Cowal Gold Project – Addendum to the Transport of Hazardous Materials Study

On 7 February 2017 the Cowal 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 an increase to the depth of the existing open pit (among other things). As a result of operations associated with deepening the existing open pit, the approved Project involves an increase in the consumption of sodium cyanide and therefore an increase in heavy vehicle deliveries of sodium cyanide to the Project.

Accordingly, this Addendum to the Transport of Hazardous Materials Study (THMS) has been prepared to reflect increase in the frequency of heavy vehicle deliveries of sodium cyanide to the Project to 5 per week

This Addendum includes an updated assessment of the likelihood of a hazardous incident as a result of the increase in frequency of deliveries of the sodium cyanide to the Project, and an update to the risk analysis results.

There is no change to the approved transport route for sodium cyanide to the CGO as described in the November 2010 Addendum to the THMS.

COWAL GOLD PROJECT

ADDENDUM TO THE TRANSPORT OF HAZARDOUS MATERIALS STUDY

JULY 2018
Project No. HAL-02-07
Document No. 00920695

ADDENDUM
Transport of Hazardous Materials Study

1. Replace all references to "Patrick Logistics Storage Facility" in Section 4.1 and Attachment 1 (including the previous addenda) with "Rocky's Own Storage Facility".

2. Replace Table 4 of Attachment 1A with:

Table 4
Transport Details

Hazardous Material	Delivery Vehicle	Maximum Volume per Delivery	Maximum Frequency of Deliveries	Transported State	Packaging
Sodium Cyanide	B-Double	40 t	5 per week	Solid	Bulk solids container (i.e. Isotainer)

3. Replace Section 1A6.1.1 of Attachment 1A with the following:

Available accident statistics for Routes 1A to 1F were obtained from the RMS and are summarised in Table 11a.

Table 11a
Summary of Accident Statistics

Route	Length (km)	No. of Heavy Vehicles (per day) [1]	% Increase of Heavy Vehicles due to Project	Heavy Vehicle Accidents (per year)[7]	Annual Million km of Heavy Vehicle Travel	Heavy Vehicle Accidents/Annual Million km of Heavy Vehicle Travel
1A	11.5	2,388 – 6,337[2,3]	0.04 – 0.1%[5]	14	10.02 – 26.60	0.53 – 1.40
1B	11.3	3,762[4] – 4,630[4]	0.05 – 0.06%[5]	22.2	15.52 – 19.10	1.16 – 1.43
1C	14.7	2,035 – 13,141[2]	0.01 – 0.12%[5]	36.6	10.92 – 70.51	0.52 – 3.35
1D	22.0	3,071[3] – 6,415[3]	0.04 – 0.08%[5]	40.8	24.66 – 51.51	0.79 – 1.65
1E	568.0	138 – 1,324[2]	0.1 – 1%[6]	11.8	28.57 – 274.58	0.04 – 0.41
1F	503.2	385 – 1,324[2]	0.1 – 0.4%[6]	22.8	70.71 – 243.26	0.09 – 0.32

1 Roads and Maritime Services Traffic Volume Viewer (retrieved 23 May 2018).
2 2018 values extrapolated from previous years assuming 1% annual growth rate.
3 Assumes 10% of all vehicles are heavy vehicles.
4 Only one-way traffic count available. Assumed equal HV counts for both traffic direction.
5 Assumes 18 truck movements per week.
6 Assumes 10 truck movements per week.
7 Roads and Maritime Services Crash Report Data (1 Jan 2012 to 21 Dec 2016).

Accident statistics for Routes 1A to 1F 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 1%) and would be unlikely to affect traffic flows or accident statistics. Routes 1A to 1F are therefore suitable for the transport of hazardous materials with respect to accident statistics. Accident statistics for Routes 1A to 1F are provided in Table 14, Section 1A6.4.4.

4. Replace Section 1A6.4.3 of Attachment 1A with the following:

Accident data for heavy vehicles utilising Routes 1A to 1F are detailed in Section 1A6.1.1 and Table 11a. Approximately 14 accidents per year involving heavy vehicles occur for Route 1A, approximately 22 accidents per year involving heavy vehicles occur for Route 1B, approximately 37 accidents per year involving heavy vehicles occur for Route 1C and approximately 41 accidents per year involving heavy vehicles occur for Route 1D. Approximately 12 accidents per year involving heavy vehicles occur for Route 1E and approximately 23 accidents per year involving heavy vehicles occur for Route 1F.

