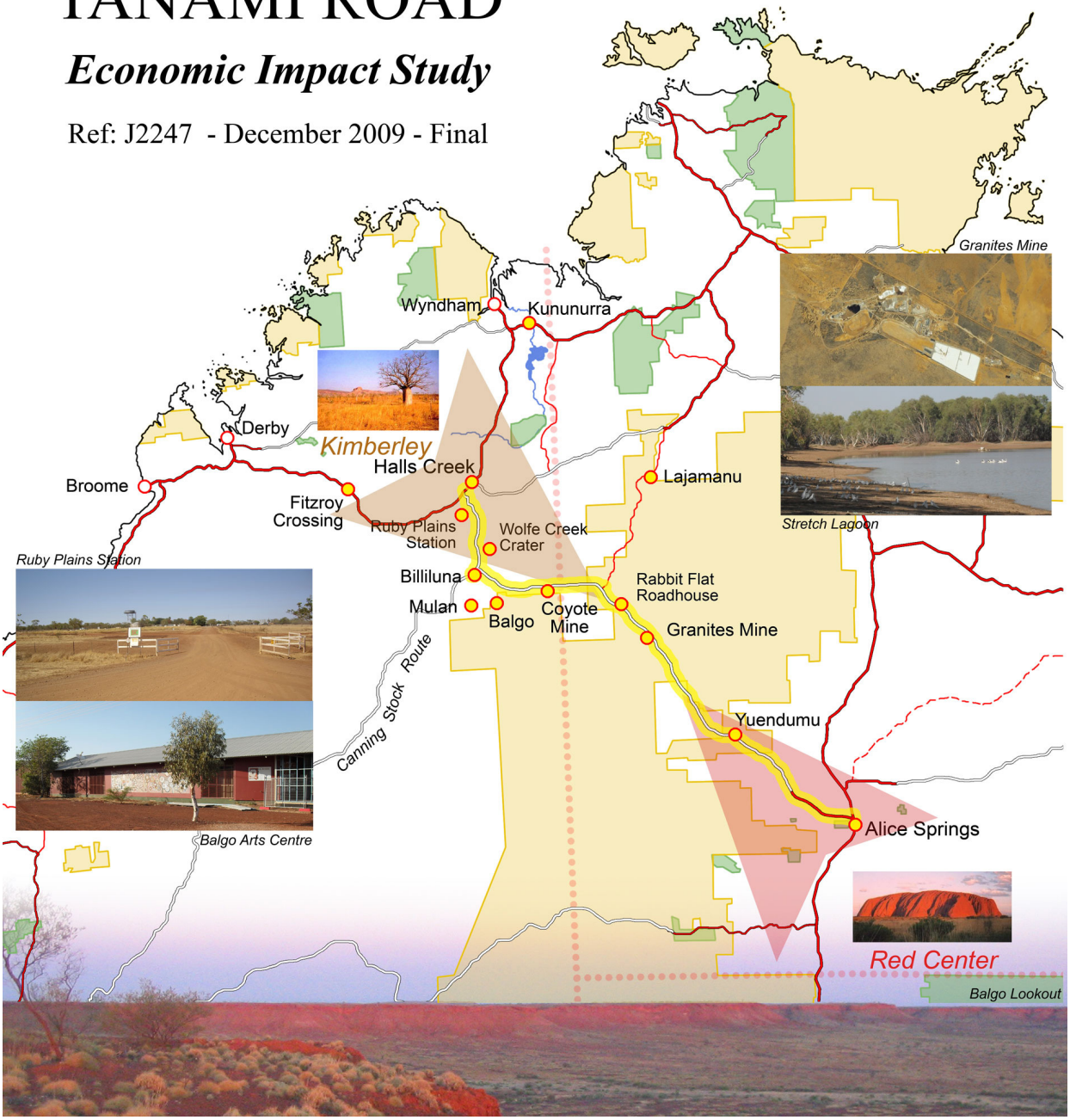
Wolfe Creek Crater

Cummings Economics

UPGRADING THE TANAMI ROAD

Economic Impact Study

Ref: J2247 - December 2009 - Final



UPGRADING THE TANAMI ROAD

Economic Impact Study

Ref: J2247
December 2009

Prepared for
SHIRE OF HALLS CREEK

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SUMMARY OF MAIN FINDINGS

- The study looks at the impacts of upgrading the 753km of currently unsealed road from Halls Creek to Yuendumu. (For the purposes of this study, it is taken that the sealing of the last remaining unsealed section from Alice Springs to Yuendumu is already committed.)

- The upgrading will benefit activity along the road including:

  - Major mining operations with a current output value of over $400m per annum.

  - Substantial indigenous communities.

  - Tourism and pastoral industries.

- The main benefit of the upgrading will be the opening up of a much shorter route with savings of up to 1,100km between the Kimberley region and the Red Centre/Alice Springs area.

  - This will result in major savings for tourism and inbound freight movements.

  - It will also have significant benefits for transport of horticulture produce from the Ord to southern markets and for the cattle industry.

- Apart from "direct" savings of operating costs and travel times, upgrading of the road will have significant "wider economic benefits" including:

  - Secondary efficiency savings as a result of less road closures and other factors for the large mining operations along the road.

  - "Regeneration" effects of creating employment in indigenous communities along the road and saving substantial income and other support expenditure in indigenous communities.

- There will be defence ramifications in providing a more direct interior route to support operations in Australia's north west.

- The Kimberley area is poised to record strong growth of mining activity over the coming decades, increased agricultural production and tourism, with likely steady growth in population and employment.

- The capital cost of the road upgrading to the standard envisaged is estimated at $160m against expected benefits at a 4% discount rate of Direct $421m, Wider Benefits $156m, Total $577,

- Estimated benefit cost ratio at a 4% discount rate is a very robust 3.4, and is still robust at a 7% discount rate at 2.3, and still positive at a 10% discount rate at 1.6.

1.0 BACKGROUND TO THE STUDY

1.1 BACKGROUND TO THE TANAMI ROAD

Many people would have an image of the Tanami as a track through endless arid desert and savannah landscapes – a road for outback 4WD adventures between the Red Centre and the Kimberley Region.

The modern reality is different. The endless arid desert and savannah landscapes are there, but by and large, it is a broad straight graded dirt road with occasional bends passing through occasional areas of low hills.

It is a road that services substantial Aboriginal communities, modern gold mines, tourism oriented facilities and cattle stations along the way.

Apart from tourist vehicles, it is a road that already carries:

- a substantial volume of community, station and business (especially mining and government), light vehicles, and
- a substantial number of heavy vehicles to service the major mining operations, communities and cattle stations along the route.

Potentially, the Tanami Road represents a major inter-regional transport link that will substantially cut costs of living and doing business in the Kimberley Region, provide improved access for Kimberley products to southern markets and further consolidate Alice Springs' role as a major transport and servicing hub in the centre of Australia.

1.2 THE STUDY

With a view to establishing a case for upgrading the road, the Shire of Halls Creek commissioned Cummings Economics to carry out the following economic impact study.

Although Shire of Halls Creek responsibility for the road extends only to the Western Australia/Northern Territory border, it was requested that the study look at upgrading the entire length of the road to sealed standard (both that section in Western Australia and the section in the Northern Territory).

The study process involved two major elements:

- Research to understand the economy of the whole Kimberley Region that would be affected by the creation of a new inter-regional linkage direct via Alice Springs to/from Adelaide and south eastern Australia.
- Field inspections and contact with communities and operations along the length of the road to understand the geography of the road and the impact of its upgrading.

The study was commenced at the end of August 2009. An initial visit to the Kimberley area was undertaken in the second half of September that involved contact and inspections especially in the Broome, Derby, Fitzroy Crossing area. This was followed by a further visit in the second half of October involved especially contacts and inspections in the Kununurra, Wyndham and Halls Creek area followed by inspection of the road itself. This included making contacts along the way and in Alice Springs.

As part of the project, extensive contact was made by telephone, email and mail to businesses and organisations in the area. Gathering of information was undertaken from publications and websites. A formal survey of cattle properties in the area was made and questions emailed to the two mines involved and communities along the route.

Details of persons and organisations contacted are given in Appendix 1.

The process of the study involved of the order of 4,000km of road travel in the Kimberley region, along the road, and in the Northern Territory.

2.0 OVERVIEW OF THE ROAD

2.1 SEGMENTS FOR ANALYSIS

The Tanami Road runs 1,015 km from a turnoff from the Great Northern Highway, 16km west of Halls Creek in the Kimberley region, in a south and south eastern direction to a junction with the Stuart Highway, 19km north of Alice Springs (see **Map #1**).

There is a symmetry in the location of activities along the road. There are cattle stations and tourism features along the initial segments of the road coming both down from the north and coming up from the south. In both cases, there are then relatively large Aboriginal communities. Coming up from the south is Yuendumu. From the north there is the Lake Gregory group of Billiluna, Mulan and Balgo. Next along the road are mines, from the south the Granites and from the north Coyote. In the middle is the stretch passing the turnoff to the Lajamanu community and Rabbit Flat Road House.

The road thus lends itself to be broken into segments for analysis. From north to south, construction and maintenance costs are analysed into the following five segments.

