shown in Appendix F.

The contributions estimated below do not consider existing funding agreements or moneys previously paid for works on Thomas Mitchell Drive or elsewhere with MSC. Whether these should be accounted for and how is to be agreed between stakeholders and is not subject to this study.

4.1 Timing

The programme of the works is driven by:

- Upgrade construction: the availability of sufficient funding
- Maintenance: MSC pavement maintenance strategy

4.1.1 Upgrade construction

Construction has commenced on part of Thomas Mitchell Drive. For the purposes of this study we are assuming the upgrade will occur in entirety in the short-term and is therefore an immediate funding requirement.

MSC has confirmed an estimated cost for completion of the Thomas Mitchell Drive upgrade as $18.54M, broken down as follows:

- Work completed (New England Hwy to Mt Arthur entrance): $9.14M
- Work awarded (Mt Arthur entrance to Glen Munro Rd): $4.65M
- Work programmed (Glen Munro Rd to Denman Rd): $4.75M (estimated), which seems reasonable based on work undertaken to date

At the stakeholder meeting on 7 October 2014, there was discussion around initial payments made on known costs with part payment for Stage 4 costs, then final payment being made on conclusion of that work, when costs are known.

Within the upgrade costs, there exists a benefit to the project in the construction on, and the incorporation of existing pavement materials. For example, existing pavement:

- Subbase layers are functioning as a select layer
- Base layers are acting as subbase layers with the incorporation of lime modification

Following request by MSC, the opportunity cost of these existing layers was estimated on the basis that these existing layers provide a real saving to the project. This saving is estimated to be $1.375M and is added to the $18.54M above to provide a total capital cost estimate for the works of $19.915M. Calculations to support the $1.375M is included in Appendix E. The basis of our estimate is:

- The existing material reused being equivalent in cost to a material consistent with subbase and select material as outlined above.

Rates for subbase material being $85/m^3 and for select being $60/m^3. Appendix E contains a letter from KCE that confirms these rates as appropriate for the locality. KCE are an experienced roads constructor. MSC did request the residual value of the whole asset be used for the cost estimate; however GHD does not support this position. The incorporation of all the asset is not appropriate as the formation is an existing condition and would be required whether or not the road was to be upgraded, and whether mining traffic was present or not. The mines would not be expected to contribute to a public road that has always been needed, regardless of its presence.

4.1.2 Maintenance

Consistent with their Road Asset Management Plan, MSC have confirmed their expectation that the road will be subject to the following maintenance regime:

- Pavement resealed every eight years
- Possible pavement rehabilitation between 20 to 25 years. Rehabilitation would include pavement work to achieve the required design life and possible improvement to safety barriers, pavement drainage or other road infrastructure necessary to satisfy standards or safety requirements of the time.

Therefore, we would expect two reseals (Years 8 and 16) then one rehabilitation[5]. Following this, the pavement would be reconstructed or maintenance continues beyond the 30 year design life. The design life is consistent with the current planned horizon of mining operations and work beyond 30 years is therefore not considered as part of this study.

We propose each mine fund the maintenance works as they arise. This ensures:

- Funding is used for the maintenance of the road
- Work is correctly funded, rather than attempting to estimate future works in 2013 dollars
- New developments or expanded operations can be included in the contributions model
- Ceased operations would not be required to fund activity and obligations redistributed between remaining mines

Therefore, contributions to maintenance are made at the time of the works.

4.2 Costs

For the purposes of this report, guide cost estimates are provided in 2013 dollars. Contributions are estimated based on the allocations estimated in Section 3. For the purposes of comparison and sensitivity analysis, the preferred (baseline standard) and user pays models are presented below. Contributions are based on the following total guide costs:

- Upgrade: $19.915 M. MSC estimate based on tendered costs, with the addition of savings realised by the incorporation of existing pavement materials.
- Reseal (x 2): $2.3 M based on GHD guide estimate of $10/m^2 and full shoulder seal provided as current design. This rate is consistent with industry rates and similar to the RMS estimate provided for the Thomas Mitchell Drive improvements undertaken in August 2010.

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[5] NB: For the purposes of this study the term “maintenance” is restricted to these capitally intensive reseals and heavy rehabilitation works, which are necessary to achieve the design life of the road. This term does not extend to routine road maintenance (such as filling potholes) that would be undertaken irrespective of the road upgrade.

- Rehabilitation: $7.42 M based on GHD knowledge of RMS rehabilitation costs to be roughly $700,000 per km. This rate is consistent with the RMS estimate provided for the Thomas Mitchell Drive improvements undertaken in August 2010.

Table 4-1 Cost allocations for the preferred contributions model

	Contribution (%)	Upgrade ($M)	Reseal (x2) ($M)	Rehabilitation ($M)	Total ($M)
Mangoola	2.8	0.57	0.06	0.21	0.84
Bengalla	6.2	1.24	0.14	0.46	1.84
Mount Arthur	25.4	5.05	0.59	1.88	7.53
Drayton	4.7	0.93	0.11	0.35	1.39
Total	*39.1*	*7.79*	*0.91*	*2.90*	*11.60*

4.2.1 Model comparison

The table below shows a comparison of all the models developed in Section 3. Of note, the average of the user pays models and all the models combined are reasonably consistent with the preferred model. This might indicate that although there are inconsistencies and debatable points of difference within each model, the overall outcome could be consistent.

Table 4-2 Contribution comparison between models

	Preferred model (Hybrid)		Baseline		User Pays Model 1		User Pays Model 2		Average
	(%)	($M)	(%)	($M)	(%)	($M)	(%)	($M)	($M)
Mangoola	2.8	0.84	2.1	0.63	1.56	0.46	4.03	1.20	0.78
Bengalla	6.2	1.84	4.7	1.38	3.40	1.01	8.80	2.61	1.71
Mount Arthur	25.4	7.53	19.1	5.66	13.90	4.12	36.00	10.68	7.0
Drayton	4.7	1.39	3.5	1.05	2.57	0.76	6.65	1.97	1.29
Total	*39.1*	11.60	*29.4*	*8.72*	*21.41*	*6.35*	55.48	*16.46*	*10.78*

Note, there are small rounding errors in several figures above.

4.2.2 Industrial area

If the industrial area was paid for by the mines, the contributions under the hybrid model would be as follows:

Table 4-3 Contributions with mines paying for the industrial area

	Contribution (%)	Upgrade ($M)	Reseal (x2) ($M)	Rehabilitation ($M)	Total ($M)
Mangoola	3.0	0.60	0.07	0.22	0.89
Bengalla	6.6	1.31	0.15	0.49	1.95
Mount Arthur	26.9	5.35	0.63	1.99	7.97
Drayton	5.0	0.99	0.12	0.37	1.47
Total	*41.4*	*8.25*	*0.97*	*3.07*	*12.29*

4.3 Apportionment

On the basis that the mines will be asked to contribute to the upgrade and ongoing maintenance of Thomas Mitchell Drive, we believe the costs allocated in Table 4-1 should form the basis of those contributions. In summary:

- Initial contributions towards the upgrade works should be paid to Council as soon as practicable and by no later than 30 September 2015, unless otherwise advised by DP&E. The initial payment would include each mine's proportionate contribution towards:
  - All actual costs and awarded tenders for Stages 1, 2 and 3 that have been completed or are underway.
  - 50% of the estimated costs for Stage 4.
- Payment of remaining contributions to be made following completion of Stage 4 construction, and reconciliation of actual project delivery costs. This would constitute in the order of 50% of the estimated Stage 4 costs. These costs would be verified as actual and appropriate construction costs.
- Contributions for the maintenance activities (reseals and rehabilitation) be paid at the time of work. If appropriate, proportions are to be adjusted to account for new or expanded mining operations based on traffic volume and composition at the time of assessment.

4.3.1 Denman Road intersection

If each of the four mines are to contribute wholly to the upgrade of the Denman Road intersection, the total cost should be determined in accordance with Table 3-11.

5. Recommendation

Based on the traffic data and logic in developing a contributions framework, we recommend the hybrid model be adopted. This requires 39.1% of road funding to be provided by the mines with allocation to each mine based on ESAkm. On this basis, the allocations presented in Table 4-1 and shown below would apply through the life cycle of the Thomas Mitchell Drive pavement (30 years):

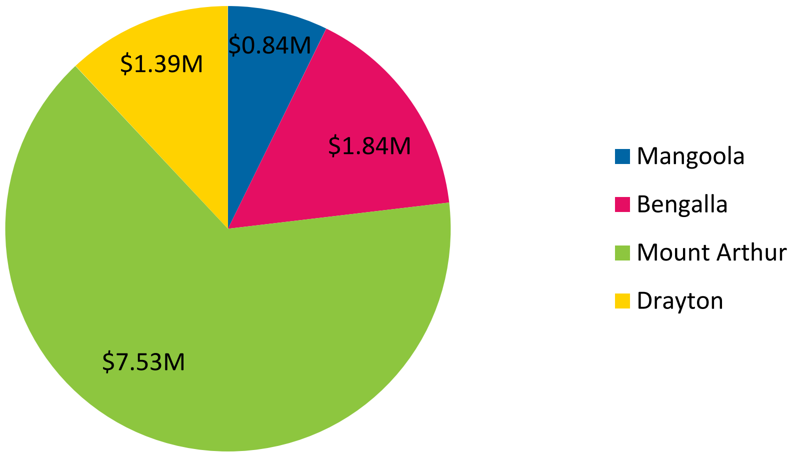

Figure 5-1 Estimated whole of life funding contribution by mine (2013 dollars)