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 sodium cyanide to the Project resulting in a release of the material must take into account the following:

- the number of vehicles transporting sodium cyanide 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 sodium cyanide to the Project resulting in a release of the material for Routes 1A to 1D is estimated to be approximately $4x10^{-4}$/year, $6x10^{-4}$/year, $6x10^{-4}$/year, and $1x10^{-3}$/year respectively (i.e. such an accident is estimated to occur on Routes 1A to 1D once every 900 to 2,400 years). The likelihood of an accident (based on averaged accident data) involving a vehicle transporting sodium cyanide to the Project resulting in a release of the material for Routes 1E and 1F is estimated to be approximately $1x10^{-3}$/year (i.e. such an accident is estimated to occur on Routes 1E and 1F once every 500 to 900 years) (Pinnacle Risk Management Pty Ltd, 2018).

The risk of the event is determined using the risk matrix in Table 11b and the consequence ratings in Table 11c (Pinnacle Risk Management Pty Ltd, 2018).

Table 11b
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 11c
Consequence Ratings

	Minor	Significant	Severe	Serious	Extremely Serious	Catastrophic
Safety and Health	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
Environment	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)
Public Relations	Minor issue, one complaint	Local issue, 10 complaints	Local media, 100 complaints	Regional or state media	Wide media national coverage	Headlines, corporate damage
Financial Impact	< $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 sodium cyanide 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 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 13 of Attachment 1A with:

Table 13
Summary of Risk Analysis Assessment Factors

Assessment Factor	Route 1A	Route 1B	Route 1C	Route 1D	Route 1E	Route 1F
Schools	2	2	4	14	3	4
Number of School Students	1,065	1,065	1,958	7,721	400	1,104
Hospitals	0	0	0	0	1	0
Number of Hospital Beds	0	0	0	0	<50	0
Aged Care Facilities	0	0	0	2	0	0
Churches	3	2	1	11	1	3
Items of Heritage or Cultural Significance	76	77	41	85	9	6
Other Land Use	#	#	#	#	#	#
Number of Park Reservations	4	5	6	12	17	19
Park Reservations – Approximate Total Road Frontage (m)	1,825	2,125	1,400	2,388	28,982	74,396
Waterways	4	5	8	1	49	36
Emergency Infrastructure	Adequate	Adequate	Adequate	Adequate	Adequate	Adequate
RMS and Transporter Preferred Route	RMS preferred route	Transporter preferred route	-	Transporter preferred route	Transporter preferred route	Transporter preferred route
Length (km)	11.5	11.3	14.7	22	568.0	503.0
No. Heavy Vehicles (per day)	2,388 – 6,337[2,3]	3,762[4] – 4,630[4]	2,035 – 13,141[2]	3,071[3] – 6,415[3]	138 – 1,324[2]	385 – 1,324[2]
% Increase of Heavy Vehicles due to Project[3]	0.04 – 0.1%[5]	0.05 – 0.06%[5]	0.01 – 0.12%[5]	0.04 – 0.08%[5]	0.1 – 1%[6]	0.1 – 0.4%[6]
Heavy Vehicle Accidents (per year)[7]	14	22.2	36.6	40.8	11.8	22.8
Annual Million km of Heavy Vehicle Travel	10.02 – 26.60	15.52 – 19.10	10.92 – 70.51	24.66 – 51.51	28.57 – 274.58	70.71 – 243.26
Heavy Vehicle Accidents/Annual Million km of Heavy Vehicle Travel	0.53 – 1.40	1.16 – 1.43	0.52 – 3.35	0.79 – 1.65	0.04 – 0.41	0.09 – 0.32
Availability of Alternative Emergency Routes	Available	Available	Available	Available	Available	Available
Emergency Response Capability	Adequate	Adequate	Adequate	Adequate	Adequate	Adequate
Operational Factors	Cost Effective	Cost Effective	Cost Effective	Cost Effective	Cost Effective	Cost Effective

1 Roads and Maritime Services Traffic Volume Viewer (retrieved 23 May 2018).

2 2018 values extrapolated from previous years assuming 1% annual growth rate.

3 Assumes 10% of all vehicles are heavy vehicles.

4 Only one-way traffic count available. Assumed equal HV counts for both traffic direction.

5 Assumes 18 truck movements per week.

6 Assumes 10 truck movements per week.

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

As each potential route has some advantages over the others but there is a range in the type of landuse along each potential route, therefore landuse alone was not used to evaluate Routes 1A to 1F. Further information is provided in Section 1A4.3.1.

