

Appendix 16

Traffic Impact and Risk Assessment

Browns Oxide Mine Project



BATCHELOR / RUM JUNGLE ROAD

TRAFFIC IMPACT AND RISK ASSESSMENT
REPORT

- Traffic Study
- Final
- 27th January 2006



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Contents

1.	Introduction	1
2.	Traffic	2
2.1	Existing Traffic	2
2.2	Existing Road Capacity	3
2.3	Crash Data	4
2.4	Browns Oxide Mine Projected Traffic	6
2.5	Projected Combined Traffic	7
2.6	Peak Traffic Movements	8
2.7	Rum Jungle Road / Litchfield Park Road Intersection	9
3.	Conclusions and Recommendations	11



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1. Introduction

SKM was commissioned by Compass Resources NL to review risks associated with the Batchelor / Rum Jungle Road, both in terms of its current condition and traffic, and in terms of the impact on its current operation as impacted by the proposed mine generated traffic.

The extent of road reviewed as part of the study was the section from the Batchelor Road / Stuart Highway intersection to the roped off road at Ch 20.45km on the Rum Jungle section of the road.

The study does not involve risk analysis matrices or associated risk probability models but reviews the impact of the proposed mine generated traffic in terms of additional traffic of various vehicle categories on the road network and those impacts on Batchelor / Rum Jungle Road and specifically the Litchfield Park Road intersection with Rum Jungle Road.

The initial and integral part of this study involved a separate Level 5 – Road Safety Audit (RSA) of the road to assess any current safety issues. This RSA is referred to throughout this report and can be used by Compass Resources NL to develop any safety and transportation procedure deemed applicable by them to the proposed mine operations.



2. Traffic

2.1 Existing Traffic

The most recently available traffic survey information from the NT Department of Planning and Infrastructure was supplied to SKM on request. A review of the traffic numbers and categories currently using Batchelor Road and Litchfield Road recorded at primary count stations 5 kilometres west of the Stuart Highway and 5 kilometres west of the Finnis River Crossing respectively are provided below.

No vehicle Average Annual Daily Traffic (AADT) counts are available for Rum Jungle Road.

Batchelor Road	2004 AADT	645
Litchfield Road	2004 AADT	353

It should be noted that traffic in July exceeds AADT counts by 50% on Batchelor Road and 100% for Litchfield Road.

A break up of the vehicle categories observed on the roads is:

Road	Percentage by Category			
	Cars Cars & Trailers	Rigid Vehicles & buses	Articulated Vehicles	B-Doubles / Road Train Doubles
Batchelor	86.7	11.7	1.4	0.1
Litchfield	88.0	8.8	3.0	0.1

The translation of these percentages produces the following vehicle traffic based on the AADT's provided by Department of Planning and Infrastructure.

Road	Cars Cars & Trailers	Rigid Vehicles & buses	Articulated Vehicles	B-Doubles / Road Train Doubles	Total
Batchelor	559	75	9	0.65	645
Litchfield	310	31	11	0.35	353

As there is no information available for the Rum Jungle Road and the count station on the Litchfield Road is 5 kilometres west of the Finnis River the significant number of vehicles that access properties off the Litchfield Road and via White Road of Rum Jungle Road are missed. These would include daily return trips to or from Batchelor and beyond from these properties.



It could be expected that the number of vehicle trips on Rum Jungle Road and the first kilometre section of Litchfield Park Road would be in excess of that on Litchfield Road at the count station but not exceed that of Batchelor Road.

Without other vehicle survey data a reasonable estimate of traffic on Rum Jungle Road and Litchfield park Road could be made as:

	Cars Cars & Trailers	Rigid Vehicles	Articulated Vehicles	B-Doubles / Road Train Doubles
AADT	425	55	11	0.65

The volume of traffic continuing on Rum Jungle Road to White Road is expected to be minimal and with the development of the Mine need to use Litchfield Park Road to access Lithgow Road via Bevan Road.