Appendices

Appendix A – Traffic data

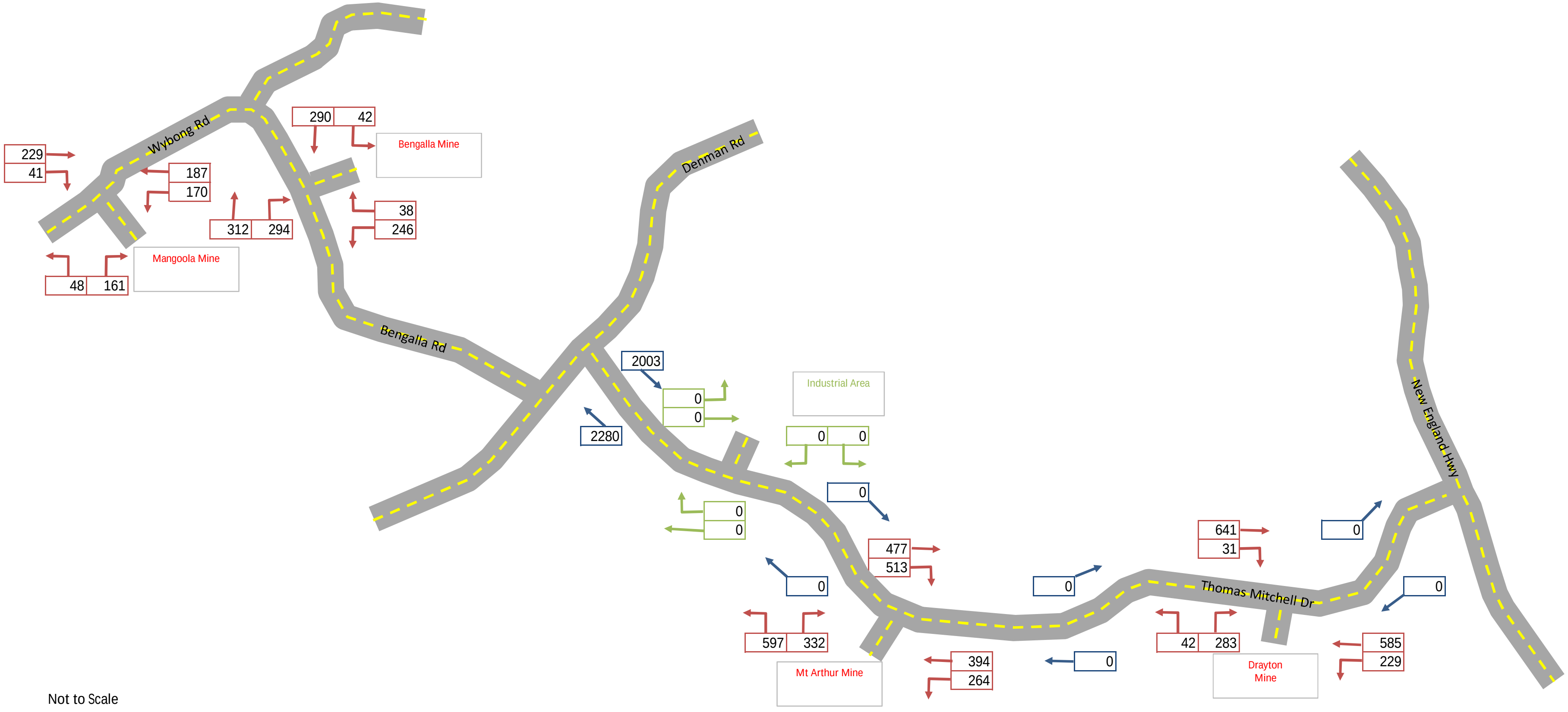

Figure A-1: Surveyed data - Light vehicles : Daytime

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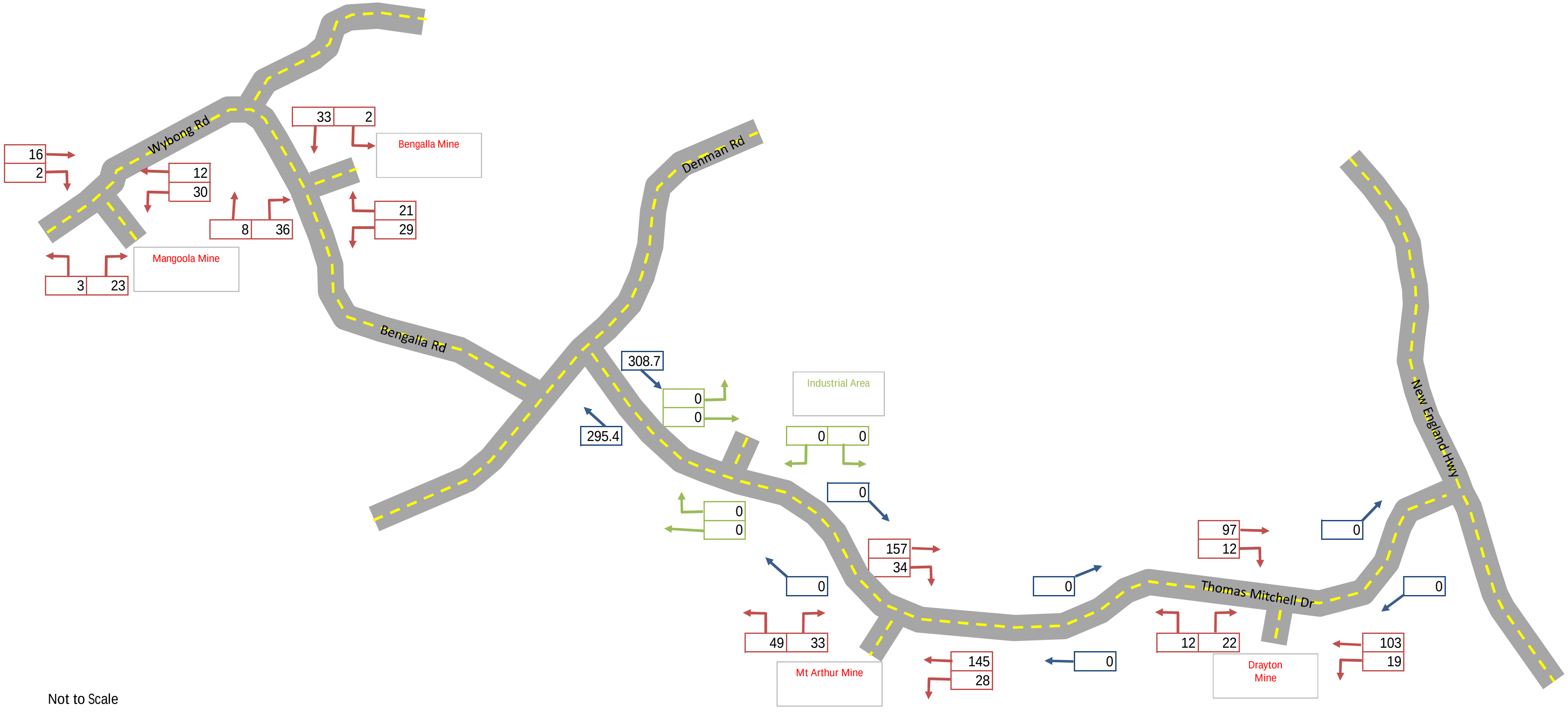