RMS Roads and Maritime Services.

6. Replace the second last Paragraph of Attachment 1A Section 1A6.4.4 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 less than approximately 1% (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.

7. Replace Table 2 of Attachment 1C with:

Table 2
Transport Details

Hazardous Material	Delivery Vehicle	Maximum Volume per Delivery	Maximum Frequency of Deliveries	Transported State	Packaging
Sodium Cyanide	Single semi-trailer	22 t	9 per week	Solid	Bulk solids container (i.e. Isotainer)
	B-Double	40 t	5 per week	Solid	Bulk solids container (i.e. Isotainer)

8. Replace footnote 1 on Table 9 of Attachment 1C with:

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

9. Replace Table 2 of Attachment 1D with:

Table 2
Transport Details

Hazardous Material	Delivery Vehicle	Maximum Volume per Delivery	Maximum Frequency of Deliveries	Transported State	Packaging
Sodium Cyanide	Single semi-trailer	22 t	9 per week	Solid	Bulk solids container (i.e. Isotainer)
	B-Double	40 t	5 per week	Solid	Bulk solids container (i.e. Isotainer)

10. Replace Section 1D6.1.1 of Attachment 1D with the following:

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)[1]	% Increase of Heavy Vehicles due to Project[3]	Heavy Vehicle Accidents (per year)[4]	Annual Million km of Heavy Vehicle Travel	Heavy Vehicle Accidents/Annual Million km of Heavy Vehicle Travel
4A	257	746[2] – 1,102[2]	0.4 – 0.55%	11.6	69.99 – 103.41	0.11 – 0.17

1 Roads and Maritime Services Traffic Volume Viewer (retrieved 23 May 2018).
2 2018 values extrapolated from previous years assuming 1% annual growth rate.
3 Assumes 28 movements per week.
4 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 type and use. The increase of heavy vehicles due to the Project would be very small (up to approximately 0.55%) 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.

11. Replace Section 1D6.4.3 of Attachment 1D with the following:

Accident data for heavy vehicles utilising Route 4A are detailed in Section 1D6.1.1 and Table 7a. Approximately 12 accidents per year involving heavy vehicles occur for 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 sodium cyanide to the Project resulting in a release of the material must take into account the following:

- the number of vehicles transporting sodium cyanide 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 sodium cyanide to the Project resulting in a release of the material for Route 4A is estimated to be $2x10^{-3}$/year (i.e. such an incident is estimated to occur on Route 4A once every 500 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
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 7c
Consequence Ratings

	Minor	Significant	Severe	Serious	Extremely Serious	Catastrophic
Safety and Health	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
Environment	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)
Public Relations	Minor issue, one complaint	Local issue, 10 complaints	Local media, 100 complaints	Regional or state media	Wide media national coverage	Headlines, corporate damage
Financial Impact	< $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 sodium cyanide 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 one of the two barrels is breached (Pinnacle Risk Management Pty Ltd, 2018).

Given a likelihood of $2x10^{-3}$/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).

12. Replace Table 9 of Attachment 1D 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	5
Park Reservations – Approximate Total Road Frontage (m)	22,500
Waterways	13
Emergency Infrastructure	Adequate
RMS and Transporter Preferred Route	RMS and Transporter preferred route
Length (km)	257
No. of Heavy Vehicles (per day)[1]	746[2] – 1,102[2]
% Increase of Heavy Vehicles due to Project[3]	0.4 – 0.55%
Heavy Vehicle Accidents (per year)[4]	11.6
Annual Million km of Heavy Vehicle Travel	69.99 – 103.41
Heavy Vehicle Accidents/Annual Million km of Heavy Vehicle Travel	0.11 – 0.17
Availability of Alternative Emergency Routes	Available
Emergency Response Capability	Adequate
Operational Factors	Cost effective

1 Roads and Maritime Services Traffic Volume Viewer (retrieved 23 May 2018).

2 2018 values extrapolated from previous years assuming 1% annual growth rate.

3 Assumes 16 truck movements per month.

4 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 1D4.3.1.

RMS Roads and Maritime Services.

13. Replace the last Paragraph of Attachment 1D Section 1D6.4.4 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 0.55% (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.