		Unsealed	Sealed	Total
1.	Turnoff 16km west of Halls Creek to Balgo turnoff	224 km	Nil	224 km
2.	Balgo turnoff to Coyote Mine/WA/NT border	84 km	Nil	84 km
3.	Western Australia border to Granites Mine	181 km	Nil	181 km
4.	Granites Mine to Yuendumu	254 km	Nil	254 km
5.	Yuendumu to turnoff Stuart Hwy, 19km north of Alice Springs	79 km	193 km	272 km
	Total	**822 km**	**193 km**	**1,015 km**

The following comments on each segment.

2.2 DESCRIPTION OF THE ROAD

Turnoff Halls Creek to Balgo Turnoff (224km)
The first section of the road winds south through approximately 35km of low hills. It then flattens out to pass Ruby Plains Station just off the road to the west at 40km from the turnoff. Road surface in this section is stony and can be very rough. It has a reputation of being one of the worst sections of the road if not graded.

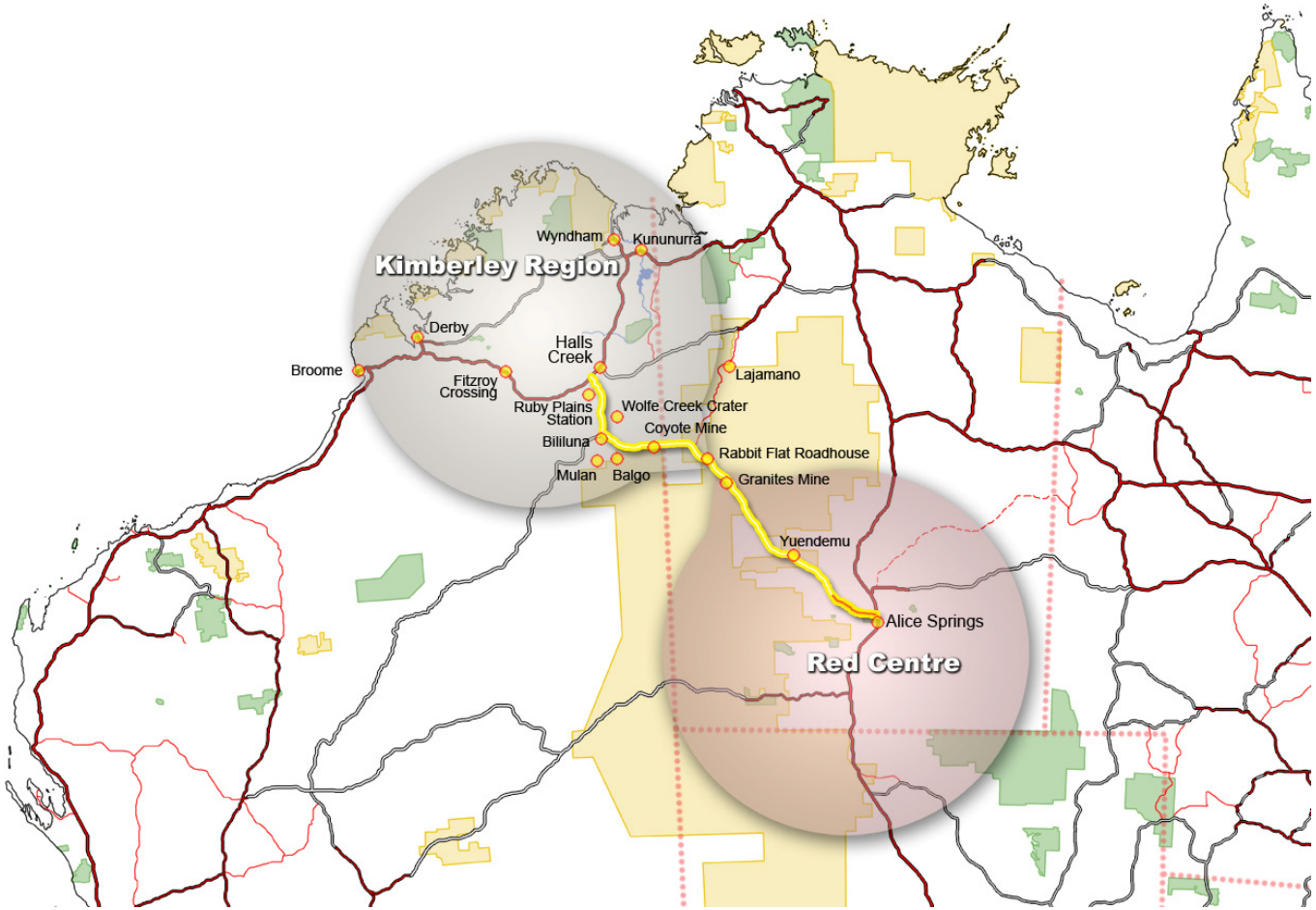
The road then travels through flat country. At 71km from Ruby Plains, a turnoff runs east 16km into the old Carranya Station/road house (now in ruins), then turns north 7km to Wolfe Creek Meteorite Crater. This is the current major tourist attraction along the road. Apart from being visited by through traffic travelling the Tanami/Canning Stock Route roads, significant numbers of visitors travel out from, and back to Halls Creek to view it.

The next major feature along the road is the group of three Aboriginal communities grouped around the Lake Gregory area at Billiluna, Balgo and Mulan (with Balgo being the largest).

Geographically, this area is a key focal point in the region. Sturt Creek flows south east out of the Kimberley area east of Halls Creek but 'dead ends' into the Great Sandy Desert area in a series of freshwater lagoons, waterholes and Lake Gregory itself.

To the immediate east of Lake Gregory are the Balgo Hills (peak height 358 metre Mt Wilson).

Map #1
The Tanami Road Route



Historically, this area was the junction of the stock route coming down Sturt Creek, the Canning Stock Route to the south and Tanami Downs Stock Route to the east. It is believed that these factors have influenced the location of the three Aboriginal communities in the area.

Apart from the population in the communities and the needs to service them, this area is of growing tourism interest. Attractions include extensive birdlife in the lakes and waterholes, outstanding Aboriginal art of Warlayirti Artists at Balgo and availability of Aboriginal cultural experiences in general. The area is at the junction of the current Canning and Tanami 4WD tourism routes.

Balgo Turnoff to Coyote Mine/WA/NT Border (84km)
The road travels across flat terrain with occasional low hills, 64km to the Coyote Gold Mine which is about 20km east of the Western Australia/Northern Territory border.

Border to Granites Mine (181km)
The road continues to be flat with occasional low hills across into the Northern Territory side 79km to the Mt Tanami area (height 489 meters) where there is a turnoff to Lajamanu 238km to the north east. The Tanami Mine nearby was operational until a recent closure. The old mine is of potential tourism interest.

The road continues 48km over flat terrain with occasional low hills in the distance to the long established Rabbit Flat Road House. The access road to Tanami Downs runs 52km south west from Rabbit Flat.

The major Granites Mine is 54km further on from Rabbit Flat. An access road to Mt Davidson outstation runs east.

Granites Mine to Yuendumu (254km)
The road from the Granites Mine continues over flat country with spinifex the dominant vegetation. About 60km out from Yuendumu, in the Mt Doreen area, ranges come close to the road to the east and to the west. There are various roads and tracks leading off to the west to an old mining area and to Vaughan Springs Station.

Yuendumu to Stuart Highway (272km)
The road from Yuendumu to Tilmouth Road House is flat terrain with substantial presence of mulga forests. Large sections are in the process of being sealed. From Tilmouth Springs the road is sealed to the Stuart Highway with the Macdonnell Ranges coming up as an increasing presence to the south.

2.3 CLASSIFICATION & JURISDICTION

The Northern Territory section is classified as an arterial road under the jurisdiction of the Northern Territory Department of Infrastructure and Planning.

The Western Australia section is classed as a local road under the jurisdiction of the Shire of Halls Creek.

There are no indigenous community or national park constraints to movement along the road.

2.4 CURRENT UPGRADING PLANS

Some press reports had indicated an intention of the Northern Territory Government to upgrade the road to sealed standard through to 80km from the border, ie. to the turnoff to Lajamanu.

A check with the Northern Territory Government indicated that the Northern Territory Government's commitment in the medium term was to seal the remaining unsealed section of the road through to Yuendumu only.

For the purpose of this study, it is assumed that the sealing of the road to Yuendumu is committed. The study thus looks at the benefits and costs of upgrading to sealed standard the remaining 743km of unsealed road from Yuendumu to the Halls Creek turnoff.

2.5 CURRENT STATE OF THE ROAD

2.5.1 Road Surfaces

This analysis is carried out using classification of roads into categories as follows.

Earthen	E
Gravel	G1
	G2
	G3
	G4
	G5
Sealed	S1
	S2
	S3
	S4
	S5

Based on information provided by the Shire of Halls Creek, and Northern Territory Roads and from field observations, current standard of the road is judged to be as follows.

