



### **Cowl Gold Project – Addendum to the Transport of Hazardous Materials Study**

On 7 February 2017 the Cowl Gold Project's (the Project) Development Consent (DA 14/98) was modified to reflect approval of the Mine Life Modification. The Mine Life Modification involves an extension of the Project's operational mine life for an additional eight years (i.e. to end 2032) and upgrades to the existing leach circuit within the process plant (among other things).

As a result of operation of the upgraded leach circuit, the approved Project involves an increase in the consumption of caustic soda and therefore an increase in heavy vehicle deliveries of caustic soda to the Project. Accordingly, this Addendum to the Transport of Hazardous Materials Study (THMS) has been prepared to reflect the approved increase in the volume of caustic soda that will be transported to the Project.

Additionally, the current suppliers for caustic soda have changed the location of the depot for caustic soda to be located at the Botany Industrial Park in Matraville, Sydney, no change to the approved transport route for caustic soda to the Project described in the THMS is necessary.

COWAL GOLD PROJECT  
ADDENDUM TO THE TRANSPORT OF HAZARDOUS MATERIALS STUDY



JULY 2018  
Document No. 919397

1. Replace reference to Orica Chlor-Alkali Plant with Ixom Botany Chlor-Alkali Plant in Section 4.3, Caustic Soda Road Transport Route Evaluation and Attachments 3A to 3D.
2. Replace Table 2 in Attachment 3A with:

**Table 2**  
**Transport Details**

Hazardous Material	Delivery Vehicle	Maximum Volume per Delivery	Maximum Frequency of Deliveries	Transported State	Packaging
Caustic Soda	Single semi-trailer	16,500 L	3 per week	Liquid	Bulk tanker

3. Replace Section 3A6.1.1 of Attachment 3A with:

Available accident statistics for Routes 1A and 1B were obtained from the Roads and maritime Services (formerly the RTA) and are summarised in Table 9a.

**Table 9a**  
**Summary of Accident Statistics**

Route	Length (km)	No. of Heavy Vehicles (per day) <sup>1</sup>	% Increase of Heavy Vehicles due to Project <sup>4</sup>	Heavy Vehicle Accidents (per year) <sup>5</sup>	Annual Million km of Heavy Vehicle Travel	Heavy Vehicle Accidents/Annual Million km of Heavy Vehicle Travel
1A	39.3	362 <sup>2</sup> – 12,489 <sup>3</sup>	0.009% – 0.3%	58.4	5.20 – 179.14	0.33 – 11.23
1B	38.5	362 <sup>2</sup> – 12,489 <sup>3</sup>	0.009% – 0.3%	57.2	5.09 – 175.50	0.33 – 11.23

<sup>1</sup> Roads and Maritime Services Traffic Volume Viewer (retrieved 23 May 2018).

<sup>2</sup> Assumes 10% of all vehicles are heavy vehicles.

<sup>3</sup> 2018 values extrapolated from previous years assuming 1% annual growth rate.

<sup>4</sup> Assumes 6 truck movements per week.

<sup>5</sup> Roads and Maritime Services Crash Report Data (1 Jan 2012 to 21 Dec 2016).

Accident statistics for Routes 1A and 1B are considered to be within normal operating levels for the road types and use. The increase of heavy vehicles due to the Project would be very small (up to approximately 0.3%) and would be unlikely to affect traffic flows or accident statistics. Routes 1A and 1B are therefore suitable for the transport of hazardous materials with respect to accident statistics. Accident statistics for Routes 1A and 1B are compared in Table 12, Section 3A6.4.4.

4. Replace Section 3A6.4.3 of Attachment 3A with:

Accident data for heavy vehicles utilising Routes 1A and 1B are detailed in Section 3A6.1.1 and Table 9a. Approximately 58 accidents per year involving heavy vehicles occur for Routes 1A and 1B.

In the event of an accident involving a heavy vehicle, the carried goods may or may not be released. The probability of release is dependent on factors such as speed, shipping conditions (i.e. pressurised compared to non-pressurised), inadequate load securing, and strength and integrity of the container. Various studies of release probabilities from heavy vehicles involved in an accident have been undertaken. The *Guidelines for Chemical Transportation Risk Analysis* (CCPS, 1995) indicates that the release probability for various road types is between 5 and 10% (i.e. approximately one heavy vehicle accident in every 10 to 20 will result in a release of the material).

An estimation of the likelihood of an accident involving a vehicle transporting caustic soda to the Project resulting in a release of the material must take into account the following:

- the number of vehicles transporting caustic soda to the Project relative to the total number of heavy vehicles already using the same transport route;
- the number of accidents that have involved heavy vehicles; and

- the probability of a release of the material (which is assumed to be 10% of all accidents involving heavy vehicles results in a release of material) (CCPS, 1995).

The likelihood of an accident (based on averaged accident data) involving a vehicle transporting caustic soda to the Project resulting in a release of the material for Routes 1A and 1B is estimated to be approximately  $4 \times 10^{-4}$ /year (i.e. such an incident is estimated to occur on Routes 1A and 1B once every 2,500 years) (Pinnacle Risk Management Pty Ltd, 2018).

The risk of the event is determined using the risk matrix in Table 9b and the consequence ratings in Table 9c (Pinnacle Risk Management Pty Ltd, 2018).

**Table 9b  
Risk Matrix**

Likelihood						
Frequent >1/yr	II	II	I	I	I	I
Probable > $10^{-1}$ to 1/yr	III	II	II	I	I	I
Possible > $10^{-2}$ to $10^{-1}$ /yr	III	III	II	II	I	I
Unlikely > $10^{-4}$ to > $10^{-2}$ /yr	III	III	III	III	II	I
Very Unlikely > $10^{-6}$ to $10^{-4}$ /yr	III	III	III	III	III	II
Extremely Unlikely $\leq 10^{-6}$ /yr	III	III	III	III	III	III
Consequence	Minor	Significant	Severe	Serious	Extremely Serious	Catastrophic

Source: Pinnacle Risk Management Pty Ltd (2011; 2018)

Class I: Indicates a high level of risk which is intolerable and where risk reduction is required. This requires the reduction of frequency and/or consequence.