14. Replace Table 2 of Attachment 1E with:

Table 2
Transport Details

Hazardous Material	Delivery Vehicle	Maximum Volume per Delivery	Maximum Frequency of Deliveries	Transported State	Packaging
Sodium Cyanide	Single semi-trailer	22 t	9 per week	Solid	Bulk solids container (i.e. Isotainer)
	B-Double	40 t	5 per week	Solid	Bulk solids container (i.e. Isotainer)

15. Replace the last 5 paragraphs of Section 1E4.1.2 of Attachment 6D with:

The *Traffic Impact Assessment of the Proposed Cowal Gold Project West Wyalong* (Traffix, 1997) carried out for the EIS identified Route 5A as the preferred access road to the Project. Following submission and approval of the EIS, Route 5A 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 AUSTROAD 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 *Cowal Gold Project Mine Access Road Upgrade Review of Environmental Factors* (Resource Strategies, 1997), and all other relevant documentation including *Cowal Gold Project Commission of Inquiry Primary Submission* (North Limited, 1998b) and *Cowal 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 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.

16. Replace Section 1E6.1.1 of Attachment 1E with the following:

Available accident statistics for Route 5A were obtained from the RMS and are summarised in Table 7.

Table 7a
Summary of Accident Statistics

Route	Length (km)	No. of Heavy Vehicles (per day)[1]	% Increase of Heavy Vehicles due to Project[3]	Heavy Vehicle Accidents (per year)[4]	Annual Million km of Heavy Vehicle Travel	Heavy Vehicle Accidents/Annual Million km of Heavy Vehicle Travel
5A	41	217[2]	1.9%	1	3.24	0.31

1 Roads and Maritime Services Traffic Volume Viewer (retrieved 23 May 2018).

2 2018 values extrapolated from previous years assuming 1% annual growth rate.

3 Assumes 28 truck movements per week.

4 Roads and Maritime Services Crash Report Data (1 Jan 2012 to 21 Dec 2016). Provided by Joshua Parkin on 24 May 2018.

Accident statistics for Route 5A 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 5A) which included sealing of the road to the Project (Section 1E4.1.2). The increase of heavy vehicles due to the Project would be small (approximately 1.9%) and would be unlikely to affect traffic flows or accident statistics. Route 5A is therefore suitable for the transport of hazardous materials with respect to accident statistics.

17. Replace Section 1E6.4.3 of Attachment 1E with the following:

Accident data for heavy vehicles utilising Route 5A are detailed in Section 1E6.1.1 and Table 7a. As detailed in Table 7a, approximately 1 accident per year involving heavy vehicles occurs on Route 5A.

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 sodium cyanide to the Project resulting in a release of the material must take into account the following:

- the number of vehicles transporting sodium cyanide 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 sodium cyanide to the Project resulting in a release of the material for Route 4A is estimated to be approximately $9x10^{-4}$/year (i.e. such an incident is estimated to occur on Route 4A once in every 1,000 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
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 7c
Consequence Ratings

	Minor	Significant	Severe	Serious	Extremely Serious	Catastrophic
Safety and Health	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
Environment	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)
Public Relations	Minor issue, one complaint	Local issue, 10 complaints	Local media, 100 complaints	Regional or state media	Wide media national coverage	Headlines, corporate damage
Financial Impact	< $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 sodium cyanide 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 $9x10^{-4}$/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).

18. Replace Table 9 of Attachment 1E with:

Table 9
Summary of Risk Analysis Assessment Factors

Assessment Factor	Route 5A
Schools	#
Number of School Students	#
Hospitals	#
Number of Hospital Beds	#
Aged Care Facilities	#
Churches	#
Items of Heritage or Cultural Significance	#
Other Landuse	Predominantly open space
Number of Park Reservations	1
Park Reservations – Approximate Total Road Frontage (m)	5,100
Waterways	22
Emergency Infrastructure	Adequate

Table 9 (Continued)
Summary of Risk Analysis Assessment Factors

Length (km)	41
No. of Heavy Vehicles (per day)[1]	217[2]
% Increase of Heavy Vehicles due to Project[3]	1.9%
Heavy Vehicle Accidents (per year)[4]	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

1 Roads and Maritime Services Traffic Volume Viewer (retrieved 23 May 2018).

2 2018 values extrapolated from previous years assuming 1% annual growth rate.

3 Assumes 28 truck movements per week.

4 Roads and Maritime Services Crash Report Data (1 Jan 2012 to 21 Dec 2016). Provided by Joshua Parkin on 24 May 2018.

Sensitive landuses along Route 5A are relatively uncommon and do not preclude this route from the route evaluation. Further information is provided in Section 1E4.3.1.

19. Replace the last Paragraph of Attachment 1E Section 1E6.4.4 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 1.9% (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 5A 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.