Halls Creek turnoff to Balgo turnoff	224 km	E	Earthen (1)
Balgo turnoff to border	84 km	E	Earthen (1)
Border to granites Mine	181 km	E	Earthen
Granites Mine to Yuendumu	200km 54 km	E G2	Earthen (2) Low standard gravel (2)

(1) *Note: There has been some gravelling of some sections in the past but it has not been maintained.*

(2) *Note: This section of the road is estimated to have had works on a fifth to take it up to the equivalent of G2 level.*

2.5.2 Travel Speeds

Travel times vary greatly depending on grading.

In the 35km hilly section from the Halls Creek turnoff to just before Ruby Plains Station, surfaces are rocky and if not graded, can slow traffic substantially.

The other main hazard along the road that will slow traffic when ungraded, is 'bulldust' patches.

Road closures due to rain are covered in Appendix 2 which also canvasses extent and composition of traffic on the road.

Based on field inspection and opinion of road users, average travel speeds current and if sealed are estimated at:

	Current		If Sealed	
	Truck	Light Veh	Truck	Light Veh
Halls Creek turnoff to Balgo turnoff	60 kph	70 kph	100 kph	110 kph
Balgo turnoff to Border	60 kph	70 kph	100 kph	110 kph
Border to Granites Mine	60 kph	70 kph	100 kph	110 kph
Granites Mine to Yuendumu	70 kph	80 kph	100 kph	110 kph

This translates into travel time savings.

		Travel Time		
Trucks	**Distance Km**	**Current Hrs**	**Sealed Hrs**	**Saving Hrs**
Halls Creek turnoff to Balgo turnoff	224	3.73	2.24	- 1.49
Balgo turnoff to Border	84	1.40	0.84	- 0.56
Border to Granites Mine	181	2.78	1.81	- 0.97
Granites Mine to Yuendumu	254	3.62	2.54	- 1.08
Total	**743**	**11.53**	**7.43**	**- 4.10**
Light Vehicles	**Distance Km**	**Current Hrs**	**Sealed Hrs**	**Saving Hrs**
Halls Creek turnoff to Balgo turnoff	224	3.20	1.14	- 2.06
Balgo turnoff to Border	84	1.20	0.76	- 0.44
Border to Granites Mine	181	2.41	1.65	- 0.76
Granites Mine to Yuendumu	254	3.18	2.31	- 0.87
Total	**743**	**9.99**	**5.86**	**- 4.13**

2.6 EXISTING TRAFFIC ON THE ROAD

Appendix 2 gives a detailed assessment of the extent and composition of existing traffic on the road.

The following summarises the estimates in seven segments.

	Estimated Average Daily Vehicle Movements					
	Heavy	Light				Total
		Tourist	Business	Communities	Stations	
Turnoff to Wolfe Creek	7	18	5	8	4	**42**
Wolfe Creek to Billiluna	6	14	5	8	2	**35**
Billiluna to Balgo turnoff	5	12	4	6	1	**28**
Balgo turnoff to Coyote Mine	2	12	2	3	-	**19**
Coyote Mine to Lajamanu turnoff	2	12	1	3	-	**17**
Lajamanu turnoff to Granites Mine	2	13	2	5	-	**22**
Granites Mine to Yuendumu	10	13	8	6	-	**37**

The heavy vehicles at the Halls Creek turnoff end are a mix of station, community supply and mining supply/exploration vehicles.

At the Yuendumu end, they are almost entirely mining supply vehicles.

3.0 CAPITAL COSTS & MAINTENANCE COSTS

3.1 CAPITAL COSTS

Capital costs are determined in part by the standard of road to be built. Discussions with Shire of Halls Creek engineering staff indicate that the standard of road envisaged is a 7 metre sealed pavement with 1.5 metre shoulders. Estimated cost if built by local government is an average of $200,000 a km. It should be noted that by and large, state road authorities build to a higher standard than local authorities and at substantially higher costs. Recent work contracts for Northern Territory roads for sealing road sections in the Yuendumu area have been costing of the order of $300,000 to $400,000 per km.

The following estimates for the Northern Territory section is based on a road standard that would cost $300,000 per km to the Granites and $200,000 per km to the Northern Territory border.

The following table summarises capital costs.

Estimated Capital Costs:	Distance Km	Cost per Km	Capital Cost
Turnoff 16km west of Halls Creek to Balgo turnoff	224	$200,000	$44.8 m
Balgo turnoff to Western Australia border	84	$200,000	$16.8 m
Total WA Section	**318**		**$61.6 m**
Western Australia border to Granites Mine	181	$200,000	$36.2 m
Granites Mine to Yuendumu	254	$300,000	$76.8 m
Total NT Section	**435**		**$113.0 m**
Overall Total	**743**		**$174.6 m**

It should be noted that this cost incudes GST. Cost excluding GST would be $158.9m.

3.2 MAINTENANCE COSTS

Shire of Halls Creek advise that current maintenance costs without any gravel resheeting are:

Full grade drains and surface....$155,500
Invert to invert.....$80,860
Running grade.....$124,400
Total.....$360,760
(ie. $1,138 per km)

Sealed maintenance is estimated at $1 – $2 million for the 317km to the WA/NT border. A figure of $1.5 per m is adopted, ie. $4,732 km.

Based on this and other Northern Territory roads data, it is estimated the road maintenance costs per km on the Northern Territory side will be:

	Current	Sealed
Western Australia border to Granites Mine	$1,300 / km	$4,700 / km
Granites Mine to Yuendumu	$2,000 / km	$4,900 / km

The following table estimates current maintenance costs and those if sealed and the difference.

Estimated Maintenance Costs:	Distance Km	Currrent $/km	Current Total $	Sealed $/km	Sealed Total $	Difference Total $
Halls Creek turnoff to Balgo turnoff	224	$1,138	$254,912	$4,732	$1,059,968	$805,056
Balgo turnoff to Border	84	$1,138	$95,592	$4,732	$397,488	$301,896
Border to Granites Mine	181	$1,300	$235,200	$4,700	$850,700	$615,500
Granites Mine to Yuendumu	254	$2,000	$508,000	$4,900	$1,244,600	$736,600
Total	**743**	**$1,472**	**$1,093,704**	**$4,782**	**$3,552,756**	**$2,459,052**

Difference excluding GST would be $2,235,502.

Nett Present Value of the increased maintenance costs are:

Discount Rate	NPV Factor	NPV
4%	17.29	$38,651,826
7%	12.41	$27,742,577
10%	9.43	$21,080,782

4.0 OVERVIEW OF REGIONS AFFECTED & INTER-REGIONAL TRAVEL IMPLICATIONS

4.1 GENERAL

In essence, the Tanami Road links the two iconic Australian regions of the Red Centre and Kimberley though a relatively flat, sparsely populated area. Although populations along the road are low, it services a traditional pastoral industry, major mining operations, gives access to tourism attractions and a number of important indigenous communities. At a strategic level, it provides a potentially important direct route between the Kimberley region and the major centres of south eastern Australia (especially Adelaide and Melbourne), via Alice Springs and the Red Centre.

4.2 POPULATION

Population of the regions affected and along the route is as follows.

Estimated Residential Population, 2008				
		Total	Indigenous	
			No.	%
KIMBERLEY REGION (WA)		29,298	12,325	*42%*
Shire of Halls Creek		3,136	2,480	*79%*
Halls Creek Township	(838)		(460)	*(55%)*
Billiluna	(144)		(119)	*(83%)*
Mulan	(114)		(99)	*(87%)*
Balgo	(460)		(410)	*(89%)*
Other along road (CD 5010202)	(100)		(n/a)	*(n/a)*
Sub Total on road	(818)		(628 plus *CD 5010202)*	
CENTRAL AUSTRALIA (NT)		35,311	13,528	*38%*
Alice Springs		23,829	4,494	*19%*
Yuendumu		686	599	*87%*
Other along road		61	n/a	*n/a*

Source: ABS data.

The foregoing is residential population. Generally, there are two types of visitor populations in the area – tourists (holiday purpose) and working visitors. Working visitors in this area are composed of government workers and contractors present in the communities, cattle properties at the time of the census, and of mining fly-in/fly-out workers. Estimates of visitor numbers at the time of the 2006 Census was as follows.

Visitor Counts, 2006 Census				
	WA	**Other**	**Overseas**	**Total**
KIMBERLEY REGION (WA)	6,857	6,358	1,139	**14,354**
Halls Creek Township	351	275	59	**685**
Billiluna	6	3	-	**9**
Mulan	15	6	-	**21**
Balgo	28	5	-	**33**
Other along road (CD 5010202)	na	na	na	**n a**
	NT	**Other**	**Overseas**	**Total**
CENTRAL AUSTRALIA (NT)	1,785	3,819	2,342	**7,946**
Yuendumu	56	19	-	**75**
Other along road	na	na	na	**n a**

Source: ABS Census data.

A substantial proportion of the recorded visitors to the Kimberley region (especially from Western Australia but also interstate), are likely to be fly-in workers to mines. In Halls Creek Shire, Coyote Mine is likely to contribute abut 80 to the visitor numbers on any given day. Separate visitor figures for the relevant Census Collection District are not available. The Central Australia figures are less likely to have large fly-in worker numbers in them, although they are likely to include over 600 at the Granites Mine on any given day.

The figures serve to illustrate however, the relatively large visitor numbers in each of the two regions connected by the Tanami Road.