Figure A-2: Surveyed data - Heavy vehicles : Daytime

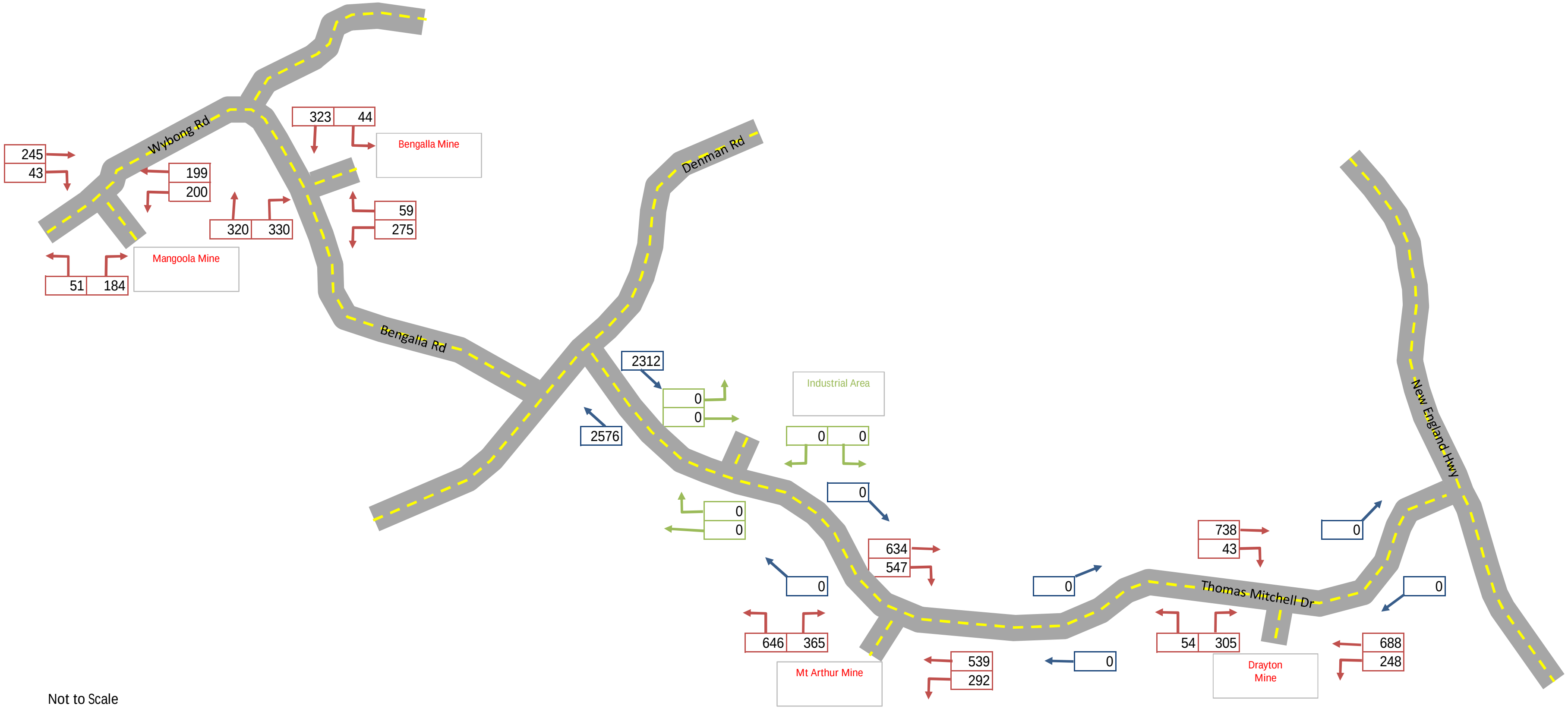


Figure A-3: Surveyed data - All vehicles : Daytime

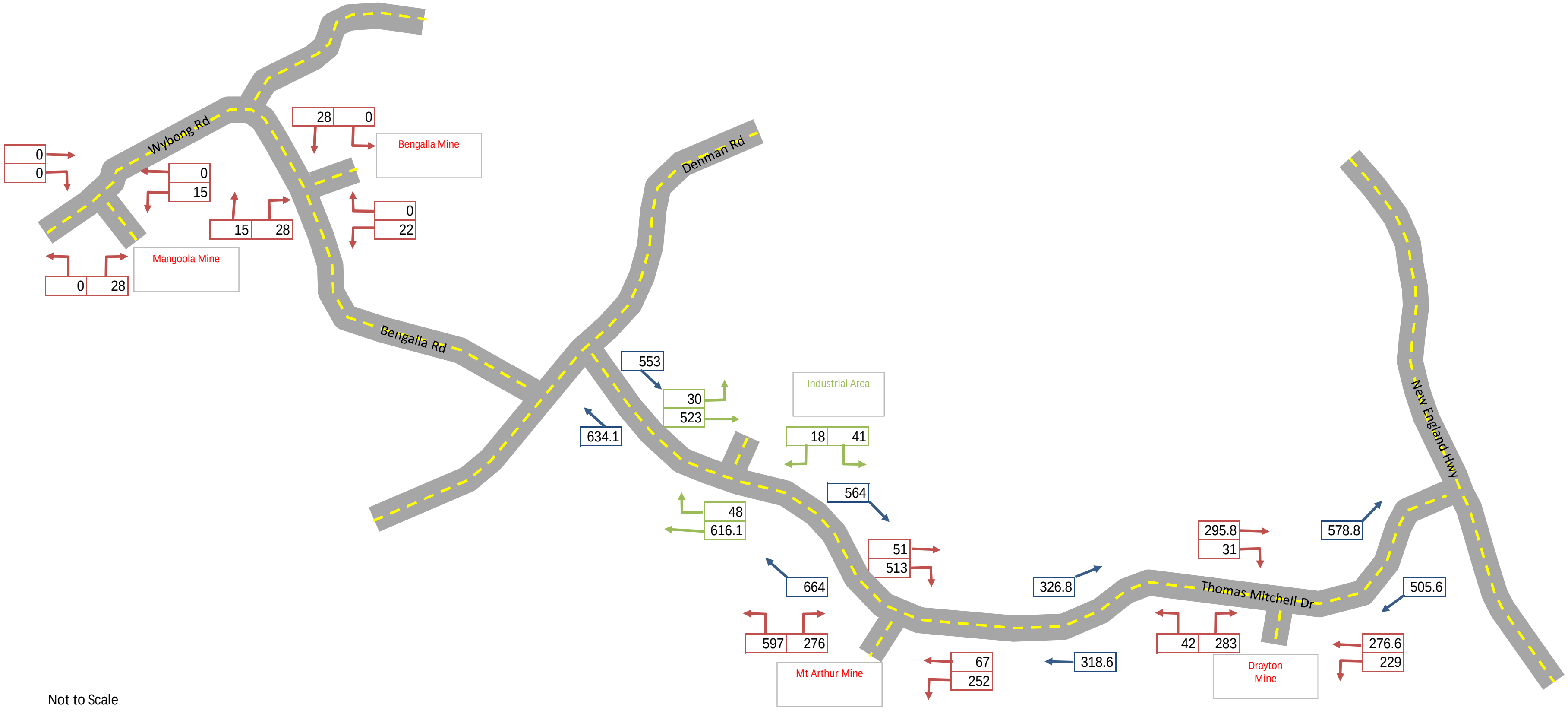
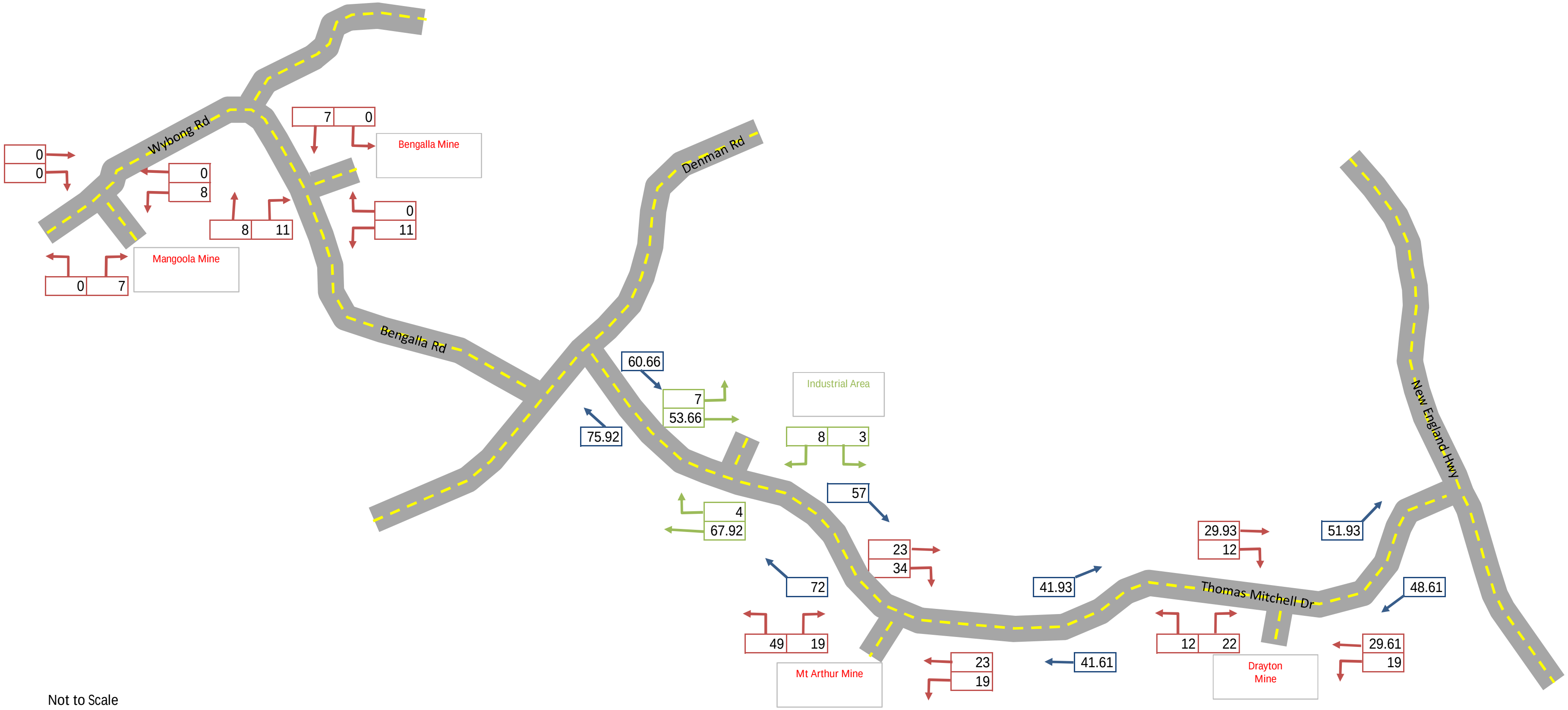


