14 February 2017

Ausrocks Consulting Engineers
17/71 Jijaws St, Sumner Park
QLD 4074

Attention: Carl Morandy

Dear Carl,

RE: PROPOSED CHERRABAH MINE, ELBOW VALLEY TRAFFIC ENGINEERING ASSESSMENT

INTRODUCTION

This report has been prepared by Pekol Traffic and Transport (PTT), as requested by Ausrocks Consulting Engineers, to assess the traffic engineering aspects of a proposed new mining lease application at Cherrabah Resort, located within Lot 1000 on SP268215.

The proposal would incorporate a dimension stone mine with an extraction rate of up to 25,000 tonnes per annum. The mining lease would comprise a total area of 17 hectares.

The site is located approximately 30km south of Warwick and falls within the jurisdiction of Southern Downs Regional Council. The area surrounding the site is classified as rural. The Sibelco Lime Mine is located on O’Deas Road, approximately 4km to the north of the subject site. The location of the subject site is shown in Figure 1 and in more detail in Figure 2.

LOCAL ROAD NETWORK

Access to the subject site is via Keogh Road, which is a local rural road. Keogh Road serves a mix of rural residential and agricultural land uses, and provides direct property access. Keogh Road runs south from a priority controlled T-intersection with O’Deas Road, where it forms the minor approach.

Keogh Road has a sealed pavement width of approximately 5.0m – 6.0m, with narrower sections of 3.5m – 4.0m at regular intervals along its 4km length. At these narrow sections, Keogh Road would operate as a single-lane, two-way road and vehicles travelling in opposite directions would be required to utilise the unpaved shoulder in order to pass. There are currently no centreline or edge markings on Keogh Road.

The posted speed limit varies from 60km/h to 80km/h at the northern end of Keogh Road (in the vicinity of the Sibelco Mine), increasing to a 100 km/h default speed limit further south. However, it is expected that actual speeds along Keogh Road would be less than 100 km/h due to the relatively narrow
carriageway width, the horizontal alignment and available sight distance. There are also advisory speed (60km/h) signs, chevron alignment markers, stop sign ahead and reduce speed signage, which would reduce vehicle speeds, particularly on the southern section of Keogh Road. A typical view of the Keogh Road cross-section is shown in Figure 3.

Figure 1: SITE LOCATION

Traffic surveys (ie seven-day tube counts) undertaken in 2008 found average volumes on Keogh Road as shown in Table 1.

Table 1: ESTIMATED EXISTING TRAFFIC VOLUMES (VEHICLES PER DAY)

<table>
<thead>
<tr>
<th>ROAD SEGMENT / LOCATION</th>
<th>WEEKDAY (VPD)</th>
<th>WEEKEND (VPD)</th>
<th>AADT</th>
<th>%HV</th>
</tr>
</thead>
<tbody>
<tr>
<td>South of O’Deas Road</td>
<td>56</td>
<td>38</td>
<td>51</td>
<td>18%</td>
</tr>
<tr>
<td>Northbound</td>
<td>28</td>
<td>19</td>
<td>26</td>
<td>17%</td>
</tr>
<tr>
<td>Southbound</td>
<td>28</td>
<td>19</td>
<td>26</td>
<td>18%</td>
</tr>
<tr>
<td>At Cherrabah Resort</td>
<td>32</td>
<td>30</td>
<td>31</td>
<td>18%</td>
</tr>
<tr>
<td>Northbound</td>
<td>16</td>
<td>15</td>
<td>16</td>
<td>16%</td>
</tr>
<tr>
<td>Southbound</td>
<td>16</td>
<td>15</td>
<td>15</td>
<td>21%</td>
</tr>
</tbody>
</table>
Figure 2: THE SITE

Figure 3: KEOGH ROAD (LOOKING NORTH)
The formed section of Keogh Road currently terminates at the entrance to Cherrabah Resort, approximately 200m south of the intersection with Hopgoods Road. However, the road reserve continues in a westerly direction along the northern boundary of Lot 1000 on SP268215. The reserve width along the unformed road varies from 40 – 60m.