2.2 Existing Road Capacity

The existing sections of Batchelor and Rum Jungle Roads are generally 6.2 to 6.3 metre seal and 1.0⁺ metre shoulders. The current condition of some shoulder sections was found to be unsatisfactory in the recently completed Stage 5 – Road Safety Audit – subject of a separate report.

Recommended road traffic capacities for various road carriageways configurations are specified in the Austroads Publication – A Guide to the Geometric Design of Rural Roads 2003:

Minimum Seal Traffic Lanes

Design AADT's	1-150	150-500	500-1000	1000-3000
Minimum Lane Width (m)	One Lane 3.5	Two Lanes 3.1	Two Lanes 3.1 – 3.5	Two Lanes 3.5

And shoulder widths associated with the various volumes are:

AADT (vpd)	Total Shoulder Width (m)	Shoulder Seal Width (m)
Single Lane Roads	2.0	0.5
Two Lane Roads		
1-500	1.5	0.5
500-1000	1.5	0.5
1000-3000	2.0	1.0



When the road was constructed the road parameters would have been in accordance with an earlier edition of the Austroads Guide that had the following carriageway widths.

Minimum Seal Traffic Lanes

Design AADT's	1-150	150-500	500-1000	Over 1000
Minimum Lane Width (m)	One Lane 3.5	Two Lanes 3.0	Two Lanes 3.0-3.5	Two Lanes 3.5

And shoulder widths associated with the various volumes are:

AADT (vpd)	Minimum Width (m)
Single Lane Roads	1.5-2.5
Two Lane Roads	
1-500	1.0*-1.5
500-100	1.0*-2.0
Over 1000	1.0-3.0

* Where 1.0m shoulders are used, provisions should be made for vehicles to stop clear of the traffic lanes in locations of low fills and transitions of cut to fill. It becomes more important where traffic volumes are over 500 vpd.

It can be noted that as traffic volumes on Batchelor and Rum Jungle Roads are around the 500vpd the shoulder section of the carriageway section does not comply with the current guidelines but has adequate capacity in terms of AADT. However, reconstruction and maintenance of shoulders and table drains must be initiated and programmed to ensure the level is maintained or improved.

2.3 Crash Data

Crash data collected by NT Police over the past 6 years for Batchelor Road and Rum Jungle Road was provided by the Department of Planning and Infrastructure. It shows the following crash statistics.

a) Batchelor Road

There were 11 crashes recorded in the 6 year period from 1st Jan 1999 to 31st Dec 2005.

- 4 accidents were at intersections - 3 at the Stuart Highway
- - 1 at Cameron Street in Batchelor
- 9 were single vehicle accidents out of control on or running off the carriageway and 6 of the 9 single vehicle accidents were along the road – 3 were at intersections.
- 1 accident involved a pedestrian walking along the side of the road in Batchelor.



- 1 accident involved a rear end with a car turn left.
- 5 accidents occurred at night and 6 occurred in the daytime.

There were no recorded fatalities, and 4 accidents necessitated admission to hospital for treatment.

b) Rum Jungle Road

There were 9 accidents recorded in the 6 year period from 1st Jan 1999 to 31st Dec 2005.

- 3 accidents were at the Litchfield Park Road intersection.
- 7 of the 9 accidents were single vehicle accidents out of control on or running off the carriageway.
- 1 accident involved a reversing car.
- 1 accident involved a collision between two cars
- 1 accident occurred at night and 8 occurred in the daytime.

There has been one recorded fatality at the Litchfield Park Road intersection, and two other accidents necessitated admission to hospital for treatment.