Figure A-4: All mine Traffic - Light Vehicles : Daytime



Not to Scale

Figure A-5: All mine Traffic - Heavy Vehicles : Daytime

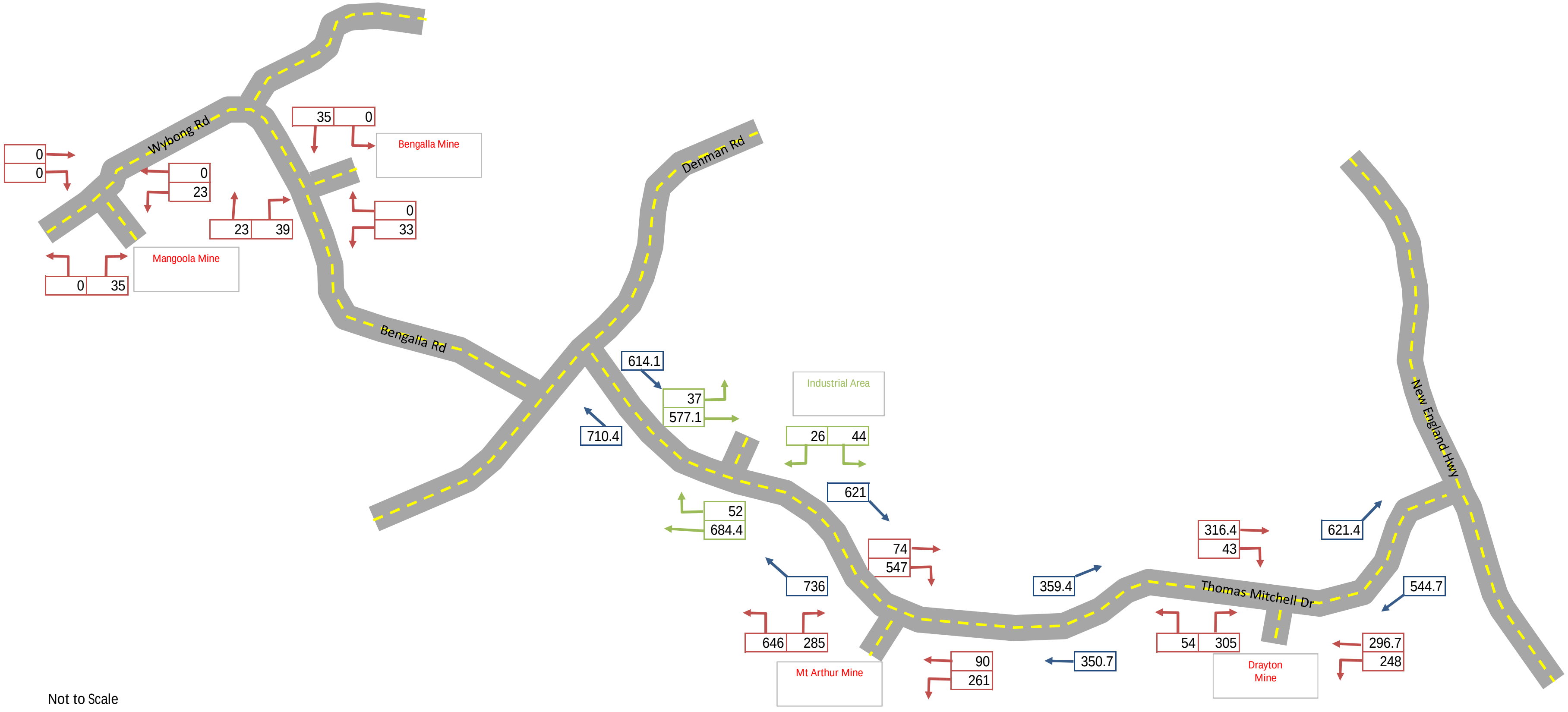


Figure A-6: All mine Traffic - All Vehicles : Daytime

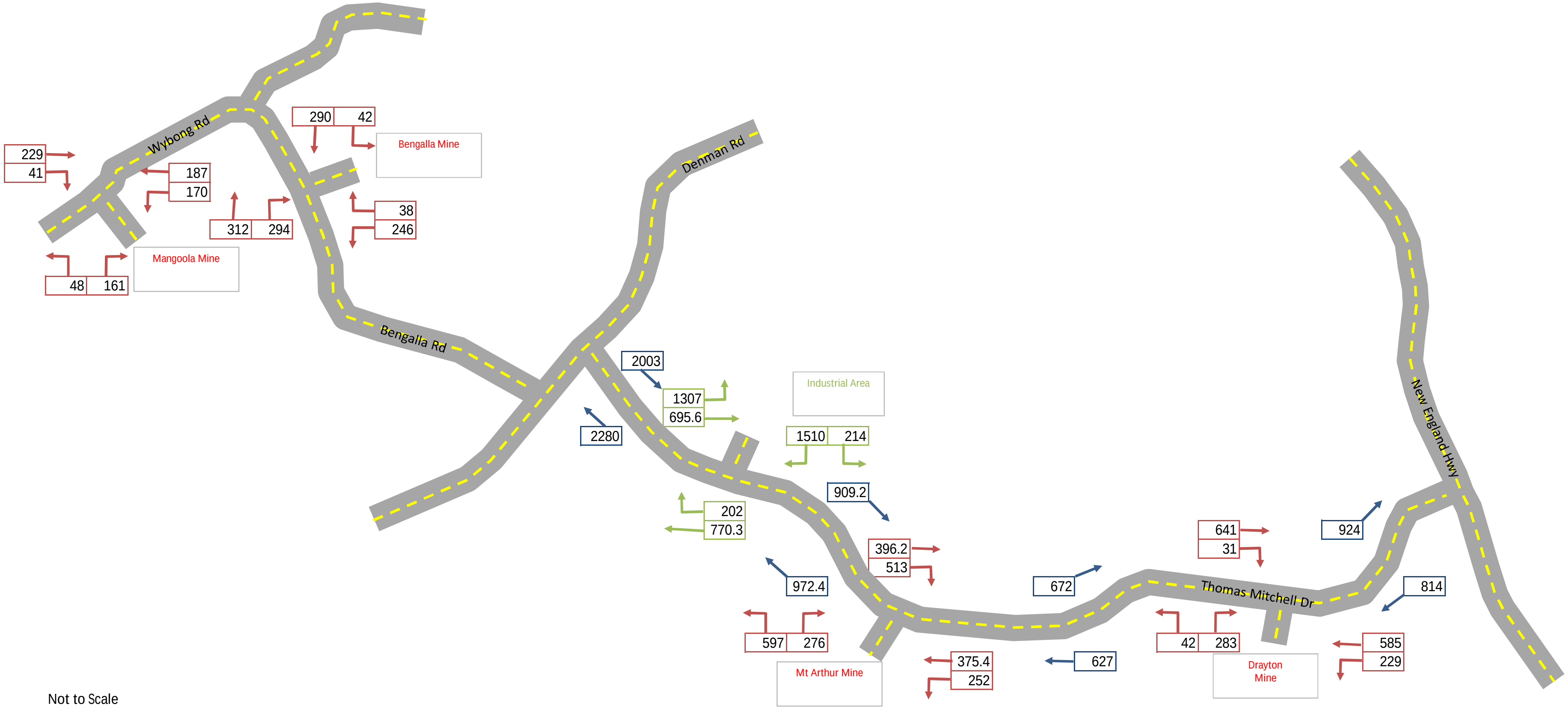


Figure A-7: Final Baseline - Light Vehicles : Daytime

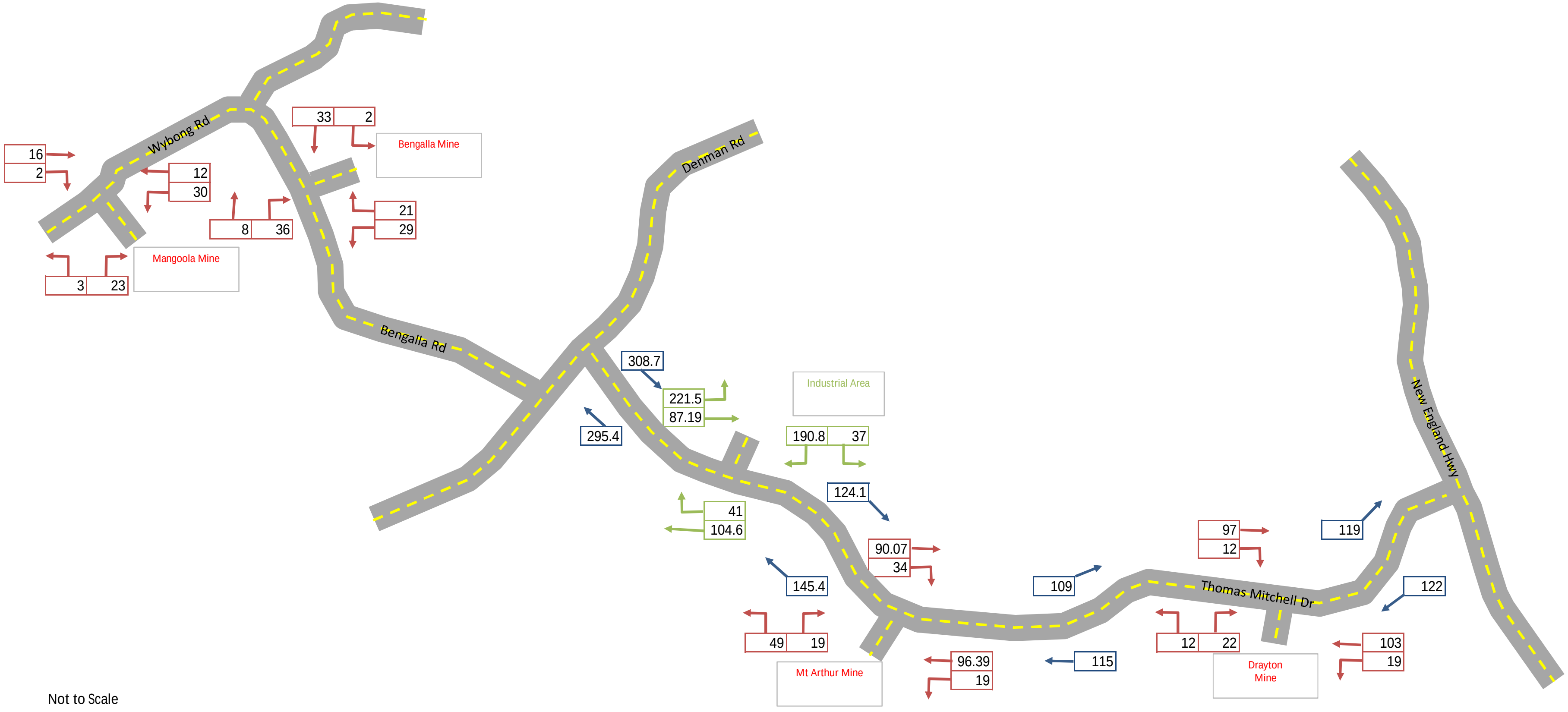


Figure A-8: Final Baseline - Heavy Vehicles : Daytime

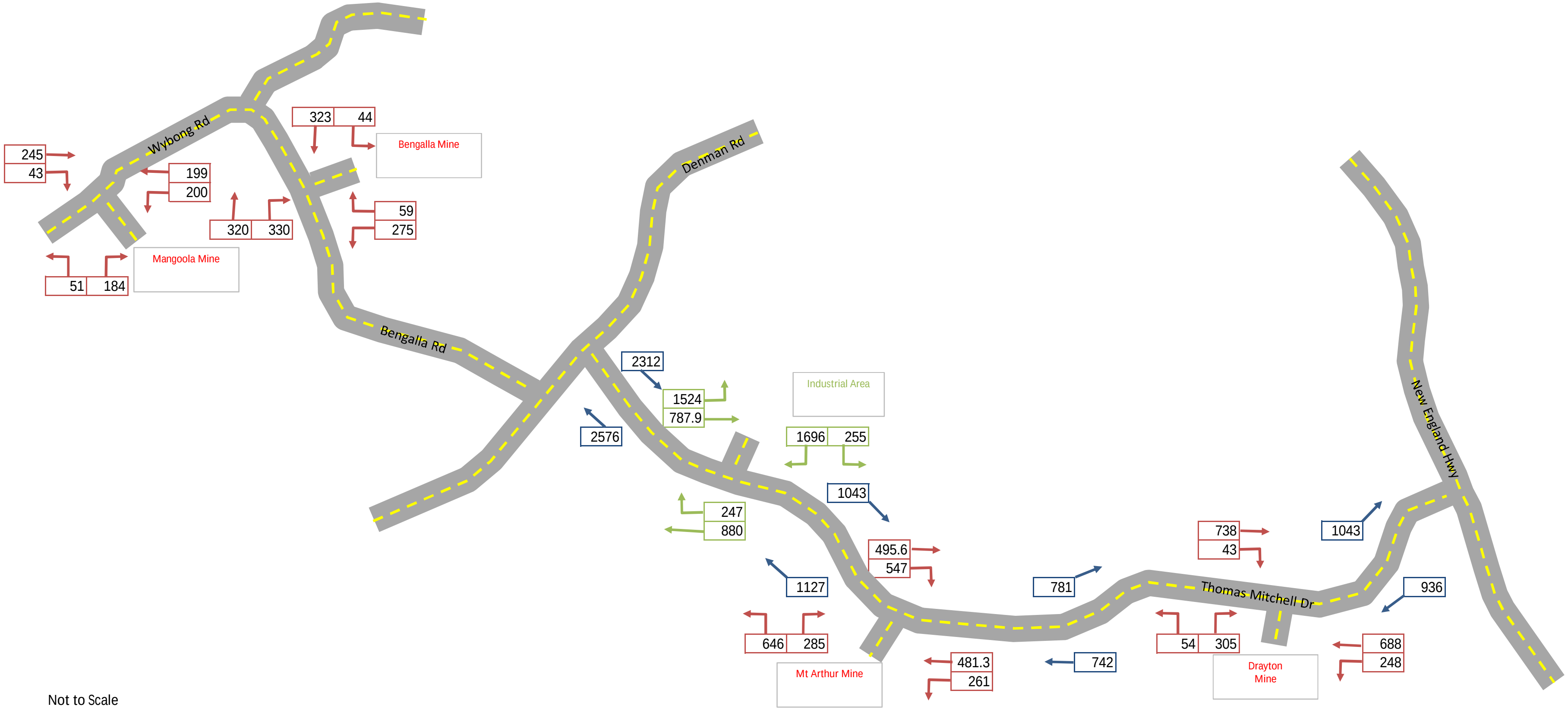


Figure A-9: Final Baseline - All Vehicles : Daytime

Table A-10: Apportionment - 2018 Revised - 24 Hour 7 Days

	Section of Thomas Mitchell Drive	Eastbound A: West of Industrial Estate	Eastbound B: East of Industrial Estate and West of Mt Arthur Mine	Eastbound C: East of Mt Arthur Mine and West of Drayton Mine	Eastbound D: East of Drayton Mine	Westbound A: West of Industrial Estate	Westbound B: East of Industrial Estate and West of Mt Arthur Mine	Westbound C: East of Mt Arthur Mine and West of Drayton Mine	Westbound D: East of Drayton Mine
Approx Length (km)		2.1	2.9	4.6	1.1	2.1	2.9	4.6	1.1
All Vehicles	Lights	2,827	1,643	1,310	1,504	2,650	1,631	1,308	1,492
	Heavies	194	187	162	164	363	191	165	191
	All	3,021	1,830	1,472	1,668	3,013	1,822	1,473	1,683
All Mine Vehicles	Lights	802	801	548	824	925	949	542	746
	Heavies	142	141	88	99	146	149	82	89
	All	944	943	636	923	1,071	1,098	623	836
Proportion	Lights	*28%*	*49%*	*42%*	*55%*	*35%*	*58%*	*41%*	*50%*
	Heavies	*73%*	*76%*	*54%*	*60%*	*40%*	*78%*	*50%*	*47%*
	All	*31%*	*52%*	*43%*	*55%*	*36%*	*60%*	*42%*	*50%*

Mangoola Mine (GHD)

		EB A	EB B	EB C	EB D	WB A	WB B	WB C	WB D
All Mine Vehicles	Lights	91	56	56	56	67	51	51	51
	Heavies	11	7	7	7	10	8	8	8
	All	103	64	64	64	77	59	59	59
Proportion	Lights	*3%*	*3%*	*4%*	*4%*	*3%*	*3%*	*4%*	*3%*
	Heavies	*6%*	*4%*	*4%*	*4%*	*3%*	*4%*	*5%*	*4%*
	All	*3%*	*3%*	*4%*	*4%*	*3%*	*3%*	*4%*	*3%*

Bengalla Mine

		EB A	EB B	EB C	EB D	WB A	WB B	WB C	WB D
All Mine Vehicles	Lights	129	112	112	112	152	133	133	133
	Heavies	23	20	20	20	17	15	15	15
	All	151	132	132	132	170	148	148	148
Proportion	Lights	*5%*	*7%*	*9%*	*7%*	*6%*	*8%*	*10%*	*9%*
	Heavies	*12%*	*11%*	*12%*	*12%*	*5%*	*8%*	*9%*	*8%*
	All	*5%*	*7%*	*9%*	*8%*	*6%*	*8%*	*10%*	*9%*

Mt Arthur Mine (GHD - Daytime)

		EB A	EB B	EB C	EB D	WB A	WB B	WB C	WB D
All Mine Vehicles	Lights	559	599	346	346	674	720	312	312
	Heavies	96	101	48	48	107	113	46	46
	All	656	700	394	394	781	833	358	358
Proportion	Lights	*20%*	*36%*	*26%*	*23%*	*25%*	*44%*	*24%*	*21%*
	Heavies	*50%*	*54%*	*30%*	*29%*	*30%*	*59%*	*28%*	*24%*
	All	*22%*	*38%*	*27%*	*24%*	*26%*	*46%*	*24%*	*21%*