Keogh Road meets O’Deas Road at a three-arm priority-controlled intersection. The intersection is a “simple” arrangement with no turn treatments. The available sight distance at the O’Deas Road / Keogh Road intersection is good with in excess of 200m safe intersection sight distance (SISD) in both directions, as shown in Figure 4. The available sight distance exceeds the desirable 151m (based on Austroads Guide to Road Design Part 4A: Unsignalised and Signalised Intersections) SISD for a 70km/h design speed (ie a posted speed of 60km/h plus 10km/h).

The Sibelco Lime Mine is located immediately adjacent to the O’Deas Road / Keogh Road intersection and has a number of access points to O’Deas Road. The main access is located approximately 300m east of Keogh Road. In the vicinity of the mine, the posted speed on O’Deas Road is limited to 60km/h with a default speed limit of 100km/h applying elsewhere.

Figure 4: SIGHT DISTANCE AT O’DEAS ROAD / KEOGH ROAD INTERSECTION

O’Deas Road runs in a easterly direction from the intersection with Keogh Road for approximately 3.5km where it meets Cullendore Road. O’Deas Road has a pavement width of approximately 8m, with no centreline or edge markings. This pavement width is sufficient for two trucks to pass each other safely. To the west of Keogh Road, O’Deas Road is unsealed (gravel) and runs for approximately 3.5km to meet Old Standthorpe Road.

A typical view of the O’Deas Road cross-section to the east of the intersection with Keogh Road is shown in Figure 5.

O’Deas Road meets Cullendore Road at a priority controlled T-intersection where it forms the minor approach. Cullendore Road runs south from the Warwick Killarney Road to the Queensland / NSW state border. It has a pavement width of approximately 8m, with centreline markings, but no edge lines. Cullendore Road has a posted speed limit of 100km/h.

The Cullendore Road / O’Deas Road intersection is a “simple” arrangement with no turn treatments on the major road. The sight distance is good to the north, with in excess of 200m SISD available. To the
south, the sight distance is limited by the curvature and the vertical alignment of Cullendore Road. We estimate that the available sight distance to the south to be around 150m.

Figure 5: O’DEAS ROAD (LOOKING EAST)

Warwick Killarney Road runs on an east–west alignment and forms part of the state controlled road network administered by the Department of Transport and Main Roads (DTMR). It generally has a sealed pavement width of 8m comprising 3.5m wide lanes in both directions.

We have obtained 2015 average annual daily traffic (AADT) data from DTMR for the Warwick Killarney Road from a nearby counter site (identification number 50028). This counter site is located approximately 1km to the west of the intersection with Cullendore Road. The data shows that the 2015 AADT volumes on this section of the Warwick Killarney Road were as follows:

- 800 vehicles per day (vpd) travelling in the eastbound direction (with 17% heavy vehicles)
- 820 vpd travelling in the southbound direction (with 12% heavy vehicles)
- 1,620 vpd two-way (with 14% heavy vehicles)
PROPOSED DEVELOPMENT

The proposed mine is expected to extract dimension stone at a base rate of 5,000 tonnes of material per annum, with a future (best-case) maximum extraction rate of 25,000 tonnes of material per annum.

All material would be transported from the mine to Brisbane for export. The proposed haul route includes Keogh Road, O’Deas Road, Cullendore Road and the Warwick Killarney Road through Warwick. The truck types to be used in the haulage of material are expected to be 19m “flat top” semi-trailers with an average net payload of 20 tonnes.

The proposed hours of operation for the mine are Monday to Friday from 7:00am to 6:00pm, excluding public holidays (ie approximately 250 working days per year). Under the base case extraction, up to four staff are likely to be working at the mine site at any particular time, increasing to a maximum of eight staff under the future case.

The proposed mine layout is shown in Figure 6 and is attached to this report.