Class II: Indicates a moderate level of risk. Whilst the risk is not unacceptable, there should be practical measures taken to lower the risk if economically viable. For risks where further mitigation is not economically viable, judgement needs to be exercised as to whether the level of risk is acceptable or not. This area is the beginning of the ALARP region (i.e. as low as reasonably practicable).

Class III: indicates a low level of risk and is broadly considered to be acceptable. Further risk mitigation may not be required / appropriate. However, low and accepted risks should be monitored and routinely reviewed to ensure that they remain acceptable. Few risks remain static. This area includes ALARP as well as what are known as trivial or negligible risks.

**Table 9c  
Consequence Ratings**

	Minor	Significant	Severe	Serious	Extremely Serious	Catastrophic
<b>Safety and Health</b>	One minor injury, First Aid	Recordable or single Medical Treatment Injury	Multiple Medical Treatment Injuries or one Lost Time Injury	Permanent disability casualty or multiple Lost Time Injuries	Multiple permanent disabilities or one fatality	Multiple fatalities

**Table 9c (Continued)  
Consequence Ratings**

	Minor	Significant	Severe	Serious	Extremely Serious	Catastrophic
<b>Environment</b>	Very minor pollution. No offsite escape of material (contained within the operational areas). Onsite nuisance value only	Minor local pollution. Nuisance offsite effect, typically of short duration, e.g. noise, odours, dust and/or visible plumes for less than one hour	Evident pollution, local concern. Minimal duration offsite effects (e.g. waterway slightly discoloured, turbid etc around the point of release with no or very few fish killed)	Significant local pollution. For example, waterways discoloured 10s of metres, fire or smoke affecting people near to the site	Major local pollution. Observable offsite effect (e.g. waterways discoloured 10s to 100s of metres for a few weeks with a significant number of aquatic life adversely affected)	Extremely severe pollution. Ecosystems at high risk of destruction. Only resolved via long term solutions (potentially taking years)
<b>Public Relations</b>	Minor issue, one complaint	Local issue, 10 complaints	Local media, 100 complaints	Regional or state media	Wide media national coverage	Headlines, corporate damage
<b>Financial Impact</b>	< \$25,000	\$25,000 to \$100,000	> \$100,000 to \$1 million	> \$1 million to \$20 million	> \$20 million to \$100 million	> \$100 million

Source: Pinnacle Risk Management Pty Ltd (2011; 2018)

For releases of caustic soda from a road traffic accident, the consequence rating is determined to be “Serious” (Pinnacle Risk Management Pty Ltd, 2018). The volume is limited to the size of the tanker (i.e. 40 tonnes) and it is possible that only one of the two barrels is breached (Pinnacle Risk Management Pty Ltd, 2018).

Given a likelihood of  $4 \times 10^{-4}$ /year and consequence rating of “Serious”, the corresponding risk level is Class III (Pinnacle Risk Management Pty Ltd, 2018). These values indicate a low level of risk associated with the transport of hazardous materials (Pinnacle Risk Management Pty Ltd, 2018).

**5. Replace Table 11 of Attachment 3A with:**

**Table 11  
Summary of Risk Analysis Assessment Factors**

Assessment Factor	Route 1A	Route 1B
Schools	18	18
Number of School Students	9,451	9,451
Hospitals	0	0
Number of Hospital Beds	0	0
Aged Care Facilities	5	5
Churches	14	14
Items of Heritage or Cultural Significance	109	113
Other Landuse	#	#
Number of Park Reservations	43	42
Park Reservations – Approximate Total Road Frontage (m)	8,180	8,130
Waterways	27	27
Emergency Infrastructure	Adequate	Adequate
RMS and Transporter Preferred Route	RMS preferred route	Transporter preferred route
Length (km)	39.3	38.5

**Table 11 (Continued)  
Summary of Risk Analysis Assessment Factors**

Assessment Factor	Route 1A	Route 1B
No. of Heavy Vehicles (per day) <sup>1</sup>	362 <sup>2</sup> – 12,489 <sup>3</sup>	362 <sup>2</sup> – 12,489 <sup>3</sup>
% Increase of Heavy Vehicles due to Project <sup>4</sup>	0.009% – 0.3%	0.009% – 0.3%
Heavy Vehicle Accidents (per year) <sup>5</sup>	58.4	57.2
Annual Million km of Heavy Vehicle Travel	5.20 – 179.14	5.09 – 175.50
Heavy Vehicle Accidents/Annual Million km of Heavy Vehicle Travel	0.33 – 11.23	0.33 – 11.23
Availability of Alternative Emergency Routes	Available	Available
Emergency Response Capability	Adequate	Adequate
Operational Factors	Cost effective	Cost effective

<sup>1</sup> Roads and Maritime Services Traffic Volume Viewer (retrieved 23 May 2018).

<sup>2</sup> Assumes 10% of all vehicles are heavy vehicles.

<sup>3</sup> 2018 values extrapolated from previous years assuming 1% annual growth rate.

<sup>4</sup> Assumes 6 truck movements per week.

<sup>5</sup> Roads and Maritime Services Crash Report Data (1 Jan 2012 to 21 Dec 2016).

# There is little difference in the type of landuse along each potential route, therefore this factor was not used to compare Routes 1A and 1B. Further information is provided in Section 3A4.3.1.

RMS Roads and Maritime Services.