4.3 TRAVEL IMPLICATIONS

The current state of the road suppresses inter-regional access between the Kimberley region and many parts of Australia. Its sealing will result in the following distance savings between Kimberley centres and other major Australian centres.

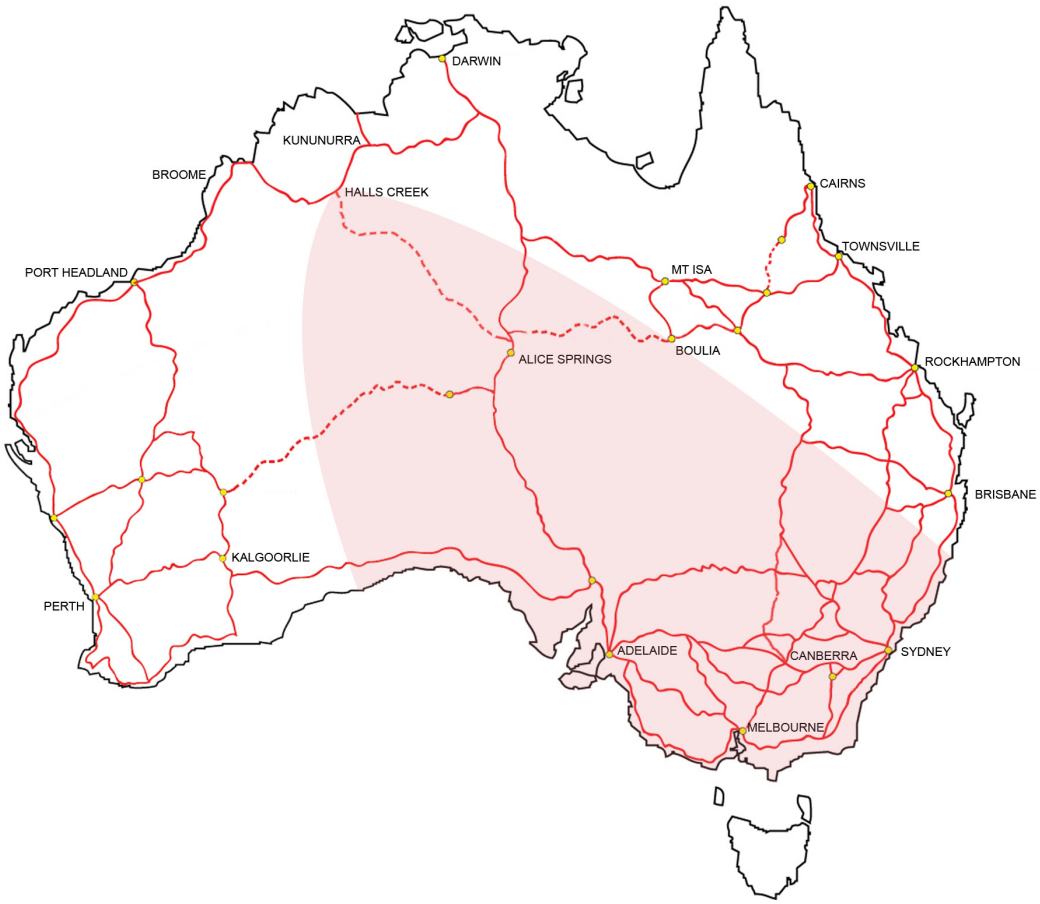
Alice Springs	Distance via Victoria & Stuart Hwy	Distance via Tanami	Saving
Kununurra	1691	1419	272
Halls Creek	2145	1076	1069
Fitzroy Crossing	2433	1332	1101
Derby	2694	1593	1101
Broome	2829	1728	1101
Adelaide	**Distance via Great Northern Victoria & Stuart Hwy**	**Distance via Tanami**	**Saving**
Kununurra	3221	2949	272
Halls Creek	3675	2606	1069
Fitzroy Crossing	3963	2862	1101
Derby	4224	3123	1101
Broome	4359	3258	1101
Melbourne	**Distance via Great Northern Victoria & Stuart Hwy**	**Distance via Tanami**	**Saving**
Kununurra	3960	3688	272
Halls Creek	4414	3345	1069
Fitzroy Crossing	4702	3601	1101
Derby	4963	3862	1101
Broome	5098	3997	1101
Sydney	**Via Tennant Creek**	**Distance via Tanami, Port Augusta**	**Saving**
Kununurra	4176	4224	- 48
Halls Creek	4579	3884	695
Fitzroy Crossing	4795	4137	658
Derby	5051	4398	653
Broome	5188	4533	655

Linkage Savings

Perth – no savings. Upgrading the Tanami Road plus the Outback Highway (Alice Springs to Laverton in Western Australia), would provide an alternative route. The Tanami Road will cut off very large distances for goods coming from the eastern states and being transhipped via Perth.

Inter-regional distance savings from Alice Springs and the major capitals of the south east to Halls Creek, Fitzroy Crossing, Derby and Broome are major at over 1,000km to Alice Springs, Adelaide and Melbourne and 635km to Sydney. Kununurra savings are marginal to Alice Springs, Adelaide and Melbourne (272), and there is no saving to Sydney. **Map #2** illustrates.

Map #2
Tanami Road Upgrading
Areas of Australia Made Closer to the Kimberleys in
Road Travel Times & Costs



5.0 ECONOMIC IMPACTS OF UPGRADING THE ROAD

5.1 PRIMARY INDUSTRIES

5.1.1 General

Implications of upgrading the road will be at two levels:

a) The inter-regional freight cost implications for transporting output/produce to markets.

b) Implications for primary industries along the road.

5.1.2 Cattle

The cattle industry remains the long-term base of primary industry production in the Kimberley region.

Currently almost all turnoff is shipped to Asian markets as live cattle exports through the ports of Broome, Wyndham and Darwin.

Along the Road

Cattle stations and numbers along the Tanami Road in the north include:

- S Kidman and Co, Ruby Plains and Sturt Creek 40 km south of turnoff.
- Youga–Walla Station accessed via Billiluna.
- Operations of Billiluna, Mulan and Balgo communities.

In the middle section of the road is:

- Suplejack – accessed from the Lajamanu Road.
- Tanami Downs – accessed from highway near Rabbit Flat Road House.

There is substantial production from central Australian cattle stations. The northern most, Mt Doreen, is on the Tanami Road just north of Yuendumu.

Central Australian cattle tend to go in three directions – north to Darwin for the live cattle market, east to Queensland to saleyards, and south to Adelaide.

It was recorded that some from Mt Doreen had travelled to Wyndham for live cattle exports via the Tanami Road in the past.

Upgrading the Tanami Road could result in diversion of some of the area's output for export via Wyndham and Broome, especially those cattle from the north west of Alice Springs. Comparative road distances ex the Tanami turnoff from the Stuart Highway are Wyndham 1,428km and Darwin 1,482km, a saving from the turnoff of 54km and more for those properties further out along the road.

The information available indicates that about 40,000 head from Central Australia are being exported live via Darwin. Estimated extra numbers likely to travel from the Central Australia area along the Tanami Road to Wyndham is put at about 5,000 head pa.

Estimated numbers along the central section of the road (Suplejack and Tanami Downs) have been put at about 13,000 with a turnoff of about 3,500. Currently, these cattle tend to move up to Darwin via the Lajamanu Road and Buntine Highway.

There is a potential to increase number of cattle and turnoff from this area and it is estimated that turnoff is likely to double.

Sealing of the Tanami will result in Wyndham becoming a better alternative than Darwin as illustrated below, and it is likely that these cattle would all move via Wyndham.

Road Distances if Tanami Road Sealed			
	Unsealed Section	Sealed Section	Total
From Suplejack			
Darwin (via Yuendumu)	254 km	727 km	981 km
Wyndham (via Tanami)	79 km	782 km	861 km
From Mt Tanami			
Darwin (via Yuendumu)	385 km	727 km	1,112 km
Wyndham (via Tanami)	52 km	824 km	876 km

At the northern end of the road, on the Western Australia side, estimated cattle turnoff is over 10,000 head. These cattle already move over the Tanami Road producing road train shipments of the order of 70 per annum, ie. about 140 movements per annum. Potential carrying capacity of this area (including Aboriginal lands), is estimated to increase numbers by 20,000, with turnoff potential of an extra 5,000.

Total cattle numbers and turnoff in the Kimberley region in 2006/07 was as follows.

Number 639,000
Turnoff 153,000
Gross Value of Production ..... $86 m

Responses by the cattle industry indicate the above underestimates the overall numbers in the area. As in the Tanami Road area, there is a capacity to increase overall stock numbers that has been identified. Estimated carrying capacity in the area is:

East Kimberley area 286,000
West Kimberley area 533,000
Total 820,000

This would indicate a capacity to expand herd by about 30%.

However, it is believed that because much of the existing herd is not well managed, there is a capacity to increase turnoff by a substantially larger percentage, with some suggesting turnoff could be increased from 150,000 up to about 250,000 head.

Almost all turnoff goes to the live cattle trade via the ports of Broome, Wyndham and Darwin. Live cattle shipments Kimberley cattle in 2008 were:

Broome 81,000
Wyndham 51,000
Balance ..... 21,000 (presumably via Darwin)

The industry in the Kimberley region would welcome the upgrading of the Tanami Road.