Drayton Mine

		EB A	EB B	EB C	EB D	WB A	WB B	WB C	WB D
All Mine Vehicles	Lights	23	34	34	310	32	46	46	251
	Heavies	12	13	13	24	12	13	13	21
	All	34	47	47	334	43	59	59	271
Proportion	Lights	*1%*	*2%*	*3%*	*21%*	*1%*	*3%*	*4%*	*17%*
	Heavies	*6%*	*7%*	*8%*	*15%*	*3%*	*7%*	*8%*	*11%*
	All	*1%*	*3%*	*3%*	*20%*	*1%*	*3%*	*4%*	*16%*

Table A-11: Apportionment - 2018 Revised - 24 Hour Weekday Assessment

		Eastbound				Westbound			
		A	B	C	D	A	B	C	D
	Section of Thomas Mitchell Drive	West of Industrial Estate	East of Industrial Estate and West of Mt Arthur Mine	East of Mt Arthur Mine and West of Drayton Mine	East of Drayton Mine	West of Industrial Estate	East of Industrial Estate and West of Mt Arthur Mine	East of Mt Arthur Mine and West of Drayton Mine	East of Drayton Mine
Approx Length (km)		2.1	2.9	4.6	1.1	2.1	2.9	4.6	1.1
All Vehicles	Lights	3,583	2,059	1,634	1,854	3,366	2,054	1,641	1,848
	Heavies	246	234	202	202	461	241	207	236
	All	3,829	2,293	1,836	2,056	3,827	2,294	1,847	2,085
All Mine Vehicles	Lights	988	987	675	1,012	1,119	1,151	652	902
	Heavies	175	174	111	124	179	183	101	110
	All	1,163	1,161	786	1,136	1,298	1,333	752	1,011
Proportion	Lights	*28%*	*48%*	*41%*	*55%*	*33%*	*56%*	*40%*	*49%*
	Heavies	*71%*	*74%*	*55%*	*61%*	*39%*	*76%*	*49%*	*47%*
	All	*30%*	*51%*	*43%*	*55%*	*34%*	*58%*	*41%*	*49%*

Mangoola Mine (GHD)

All Mine Vehicles	Lights	112	69	69	69	82	63	63	63
	Heavies	14	9	9	9	12	10	10	10
	All	126	78	78	78	95	72	72	72
Proportion	Lights	*3%*	*3%*	*4%*	*4%*	*2%*	*3%*	*4%*	*3%*
	Heavies	*6%*	*4%*	*4%*	*4%*	*3%*	*4%*	*5%*	*4%*
	All	*3%*	*3%*	*4%*	*4%*	*2%*	*3%*	*4%*	*3%*

Bengalla Mine

All Mine Vehicles	Lights	160	139	139	139	171	149	149	149
	Heavies	28	25	25	25	19	17	17	17
	All	188	164	164	164	190	166	166	166
Proportion	Lights	*4%*	*7%*	*9%*	*8%*	*5%*	*7%*	*9%*	*8%*
	Heavies	*11%*	*10%*	*12%*	*12%*	*4%*	*7%*	*8%*	*7%*
	All	*5%*	*7%*	*9%*	*8%*	*5%*	*7%*	*9%*	*8%*

Mt Arthur Mine (GHD - Daytime)

All Mine Vehicles	Lights	689	737	425	425	828	883	384	384
	Heavies	118	125	61	61	133	140	58	58
	All	807	862	487	487	961	1,023	442	442
Proportion	Lights	*19%*	*36%*	*26%*	*23%*	*25%*	*43%*	*23%*	*21%*
	Heavies	*48%*	*53%*	*30%*	*30%*	*29%*	*58%*	*28%*	*25%*
	All	*21%*	*38%*	*27%*	*24%*	*25%*	*45%*	*24%*	*21%*

Drayton Mine

All Mine Vehicles	Lights	28	41	41	378	39	56	56	306
	Heavies	14	16	16	29	14	16	16	25
	All	42	57	57	407	53	72	72	331
Proportion	Lights	*1%*	*2%*	*3%*	*20%*	*1%*	*3%*	*3%*	*17%*
	Heavies	*6%*	*7%*	*8%*	*15%*	*3%*	*7%*	*8%*	*11%*
	All	*1%*	*3%*	*3%*	*20%*	*1%*	*3%*	*4%*	*16%*

Table A-12: Apportionment - 2013 Revised - 24 Hour 7 Days

		Eastbound				Westbound			
		A	B	C	D	A	B	C	D
	Section of Thomas Mitchell Drive	West of Industrial Estate	East of Industrial Estate and West of Mt Arthur Mine	East of Mt Arthur Mine and West of Drayton Mine	East of Drayton Mine	West of Industrial Estate	East of Industrial Estate and West of Mt Arthur Mine	East of Mt Arthur Mine and West of Drayton Mine	East of Drayton Mine
Approx Length (km)		2.1	2.9	4.6	1.1	2.1	2.9	4.6	1.1
All Vehicles	Lights	2,624	1,525	1,216	1,396	2,460	1,514	1,214	1,385
	Heavies	180	173	150	152	337	178	153	177
	All	2,804	1,699	1,367	1,548	2,797	1,692	1,367	1,563
All Mine Vehicles	Lights	785	800	527	803	910	945	517	722
	Heavies	118	120	81	92	124	129	75	83
	All	904	920	608	895	1,035	1,073	593	805
Proportion	Lights	*30%*	*52%*	*43%*	*58%*	*37%*	*62%*	*43%*	*52%*
	Heavies	*66%*	*69%*	*54%*	*60%*	*37%*	*72%*	*49%*	*47%*
	All	*32%*	*54%*	*44%*	*58%*	*37%*	*63%*	*43%*	*52%*

Mangoola Mine (GHD)

All Mine Vehicles	Lights	61	38	38	38	45	34	34	34
	Heavies	8	5	5	5	7	5	5	5
	All	68	42	42	42	51	39	39	39
Proportion	Lights	*2%*	*2%*	*3%*	*3%*	*2%*	*2%*	*3%*	*2%*
	Heavies	*4%*	*3%*	*3%*	*3%*	*2%*	*3%*	*3%*	*3%*
	All	*2%*	*2%*	*3%*	*3%*	*2%*	*2%*	*3%*	*3%*

Bengalla Mine

All Mine Vehicles	Lights	96	84	84	84	114	99	99	99
	Heavies	17	15	15	15	13	11	11	11
	All	113	99	99	99	127	110	110	110
Proportion	Lights	*4%*	*5%*	*7%*	*6%*	*5%*	*7%*	*8%*	*7%*
	Heavies	*9%*	*9%*	*10%*	*10%*	*4%*	*6%*	*7%*	*6%*
	All	*4%*	*6%*	*7%*	*6%*	*5%*	*7%*	*8%*	*7%*

Mt Arthur Mine (GHD - Daytime)

All Mine Vehicles	Lights	605	645	372	372	720	766	338	338
	Heavies	82	87	48	48	93	99	46	46
	All	688	732	420	420	813	865	384	384
Proportion	Lights	*23%*	*42%*	*31%*	*27%*	*29%*	*51%*	*28%*	*24%*
	Heavies	*46%*	*50%*	*32%*	*32%*	*28%*	*56%*	*30%*	*26%*
	All	*25%*	*43%*	*31%*	*27%*	*29%*	*51%*	*28%*	*25%*

Drayton Mine

All Mine Vehicles	Lights	23	34	34	310	32	46	46	251
	Heavies	12	13	13	24	12	13	13	21
	All	34	47	47	334	43	59	59	271
Proportion	Lights	*1%*	*2%*	*3%*	*22%*	*1%*	*3%*	*4%*	*18%*
	Heavies	*7%*	*8%*	*9%*	*16%*	*3%*	*7%*	*9%*	*12%*
	All	*1%*	*3%*	*3%*	*22%*	*2%*	*3%*	*4%*	*17%*

Table A-13: Apportionment - 2013 Revised - 24 Hour Weekday Assessment

		Eastbound				Westbound			
		A	B	C	D	A	B	C	D
	Section of Thomas Mitchell Drive	West of Industrial Estate	East of Industrial Estate and West of Mt Arthur Mine	East of Mt Arthur Mine and West of Drayton Mine	East of Drayton Mine	West of Industrial Estate	East of Industrial Estate and West of Mt Arthur Mine	East of Mt Arthur Mine and West of Drayton Mine	East of Drayton Mine
Approx Length (km)		2.1	2.9	4.6	1.1	2.1	2.9	4.6	1.1
All Vehicles	Lights	3,326	1,912	1,517	1,721	3,124	1,906	1,523	1,716
	Heavies	228	217	187	188	428	224	192	219
	All	3,555	2,129	1,704	1,908	3,552	2,130	1,715	1,935
All Mine Vehicles	Lights	957	974	643	979	1,095	1,138	619	869
	Heavies	149	151	102	115	156	161	93	102
	All	1,106	1,125	744	1,094	1,251	1,299	713	972
Proportion	Lights	*29%*	*51%*	*42%*	*57%*	*35%*	*60%*	*41%*	*51%*
	Heavies	*65%*	*70%*	*54%*	*61%*	*36%*	*72%*	*49%*	*47%*
	All	*31%*	*53%*	*44%*	*57%*	*35%*	*61%*	*42%*	*50%*

Mangoola Mine (GHD)

All Mine Vehicles	Lights	74	46	46	46	55	42	42	42
	Heavies	9	6	6	6	8	6	6	6
	All	84	52	52	52	63	48	48	48
Proportion	Lights	*2%*	*2%*	*3%*	*3%*	*2%*	*2%*	*3%*	*2%*
	Heavies	*4%*	*3%*	*3%*	*3%*	*2%*	*3%*	*3%*	*3%*
	All	*2%*	*2%*	*3%*	*3%*	*2%*	*2%*	*3%*	*2%*

Bengalla Mine

All Mine Vehicles	Lights	120	104	104	104	128	111	111	111
	Heavies	21	18	18	18	14	13	13	13
	All	141	123	123	123	142	124	124	124
Proportion	Lights	*4%*	*5%*	*7%*	*6%*	*4%*	*6%*	*7%*	*6%*
	Heavies	*9%*	*8%*	*10%*	*10%*	*3%*	*6%*	*7%*	*6%*
	All	*4%*	*6%*	*7%*	*6%*	*4%*	*6%*	*7%*	*6%*

Mt Arthur Mine (GHD - Daytime)

All Mine Vehicles	Lights	735	783	451	451	874	929	410	410
	Heavies	104	111	61	61	119	126	58	58
	All	839	894	513	513	993	1,055	468	468
Proportion	Lights	*22%*	*41%*	*30%*	*26%*	*28%*	*49%*	*27%*	*24%*
	Heavies	*46%*	*51%*	*33%*	*33%*	*28%*	*57%*	*30%*	*27%*
	All	*24%*	*42%*	*30%*	*27%*	*28%*	*50%*	*27%*	*24%*

Drayton Mine

All Mine Vehicles	Lights	28	41	41	378	39	56	56	306
	Heavies	14	16	16	29	14	16	16	25
	All	42	57	57	407	53	72	72	331
Proportion	Lights	*1%*	*2%*	*3%*	*22%*	*1%*	*3%*	*4%*	*18%*
	Heavies	*6%*	*7%*	*9%*	*16%*	*3%*	*7%*	*8%*	*12%*
	All	*1%*	*3%*	*3%*	*21%*	*1%*	*3%*	*4%*	*17%*

Appendix B – Pavement calculations (ESAkm)