**6. Replace footnote 1 on Table 12 of Attachment 3A with:**

- Roads and Maritime Services Crash Report Data (1 Jan 2012 to 21 Dec 2016).

**7. Replace the final two paragraphs in Section 3A6.4.4 with:**

There are no defined absolute risk criteria for the transport of hazardous materials throughout NSW, therefore the assessment of risk results is a balanced judgement based on experience in accordance with HIPAP No. 6. Overall, the net increase in the number of heavy vehicles due to the transport of this material would be up to approximately 0.3% (i.e. a minor impact on existing traffic volume). Therefore, there would be only a minor increase in transport risk when compared to existing risk levels.

From a risk perspective, the results detailed in Tables 11 and 12 show little difference in the level of risk associated with Routes 1A and 1B. In addition, these results deem both potential routes to pose a minimal to acceptable level of risk to surrounding people, property and the natural environment. Therefore, there is insufficient difference in the results of the risk analysis to recommend a preferred route. Routes 1A and 1B are therefore equally suitable for the transport of hazardous materials from a comparative risk perspective.

**8. Replace Table 2 of Attachment 3B with:**

**Table 2  
Transport Details**

Hazardous Material	Delivery Vehicle	Maximum Volume per Delivery	Maximum Frequency of Deliveries	Transported State	Packaging
Caustic Soda	Single semi-trailer	16,500 L	3 per week	Liquid	Bulk tanker

**9. Replace Section 3B6.1.1 of Attachment 3B with:**

Available accident statistics for Route 2A were obtained from the RMS and are summarised in Table 7a.

**Table 7a  
Summary of Accident Statistics**

Route	Length (km)	No. of Heavy Vehicles (per day) <sup>1</sup>	% Increase of Heavy Vehicles due to Project <sup>4</sup>	Heavy Vehicle Accidents (per year) <sup>5</sup>	Annual Million km of Heavy Vehicle Travel	Heavy Vehicle Accidents/Annual Million km of Heavy Vehicle Travel
2A	381.5	166 <sup>2</sup> – 7,028 <sup>2,3</sup>	0.01% – 0.7%	61.8	23.07 – 978.57	0.06 – 2.68

<sup>1</sup> Roads and Maritime Services Traffic Volume Viewer (retrieved 23 May 2018).

<sup>2</sup> 2018 values extrapolated from previous years assuming 1% annual growth rate.

<sup>3</sup> Only one-way traffic count available. Assumed equal HV counts for both traffic direction.

<sup>4</sup> Assumes 6 truck movement per week.

<sup>5</sup> Roads and Maritime Services Crash Report Data (1 Jan 2012 to 21 Dec 2016).

Accident statistics for Route 2A are considered to be within normal operating levels for the road type and use. The increase of heavy vehicles due to the Project would be very small (up to approximately 0.7%) and would be unlikely to affect traffic flows or accident statistics. Route 2A is therefore suitable for the transport of hazardous materials with respect to accident statistics.

#### 10. Replace Section 3B6.4.3 of Attachment 3B with:

Accident data for heavy vehicles utilising Route 2A are detailed in Section 3B6.1.1 and Table 7. Approximately 62 accidents per year involving heavy vehicles occur on Route 2A.

In the event of an accident involving a heavy vehicle, the carried goods may or may not be released. The probability of release is dependent on factors such as speed, shipping conditions (i.e. pressurised compared to non-pressurised), inadequate load securing, and strength and integrity of the container.

Various studies of release probabilities from heavy vehicles involved in an accident have been undertaken. The *Guidelines for Chemical Transportation Risk Analysis* (CCPS, 1995) indicates that the release probability for various road types is between 5 and 10% (i.e. approximately one heavy vehicle accident in every 10 to 20 will result in a release of the material).

An estimation of the likelihood of an accident involving a vehicle transporting caustic soda to the Project resulting in a release of the material must take into account the following:

- the number of vehicles transporting caustic soda to the Project relative to the total number of heavy vehicles already using the same transport route;
- the number of accidents that have involved heavy vehicles; and
- the probability of a release of the material (which is assumed to be 10% of all accidents involving heavy vehicles results in a release of material) (CCPS, 1995).

The likelihood of an accident (based on averaged accident data) involving a vehicle transporting caustic soda to the Project resulting in a release of the material for Route 2A is estimated to be  $7 \times 10^{-4}$ /year (i.e. such an incident is estimated to occur on Route 2A once every 1,357 years) (Pinnacle Risk Management Pty Ltd, 2018).

The risk of the event is determined using the risk matrix in Table 7c and the consequence ratings in Table 7b (Pinnacle Risk Management Pty Ltd, 2018).

**Table 7b  
Risk Matrix**

Likelihood						
Frequent >1/yr	II	II	I	I	I	I
Probable >10 <sup>-1</sup> to 1/yr	III	II	II	I	I	I
Possible >10 <sup>-2</sup> to 10 <sup>-1</sup> /yr	III	III	II	II	I	I
Unlikely >10 <sup>-4</sup> to >10 <sup>-2</sup> /yr	III	III	III	III	II	I
Very Unlikely >10 <sup>-6</sup> to 10 <sup>-4</sup> /yr	III	III	III	III	III	II
Extremely Unlikely <=10 <sup>-6</sup> /yr	III	III	III	III	III	III
<b>Consequence</b>	Minor	Significant	Severe	Serious	Extremely Serious	Catastrophic

Source: Pinnacle Risk Management Pty Ltd (2011; 2018)

Class I: Indicates a high level of risk which is intolerable and where risk reduction is required. This requires the reduction of frequency and/or consequence.