There are elements of the cattle herd that are not suitable for the live cattle market, especially cows and bulls and shorthorn breeds. There were reports that lack of markets for this type of cattle were leading to them dying in the paddock. There is believed to be about 65,000 head of shorthorns in the north Kimberley area not suitable for live cattle export markets alone. The market for this type of cattle is limited in Perth.

While there are proposals being put forward for an abattoir in the area, past attempts have not been successful. The sealing of the Tanami Road would provide access to major outlets for this type of cattle to processing facilities in south eastern Australia, especially South Australia.

It is estimated from responses from the industry that about 10% of an expanded Kimberley output would travel south over a sealed road, ie. about 25,000 head per annum.

To summarise, it is estimated that, if sealed, cattle movements along the road would increase as follows.

Estimate Cattle Numbers over Tanami Road					
		Current		**Road Sealed**	
North to live cattle trade	Ex Central Australia	Neg		5,000 head 30 road trains 60 triple movements	
	Ex Central section of the road	Neg		7,000 head 40 road trains 80 triple movements	
	Ex Northern section of the road	10,000 head 70 road trains 140 triple movements		15,000 head 105 road trains 210 triple movements	
South to Abattoirs	Ex Kimberley area generally	Nil		25,000 head 150 road trains 300 triple movements	
Total				**52,000 head 325 road trains 650 triple movements**	
	Av vehicles per day:	**Road trains pa**	**Road trains daily**	**Road trains pa.**	**Road trains daily**
	Northern section	140	0.4	650	1.8
	Central section	-	-	440	1.2
	Southern section	-	-	360	1.0

5.1.3 Horses

Australia is estimated to have between 300 to 400,000 horses classified as being feral. They are mainly found in arid and semi-arid regions. If left unmanaged they have the potential to increase at 20% per year. In Western Australia, feral horses are mainly located in the Kimberley, Pilbara and Goldfields areas. A Department of Agriculture and Food survey in 2002/03 indicated 1% of pastoral leases were considered to have a heavy infestation, and 5% a medium infestation of feral horses. Feral horses are a complex management problem. They are widespread, often in relatively inaccessible country, and are a major pest to both agriculture and the environment. They represent a potential commercial resource, but attract animal welfare concerns. In Western Australia the main management methods are commercial harvesting and control by shooting. Commercial harvesting is undertaken to reduce large numbers when the price per head exceeds the cost of transport and mustering. Given the cost of transport, it has generally been uneconomical to harvest them in many areas of Western Australia.

Australia processes 30-40,000 horses annually for human and pet consumption of which 20% are feral horses. Horsemeat from feral animals cannot be sold for human consumption in Australia and is exported. According to the Australian Quarantine and Inspection Service, the largest volume of export horsemeat was 6,137 tonnes in 1998/99 worth an estimated $26.4 million. In 2006/07, 2,320 tonnes of horsemeat was exported to 14 countries with the majority going to Russia (48%), Switzerland (15%), Belgium (14%) and France (11%). The total value of exports in 2006/07 was $10.3 million.

Horsemeat for export must be processed in export accredited abattoirs. Currently there are two export accredited abattoirs; Metro Velda in Peterborough, South Australia and Meramist in Caboolture, Qld. Significant numbers of horses for the Metro Velda abattoir have been sourced from the Northern Territory and Halls Creek area and in past years returned $200 – $250 delivered South Australia. There are also 33 licensed knackeries in Australia that produce pet food from horsemeat.

One source thought that a sealed Tanami Road would reduce road transport costs from $10 per km to $6 per km and result in at least one triple per week. Another source stated that horsemeat was being substituted for kangaroo meat in the export market and demand could result in up to 7 triples per week.

At present there are a number of multi-species abattoir proposals in the NT. One proposal targets camels, horses, cattle, water buffalo and donkeys in order of preference/numbers processed. Proposed locations of multi-species abattoirs include Alice Springs, Katherine and Batchelor. The Alice Springs proposal would be of particular significance for the Tanami Road and there seems good prospects of it succeeding. It is estimated that it would draw in along the Tanami Road camels from as far out as Mt Doreen and horses from the Kimberley area at a rate of 3 to 4 road trains a week for 5 years until the large numbers in the area were reduced.

The following analysis provides for 3.5 road trains per week for 5 years.

5.1.4 Cropping

The construction of the Ord River Dam in the 1960's led to the Ord River plains becoming an agricultural area and the development of Kununurra as the main centre of the East Kimberley area. Current irrigation area is about 14,000 ha.

Attempts to establish agricultural production on the Fitzroy River in the vicinity of Fitzroy Crossing have not been sustained in the past.

Some small scale horticulture has been established in the Broome and Derby areas producing mangoes, melons, and bananas, mainly for the Perth market and pasture seed.

Gross Value of Crops in 2006/07 was as follows.

Vegetables	$33 m
Fruit	$6 m
Pasture & other crops for hay	$4 m
Nurseries	$2 m
Other	$8 m
Total	**$53 m**

Most of the production is in the Ord Irrigation Area with about $5m of the above in the Broome and Derby area. More detailed figures (2006/07) are:

Watermelons	$10383,000
Pumpkins	$10214,000
Rockmelons	$6270,000
Sugarcane	$6010,000
Mangoes	$4397,000
Hay	$3784,000
Melons	$3074,000
Beans	$1732,000
Bananas	$1848,000
Legumes	$779,000
Turf	$739,000
Indoor nurseries	$668,000
Maize & sorghum	$610,000
Pawpaws	$576,000
Zuchini, cucumber	$448,000
Cut flowers	$325,000
Outdoor nurseries	$265,000
Herbs	$246,000
other	$364,000

ABS Statistics for 2006/07 indicate the following tonnages of fruit and vegetables are being produced in the area. These are transported by road to southern markets.

Melons	19,000 tonnes
Pumpkins	13,200 tonnes
Mangoes	1,700 tonnes
Beans	400 tonnes
Bananas	300 tonnes
Pawpaws	200 tonnes
Cucumbers	100 tonnes
Total	**34,900 tonnes**

Based on triples carrying 60 tonnes per truck, truck movements south would be 1.6 per day. Based on information from transport companies, split up between markets is estimated at:

Perth	11,840 tonnes	32%
Adelaide/Melbourne	23,310 tonnes	63%
Tennant Ck to East	1,480 tonnes	4%
Total	**37,000 tonnes**	

The Tanami route would save 272km to Adelaide/Melbourne on the existing route via Katherine.

The 23,000 tonnes would be likely to travel over that route if sealed. This would involve about 390 movements a year with a diversion saving of 272km.

Much of these vehicle movements would involve an inward movement to deliver refrigerated freight to the Kimberley area as part of the inbound freight movement covered in Section 8.4.3.

5.1.5 The Future

The Western Australia Government has announced a $200m investment to double the Ord Irrigation Scheme.

There is still some uncertainty about what crops this will involve. However, for this study, we have assumed the pattern remains the same, and that it would result in traffic down a sealed Tanami Road doubling.

It was drawn to our attention in the course of the study, that there was renewed interest in re-establishing agricultural production in the Fitzroy River area. However, no additional produce from that source has been allowed for in this study.

5.2 MINING

5.2.1 General

Mining impacts are also divided between:

a) Current and prospective mining along the Tanami Road.

b) The road's potential to provide a cheaper route to supply mining activity generally in the Kimberley region.

Map #3 gives main locations.

5.2.2 Current Mining Activity Along the Road

The Tanami area has been involved in gold production over a long period of time.

There are currently two major operations in the area.

Tanami Gold NL

Coyote Mine on the Western Australia side about 20km from the border.

Newmont Mining Corporation

Tanami Operations 254km north of Yuendumu.

Tanami Operations include a processing facility and mine accommodation camp at the Granites and 40km west of the Granites, an underground mine at Dead Bullock Soak Goldfield (Callie Mine).

The Newmont operation is by far the larger of the two with a 2008 production of 367,000ozs with a value of $381m.

Workforce varies depending on construction activity however, current workforce is about as follows:

Company personnel	117
Contractors	659
Total	**836**

The Granites accommodation camp houses 199 Newmont employees, 506 contractors as well as 130 to 170 short-term contractors/projects personnel. Traffic is also generated by the processing plant located at the Granites.

Almost all the workforce is on a fly-in basis, mainly out of Perth. However, significant traffic is generated as follows.

Light Vehicles

Contractors and trade vehicles

Technical and sales

Government personnel

Heavy Vehicles

Production input chemicals, cyanide, ammonium nitrate

Fuel

General supplies

Replacement parts

Construction materials

Map #4
Mining Projects – Kimberley Region

Source: Acil Tasman – Vision 2020 Report – Australian Mining Council.

It is estimated that the mine produces heavy vehicle movements as follows.