2.4 Browns Oxide Mine Projected Traffic

The traffic on Batchelor and Rum Jungle Roads generated by the Browns Oxide Mine Project has been developed for the Public Environmental Report is broken down into the various vehicle types as shown below:

Table 1 - Projected Traffic Generation

Construction Phase (5 months)

Vehicle	Type	Monthly trips	Daily traffic (both ways)	
construction materials	B-double	30	2	
Bus	36 person	60	4	rigid vehicle
Light Vehicles	passenger	850	56.7	

or Grouped into General Vehicle Categories

Light Vehicles	56.7
Rigid Vehicles	4
Articulated Vehicles	0
B-Doubles / RT Doubles	2
Triple RT's	0

Operation Phase

Vehicle	Type	Monthly trips	Daily traffic (two way)	
Employees	Light Vehicles	1500	100	
Fuel	100t Road Train - triple	30	2.0	
Acid	60t B-Double	4	0.3	
Explosives	40t Special Tank	8	0.5	articulated
Reagents	B-Double	18	1.2	
Lime	60t B-Double	20	1.3	
Stores etc.	B-Double	8	0.5	
Product Haulage	60t B-Double	20	1.3	

or Grouped into General Vehicle Categories

or

Light Vehicles	100
Rigid Vehicles	0
Articulated Vehicles	0.5
B-Doubles / RT Doubles	4.7
Triple RT's	2.0



2.5 Projected Combined Traffic

To review the relative additional traffic in vehicle categories we have produced a tabulated comparison for the construction phase and operational phase of the mine.

Table 2 –Projected Combined Traffic.

Traffic	Road	Cars / Cars+Trailer s	Rigid Vehicles	Articulated Vehicles	B-Doubles, Double Road Trains	Triple Road Trains
Existing	Batchelor	559	75	9	0.65	0
	Rum Jungle	425	55	11	0.65	0
	Litchfield Park	425	55	11	0.65	0
Mine Construction	Batchelor	57	4	0	2	0
	Rum Jungle	57	4	0	2	0
	Litchfield Park	0	0	0	0	0
Mine Operational	Batchelor	100	0	0.5	4.7	2
	Rum Jungle	100	0	0.5	4.7	2
	Litchfield Park	0	0	0	0	0
Total (Including Construction Phase)	Batchelor	616	79	9	3	0
	Rum Jungle	525	55	11.5	5.3	2
	Litchfield Park	425	55	11	0.65	0
Total (Including Operational Phase)	Batchelor	659	75	9.5	5.3	2
	Rum Jungle	525	55	11.5	5.3	2
	Litchfield Park	425	55	11	0.65	0
Relative increase in Construction Phase	Batchelor	0.10	0.05	0.00	3.08	0.00
	Rum Jungle	0.13	0.07	0.00	3.08	0.00
	Litchfield Park	0	0	0	0	0
Relative Increase in Operational Phase	Batchelor	0.18	0.00	0.06	7.18	2.00
	Rum Jungle	0.24	0.00	0.05	7.18	2.00
	Litchfield Park	0	0	0	0	0

The distribution in the above table of traffic assumes all traffic travelling to the Mine site originates from the Stuart Highway and returns there. This is conservative for numbers on all roads as a number of personnel during the construction phase may be based in Batchelor and in the Operational phase may be based in Batchelor and locally – possibly on properties accessing the Lichfield Park Road.

However it is expected the supply vehicles approaching and departing site would originate from the Stuart Highway.

SINCLAIR KNIGHT MERZ



A comparison of traffic generated by the mine in the two phases shows the increase in daily traffic are marginal for all vehicle categories except B-Doubles / Road Train Doubles and Road Train Triples.

However, the concern in average daily traffic for the B-Double, Road Train Doubles and Road Train Triples in only small in numbers at a total of 6.7 vehicles per day (v.p.d) or 3.35 v.p.d each way

If triple road trains are not permitted to operate at Batchelor and Rum Jungle Road the increase in B-Double or Road Train Doubles would only amount to an average of 1 v.p.d or a total daily volume of 7.7 v.p.h or 3.85 v.p.d in each direction.

To put this into perspective three Road Train Doubles were observed hauling cattle on Litchfield and Rum Jungle Roads to Batchelor within a period of 1.5 hours at an inspection of the roads on the 5th January 2006.