Class II: Indicates a moderate level of risk. Whilst the risk is not unacceptable, there should be practical measures taken to lower the risk if economically viable. For risks where further mitigation is not economically viable, judgement needs to be exercised as to whether the level of risk is acceptable or not. This area is the beginning of the ALARP region (i.e. as low as reasonably practicable).

Class III: indicates a low level of risk and is broadly considered to be acceptable. Further risk mitigation may not be required / appropriate. However, low and accepted risks should be monitored and routinely reviewed to ensure that they remain acceptable. Few risks remain static. This area includes ALARP as well as what are known as trivial or negligible risks.

**Table 7c  
Consequence Ratings**

	Minor	Significant	Severe	Serious	Extremely Serious	Catastrophic
<b>Safety and Health</b>	One minor injury, First Aid	Recordable or single Medical Treatment Injury	Multiple Medical Treatment Injuries or one Lost Time Injury	Permanent disability casualty or multiple Lost Time Injuries	Multiple permanent disabilities or one fatality	Multiple fatalities
<b>Environment</b>	Very minor pollution. No offsite escape of material (contained within the operational areas). Onsite nuisance value only	Minor local pollution. Nuisance offsite effect, typically of short duration, e.g. noise, odours, dust and/or visible plumes for less than one hour	Evident pollution, local concern. Minimal duration offsite effects (e.g. waterway slightly discoloured, turbid etc around the point of release with no or very few fish killed)	Significant local pollution. For example, waterways discoloured 10s of metres, fire or smoke affecting people near to the site	Major local pollution. Observable offsite effect (e.g. waterways discoloured 10s to 100s of metres for a few weeks with a significant number of aquatic life adversely affected)	Extremely severe pollution. Ecosystems at high risk of destruction. Only resolved via long term solutions (potentially taking years)
<b>Public Relations</b>	Minor issue, one complaint	Local issue, 10 complaints	Local media, 100 complaints	Regional or state media	Wide media national coverage	Headlines, corporate damage
<b>Financial Impact</b>	< \$25,000	\$25,000 to \$100,000	> \$100,000 to \$1 million	> \$1 million to \$20 million	> \$20 million to \$100 million	> \$100 million

Source: Pinnacle Risk Management Pty Ltd (2011; 2018)

For releases of caustic soda from a road traffic accident, the consequence rating is determined to be “Serious” (Pinnacle Risk Management Pty Ltd, 2018). The volume is limited to the size of the tanker (i.e. 40 tonnes) and it is possible that only one of the two barrels is breached (Pinnacle Risk Management Pty Ltd, 2018).

Given a likelihood of  $7 \times 10^{-4}$ /year and consequence rating of “Serious”, the corresponding risk level is Class III (Pinnacle Risk Management Pty Ltd, 2018). These values indicate a low level of risk associated with the transport of hazardous materials (Pinnacle Risk Management Pty Ltd, 2018).

**11. Replace Table 9 of Attachment 3B with:**

**Table 9  
Summary of Risk Analysis Assessment Factors**

Assessment Factor	Route 2A
Schools	#
Number of School Students	#
Hospitals	#
Number of Hospital Beds	#
Aged Care Facilities	#
Churches	#
Items of Heritage or Cultural Significance	#
Other Landuse	#
Number of Park Reservations	4
Park Reservations – Approximate Total Road Frontage (m)	8,125
Waterways	9
Emergency Infrastructure	Adequate
RMS and Transporter Preferred Route	RMS and Transporter preferred route
Length (km)	381.5
No. of Heavy Vehicles (per day) <sup>1</sup>	166 <sup>2</sup> – 7,028 <sup>2,3</sup>
% Increase of Heavy Vehicles due to Project <sup>4</sup>	0.01% – 0.7%
Heavy Vehicle Accidents (per year) <sup>5</sup>	61.8
Annual Million km of Heavy Vehicle Travel	23.07 – 978.57
Heavy Vehicle Accidents/Annual Million km of Heavy Vehicle Travel	0.06 – 2.68
Availability of Alternative Emergency Routes	Available
Emergency Response Capability	Adequate
Operational Factors	Cost effective

<sup>1</sup> Roads and Maritime Services Traffic Volume Viewer (retrieved 23 May 2018).

<sup>2</sup> 2018 values extrapolated from previous years assuming 1% annual growth rate.

<sup>3</sup> Only one-way traffic count available. Assumed equal HV counts for both traffic direction.

<sup>4</sup> Assumes 6 truck movement per week.

<sup>5</sup> Roads and Maritime Services Crash Report Data (1 Jan 2012 to 21 Dec 2016).

# Sensitive landuses along Route 2A are relatively uncommon and do not preclude this route from the route evaluation. Further information is provided in Section 3B4.3.1.

RMS Roads and Maritime Services.

**12. Replace the final paragraph in Section 3B6.4.4 with:**

There are no defined absolute risk criteria for the transport of hazardous materials throughout NSW, therefore the assessment of risk results is a balanced judgement based on experience in accordance with HIPAP No. 6. Overall, the net increase in the number of heavy vehicles due to the transport of this material would be up to approximately 0.7% (i.e. a minor impact on existing traffic volume). Therefore, there would be only a minor increase in transport risk when compared to existing risk levels. From a risk perspective, the results detailed in Tables 9 and 10 deem Route 2A to pose a minimal level of risk to surrounding people, property and the natural environment. This route is therefore suitable for the transport of hazardous materials to the Project.

**13. Replace Table 2 of Attachment 3C with:****Table 2  
Transport Details**

Hazardous Material	Delivery Vehicle	Maximum Volume per Delivery	Maximum Frequency of Deliveries	Transported State	Packaging
Caustic Soda	Single semi-trailer	16,500 L	3 per week	Liquid	Bulk tanker

**14. Replace Section 3C6.1.1 of Attachment 3C with:**

Available accident statistics for Routes 3A and 3B were obtained from the RMS and are summarised in Table 8a.