1. Northfuels – fuel – 8 triples per week- tankers arrive loaded on rail at Alice Springs - extra 2 triples/week during backfill operations.
2. Freightwest – mill balls – 4 to 5 triples per month.
3. Chemtrans – sulphuric acid – 1 triple per week from Townsville Zinc Refinery.
4. Chemtrans – hydrochloric acid (caustic soda) & reagents – 1 triple per month via Alice Springs from southern states.
5. Isa Freight Express – cyanide – 1 triple per fortnight.
6. Isa Freight Express – ammonium nitrate – 1 triple per fortnight.
7. G & S Transport – general – 1 triple per day.
8. G & S Transport – lime – 1 triple per week arrive on rail at Alice Springs.
9. Kalari Transport – cement – very minimal in last 12 months but about to start new backfill campaign, 12 to 24 months ago had minimum of 1 triple per day and up to 4 triples per day on backfill campaign. Campaigns usually run for 3 months then break for a couple of weeks then start another 3 month campaign. This campaign program can last all year round depending on mine program.
10. Holcim – aggregate & sand – 2000 mt/yr & 75 mt payload= 1 triple per fortnight.

The Coyote operation is smaller with a production in 2008/09 of about 23,000oz valued at $27m.

The operation includes both open pit and underground operations.

It has a workforce of about 120 employees and 30 contractors which is on a fly-in basis out of Perth and Darwin. Average on-site on any one day is about 80

The following sets out estimates of heavy truck movement generated.

Trucks that come in from the north include:

1 triple road train per week ex Perth (general freight).

1 triple road train per fortnight ex Darwin (fuel).

Some that usually come in via Alice Springs will divert around the northern route if the southern access is closed. This is estimated at about 20 per annum.

Much of the supplies come via Alice Springs. This includes 2 triples per month of general transport and 1 triple per month of lime.

Explosives come from Kalgoorlie once a month through Alice Springs.

Toll/IPEC have fresh food deliveries ex Alice Springs every 2 to 3 weeks.

Apart from heavy transport movements, the Coyote Mine generates light vehicle movements in the business category.

There is one drive in employee from the Lake Gregory group of communities. Upgrading the road would facilitate drawing workforce from this area.

Other business category traffic will include:

- Some contractors and tradesmen vehicles.
- Some company traffic to Halls Creek for supplies, parts, etc., and occasionally to Rabbit Flat Road House.
- Some traffic to Halls Creek for services (eg. emergency, health, etc.). Medical visits are estimated at a couple of times a month.
- Company representatives/sales and service personnel visits.

In addition to the current operations of mines along the Tanami Road, substantial exploration activity is taking place throughout the area that is generating truck and light vehicle movements (in this study, mining light vehicles are included with "business" movements).

Costs of underdeveloped road systems to the mining industry are high, not just in additional transport costs, but in 'secondary' impacts.

Unlike the cattle industry that mainly generates traffic during the dry season, mines need to operate all year round. These operations can be heavily affected by road closures.

Road closures due to rain can cause both direct losses through curtailment of production **or** major capital expenditure on storage capacity for inputs and a need to hold additional stocks of inputs, parts and equipment. Newmont Tanami Operations carry 6 weeks of stock at great expense both in the value of the stock itself, but also construction of storage capacity.

Mines also operate a great deal of complicated machinery and equipment which is subject to breakdowns and at times, need to bring in parts urgently. Delays in getting urgently needed parts to the mine can cause partial and even full shutdowns involving substantial loss of revenue. This has generated a whole class of transport operations called 'hot shots' that involve non-stop delivery using two drivers. Value of production for a mine such as the Granites is such that mine shutdown due to a breakdown would involve losses of about $1m a day and every hour saved in 'hot shot' responses can save large amounts of money (in the case of the Granites, an estimated saving of $83,000 if a full shut down occurs).

Another often unrecognised factor impinging on mine operations (and for that matter on other operations in the area), is the need to come to the rescue of travellers along the road who have broken down. The Coyote operation indicated that use of vehicles and personnel for this purpose was costing the company of the order of $100,000 per annum. Some of this would occur if the road was sealed, but the unsealed state would account for a large proportion of this cost.

It was estimated by Tanami Gold that the above factors were causing losses or adding to the Coyote operations' costs, by about $5m per annum. Coyote Mine produces one-eight of Newmont's Tanami Operations gold production.

It has not been possible to estimate these factors accurately.

A modest amount of $2m per annum over the two mines is brought to account under the heading "Secondary Benefits to Mining" with NPV of benefits of $60.00m at 4% discount rate and 4% growth factor, ($39.2m @ 7% discount rate), ($28.08m @ 10% discount rate).

5.2.3 Future Prospects Along the Tanami Road

Existing Mines

The Coyote Mine currently has a projected mine life of a further 5 years, but is exploring actively for additional lode. It projects that it will increase its production rapidly over the next three years from 23,000 to 300,000oz a year with workforce increasing from 150 to 750.

Newmont has been finalising a Tanami Operations Optimisation Project which is investigating potential cost and production efficiencies gained by options such as moving the accommodation village and processing plant from the Granites to the new mine site at Dead Bullock Soak (Callie Mine).

The global crisis has impacted strongly on the capital costs of options but it is still expected that a significant investment will extend the mine life beyond 2015 and possibly past 2020.

The general economics of gold mining will be impacted if prices fall from the current high levels of over USD 1,000/oz.

In some cases, large gold mining companies may sell smaller known gold resources to junior mining companies who are able to mine more economically.

Halls Creek Turnoff to Billiluna

Navigator Resources is exploring for rare earths in the Cummins Range area west of the Tanami Road, south west of Halls Creek. An independent resources estimate (released recently), indicates deposits comparable to Mt Weld near Laverton. Mt Weld is planing to process the rare earths in Malaysia. Phosphate is likely to be a by-product of the mine and could result in a need to be transported to Wyndham for further processing. The Cummins Range rare earth deposit is one of only four in Australia. The rare earth market is dominated by China (95% of the world's supply). Rare earths are essential to the new green economy (eg. hybrid cars and wind turbines).

AusQuest's Wolfe Manganese Project currently involves drilling to the east of Ruby Plains homestead and also west of the Tanami Road down to the Billiluna area.

Atomic Resources are actively exploring for uranium in the Sturt Creek pastoral lease area east of Billiluna.

Billiluna to Border

Northern Uranium's Gardiner Tanami Super Project is located on and north of the Tanami Road and extends into the Northern Territory in the Browns Range area. It involves exploration for uranium and is described as the company's "flagship project". The company believes the area is prospective for a large high grade high value uranium deposit.

Northern Uranium has also reached agreement with Manhattan Corporation Limited for Northern to earn a 60% interest in Manhattan's Gardiner Range project by expenditure of $1.05 million.

Excalibur Mining Corporation/Palace Resources are also exploring for uranium in the Browns Range area north of the Tanami Road straddling the Western Australia/Northern Territory border.

Border to Yuendumu

Ord River Resources, apart from exploring to the east of Halls Creek in the Copper Flats area, are exploring for gold in the Suplejack area north of the Tanami Road in the Northern Territory, 80km north of the old Tanami Mine.

Energy Metals are developing uranium prospects to the west (Bigryli Project) and north west (Macallan Project) of Yuendumu. If developed, these seem likely to use the Tanami Road for access. Bigryli Project would access from about 70km out from Yuendumu and Macallan Project from about 200km out. Energy Metals recently received approval for Chinese interests to acquire a 70% stake in the project. China Guangdong Nuclear Power Holding Co. already has four power stations and a further 18 under construction.

Toro Energy is exploring mainly east of the Tanami Road north from Yuendumu and around the Rabbit Flat area. Their Napperby Project east of Yuendumu is currently concluding a scoping study aimed at identifying the key economic factors toward development. Toro Energy is also following up on a recent discovery at Lake Mackay, west of Yuendumu on the WA/NT border.

Thundelarra Exploration are in a strong position to aggressively progress the further development of their NT uranium projects, primarily Pine Creek, but also their uranium prospects around Energy Metals Bigrlyi project to the west/north wet of Yuendumu.

Reward Metals are exploring for potash at Lake Mackay on the NT/WA border. Current road infrastructure would likely see any development use the Gary Junction Road.

We believe that given the likelihood of strong demand for minerals, projecting mining activity along the road at 4% per annum would be justified.

5.2.4 Mining Activity in the Wider Kimberley Region

Mining activity has been an important element in the Kimberley region economy over a long period of time.

The following table gives value of mineral production over the five years to 2007/08 by local government area indicating current value is running at about $1.5bn per annum.

	Value – Mineral Production ($ Millions)				
Local Government Area	**2003/04**	**2004/05**	**2005/06**	**2006/07**	**2007/08**
Broome	2.7	2.7	4.4	4.4	6.3
Derby-West Kimberley	83.5	94.0	98.9	163.4	683.7
Halls Creek	0.0	135.9	194.3	439.1	343.1
Wyndham-East Kimberley	505.1	575.6	646.1	578.8	511.4
Kimberley	591.3	808.2	943.6	1,185.7	1,544.5

Source: Department of Mines & Petroleum.

Value of production in 2003/04 was dominated by the Argyle Diamond Mine in the southern section of the Shire of Wyndham East Kimberley. Rio Tinto's Argyle Mine commenced operation in 1985 and is in the process of going underground to extend the life of the mine to 2019. The Argyle Mine is the world's largest supplier of diamonds and has produced USD6 billion in revenue. The mine is in a process of 'localising' its workforce and by 2010 aims to have 80% of its workforce based in the area, with half being indigenous.