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Traffic link	Segment	2013 AADT	%HV	Growth rate%	CGF	ESA/HV	Direction Factor (DF)	Lane Distribution Factor (LDF)	DESA 30	Years	Length (km)	ESA x km	
Pavement design	Denman Rd - Glen Munro								18,900,000		2.76	52,164,000	
	Glen Munro - MAC								13,200,000		2.21	29,172,000	
	MAC - Drayton								13,200,000		4.6	60,720,000	
	Drayton - NEH								13,200,000		1	13,200,000	
									58,500,000			155,256,000	
Mangoola	Denman - Glen Munro	120	12%	0.01%	30.04354	2.52	0.5	1	198,124		2.76	546,823	1.05%
	Glen Munro - MAC	82	12%	0.01%	30.04354	2.52	0.5	1	136,130		2.21	300,847	1.03%
	MAC - Drayton	82	12%	0.01%	30.04354	2.52	0.5	1	136,130		4.6	626,197	1.03%
	Drayton - NEH	82	12%	0.01%	30.04354	2.52	0.5	1	136,130		1	136,130	1.03%
									606,514			1,609,997	1.04%
Bengalla	Denman - Glen Munro	240	12%	0.01%	30.04354	2.52	0.5	1	412,328		2.76	1,138,026	2.18%
	Glen Munro - MAC	209	12%	0.01%	30.04354	2.52	0.5	1	359,125		2.21	793,665	2.72%
	MAC - Drayton	209	12%	0.01%	30.04354	2.52	0.5	1	359,125		4.6	1,651,973	2.72%
	Drayton - NEH	209	12%	0.01%	30.04354	2.52	0.5	1	359,125		1	359,125	2.72%
									1,489,702			3,942,789	2.54%
MAC	Denman - Glen Munro	1501	12%	0.01%	30.04354	2.52	0.5	1	2,422,075		2.76	6,684,928	12.82%
	Glen Munro - MAC	1597	12%	0.01%	30.04354	2.52	0.5	1	2,577,086		2.21	5,695,361	19.52%
	MAC - Drayton	804	12%	0.01%	30.04354	2.52	0.5	1	1,298,188		4.6	5,971,666	9.83%
	Drayton - NEH	804	12%	0.01%	30.04354	2.52	0.5	1	1,298,188		1	1,298,188	9.83%
									7,595,538			19,650,143	12.66%
Drayton	Denman - Glen Munro		30%	0.01%	30.04354	2.52	0.5	1	-		2.76	-	0.00%
	Glen Munro - MAC		25%	0.01%	30.04354	2.52	0.5	1	-		2.21	-	0.00%
	MAC - Drayton		25%	0.01%	30.04354	2.52	0.5	1	-		4.6	-	0.00%
	Drayton - NEH		7%	0.01%	30.04354	2.52	0.5	1	-		1	-	0.00%
									-			-	0.00%
	TOTAL MINE								9,691,754			25,202,928	16.23%

Thomas Mitchell Dr - 2018 USER PAYS 1													
Traffic link	Segment	2018							DESA				
		AADT	%HV	Growth rate%	CGF	ESA/HV	Direction Factor (DF)	Lane Distribution Factor (LDF)	30	Years	Length (km)	ESA x km	
Pavement design	Denman - Glen Munro								18,900,000		2.76	52,164,000	
	Glen Munro - MAC								13,200,000		2.21	29,172,000	
	MAC - Drayton								13,200,000		4.6	60,720,000	
	Drayton - NEH								13,200,000		1	13,200,000	
									58,500,000			155,256,000	
Mangoola	Denman - Glen Munro	180	12%	0.01%	30.04354	2.52	0.5	1	297,186		2.76	820,234	1.57%
	Glen Munro - MAC	122	12%	0.01%	30.04354	2.52	0.5	1	204,195		2.21	451,270	1.55%
	MAC - Drayton	122	12%	0.01%	30.04354	2.52	0.5	1	204,195		4.6	939,296	1.55%
	Drayton - NEH	122	12%	0.01%	30.04354	2.52	0.5	1	204,195		1	204,195	1.55%
									909,771			2,414,995	1.56%
Bengalla	Denman - Glen Munro	321	12%	0.01%	30.04354	2.52	0.5	1	551,489		2.76	1,522,110	2.92%
	Glen Munro - MAC	280	12%	0.01%	30.04354	2.52	0.5	1	480,329		2.21	1,061,527	3.64%
	MAC - Drayton	280	12%	0.01%	30.04354	2.52	0.5	1	480,329		4.6	2,209,514	3.64%
	Drayton - NEH	280	12%	0.01%	30.04354	2.52	0.5	1	480,329		1	480,329	3.64%
									1,992,476			5,273,480	3.40%
MAC	Denman - Glen Munro	1437	14%	0.01%	30.04354	2.52	0.5	1	2,808,952		2.76	7,752,707	14.86%
	Glen Munro - MAC	1533	14%	0.01%	30.04354	2.52	0.5	1	2,963,963		2.21	6,550,358	22.45%
	MAC - Drayton	752	12%	0.01%	30.04354	2.52	0.5	1	1,298,188		4.6	5,971,666	9.83%
	Drayton - NEH	752	12%	0.01%	30.04354	2.52	0.5	1	1,298,188		1	1,298,188	9.83%
									8,369,291			21,572,920	13.90%
Drayton	Denman - Glen Munro	78	30%	0.01%	30.04354	2.52	0.5	1	323,454		2.76	892,733	1.71%
	Glen Munro - MAC	106	25%	0.01%	30.04354	2.52	0.5	1	362,752		2.21	801,682	2.75%
	MAC - Drayton	106	25%	0.01%	30.04354	2.52	0.5	1	362,752		4.6	1,668,660	2.75%
	Drayton - NEH	605	7%	0.01%	30.04354	2.52	0.5	1	619,701		1	619,701	4.69%
									1,668,660			3,982,776	2.57%
	TOTAL MINE								12,940,198			33,244,171	21.41%

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Traffic link	Segment	2013							DESA				
		AADT	%HV	Growth rate%	CGF	ESA/HV	Direction Factor (DF)	Lane Distribution Factor (LDF)	30	Years	Length (km)	ESA x km	%
All traffic	Denman - Glen Munro	5523	8.9%	1.50%	37.53868	2.52	0.5	1	8,523,695		2.76	23,525,399	
	Glen Munro - MAC	3284	9.9%	1.50%	37.53868	2.52	0.5	1	5,607,287		2.21	12,392,104	
	MAC - Drayton	2628	10.5%	1.50%	37.53868	2.52	0.5	1	4,783,369		4.6	22,003,497	
	Drayton - NEH	2505	11.4%	1.50%	37.53868	2.52	0.5	1	4,911,053		1	4,911,053	
									23,825,404			62,832,053	
Mangoola	Denman - Glen Munro	120	12%	1.50%	37.53868	2.52	0.5	1	247,552		2.76	683,242	2.90%
	Glen Munro - MAC	82	12%	1.50%	37.53868	2.52	0.5	1	170,091		2.21	375,901	3.03%
	MAC - Drayton	82	12%	1.50%	37.53868	2.52	0.5	1	170,091		4.6	782,418	3.56%
	Drayton - NEH	82	12%	1.50%	37.53868	2.52	0.5	1	170,091		1	170,091	3.46%
									757,824			2,011,652	3.20%
Bengalla	Denman - Glen Munro	240	12%	1.50%	37.53868	2.52	0.5	1	515,194		2.76	1,421,936	6.04%
	Glen Munro - MAC	209	12%	1.50%	37.53868	2.52	0.5	1	448,717		2.21	991,666	8.00%
	MAC - Drayton	209	12%	1.50%	37.53868	2.52	0.5	1	448,717		4.6	2,064,100	9.38%
	Drayton - NEH	209	12%	1.50%	37.53868	2.52	0.5	1	448,717		1	448,717	9.14%
									1,861,347			4,926,419	7.84%
MAC	Denman - Glen Munro	1501	12%	1.50%	37.53868	2.52	0.5	1	3,026,325		2.76	8,352,656	35.50%
	Glen Munro - MAC	1597	12%	1.50%	37.53868	2.52	0.5	1	3,220,007		2.21	7,116,216	57.43%
	MAC - Drayton	804	12%	1.50%	37.53868	2.52	0.5	1	1,622,055		4.6	7,461,453	33.91%
	Drayton - NEH	804	12%	1.50%	37.53868	2.52	0.5	1	1,622,055		1	1,622,055	33.03%
									9,490,442			24,552,381	39.08%
Drayton	Denman - Glen Munro		30%	1.50%	37.53868	2.52	0.5	1	-		2.76	-	0.00%
	Glen Munro - MAC		25%	1.50%	37.53868	2.52	0.5	1	-		2.21	-	0.00%
	MAC - Drayton		25%	1.50%	37.53868	2.52	0.5	1	-		4.6	-	0.00%
	Drayton - NEH		7%	1.50%	37.53868	2.52	0.5	1	-		1	-	0.00%
									-			-	0.00%
	MINE TOTAL								12,109,613	-	-	31,490,453	50.12%

Thomas Mitchell Dr - 2018 USER PAYS 2													
Traffic link	Description	2018							DESA				
		AADT	%HV	Growth rate%	CGF	ESA/HV	Direction Factor (DF)	Lane Distribution Factor (LDF)	30	Years	Length (km)	ESA x km	
Pavement design	Denman - Glen Munro	6184	9%	1.50%	37.53868	2.52	0.5	1	9,857,060		2.76	27,205,486	
	Glen Munro - MAC	3743	10%	1.50%	37.53868	2.52	0.5	1	6,691,323		2.21	14,787,823	
	MAC - Drayton	3018	11%	1.50%	37.53868	2.52	0.5	1	5,781,650		4.6	26,595,592	
	Drayton - NEH	3434	11%	1.50%	37.53868	2.52	0.5	1	6,277,091		1	6,277,091	
									28,607,124			74,865,993	
Mangoola	Denman - Glen Munro	180	12%	1.50%	37.53868	2.52	0.5	1	371,327		2.76	1,024,863	3.77%
	Glen Munro - MAC	122	12%	1.50%	37.53868	2.52	0.5	1	255,136		2.21	563,851	3.81%
	MAC - Drayton	122	12%	1.50%	37.53868	2.52	0.5	1	255,136		4.6	1,173,628	4.41%
	Drayton - NEH	122	12%	1.50%	37.53868	2.52	0.5	1	255,136		1	255,136	4.06%
									1,136,737			3,017,479	4.03%
Bengalla	Denman - Glen Munro	321	12%	1.50%	37.53868	2.52	0.5	1	689,072		2.76	1,901,839	6.99%
	Glen Munro - MAC	280	12%	1.50%	37.53868	2.52	0.5	1	600,160		2.21	1,326,353	8.97%
	MAC - Drayton	280	12%	1.50%	37.53868	2.52	0.5	1	600,160		4.6	2,760,734	10.38%
	Drayton - NEH	280	12%	1.50%	37.53868	2.52	0.5	1	600,160		1	600,160	9.56%
									2,489,551			6,589,086	8.80%
MAC	Denman - Glen Munro	1437	14%	1.50%	37.53868	2.52	0.5	1	3,509,718		2.76	9,686,821	35.61%
	Glen Munro - MAC	1533	14%	1.50%	37.53868	2.52	0.5	1	3,703,400		2.21	8,184,515	55.35%
	MAC - Drayton	752	12%	1.50%	37.53868	2.52	0.5	1	1,622,055		4.6	7,461,453	28.06%
	Drayton - NEH	752	12%	1.50%	37.53868	2.52	0.5	1	1,622,055		1	1,622,055	25.84%
									10,457,228			26,954,844	36.00%
Drayton	Denman - Glen Munro	78	30%	1.50%	37.53868	2.52	0.5	1	404,148		2.76	1,115,448	4.10%
	Glen Munro - MAC	106	25%	1.50%	37.53868	2.52	0.5	1	453,250		2.21	1,001,682	6.77%
	MAC - Drayton	106	25%	1.50%	37.53868	2.52	0.5	1	453,250		4.6	2,084,950	7.84%
	Drayton - NEH	605	7%	1.50%	37.53868	2.52	0.5	1	774,302		1	774,302	12.34%
									2,084,950			4,976,383	6.65%
	MINE TOTAL								16,168,466			41,537,792	55.48%