2.6 Peak Traffic Movements

The peak morning and evening traffic movements must be considered as the work force segment of traffic generated by the mine will be concentrated at change of shifts.

The peak traffic from the mine, with a three shift cycle is 33% of the 100 light vehicles per day or 34 vehicles – 17 vehicles arriving, 17 vehicles departing.

Mine Morning Peak Period 6:30 – 7:30 am

Mine Evening Peak Period 2:30 – 3:30 pm

The percentage of the base level existing traffic travelling in the morning and evening peak hour coinciding with mine peak traffic movements is difficult to predict.

However, the majority of morning tourist traffic is not likely to use Batchelor and Rum Jungle Roads until after 7:30 am. There if there is a coincidence of peak hour movements it is likely to be in the afternoon with tourists etc. returning through Batchelor. Base traffic is likely to be in the order of 10% of the AADT or

60 vph on Batchelor Road

and about 45⁺ vph on Rum Jungle Road

The projected 34 vph from the mine result in an aggregate total traffic flow of 94 and 79 vph respectively. Mine generated traffic being an estimate of approximately 50% the Batchelor Road traffic and 50 – 75% of the Rum Jungle Road traffic.



The percentage of peak hour traffic on Batchelor Road is conservative as a portion of the Browns Work Force would be expected to reside in Batchelor.

The total estimated traffic is well within the carrying capacity of the sealed road lanes and carriageway and the National Road Design Guidelines.

Comments by Northern Territory Police associated with previous accidents on the road involving road trains confirm observations in the Road Safety Audit Report that shoulders are too steep, too narrow and require reconstruction and regular maintenance. Deep scours in table drains directly adjacent shoulder compound the shoulder problems. Once the responsible Authority undertakes the required maintenance works, heavy vehicles (of all categories) should travel the roads with an improved level of safety (including the small number of Browns Mine traffic). This improved level of safety would be further underpinned by reducing the posted speed limit to 80km/h.

The Road Safety Report findings reinforce the current safety concerns with the Rum Jungle Road in particular, and recommends that the speed limit be reduced to 80 kilometres per hour or as a maximum 100km/h in lieu of the currently posted unlimited speed.

2.7 Rum Jungle Road / Litchfield Park Road Intersection

Correspondence received from the Northern Territory Government recommends improvements be made to the above mentioned intersection.

The intersection is currently constructed and operates as a Tee-intersection with give way signed control of Litchfield Park Road at Rum Jungle Road i.e. traffic approaching the intersection on Litchfield Road must slow or stop to give way to through or right turning traffic on Rum Jungle Road. The posted speed limit for both roads is Unlimited.

The intersection was reviewed as part of the separate Road Safety Audit and was not noted as warranting any specific upgrading apart from more additional and better placed advanced warning signage. This is primarily due to the tight horizontal alignment of Litchfield Road and the vertical alignment of both roads on the approach to the intersection (at a crest on Rum Jungle Road).

The projected addition low numbers of Browns Mine traffic to Rum Jungle Road does not impact on the efficient operation of the intersection that is subject to low traffic flows even in peak periods. The current intersection has more than adequate capacity to accommodate the projected traffic including any natural growth in the coming years.

However, it is acknowledged that traffic passing through the intersection to Browns Mine on Rum Jungle Road will be higher by up to around 20 vph. The increased traffic will improve the awareness of locals using the intersection that traffic controls at the intersection must be complied with. Concern for tourists and other drivers unfamiliar with the Litchfield Park Road approach to