Figure 6: PROPOSED MINE LAYOUT
Access

Access to the mine site is proposed from Keogh Road utilising the unformed road reserve which runs along the northern boundary of Lot 1000 on SP268215. The mine access road would be constructed as a private road and it is proposed to close the existing road reserve. We understand that an application for a permanent road closure has been lodged with the Department of Natural Resources and Mines.

The mine access road will require a new t-intersection on Keogh Road located immediately to the north of the existing Cherrabah Resort entrance, as shown in Figure 2. In terms of the design of the new intersection, it is recommended that:

- the mine access road forms the minor approach and is stop-sign controlled
- the mine access road meets Keogh Road at a 90-degree angle
- adequate sight distance be provided
- the swept paths of a 19m semi-trailer be accommodated
- Trucks Crossing / Entering Signs (W5-22) be installed on Keogh Road, both to the north and south of the mine access road intersection

Traffic Generation

The traffic generation for the mine has been estimated based on the annual production levels, the hours and days of operation, the average truck capacity and the predicted number of employees, as shown in Table 2.

<table>
<thead>
<tr>
<th>OPERATING DETAILS</th>
<th>BASE PRODUCTION</th>
<th>FUTURE PRODUCTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annual Production</td>
<td>5,000 tonnes/year</td>
<td>25,000 tonnes/year</td>
</tr>
<tr>
<td>Days per year operation</td>
<td>250 operating days/year</td>
<td>250 operating days/year</td>
</tr>
<tr>
<td>Hours per day operation</td>
<td>11 hours/day</td>
<td>11 hours/day</td>
</tr>
<tr>
<td>Average truck payload</td>
<td>20 tonnes/truck</td>
<td>20 tonnes/truck</td>
</tr>
<tr>
<td>Average daily truck numbers</td>
<td>2 two-way truck movements (1 arrivals and 1 departures)</td>
<td>10 two-way truck movements (5 arrivals and 5 departures)</td>
</tr>
<tr>
<td>Average daily staff vehicle movements</td>
<td>8 two-way movements (4 arrivals and 4 departures)</td>
<td>16 two-way movements (8 arrivals and 8 departures)</td>
</tr>
</tbody>
</table>

The predicted increase in daily vehicle movements associated with the mine is estimated to be two truck movements per day (ie one arrival and one departure), with eight light vehicle movements (ie four arrivals and four departures) for the base production level of 5,000 tonnes per annum. In the future case (ie 25,000 tonnes per annum extraction), the increase in traffic is estimated to be 10 truck movements per day (ie five arrivals and five departures), with 16 light vehicle movements (ie eight arrivals and eight departures).

The estimated increase in daily traffic movements on Keogh Road is shown in Table 3. No allowance has been made for background traffic growth on the basis that Keogh Road is a cul-de-sac with limited development opportunities.
However, it is understood that there is an existing approval for 23 rural residential lots within Cherrabah Resort. The typical traffic generation for a residential lot is 8 – 10 vehicle trips per day. However, traffic generation rates for isolated rural residential lots are generally lower than in urban areas due to increased levels of trip-chaining. Therefore, reflecting the location of these lots approximately 30km from Warwick, a daily traffic generation rate of 4 trips per day has been adopted.