Other production in 2003/04 included iron ore from Yampi Sound area (Cockatoo and Koolan Islands).

New projects since then have included:

- Coyote Gold Mine on the Tanami Road (see previous section).
- Savannah Nickel Mine along the Great Northern Highway north of Halls Creek - milling 680,000 tonnes a year, and shipping concentrates through Wyndham (2008/09 – 103,228 tonnes).
- Ellendale Diamond Mine, east of Derby (Gem Diamonds Ltd). Since Gem Diamond's acquisition of Kimberley Diamond Company in December 2007, processing capacity has been enhanced. In 2008, Ellendale was able to process 8.3m tonnes (6.3Mt in 2007) to recover 588,645 carats (475,306 carats in 2007). The Ellendale Mine consists of a number of lampriotic pipes of which the E9 pipe is currently being mined. The E4 pipe was previously mined but due to recent market conditions, was put on care and maintenance in February 2009. This resulted in the Ellendale Mine production being 145,298 carats for the nine months ended 30 September 2009.

  Approximately 50% of the global supply of fancy and vivid yellow diamonds (sought after for their rarity) are mined at the Ellendale Mine. Current resource statements for Ellendale show a resource of 98 million tonnes. Sampling and exploration programs are on-going at Ellendale with numerous lamproites that may be developed in the future.
- Blina, Boundary, Sundown and West Terrace small oil production, east of Derby.

This has resulted in a value of mining output tripling.

Given continuing strong world demand for minerals, mining production in the Kimberley region is expected to grow strongly over the project period.

Identified advanced projects are as follows:

Oil and Gas	○ Point Parker LNG Plant north of Broome tapping gas from the Browse Basin (Woodside), 50km north of Broome. ○ Stokes Bay, north of Derby – onshore gas. ○ Yuleroo, east of Broome – onshore gas.
Lead/Zinc/Gold	○ Sorby Hills – Approx 50km north of Kununurra- Kimberley Metals Limited. Total expenditure since inception of Sorby Hills approx $50 million. Prior to 1990 resource estimation, mine feasibility studies and attempted decline development. Post 1990 little work completed. Listing planned for first quarter 2010 to raise $25 million. Need $5-7 million to be spent to complete a bankable feasibility study and environmental approvals. Operating life 15 years with total initial capital investment of $150 million. Potential export 40 000 tpa of lead via Wyndham. Construction workforce 300 operation workforce 150.
Platinum	○ Panton - 60km north of Halls Creek – Platinum Australia. Project not viable at current metal prices but further recovery could render the project commercially viable. The company developed a new metallurgical process for the recovery of PGMs as part of a Feasibility study on the Panton project.
Copper/Zinc	○ Koongie Park – Approx 25 km southwest of Halls Creek – Anglo Australian Resources NL. Total expenditure since 1972 on Koongie approx $13 million. A Pre- Feasibility study was completed in October 2008 highlighting the potential to develop an underground and open pit operation from the Sandiego and Onedin prospects. The Sandiego resource estimation completed in April 2009 supports a 7 year mine life and a 500 000 tpa processing plant. The Onedin resource estimate could extend the mine life. Annual production from Sandiego is estimated at 40 000 mt zinc concentrate and 20 000 mt copper concentrate. Capital cost $70 million.

Zinc/Lead	○ Pillara – Approx 40km southeast of Fitzroy Crossing – Xstrata and Teck Cominco. Pillara mine was restarted in early 2007 and produced 42 100 tonnes of zinc metal and 12 400 tonnes of lead metal in 2007. It was supposed to produce 70 – 80 000 tpa of zinc metal and have a mine life of 4 years. The mine was put on care and maintenance in August 2008 due to poor grades, lower than expected output, low metal prices and the rising Australian dollar. The mine had a workforce of 300. ○ Kapok – Approx 40km southeast of Fitzroy Crossing – Meridian Minerals Limited. Recently commenced drill program as a key component into re-opening the Kapok mine and developing the Kapok West mineral resource. Initial results should be available January/February 2010.
Coal	○ Liveringa, west of Fitzroy Crossing.
Uranium	○ Ootogoona, north of Derby.
Bauxite	○ Mitchell Plateau, north Kimberley coast.

Extensive exploration activity taking place includes:

Exploration Phase

Copper	○ Halls Creek – 3D Resources. ○ Mt Angelo – 3D Resources. ○ McIntosh – 3D Resources.
Diamonds	○ Seppelt 1 & 2 & Ashmore – Approx 200 km northwest of Kununurra. North Australian Diamonds Limited (previously Striker Resources). Inferred resource 450 000 carats. Seppelt continues to have economic potential but not in current market thus the company holds these resources under mining lease.
Platinum Group Metals (PGM)	○ McIntosh –Joint venture with 3D Resources and Sally Malay Mining (now Panoramic Resources)
Nickel/Copper	○ Keller Creek – Breakaway Resources. South of Warmun. ○ East Kimberley – Thundelarra Exploration. South of Warmun.
Nickel/Copper/PGM	○ Laura River – Magma Metals Limited (70 percent interest). 35 km southwest of Halls Creek.
Nickel/Copper/PGM/Lead/Silver/Zinc/Gold	○ Eastman – Magma Metals Limited. 115 km southwest of Halls Creek. Eastman Bore for nickel, copper and PGM & Koongie Park for copper, zinc, lead, gold & silver.

Continuing development of these resources is likely to play a major role in stimulating continuing growth of the Kimberley regional economy over the next thirty years and sustaining a population growth projected of 2% per annum.

5.2.5 Future Growth

Given the prospective world demand for minerals, it seems likely that over the life of the road, traffic generated by mining along the road would at least remain at the current level, but expand strongly if the road is upgraded.

Over the 30-year road project period, increase in heavy mining traffic is modelled at an average of 4% per annum, but it is likely that the growth of mining traffic will not be steady and in fact there may be some periods that see a drop off and some periods when it would accelerate strongly.

Sealing of the road is likely to have a one-off impact of increasing light traffic to mines as it is likely there will be less of a reliance on expensive fly-in of workforce, contractors and business visitors.

Prospective development of uranium and gold mining over most of the road's lengths would produce a pattern of transport usage similar to present mining usage, ie. inward transport of processing inputs but little outward movement of product.

If rare earth or possibly manganese mining took place in the area south of Halls Creek, demand could arise for heavy haulage of significant product, probably to the port at Wyndham. This is still uncertain and has not been included in this assessment.

5.2.6 Australian Minerals Council Studies

It is worth noting that the Minerals Council of Australia in its "*Vision 2020 Project - the Australian Mineral Industry's Infrastructure Path to Prosperity – An Assessment of Industrial and Community Infrastructure in Major Resource Regions*", prepared by ACIL Tasman, May 2009, specifically refers to the Tanami Road as a leading priority for Northern Territory roads and that the upgrading of the road will service wider community needs including safety, strategic defence, communication and regional economic development considerations.

The Tanami Road is also mentioned in the same report along with the Kalumburu Road as a key road that needs upgrading for mining development in the Western Australia, Kimberley Region.

5.3 TOURISM

5.3.1 General

The Kimberley region is one of Australia's distinctive iconic outback regions and tourism is largely built around sightseeing and experiencing its special visual, natural and cultural environment.

Much of this traffic is self drive (with a heavy grey nomad presence) or adventure coach sightseeing tours with some resort type traffic (eg. El Questro) oriented to presenting the land environment.

The Kimberley region however, also has a marine environment. This includes the rich cultural history of Broome and a significant resort traffic has been built around the Cable Beach area, much of it more resort type rather than sightseeing oriented.

The highly indented Kimberley coast is difficult to access by road and sightseeing has been developed using cruise ships.

5.3.2 Implications of Upgrading the Tanami Road

The major tourism role of the Tanami Road at present is that of a 4WD adventure route, for both 4WD independent and tagalong travellers and for 4WD adventure coach groups, a role it shares with the Canning Stock Route in this part of Australia and in the Kimberley area with the Gibb River Road.

As the road has improved over the years, the challenging experience of the old "Tanami Track" has diminished. Its current ranking as a 4WD 'experience' is now probably below that of the Canning Stock Route as a 'challenge', and the Gibb River Road as a 'scenic experience'.

For 4WD vehicles, apart from being a challenge, it also represents a direct route linking the Red Centre and the Kimberley regions.

Sealing the road would diminish its 4WD adventure role and enhance many times over its role as a Red Centre – Kimberley interconnection, opening up the route to caravan and 2WD vehicles.

For visitor wishing to access the area direct from the Red Centre and vice versa, it will involve a 1100km saving.

For visitors from south eastern Australia, it will open up the possibility of circuits.

- Melbourne/Adelaide/Alice Springs/Kimberley/Top End and return via Alice Springs.
- East Coast/Top End/Kimberley/Alice Springs return via Barkly Highway or Adelaide.

At present, visitors from these areas who wish to visit the Kimberley region as well as the Top End face the alternatives of having to back track between Kimberley and the Top End or pass right down the west coast to Perth and back via the Nullabor.

5.3.3 Current Tourism Movements

Visitor numbers to the Kimberley region are not collected separately, but included in a North West Australia tourism region that includes the Pilbara.