Appendix C – Pavement design

Equivalent pavement depth calculation

	Depth	Extra over background	% extra over	equivalent pavement depth	equivalent depth	% pavement
Background	270	0		270	270	80.60%
Background + mine		46	71%	46	316	13.73%
Background + IA		11	17%	11	327	3.28%
Background + growth		8	12%	8	335	2.39%
		65	100%			
TOTAL	335					

Pavement width (area related)						% from User pays 1 - 2018			Hybrid
Cross section									
width (m)	mine only (m)	Shared (m)	total(m)	% of total cross section pavement			ESAkm	%	% total $
11.0	3.24	7.8				Mangoola	2,414,995	7.3%	2.84%
	0	6.26	6.26	56.9%	Background	Bengalla	5,273,480	15.9%	6.20%
	3.24	1.07	4.30	39.1%	Mines	Mount Arthur	21,572,920	64.9%	25.38%
	0	0.25	0.25	2.3%	Industrial Area	Drayton	3,982,776	12.0%	4.68%
	0	0.19	0.19	1.7%	Growth		33,244,171		39.1%

GHD CLIENTS|PEOPLE|PERFORMANCE

Pavement Summary

Project:	Thomas Mitchell Drive Upgrade			
Job No:	22/17038			
Road:	Thomas Mitchell Drive			
Section:	All			
Date:	19-Nov-13			
Designed By:	H. Porter	Date:	19-Nov-13	19-Nov-13
Reviewed By	J. Grobler	Date:		

Pavement Type: Insitu lime modification and overlay	
Pavement Description:	Granular overlay
Direction:	-
Chainage (m):	Traffic Block 1
Project Reliability:	95.0%
DESA (ESA's): Background	9.50E+05
DESA (ESA's): Background + Mine	3.90E+06
DESA (ESA's): Background + Industrial + Mine	6.60E+06
DESA (ESA's): Background + Industrial + Mine + Growth	8.20E+06
Design Subgrade CBR (%):	2

Pavement Layer	Pavement Material	Specification	Background	Background + Mine	Background + Industrial + Mine	Background + Industrial + Mine + Growth
			Layer Thickness (mm)			
Surfacing Layer	14/7 mm double seal	n/a	15	15	15	15
Seal	Primerseal	n/a	-	-	-	-
Base Course	DGB20	n/a	125	195	210	220
Subbase Course	Insitu lime stabilise existing	n/a	200	200	200	200
Select Material Zone 1	Select fill (CBR 10%)	n/a	-	-	-	-
Select Material Zone 2	Select fill (CBR 5%)	n/a	-	-	-	-
Total Pavement Depth	-	-	325	395	410	420
Total Box Depth	-	-	340	410	425	435
Percentage pavement increase compared with background traffic only			-	22%	26%	29%

Pavement Type RC5 / HP5	
Pavement Description:	Unbound granular re-construction
Direction:	-
Chainage (m):	Traffic Block 1
Project Reliability:	95.0%
DESA (ESA's): Background	9.50E+05
DESA (ESA's): Background + Mine	3.90E+06
DESA (ESA's): Background + Industrial + Mine	6.60E+06
DESA (ESA's): Background + Industrial + Mine + Growth	8.20E+06
Design Subgrade CBR (%):	2

Pavement Layer	Pavement Material	Specification	Background	Background + Mine	Background + Industrial + Mine	Background + Industrial + Mine + Growth
			Layer Thickness (mm)			
Surfacing Layer	14/7 mm double seal	n/a	15	15	15	15
Seal	Primerseal	n/a	-	-	-	-
Base Course	DGB20	n/a	150	150	150	150
Subbase Course	DGS40	n/a	115	150	165	170
Select Material Zone 1	Select fill (CBR 10%)	n/a	180	180	180	180
Select Material Zone 2	Select fill (CBR 5%)	n/a	310	310	310	310
Total Pavement Depth	-	-	265	300	315	320
Total Box Depth	-	-	770	805	820	825
Percentage pavement increase compared with background traffic only			-	13%	19%	21%

Pavement Type: Insitu lime modification and overlay	
Pavement Description:	Granular overlay
Direction:	-
Chainage (m):	Traffic Block 2
Project Reliability:	95.0%
DESA (ESA's): Background	1.10E+06
DESA (ESA's): Background + Mine	4.00E+06
DESA (ESA's): Background + Industrial + Mine	5.00E+06
DESA (ESA's): Background + Industrial + Mine + Growth	6.20E+06
Design Subgrade CBR (%):	3

Pavement Layer	Pavement Material	Specification	Background	Background + Mine	Background + Industrial + Mine	Background + Industrial + Mine + Growth
			Layer Thickness (mm)			
Surfacing Layer	14/7 mm double seal	n/a	15	15	15	15
Seal	Primerseal	n/a	-	-	-	-
Base Course	DGB20	n/a	55	115	125	135
Subbase Course	Insitu lime stabilise existing	n/a	175	175	175	175
Select Material Zone 1	Select fill (CBR 10%)	n/a	-	-	-	-
Select Material Zone 2	Select fill (CBR 5%)	n/a	-	-	-	-
Total Pavement Depth	-	-	230	290	300	310
Total Box Depth	-	-	245	305	315	325
Percentage pavement increase compared with background traffic only			-	26%	30%	35%

Pavement Type HP1	
Pavement Description:	Unbound granular re-construction
Direction:	-
Chainage (m):	Traffic Block 2
Project Reliability:	95.0%
DESA (ESA's): Background	1.10E+06
DESA (ESA's): Background + Mine	4.00E+06
DESA (ESA's): Background + Industrial + Mine	5.00E+06
DESA (ESA's): Background + Industrial + Mine + Growth	6.20E+06
Design Subgrade CBR (%):	3

Background	Background + Mine	Background + Industrial + Mine	Background + Industrial + Mine + Growth

Pavement Layer	Pavement Material	Specification	Layer Thickness (mm)			
Surfacing Layer	14/7 mm double seal	n/a	15	15	15	15
Seal	Primerseal	n/a	-	-	-	-
Base Course	DGB20	n/a	150	150	150	150
Subbase Course	DGS40	n/a	120	150	155	165
Select Material Zone 1	Select fill (CBR 10%)	n/a	325	325	325	325
Select Material Zone 2	Select fill (CBR 5%)	n/a	-	-	-	-
Total Pavement Depth	-	-	270	300	305	315
Total Box Depth	-	-	610	640	645	655
Percentage pavement increase compared with background traffic only			-	11%	13%	17%

Pavement Type: Insitu lime modification and overlay	
Pavement Description:	Granular overlay
Direction:	-
Chainage (m):	Traffic Block 3
Project Reliability:	95.0%
DESA (ESA's): Background	1.10E+06
DESA (ESA's): Background + Mine	3.00E+06
DESA (ESA's): Background + Industrial + Mine	4.10E+06
DESA (ESA's): Background + Industrial + Mine + Growth	5.20E+06
Design Subgrade CBR (%):	2

			Background	Background + Mine	Background + Industrial + Mine	Background + Industrial + Mine + Growth
Pavement Layer	Pavement Material	Specification	Layer Thickness (mm)			
Surfacing Layer	14/7 mm double seal	n/a	15	15	15	15
Seal	Primerseal	n/a	-	-	-	-
Base Course	DGB20	n/a	50	95	110	115
Subbase Course	Insitu lime stabilise existing	n/a	180	180	180	180
Select Material Zone 1	Select fill (CBR 10%)	n/a	-	-	-	-
Select Material Zone 2	Select fill (CBR 5%)	n/a	-	-	-	-
Total Pavement Depth	-	-	230	275	290	295
Total Box Depth	-	-	245	290	305	310
Percentage pavement increase compared with background traffic only			-	20%	26%	28%

Pavement Type: Insitu lime modification and overlay	
Pavement Description:	Granular overlay
Direction:	-
Chainage (m):	Traffic Block 4
Project Reliability:	95.0%
DESA (ESA's): Background	1.10E+06
DESA (ESA's): Background + Mine	3.60E+06
DESA (ESA's): Background + Industrial + Mine	4.70E+06
DESA (ESA's): Background + Industrial + Mine + Growth	5.90E+06
Design Subgrade CBR (%):	2

			Background	Background + Mine	Background + Industrial + Mine	Background + Industrial + Mine + Growth
Pavement Layer	Pavement Material	Specification	Layer Thickness (mm)			
Surfacing Layer	14/7 mm double seal	n/a	15	15	15	15
Seal	Primerseal	n/a	-	-	-	-
Base Course	DGB20	n/a	120	175	185	195
Subbase Course	Insitu lime stabilise existing	n/a	180	180	180	180
Select Material Zone 1	Select fill (CBR 10%)	n/a	-	-	-	-
Select Material Zone 2	Select fill (CBR 5%)	n/a	-	-	-	-
Total Pavement Depth	-	-	300	355	365	375
Total Box Depth	-	-	315	370	380	390
Percentage pavement increase compared with background traffic only			-	18%	22%	25%

Pavement Type RC5	
Pavement Description:	Unbound granular re-construction
Direction:	-
Chainage (m):	Traffic Block 4
Project Reliability:	95.0%
DESA (ESA's): Background	1.10E+06
DESA (ESA's): Background + Mine	3.60E+06
DESA (ESA's): Background + Industrial + Mine	4.70E+06
DESA (ESA's): Background + Industrial + Mine + Growth	5.90E+06
Design Subgrade CBR (%):	2

			Background	Background + Mine	Background + Industrial + Mine	Background + Industrial + Mine + Growth
Pavement Layer	Pavement Material	Specification	Layer Thickness (mm)			
Surfacing Layer	14/7 mm double seal	n/a	15	15	15	15
Seal	Primerseal	n/a	-	-	-	-
Base Course	DGB20	n/a	150	150	150	150
Subbase Course	DGS40	n/a	120	150	155	160
Select Material Zone 1	Select fill (CBR 10%)	n/a	180	180	180	180
Select Material Zone 2	Select fill (CBR 5%)	n/a	310	310	310	310
Total Pavement Depth	-	-	270	300	305	310
Total Box Depth	-	-	775	805	810	815
Percentage pavement increase compared with background traffic only			-	11%	13%	15%

AVERAGE (%)		17%	21%	24%
AVERAGE depth (mm)	270	316	327	335
AVERAGE change (mm)		46	57	65
MAXIMUM (%)		26%	30%	35%
MAXIMUM depth (mm)	325	395	410	420
MAXIMUM change (mm)		70	85	95
MINIMUM (%)		11%	13%	15%
MINIMUM depth (mm)	230	275	290	295
MINIMUM change (mm)		45	60	65