Table 3: PREDICTED INCREASE IN TRAFFIC ON KEOGH ROAD

<table>
<thead>
<tr>
<th>DIRECTION</th>
<th>EXISTING AADT</th>
<th>EXISTING HV%</th>
<th>APPROVED SUBDIVISION AADT</th>
<th>APPROVED SUBDIVISION HV%</th>
<th>5,000 T/A PRODUCTION AADT</th>
<th>5,000 T/A PRODUCTION HV%</th>
<th>25,000 T/A PRODUCTION AADT</th>
<th>25,000 T/A PRODUCTION HV%</th>
</tr>
</thead>
<tbody>
<tr>
<td>South of O’Deas Road</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Northbound</td>
<td>26</td>
<td>17%</td>
<td>62</td>
<td>13%</td>
<td>75</td>
<td>14%</td>
<td>81</td>
<td>19%</td>
</tr>
<tr>
<td>Southbound</td>
<td>26</td>
<td>18%</td>
<td>61</td>
<td>14%</td>
<td>75</td>
<td>15%</td>
<td>81</td>
<td>18%</td>
</tr>
<tr>
<td>Two-way</td>
<td>51</td>
<td>18%</td>
<td>123</td>
<td>14%</td>
<td>150</td>
<td>14%</td>
<td>162</td>
<td>19%</td>
</tr>
<tr>
<td>At Cherrabah Resort</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Northbound</td>
<td>16</td>
<td>16%</td>
<td>72</td>
<td>12%</td>
<td>65</td>
<td>13%</td>
<td>71</td>
<td>19%</td>
</tr>
<tr>
<td>Southbound</td>
<td>15</td>
<td>21%</td>
<td>72</td>
<td>14%</td>
<td>65</td>
<td>15%</td>
<td>71</td>
<td>22%</td>
</tr>
<tr>
<td>Two-way</td>
<td>31</td>
<td>18%</td>
<td>143</td>
<td>13%</td>
<td>130</td>
<td>14%</td>
<td>142</td>
<td>21%</td>
</tr>
</tbody>
</table>

IMPACT ON THE LOCAL ROAD NETWORK

The Austroads Guide to Road Design Part 3: Geometric Design – Table 4.5 recommends design cross sections for rural roads based on average annual daily traffic (AADT) volumes. These geometric requirements are summarised in Table 4.

Table 4: SINGLE CARRIAGEWAY RURAL ROAD WIDTHS (SOURCE: AUSTROADS)

<table>
<thead>
<tr>
<th>ELEMENT</th>
<th>1 – 150</th>
<th>150 – 500</th>
<th>500 – 1000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Traffic Lanes (m) (Total)</td>
<td>1 x 3.7</td>
<td>2 x 3.1</td>
<td>2 x 3.1 to 3.5</td>
</tr>
<tr>
<td>Shoulder (m)</td>
<td>2.5</td>
<td>1.5</td>
<td>1.5</td>
</tr>
<tr>
<td>Minimum shoulder seal (m)</td>
<td>0</td>
<td>0.5</td>
<td>0.5</td>
</tr>
<tr>
<td>Total Carriageway (m)</td>
<td>8.7</td>
<td>9.2</td>
<td>9.2 – 10.0</td>
</tr>
</tbody>
</table>
Table 4 above shows that where traffic volumes are less than 150 vehicles per day, single lane (ie 3.7m wide) carriageways may be used, particularly where the terrain is open and the sight distance is good. Therefore, based on the predicted background flows on Keogh Road and the level of base case extraction traffic, the existing pavement width (ie 4.0 – 6.0m) is sufficient for the expected traffic volumes and no additional pavement widening is considered to be warranted.

However, once extraction exceeds 5,000 tonnes per annum, traffic flows on Keogh Road would be predicted to exceed the maximum volume for a single lane carriageway. Typically, the total sealed width of a two-lane carriageway should be 7.2m to allow adequate width for passing. Currently none of Keogh Road would meet this standard and it is not considered reasonable for this development to bear the cost of upgrading the entire 4km length. Therefore, it is recommended that widening to a 7.2m wide sealed pavement be provided only at those locations where the horizontal or vertical road alignment limits available sight distance.

DTMR recommends that twice the stopping sight distance (ie 1.15m to 1.15m) be provided on low volume rural roads with no line marking. Based on the observed speeds, sight distances along Keogh Road would need to be in the range of 115m to 170m. Based on our review of the horizontal and vertical alignment of Keogh Road, we would recommend that widening be provided at the location shown in Figure 7. Table 5 describes the limitation at each location.