**Table 8a  
Summary of Accident Statistics**

Route	Length (km)	No. of Heavy Vehicles (per day) <sup>1</sup>	% Increase of Heavy Vehicles due to Project <sup>4</sup>	Heavy Vehicle Accidents (per year) <sup>5</sup>	Annual Million km of Heavy Vehicle Travel	Heavy Vehicle Accidents/Annual Million km of Heavy Vehicle Travel
3A	97	170 <sup>2,3</sup> – 505 <sup>3</sup>	0.2% – 0.7%	2.25	6.02 – 17.87	0.13 – 0.37
3B	77	159 <sup>2,3</sup> – 903 <sup>2,3</sup>	0.1% – 0.7%	3.25	4.47 – 25.37	0.13 – 0.73

<sup>1</sup> Roads and Maritime Services Traffic Volume Viewer (retrieved 23 May 2018).

<sup>2</sup> Assumes 10% of all vehicles are heavy vehicles.

<sup>3</sup> 2018 values extrapolated from previous years assuming 1% annual growth rate.

<sup>4</sup> Assumes 6 truck movement per week.

<sup>5</sup> Roads and Maritime Services Crash Report Data (1 Jan 2012 to 21 Dec 2016).

Accident statistics for Routes 3A and 3B are considered to be within normal operating levels for the road types and use. The increase of heavy vehicles due to the Project would be very small (up to approximately 0.7%) and would be unlikely to affect traffic flows or accident statistics. Routes 3A and 3B are therefore suitable for the transport of hazardous materials with respect to accident statistics. Accident statistics for Routes 3A and 3B are compared in Table 11, Section 3C6.4.4.

**15. Replace Section 3C6.4.3 of Attachment 3C with:**

Accident data for heavy vehicles utilising Routes 3A and 3B are detailed in Section 3C6.1.1 and Table 8a. Approximately 2 accidents per year involving heavy vehicles occur for Route 3A and 3 accidents per year involving heavy vehicles occur for Route 3B.

In the event of an accident involving a heavy vehicle, the carried goods may or may not be released. The probability of release is dependent on factors such as speed, shipping conditions (i.e. pressurised compared to non-pressurised), inadequate load securing, and strength and integrity of the container.

Various studies of release probabilities from heavy vehicles involved in an accident have been undertaken. The *Guidelines for Chemical Transportation Risk Analysis* (CCPS, 1995) indicates that the release probability for various road types is between 5 and 10% (i.e. approximately one heavy vehicle accident in every 10 to 20 will result in a release of the material).

An estimation of the likelihood of an accident involving a vehicle transporting caustic soda to the Project resulting in a release of the material must take into account the following:

- the number of vehicles transporting caustic soda to the Project relative to the total number of heavy vehicles already using the same transport route;
- the number of accidents that have involved heavy vehicles; and

- the probability of a release of the material (which is assumed to be 10% of all accidents involving heavy vehicles results in a release of material) (CCPS, 1995).

The likelihood of an accident (based on averaged accident data) involving a vehicle transporting caustic soda to the Project resulting in a release of the material for Routes 3A and 3B is estimated to be approximately  $2 \times 10^{-4}$ /year (i.e. such an incident is estimated to occur on Routes 3A and 3B once every 4,000 years) (Pinnacle Risk Management Pty Ltd, 2018).

The risk of the event is determined using the risk matrix in Table 8b and the consequence ratings in Table 8c (Pinnacle Risk Management Pty Ltd, 2018).

**Table 8b  
Risk Matrix**

Likelihood						
Frequent >1/yr	II	II	I	I	I	I
Probable > $10^{-1}$ to 1/yr	III	II	II	I	I	I
Possible > $10^{-2}$ to $10^{-1}$ /yr	III	III	II	II	I	I
Unlikely > $10^{-4}$ to > $10^{-2}$ /yr	III	III	III	III	II	I
Very Unlikely > $10^{-6}$ to $10^{-4}$ /yr	III	III	III	III	III	II
Extremely Unlikely <= $10^{-6}$ /yr	III	III	III	III	III	III
Consequence	Minor	Significant	Severe	Serious	Extremely Serious	Catastrophic

Source: Pinnacle Risk Management Pty Ltd (2011; 2018)

Class I: Indicates a high level of risk which is intolerable and where risk reduction is required. This requires the reduction of frequency and/or consequence.

Class II: Indicates a moderate level of risk. Whilst the risk is not unacceptable, there should be practical measures taken to lower the risk if economically viable. For risks where further mitigation is not economically viable, judgement needs to be exercised as to whether the level of risk is acceptable or not. This area is the beginning of the ALARP region (i.e. as low as reasonably practicable).

Class III: indicates a low level of risk and is broadly considered to be acceptable. Further risk mitigation may not be required / appropriate. However, low and accepted risks should be monitored and routinely reviewed to ensure that they remain acceptable. Few risks remain static. This area includes ALARP as well as what are known as trivial or negligible risks.