Appendix D – Users pays sensitivity

	1 Measured traffic (2013), design HV (2012), 2% growth		2. Measured traffic (2013), design HV (2012), 1.11% growth		3. Measured traffic & %HV (2013), 2% growth		4. Measured traffic & %HV (2013), 1.11% growth		5. Measured traffic (2013), 18% HV (RFT), 2% growth		6. Measured traffic (2013), 18% HV, 1.11% growth		7. Design ESA (2012)		8. Calculated ESAs using design parameters & traffic (2013)	
Source	ESA km (M)	%	ESA km (M)	%	ESA km (M)	%	ESA km (M)	%	ESA km (M)	%	ESA km (M)	%	ESA km (M)	%	ESA km (M)	%
All traffic	117.5		102.5		73.3		63.9		129.8		113.1		155.3		130.8	
Mine	29.2	24.9%	29.2	28.5%	29.2	39.8%	29.2	45.7%	29.2	22.5%	29.2	25.8%	29.2	18.8%	29.2	22.3%
Non-mine (IA+base)	57.9	49.3%	57.9	56.5%	25.1	34.2%	25.1	39.3%	66.9	51.5%	66.9	59.2%	67.7	43.6%	67.7	51.8%
Growth	30.4	25.9%	15.4	15.0%	19	25.9%	9.6	15.0%	33.7	26.0%	17	15.0%	58.4	37.6%	33.9	25.9%
Comments	Represents observed traffic with the nominated pavement design growth rate		Represents the observed traffic with the RMS network growth rate		This scenarios are not appropriate as the %HV is not realistic and under represents total traffic ESAkm due to road works				Scenario's 5 and 6 are based on observed traffic with MSC %HV parameters for the design				These scenarios are based on design traffic agreed with MSC in 2012. Scenario 7 normalised ESAs over the non-IA sections at the highest estimated level. Scenario 8 represents design figures without that normalisation. 7 is actually USER PAYS 1.			

The above table shows various user pays models that were considered, incorporating the adjustment of % heavy vehicles, growth rate and/or traffic volumes. These models were not considered appropriate for adoption in this study.

Appendix E – Pavement material benefit

14-951CN

12 December, 2014

GHD Pty Ltd
Level 3, GHD Tower,
24 Honeysuckle Drive,
Newcastle NSW 2300

Attention: Paul Youman

Re: Budget Estimate for Pavement Material in Muswellbrook Area

Paul,

As requested we confirm that the below rates are estimate for works completed on road projects in the Muswellbrook area. We highlight that the actual rate will vary based on actual location, size and scope of works required

Supply and place subbase	$85/cu.m + GST
Supply and place select material	$60/cu.m+GST

If you have any questions please do not hesitate to contact me at our Beresfield office.

Yours faithfully
Keller Civil Engineers Pty Ltd

Clinton North

Hunter Valley Operations Manager

Ph: 49 22 5000
Fax: 49 22 5001

Chainage							Volume	Rate	Volume	Rate	
From	To	Traffic Lane	Initial treatment	Rehab Treatment	Lane Width (m)	Area (m2)	Re-used	($/m3)	Remaining	($/m3)	Value ($)
255	740	NB & SB	Mill existing seal (25mm)	200MM INSITU MODIFIED STABILISATION WITH LIME AND 125MM DGB20 OVERLAY AND DOUBLE/DOUBLE SPRAY SEAL	3.5	3395.0	679.0	$85	441.35	$60	$84,196
740	1110	NB & SB	Mill existing seal (25mm)	200MM INSITU MODIFIED STABILISATION WITH LIME AND 125MM DGB20 OVERLAY AND DOUBLE/DOUBLE SPRAY SEAL	6.71 3.5	3777.7	755.5	$85	491.101	$60	$93,687
1110	1322	NB & SB	Mill existing seal (25mm)	200MM INSITU MODIFIED STABILISATION WITH LIME AND 125MM DGB20 OVERLAY AND DOUBLE/DOUBLE SPRAY SEAL	3.5	1484.0	296.8	$85	192.92	$60	$36,803
1952	2656	SB	Mill existing seal (40mm)	200MM INSITU MODIFIED STABILISATION WITH LIME AND 125MM DGB20 OVERLAY AND DOUBLE/DOUBLE SPRAY SEAL	6.71	4723.8	944.8	$85	614.0992	$60	$117,151
1952	2117	NB	Mill existing seal (20mm)	200MM INSITU MODIFIED STABILISATION WITH LIME AND 125MM DGB20 OVERLAY AND DOUBLE/DOUBLE SPRAY SEAL	3.5	577.5	115.5	$85	75.075	$60	$14,322
2146	2656	NB	Mill existing seal (45mm)	200MM INSITU MODIFIED STABILISATION WITH LIME AND 125MM DGB20 OVERLAY AND DOUBLE/DOUBLE SPRAY SEAL	3.5	1785.0	357.0	$85	232.05	$60	$44,268
2785	3948	NB & SB	Mill existing seal (30mm)	175MM INSITU MODIFIED STABILISATION WITH LIME AND 150MM DGB20 OVERLAY AND DOUBLE/DOUBLE SPRAY SEAL	3.5	8141.0	1424.7	$85	1261.855	$60	$196,809
4050	4131	NB & SB	Mill existing seal (35mm)	175MM INSITU MODIFIED STABILISATION WITH LIME AND 175MM DGB20 OVERLAY AND DOUBLE/DOUBLE SPRAY SEAL	3.5	567.0	99.2	$85	87.885	$60	$13,707
5257	5632	NB & SB	Mill existing seal (30mm)	175MM INSITU MODIFIED STABILISATION WITH LIME AND 175MM DGB20 OVERLAY AND DOUBLE/DOUBLE SPRAY SEAL	3.5	2625.0	459.4	$85	406.875	$60	$63,459
5632	6160	NB & SB	Mill existing seal (25mm)	175MM INSITU MODIFIED STABILISATION WITH LIME AND 150MM DGB20 OVERLAY AND DOUBLE/DOUBLE SPRAY SEAL	3.5	3696.0	646.8	$85	572.88	$60	$89,351
6160	6480	NB & SB	Mill existing seal (40mm)	175MM INSITU MODIFIED STABILISATION WITH LIME AND 125MM DGB20 OVERLAY AND 45MM AC14	3.5	2240.0	392.0	$85	347.2	$60	$54,152
6480	7435	SB	Mill existing seal (30mm)	200MM INSITU MODIFIED STABILISATION WITH LIME AND 125MM DGB20 OVERLAY AND DOUBLE/DOUBLE SPRAY SEAL	3.5	3342.5	668.5	$85	434.525	$60	$82,894
6480	6733	NB	Mill existing seal (30mm)	200MM INSITU MODIFIED STABILISATION WITH LIME AND 125MM DGB20 OVERLAY AND DOUBLE/DOUBLE SPRAY SEAL	3.5	885.5	177.1	$85	115.115	$60	$21,960
6774	7435	NB	Mill existing seal (30mm)	200MM INSITU MODIFIED STABILISATION WITH LIME AND 125MM DGB20 OVERLAY AND DOUBLE/DOUBLE SPRAY SEAL	3.5	2313.5	462.7	$85	300.755	$60	$57,375
7435	7715	NB & SB	Mill existing seal (30mm)	175MM INSITU MODIFIED STABILISATION WITH LIME AND 175MM DGB20 OVERLAY AND DOUBLE/DOUBLE SPRAY SEAL	3.5	1960.0	343.0	$85	303.8	$60	$47,383
7984	8140	NB & SB	Mill existing seal (25mm)	175MM INSITU MODIFIED STABILISATION WITH LIME AND 175MM DGB20 OVERLAY AND 45MM AC14	3.5	1092.0	191.1	$85	169.26	$60	$26,399
8140	9409	NB & SB	Mill existing seal (20mm)	180MM INSITU MODIFIED STABILISATION WITH LIME AND 180MM DGB20 OVERLAY AND DOUBLE/DOUBLE SPRAY SEAL	3.5	8883.0	1598.9	$85	1332.45	$60	$215,857
9574	9760	NB & SB	Mill existing seal (30mm)	180MM INSITU MODIFIED STABILISATION WITH LIME AND 180MM DGB20 OVERLAY AND 45MM AC14	3.5	1302.0	234.4	$85	195.3	$60	$31,639
9760	9883	NB & SB	Mill existing seal (30mm)	180MM INSITU MODIFIED STABILISATION WITH LIME AND 150MM DGB20 OVERLAY AND DOUBLE/DOUBLE SPRAY SEAL	3.5	861.0	155.0	$85	129.15	$60	$20,922
9951	10300	SB	Mill existing seal (25mm)	180MM INSITU MODIFIED STABILISATION WITH LIME AND 150MM DGB20 OVERLAY AND DOUBLE/DOUBLE SPRAY SEAL	3.5	1221.5	219.9	$85	183.225	$60	$29,682
10185	10300	NB	Mill existing seal (25mm)	180MM INSITU MODIFIED STABILISATION WITH LIME AND 150MM DGB20 OVERLAY AND DOUBLE/DOUBLE SPRAY SEAL	3.5	402.5	72.5	$85	60.375	$60	$9,781
10371	10507	NB & SB	Mill existing seal (20mm)	175MM INSITU MODIFIED STABILISATION WITH LIME AND 175MM DGB20 OVERLAY AND 45MM AC14	3.5	952.0	166.6	$85	147.56	$60	$23,015
					Total	56227.5	10460.3	Total	8094.805	Total	$1,374,812
										SAY	$ 1,375,000

Appendix F – MSC cost summary

Payment Schedule for Thomas Mitchell Drive Upgrade Works

Thomas Mitchell Drive Upgrade Cost

Works Completed

Description	Amount ($)
Preliminary and geotechnical Investigation	$90,201
Design	$492,000
Construction of Stage 1 & 2 (From NE Hway to Mt Arthur Access Road)	$8,555,000
Sub Total	$9,137,201

Works in Progress (Contracts Awarded)

Description	Amount ($)
Construction of Stage 3 (From Mt Arthur Access Road to Glen Munro Road	$3,729,500
Installation of Stormwater Drainage along TMD at Industrial Estate	$920,000
Sub Total Contract awarded)	$4,649,500

Total Cost of Works Committed to date	**$13,786,701**
Cost savings due to existing pavement layers	**$1,800,000**
Total Project Cost to date	**$15,586,701**

Works Programed

Construction of Stage 4 (From Glen Munro Road to Denman Road)	$4,750,000

Contribution Plan as per Draft TMD Contribution Plan

Total Project Cost to date	$15,586,701
Total Contribution Due to date = 39.1% of Total Committed Works as per Executive Summary of Draft Thomas Mitchell Drive Contribution Study.	$6,094,400

Mine	Contribution Due Now	Remaining Contribution at Commencement of Stage 4 Works
Mangoola	$514,361	$156,750
Bengalla	$981,962	$299,250
Mt Arthur	$3,959,022	$1,206,500
Drayton	$639,055	$194,750
Total	$6,094,400	$1,857,250

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Document Status

Rev No.	Author	Reviewer		Approved for Issue		
		Name	Signature	Name	Signature	Date
0	P Youman	G Wood	*G Wood*	G Wood	*G Wood*	25/11/2014
1	P Youman	G Wood	*G Wood*	G Wood	*G Wood*	21/01/2015
2	P Youman	G Wood	*G Wood*	G Wood	*G Wood*	24/04/2015
3	P Youman	G Wood		G Wood		22/05/2015

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