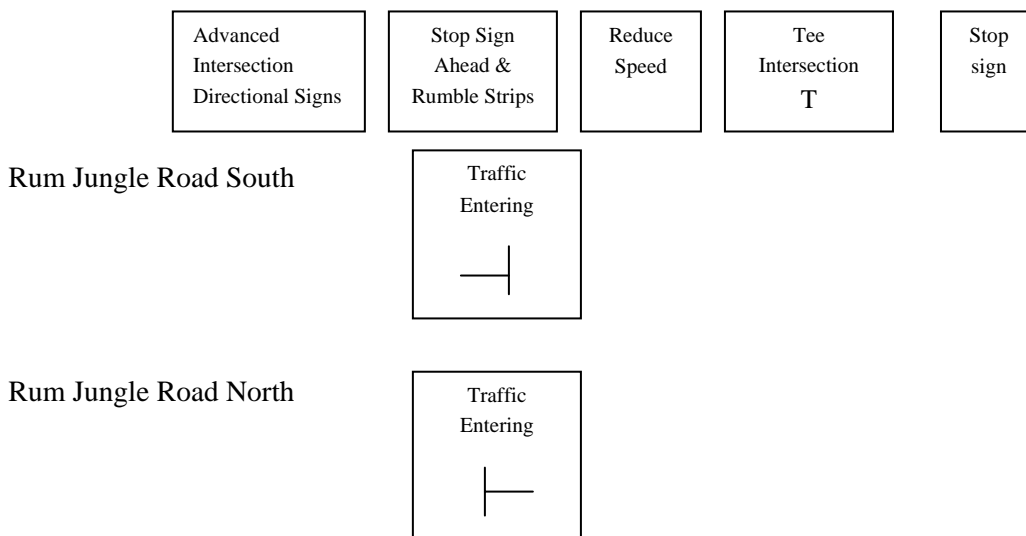


the Rum Jungle Road intersection is acknowledged due to the tight curves on the approach and the posted unlimited speed. Drivers are often weary and not alert after a long day and improved advanced warning signage and devices have been recommended for the current intersection configuration.

To emphasise the increased through and turning traffic on Rum Jungle Road it is recommended that the intersection operation be changed to a Stop sign / Hold line controlled intersection to reduce the tendency of drivers to just slow down without stopping, before turning onto Rum Jungle Road from Litchfield Park road.

The intersection could be resealed with different aggregate to provide a visual clue of the intersection hierarchy. New linemarking would be required as part of the works in addition to new signage on the approaches to the intersection. New signage recommended should include:

Lichfield Park Road



In addition guide posts should be installed at closer spacings on the Litchfield Park Road approach and the opposite side of Rum Jungle Road adjacent to the existing Direction Sign and Hazard Board. Rumble strips should also be considered for installation just prior to the Reduce Speed sign.

Completion of part of this intersectional signage and line marking should be implemented as part of for the current intersection arrangement as remedial works by the road authority.



3. Conclusions and Recommendations

Generally the impact of traffic generated by the proposed Browns Oxide Mine Project would be marginal in terms of impact on road carrying capacity. The geometry and carriageways of the road sections are adequate for the current and resultant traffic volumes in accordance with all but the latest edition of the Austroads – Guide to the Geometric Design of Rural Roads.

The additional traffic generated by the proposed development will create a marginal increase to the current traffic with the heavy vehicle proportion of that forming only a low number of trips through Batchelor and the road network. Intersections and roads currently carry similar vehicles and the extra 4.1 v.p.d. in each direction should not create any significant increase in risk within the Batchelor township; primarily due to the slower speed environment.

The number of accidents recorded for both Batchelor Road and Rum Jungle Road are primarily single vehicle accidents rather than collisions and the additional traffic generated by the proposed development should not change those trends.

Works recommended that should improve safety of the intersection and Rum Jungle Road are:

- 1) Remedial works and continued maintenance of the road to the level and standards to that which it is designed and constructed – to provide for safe passage of all traffic.
- 2) Modify the intersection with additional / improved signage to rely and reinforce the recommended modification to the intersection control and road hierarchy.
- 3) Reseal the intersection with a contrasting aggregate seal including the carriageway on Litchfield Park road for a distance of 200 metres to reinforce the signage and line marking.
- 4) Lower the posted speed limit on Rum Jungle Road to 80 km/h from the unlimited speed limit currently posted.
- 5) Communicate the planned operational changes to local residents by regular consultation and post during the change process.