**Table 8c  
Consequence Ratings**

	Minor	Significant	Severe	Serious	Extremely Serious	Catastrophic
<b>Safety and Health</b>	One minor injury, First Aid	Recordable or single Medical Treatment Injury	Multiple Medical Treatment Injuries or one Lost Time Injury	Permanent disability casualty or multiple Lost Time Injuries	Multiple permanent disabilities or one fatality	Multiple fatalities

**Table 8c (Continued)  
Consequence Ratings**

	Minor	Significant	Severe	Serious	Extremely Serious	Catastrophic
<b>Environment</b>	Very minor pollution. No offsite escape of material (contained within the operational areas). Onsite nuisance value only	Minor local pollution. Nuisance offsite effect, typically of short duration, e.g. noise, odours, dust and/or visible plumes for less than one hour	Evident pollution, local concern. Minimal duration offsite effects (e.g. waterway slightly discoloured, turbid etc around the point of release with no or very few fish killed)	Significant local pollution. For example, waterways discoloured 10s of metres, fire or smoke affecting people near to the site	Major local pollution. Observable offsite effect (e.g. waterways discoloured 10s to 100s of metres for a few weeks with a significant number of aquatic life adversely affected)	Extremely severe pollution. Ecosystems at high risk of destruction. Only resolved via long term solutions (potentially taking years)
<b>Public Relations</b>	Minor issue, one complaint	Local issue, 10 complaints	Local media, 100 complaints	Regional or state media	Wide media national coverage	Headlines, corporate damage
<b>Financial Impact</b>	< \$25,000	\$25,000 to \$100,000	> \$100,000 to \$1 million	> \$1 million to \$20 million	> \$20 million to \$100 million	> \$100 million

Source: Pinnacle Risk Management Pty Ltd (2011; 2018)

For releases of caustic soda from a road traffic accident, the consequence rating is determined to be “Serious” (Pinnacle Risk Management Pty Ltd, 2018). The volume is limited to the size of the tanker, i.e. 40 tonnes, and it is possible that only one of the two barrels is breached (Pinnacle Risk Management Pty Ltd, 2018).

Given a likelihood of  $2 \times 10^{-4}$ /year and consequence rating of “Serious”, the corresponding risk level is Class III (Pinnacle Risk Management Pty Ltd, 2018). These values indicate a low level of risk associated with the transport of hazardous materials (Pinnacle Risk Management Pty Ltd, 2018).

**16. Replace Table 10 of Attachment 3C with:**

**Table 10  
Summary of Risk Analysis Assessment Factors**

Assessment Factor	Route 3A	Route 3B
Schools	#	#
Number of School Students	#	#
Hospitals	#	#
Number of Hospital Beds	#	#
Aged Care Facilities	#	#
Churches	#	#
Items of Heritage or Cultural Significance	#	#
Other Landuse	#	#
Number of Park Reservations	1	1
Park Reservations – Approximate Total Road Frontage (m)	500	3,100
Waterways	42	20
Emergency Infrastructure	Adequate	Adequate

**Table 10 (Continued)**  
**Summary of Risk Analysis Assessment Factors**

Assessment Factor	Route 3A	Route 3B
RMS and Transporter Preferred Route	RMS preferred route	Transporter preferred route
Length (km)	97	77
No. of Heavy Vehicles (per day) <sup>1</sup>	170 <sup>2,3</sup> – 505 <sup>3</sup>	159 <sup>2,3</sup> – 903 <sup>2,3</sup>
% Increase of Heavy Vehicles due to Project <sup>2</sup>	0.2% – 0.7%	0.1% – 0.7%
Heavy Vehicle Accidents (per year) <sup>3</sup>	2.25	3.25
Annual Million km of Heavy Vehicle Travel	6.02 – 17.87	4.47 – 25.37
Heavy Vehicle Accidents/Annual Million km of Heavy Vehicle Travel	0.13 – 0.37	0.13 – 0.73
Availability of Alternative Emergency Routes	Available	Available
Emergency Response Capability	Adequate	Adequate
Operational Factors	Less cost effective	More cost effective

<sup>1</sup> Roads and Maritime Services Traffic Volume Viewer (retrieved 23 May 2018).

<sup>2</sup> Assumes 10% of all vehicles are heavy vehicles.

<sup>3</sup> 2018 values extrapolated from previous years assuming 1% annual growth rate.

<sup>4</sup> Assumes 6 truck movement per week.

<sup>5</sup> Roads and Maritime Services Crash Report Data (1 Jan 2012 to 21 Dec 2016).

# There is little difference in the type of landuse along each potential route, therefore these factors were not used to compare Routes 3A and 3B. Further information is provided in Section 3C4.3.1.

RMS Roads and Maritime Services.

**17. Replace footnote 1 on Table 11 of Attachment 3C with:**

- Roads and Maritime Services Crash Report Data (1 Jan 2012 to 21 Dec 2016).

**18. Replace the final two paragraphs in Section 3C6.4.4 with:**

There are no defined absolute risk criteria for the transport of hazardous materials throughout NSW, therefore the assessment of risk results is a balanced judgement based on experience in accordance with HIPAP No. 6. Overall, the net increase in the number of heavy vehicles due to the transport of this material would be up to approximately 0.7% (i.e. a minor impact on existing traffic volume). Therefore, there would be only a minor increase in transport risk when compared to existing risk levels.

From a risk perspective, the results detailed in Tables 10 and 11 show little difference in the level of risk associated with Routes 3A and 3B. In addition, these results deem both potential routes to pose a minimal to acceptable level of risk to surrounding people, property and the natural environment. Therefore, there is insufficient difference in the results of the risk analysis to recommend a preferred route. Routes 3A and 3B are therefore equally suitable for the transport of hazardous materials from a comparative risk perspective.

**19. Replace Table 2 of Attachment 3D with:**

**Table 2**  
**Transport Details**

Hazardous Material	Delivery Vehicle	Maximum Volume per Delivery	Maximum Frequency of Deliveries	Transported State	Packaging
Caustic Soda	Single semi-trailer	16,500 L	3 per week	Liquid	Bulk tanker

**20. Replace the last 5 paragraphs of Section 3D4.1.2 of Attachment 3D with:**

The *Traffic Impact Assessment of the Proposed Cowal Gold Project West Wyalong* (Traffix, 1997) carried out for the EIS identified Route 4A as the preferred access road to the Project. Following submission and approval of the EIS, Route 4A is the approved Project Access Road and has been upgraded in accordance with Project Development Approval Conditions. The road works along the Access Road have been undertaken by Bland Shire Council to relevant AUSTRROAD design standards.