Figure 7: RECOMMENDED WIDENING LOCATIONS

The existing pavement width of O’Deas Road, Cullendore Road and Warwick Killarney Road at around 8m is sufficient to allow two trucks to pass safely. These roads already carry significant levels of heavy vehicle traffic from the Sibelco Lime Mine and other heavy industry in the local area. Therefore, it is
expected that these roads can comfortably accommodate the additional traffic generated by this development.

**Table 5: DESCRIPTION OF GEOMETRY DEFICIENCIES**

<table>
<thead>
<tr>
<th>LOCATION</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Horizontal curve located on a crest 50m north of Cherrabah Resort entrance Pavement 5.0m wide</td>
</tr>
<tr>
<td>B</td>
<td>Horizontal curve on crest adjacent to Hopgoods Road, 300m north of Cherrabah Resort entrance Pavement 5.0m wide</td>
</tr>
<tr>
<td>C</td>
<td>Horizontal curve with vertical crest 1.5km north of Cherrabah Resort entrance and 2.5km south of O’Deas Road intersection Pavement 5.0m wide</td>
</tr>
<tr>
<td>D</td>
<td>Vertical crest 2km south of O’Deas Road intersection Pavement 5.0m wide</td>
</tr>
<tr>
<td>E</td>
<td>Horizontal curve located approximately 1km south of O’Deas Road intersection Pavement 5.0m wide</td>
</tr>
</tbody>
</table>

**CONCLUSIONS & RECOMMENDATIONS**

**Conclusions**

This report has assessed the traffic engineering aspects of a proposed dimension stone mining lease application at Cherrabah Resort. The main points to note are:

- the proposed mine would be expected to extract dimension stone at a base rate of 5,000 tonnes per annum, with a future (best-case) maximum extraction rate of 25,000 tonnes per annum
- all material would be transported to Brisbane (for export) via Keogh Road, O’Deas Road, Cullendore Road then Warwick Killarney Road through Warwick
- the truck types to be used in the haulage of material are expected to be using 19m “flat top” semi-trailers with an average net payload of 20 tonnes
- the mine would be accessed from Keogh Road, utilising the existing unformed road reserve
- mine access road would be constructed as a private road and it is proposed apply to close the existing road reserve
- the mine access road will require a new t-intersection on Keogh Road located immediately to the north of the existing Cherrabah Resort entrance
- the predicted mine traffic generation is estimated to be as follows:
  - base rate (5,000 tonnes per annum): two truck movements per day (one arrival and one departure), with eight light vehicle movements (ie four arrivals and four departures)
  - future rate (25,000 tonnes per annum): 10 truck movements per day (ie five arrivals and five departures), with 16 light vehicle movements (ie eight arrivals and eight departures)
at the base level of extraction (ie 5,000 tonnes per annum), the existing Keogh Road pavement width (ie 4.0 – 6.0m) is sufficient for the expected traffic volumes and no additional pavement widening is considered to be warranted

- once extraction exceeds 5,000 tonnes per annum, traffic flows on Keogh Road would be predicted to exceed the maximum volume for a single lane carriageway
- the existing pavement width of O’Deas Road, Cullendore Road and Warwick Killarney Road at around 8m is sufficient to allow two trucks to pass safely

**Recommendations**

Based on our analysis it is recommended that:

- the design of the new Keogh Road / mine access road intersection be based on the following:
  - the mine access road forms the minor approach and is stop-sign controlled
  - the mine access road meets Keogh Road at a 90-degree angle
  - adequate sight distance be provided
  - the swept paths of a 19m semi-trailer be accommodated
  - Trucks Crossing / Entering Signs (W5-22) be installed on Keogh Road, both to the north and south of the mine access road intersection

- once mine extraction exceeds 5,000 tonnes per annum, widen Keogh Road to a 7.2m wide sealed at the locations indicated in Figure 7

If you have any questions regarding the issues discussed above, please do not hesitate to contact us.

Yours sincerely,

Adam Pekol
Director (RPEQ 5286)