Condition (i) of the Part 5 Approval for the Access Road requires that the Project Access Road development be carried out generally in accordance with the *Cowel Gold Project Mine Access Road Upgrade Review of Environmental Factors* (Resource Strategies, 1997), and all other relevant documentation including *Cowel Gold Project Commission of Inquiry Primary Submission* (North Limited, 1998b) and *Cowel Gold Project Commission of Inquiry Submission in Reply* (North Limited, 1998c) to the Commission of Inquiry, as may be modified by the conditions in the Part 5 Approval. Other relevant documentation includes *Traffic Impact Assessment of the Proposed Cowal Gold Project West Wyalong* (Traffix, 1997) and *Section 94 Study and Plan* (Bland Shire Council, 1999).

The Project Access Road has been upgraded to provide a sealed carriageway over its entire length, with appropriate geometric and structural improvements (Traffix, 1997). The Project Access Road upgrade programme included the following (North Limited, 1998b):

- widening and sealing of the existing dirt road within the existing road reserve from the Project site entrance to the Lake Cowal station silo across a gazetted rail crossing;
- sealing the existing gravel road and adjustment of the alignment on some bends within the existing road reserve west along Blow Clear Road for a distance of approximately 10.5 km to its intersection with Wamboyne Road at Blow Clear; and
- intersection improvements and some widening on curves within the existing road reserve (over a distance of 0.5 km to improve bends [Traffix, 1997]) south along Wamboyne Road for a distance of approximately 18.7 km to its intersection with Ungarie Road.

Other improvements that have been undertaken include the provision of passing lanes and road shoulders and the upgrade of several major intersections where increased traffic numbers were identified as having the potential to compromise safety and/or operational efficiency.

The Project Access Road has been specifically designed to provide access to the Project. Other potential transport routes to the Project (Routes 4B and 4C) comprise segments of unsealed local roads of varying condition which, in their present state, would not provide suitable, all-weather access to the Project for heavy vehicles, particularly those carrying hazardous materials. These roads are therefore, not considered to be suitable for heavy vehicles.

**21. Replace Section 3D6.1.1 of Attachment 3D with:**

Available accident statistics for Route 4A were obtained from the RMS and are summarised in Table 7a.

**Table 7a**  
**Summary of Accident Statistics**

Route	Length (km)	No. of Heavy Vehicles (per day) <sup>1</sup>	% Increase of Heavy Vehicles due to Project <sup>3</sup>	Heavy Vehicle Accidents (per year) <sup>4</sup>	Annual Million km of Heavy Vehicle Travel	Heavy Vehicle Accidents/Annual Million km of Heavy Vehicle Travel
4A	41	217 <sup>2</sup>	0.5%	1	3.24	0.31

<sup>1</sup> Roads and Maritime Services Traffic Volume Viewer (retrieved 23 May 2018).

<sup>2</sup> 2018 values extrapolated from previous years assuming 1% annual growth rate.

<sup>3</sup> Assumes 6 truck movements per week.

<sup>4</sup> Roads and Maritime Services Crash Report Data (1 Jan 2012 to 21 Dec 2016).

Accident statistics for Route 4A are considered to be within normal operating levels for the road types and use. Improved driving conditions have been achieved due to the upgrading of the Project Access Road (Route 4A) which included sealing of the road to the Project (Section 3D4.1.2). The increase of heavy vehicles due to the Project would be small (approximately 0.5%) and would be unlikely to affect traffic flows or accident statistics. Route 4A is therefore suitable for the transport of hazardous materials with respect to accident statistics.

## 22. Replace Section 3D6.4.3 of Attachment 3D with:

Accident data for heavy vehicles utilising Route 4A are detailed in Section 3D6.1.1 and Table 7. As detailed in Table 7a, approximately 1 accident per year involving heavy vehicles occurs on Route 4A.

In the event of an accident involving a heavy vehicle, the carried goods may or may not be released. The probability of release is dependent on factors such as speed, shipping conditions (i.e. pressurised compared to non-pressurised), inadequate load securing, and strength and integrity of the container.

Various studies of release probabilities from heavy vehicles involved in an accident have been undertaken. The *Guidelines for Chemical Transportation Risk Analysis* (CCPS, 1995) indicates that the release probability for various road types is between 5 and 10% (i.e. approximately one heavy vehicle accident in every 10 to 20 will result in a release of the material).

An estimation of the likelihood of an accident involving a vehicle transporting caustic soda to the Project resulting in a release of the material must take into account the following:

- the number of vehicles transporting caustic soda to the Project relative to the total number of heavy vehicles already using the same transport route;
- the number of accidents that have involved heavy vehicles; and
- the probability of a release of the material (which is assumed to be 10% of all accidents involving heavy vehicles results in a release of material) (CCPS, 1995).

The likelihood of an accident (based on averaged accident data) involving a vehicle transporting caustic soda to the Project resulting in a release of the material for Route 4A is estimated to be approximately  $2 \times 10^{-3}$ /year (i.e. such an incident is estimated to occur on Route 4A once in every 5,000 years) (Pinnacle Risk Management Pty Ltd, 2018).

The risk of the event is determined using the risk matrix in Table 7b and the consequence ratings in Table 7c (Pinnacle Risk Management Pty Ltd, 2018).

**Table 7b  
Risk Matrix**

Likelihood						
Frequent >1/yr	II	II	I	I	I	I
Probable > $10^{-1}$ to 1/yr	III	II	II	I	I	I
Possible > $10^{-2}$ to $10^{-1}$ /yr	III	III	II	II	I	I
Unlikely > $10^{-4}$ to $>10^{-2}$ /yr	III	III	III	III	II	I
Very Unlikely > $10^{-6}$ to $10^{-4}$ /yr	III	III	III	III	III	II

**Table 7b (Continued)**  
**Risk Matrix**

Likelihood						
Extremely Unlikely $\leq 10^{-6}/\text{yr}$	III	III	III	III	III	III
<b>Consequence</b>	Minor	Significant	Severe	Serious	Extremely Serious	Catastrophic

Source: Pinnacle Risk Management Pty Ltd (2011; 2018)

Class I: Indicates a high level of risk which is intolerable and where risk reduction is required. This requires the reduction of frequency and/or consequence.

Class II: Indicates a moderate level of risk. Whilst the risk is not unacceptable, there should be practical measures taken to lower the risk if economically viable. For risks where further mitigation is not economically viable, judgement needs to be exercised as to whether the level of risk is acceptable or not. This area is the beginning of the ALARP region (i.e. as low as reasonably practicable).

Class III: indicates a low level of risk and is broadly considered to be acceptable. Further risk mitigation may not be required / appropriate.

However, low and accepted risks should be monitored and routinely reviewed to ensure that they remain acceptable. Few risks remain static. This area includes ALARP as well as what are known as trivial or negligible risks.

**Table 7c**  
**Consequence Ratings**

	Minor	Significant	Severe	Serious	Extremely Serious	Catastrophic
<b>Safety and Health</b>	One minor injury, First Aid	Recordable or single Medical Treatment Injury	Multiple Medical Treatment Injuries or one Lost Time Injury	Permanent disability casualty or multiple Lost Time Injuries	Multiple permanent disabilities or one fatality	Multiple fatalities
<b>Environment</b>	Very minor pollution. No offsite escape of material (contained within the operational areas). Onsite nuisance value only	Minor local pollution. Nuisance offsite effect, typically of short duration, e.g. noise, odours, dust and/or visible plumes for less than one hour	Evident pollution, local concern. Minimal duration offsite effects (e.g. waterway slightly discoloured, turbid etc around the point of release with no or very few fish killed)	Significant local pollution. For example, waterways discoloured 10s of metres, fire or smoke affecting people near to the site	Major local pollution. Observable offsite effect (e.g. waterways discoloured 10s to 100s of metres for a few weeks with a significant number of aquatic life adversely affected)	Extremely severe pollution. Ecosystems at high risk of destruction. Only resolved via long term solutions (potentially taking years)
<b>Public Relations</b>	Minor issue, one complaint	Local issue, 10 complaints	Local media, 100 complaints	Regional or state media	Wide media national coverage	Headlines, corporate damage
<b>Financial Impact</b>	< \$25,000	\$25,000 to \$100,000	> \$100,000 to \$1 million	> \$1 million to \$20 million	> \$20 million to \$100 million	> \$100 million

Source: Pinnacle Risk Management Pty Ltd (2011; 2018)

For releases of caustic soda from a road traffic accident, the consequence rating is determined to be “Serious” (Pinnacle Risk Management Pty Ltd, 2018). The volume is limited to the size of the tanker (i.e. 40 tonnes) and it is possible that only one of the two barrels is breached (Pinnacle Risk Management Pty Ltd, 2018).

Given a likelihood of  $2 \times 10^{-3}/\text{year}$  and consequence rating of “Serious”, the corresponding risk level is Class III (Pinnacle Risk Management Pty Ltd, 2018). These values indicate a low level of risk associated with the transport of hazardous materials (Pinnacle Risk Management Pty Ltd, 2018).

**23. Replace Table 9 of Attachment 3D with:**

**Table 9  
Summary of Risk Analysis Assessment Factors**

Assessment Factor	Route 4A
Schools	#
Number of School Students	#
Hospitals	#
Number of Hospital Beds	#
Aged Care Facilities	#
Churches	#
Items of Heritage or Cultural Significance	#
Other Landuse	#
Number of Park Reservations	1
Park Reservations – Approximate Total Road Frontage (m)	5,100
Waterways	22
Emergency Infrastructure	Adequate
Length (km)	41
No. of Heavy Vehicles (per day) <sup>1,2</sup>	217 <sup>2</sup>
% Increase of Heavy Vehicles due to Project <sup>3</sup>	0.5%
Heavy Vehicle Accidents (per year) <sup>4</sup>	1
Annual Million km of Heavy Vehicle Travel	3.24
Heavy Vehicle Accidents/Annual Million km of Heavy Vehicle Travel	0.31
Availability of Alternative Emergency Routes	Available
Emergency Response Capability	Adequate
Operational Factors	Cost effective

<sup>1</sup> Roads and Maritime Services Traffic Volume Viewer (retrieved 23 May 2018).

<sup>2</sup> 2018 values extrapolated from previous years assuming 1% annual growth rate.

<sup>3</sup> Assumes 6 truck movements per week.

<sup>4</sup> Roads and Maritime Services Crash Report Data (1 Jan 2012 to 21 Dec 2016).

# Sensitive landuses along Route 4A are relatively uncommon and do not preclude this route from the route evaluation. Further information is provided in Section 3D4.3.1.

**24. Replace the final paragraph in Section 3D6.4.4 with:**

There are no defined absolute risk criteria for the transport of hazardous materials throughout NSW, therefore the assessment of risk results is a balanced judgement based on experience in accordance with HIPAP No.6. Overall, the net increase in the number of heavy vehicles due to the transport of this material would be approximately 0.5% (i.e. a minor impact on existing traffic volume). Therefore, there would be only a minor increase in transport risk when compared to existing risk levels. From a risk perspective, the results detailed in Tables 9 and 10 deem Route 4A to pose a minimal level of risk to surrounding people, property and the natural environment. This route is therefore suitable for the transport of hazardous materials to the Project.