Wider tourism data available for this region indicates as follows.

Australia's North West Overnight Visitors, 2007			
	No.	**Visitor Nights**	**Expenditure**
Domestic	505,000	5,688,000	$534 m
International	64,000	1,022,000	$62 m
Total	**569,000**	**6,710,000**	**$596 m**
Origin	**Visitor No's**	**%**	
WA	350,000	62%	
Interstate	155,000	27%	
Overseas	64,000	11%	
UK – 12,000			
Germany – 8,000			
NZ – 8,000			
Other – 36,000			
Total	**569,000**	**100%**	
Purpose of Visit – Visitor Nights	**Domestic**	**International**	
Holiday	2,335,000	506,000	
Visiting friends & relatives	586,000	66,000	
Business	2,471,000	115,000	
Other	296,000	335,000	
Total	**5,688,000**	**1,022,000**	
Transport Used - Visitors	**Domestic**	**International**	
Air	282,000	25,000	
Private car	177,000	33,000	
Other	54,000	13,000	
Total	**505,000**	**64,000**	

Source: Tourism Research Australia form NVS & IVS.

It is notable that composition by purpose of visit for this wider region included large numbers of business visitors among both international and domestic visitors and 'other' among international visitors.

This is consistent with large numbers of 'fly-in' workers related to mining and other industries.

Actual holiday overnight visitor nights were:

Domestic 2,335,000
International 506,000
Total.....2,841,000

This is 42% of the total, but it can be expected that the great majority of these will relate to the Kimberley region.

It can also be expected that exclusion of business visitors will reduce the high level of domestic travel especially from Western Australia, and the proportion of travel to the area by air.

The indications are that the Kimberley region holiday visitor traffic has the following features.

It is probably of the order of 180,000 a year generating towards 2 million visitor nights.

Apart from the Broome resort traffic and costal cruise traffic which would mainly arrive by air and stay in hotels, motels and resorts, it is heavily in own vehicle (heavily grey nomad type) or adventure coach tours (including a heavy international component) staying in cabins, caravan parks and camping grounds.

5.3.4 Tourism Red Centre

The Red Centre region (Alice Springs and Petermann Tourism Regions) is one of Australia's major holiday purpose destinations.

Overnight Visitors, Year End Sep Qtr, 2008		
	Domestic	**International**
Alice Springs	218,000	175,616
Petermann	160,000	207,834

Composition International Visitors, Alice Springs, Year End Sep Qtr, 2008	
New Zealand	3,540
Japan	4,924
Other Asia	5,315
US/Canada	29,770
UK	34,643
Other Europe	91,685
Other	5,738

These visitor numbers are mainly holiday visitors.

The international visitors are usually on more extended trips that include visits to other Australian regions, especially those from UK/Europe.

5.3.5 Current Inter-linkages Between the Two Regions

Data from Tourism Research Australia for the year 2007 indicates that visitors to the Red Centre who also visited, the Australia's North West Tourism region totalled International 17,634 and domestic 13,689, ie. a total of 31,323.

Compared with total domestic visitors, the proportion of domestic holiday visitors who visit both regions is relatively low and less than 10%. However, of international visitors, the proportion is currently relatively high. It is estimated that of the order of 40% of current international visitors to the Kimberley region also visit the Red Centre.

5.3.6 Tourism Along the Road

Halls Creek

Information from the Halls Creek Visitor Information Centre indicates the following estimated split up of visitor traffic:

Coaches 20%
Independent vehicles 80%

Coaches

- Coaches for 6 months to end October – 382.
- 90% based on Broome or Kununurra.
- Less than 5% would use the Tanami Road.
- Passengers 50% domestic, 50% international. International mainly Europeans, US say 15%, few Asians, New Zealand good market.
- Coach companies include APT, Kimberley Wild Adventure, AAT Kings, Outback Spirit, and Outback Discovery.

Independent Vehicles

- 70% 2WD, 30% 4WD, but 4WD increasing.
- Domestic 80%, international 20%.
- 70% New South Wales/Victoria.
- 30% hired.

Along the Road

There is petrol publicly available at communities of Billiluna (and at Balgo off the Tanami Road) and at Yuendumu. Otherwise, the only petrol publicly available is at the Rabbit Flat Road House.

There is overnight accommodation available at Balgo and Yuendumu but it is not geared to tourism. There is no accommodation at Rabbit Flat Road House except camping facilities with toilets and showers.

Tourist traffic along the road is basically confined to 4WD vehicles, mainly grey nomad and adventure type traffic.

Discussions with Rabbit Flat Road House indicated the following scale and type of tourism traffic moves along the road.

Peak of traffic is June/July/August with shoulder periods April/May and September/October and very little November to March/April.

90% of vehicles are 4WD with about 50% towing.

Most is northbound with southbound later in the season.

About 50 coaches a year including Waratah, Outback Spirit, Outback Discovery, Oz Tours (ex Cairns), North West Safaris, AAT Kings and Kipton (South Australia). There are also some tagalong tours.

Estimated tourist vehicle numbers are:

April/May ..... 10 - 20
July/August/September ..... Up to 50 a day
September/October .....5 – 10 a day
November - March .....Negligible

It is estimated (see further details, Appendix 2 / 3.4) that average year round is about 13 vehicles a day.

Other Sections

There is a significant traffic ex Halls Creek and return to the Wolfe Creek Crater and some further down to Balgo/Billiluna area.

Most of those coming up the Canning Stock Route and going down the Tanami (or vice versa) will come into Halls Creek to reprovision/rest creating further movements on the Billiluna/Halls Creek section.

Otherwise tourist traffic that passes the Balgo turnoff will almost all be passing through to the Alice Springs area except for a small amount turning off and proceeding up to Lajamanu.

Current Vehicle Movements
Based on the information available, estimated average number of tourist light vehicles on the road are:

Turnoff to Wolfe Creek.....18
Wolfe Creek to Billiluna.....14
Billiluna to Lajamanu turnoff.....12
Lajamanu turnoff to Yuendumu.....13

(See Appendix 2, for further details.)

At an estimated average of 2.1 persons per vehicle, the numbers passing through the length of the road at average 13 vehicles per day would work out at about 10,000 visitors a year or about 30% of those that indicated as visiting both Kimberley and Red Centre regions.

5.3.7 Underlying Future Potential

The overwhelming feature of the road are the desert scapes it passes through. Mostly, it is flat with a variety of arid zone vegetation.

There are hills along the road north of Yuendumu and 35km south from the Halls Creek turnoff, the road runs through hilly country.

Otherwise the road is flat with only occasional low hills along the road, often in the distance.

The two topographical features of interest are the Wolfe Creek crater, that has been made notorious in some people's minds by a horror movie centred on it and the Balgo Hills lookout behind the township.

Coming from the south, the operating Granites Mine is unlikely to prove to be an attraction. However, some of the old mining in the area (eg. the old Tanami Mine) might prove to be of interest.

The story of the Rabbit Flat Road House is of some interest.

Birdlife on the lakes and lagoons in the Sturts Creek/Balgo/Gregory Lakes area is of substantial potential interest. Stretch Lagoon is not far from the road. However, there would be a need to improve access, facilities, interpretive signage and guiding for this area to attract substantial visitation.

The indigenous art being produced in the area is of potential interest at Yuendumu, but especially at the Arts Centre at Balgo. The Cultural Centre at Balgo will provide a focus for visitors to experience cultural aspects of the region.

The other features along the road of interest is the history of the pastoral industry and remote stations. The history of the old stock routes through the desert area, the Tanami route and the junction with the Canning Stock Route remains unpresented.

By and large, the attractions along the road itself are not as powerful as those further north in the Kimberley area and further south in the Red Centre. The most important tourism function of the road will be its interlinkage role along with the romance of travelling through one of Australia's legendry and feared outback desert tracks.

Apart from this, the best prospects of presenting special attractions along the route appear to be Wolfe Creek Crater and the combined attractions of the Gregory Lakes area, the birdlife, Sturts Creek, the junction of the old stock routes, the Balgo Hills, and world famous indigenous art and indigenous culture.

5.3.8 Likely Future Growth

There is no doubt that sealing of the road would result in a massive increase in tourism traffic from its current small base:

- Through traffic.
- Kimberley regional traffic down to and back from Wolfe Creek Crater/Balgo area.

Opinion within the tourist industry suggested that the increases would be of the order of 500% in the traffic travelling down to the Wolfe Creek/Balgo area as excursion from Halls Creek and a 200% increase in 'through' traffic.

This would imply the following increases compared with existing estimated traffic to/from the location shown.

	Through	Wolfe Ck	Canning	Balgo	Lajamanu	Total
Existing:						
Turnoff to Wolfe Ck Crater	12	4	1	1	-	18
Wolfe Ck to Billiluna	12	-	1	1	-	14
Billiluna to Balgo	12	-	-	1	-	13
Balgo to Lajamanu turnoff	12	-	-	-	-	12
Lajamanu turnoff to Yuendumu	12	-	-	-	1	13
Projected:						
Turnoff to Wolfe Ck Crater	36	10	1	10	-	57
Wolfe Ck to Billiluna	36	-	1	10	-	47
Billiluna to Balgo	36	-	-	10	-	46
Balgo to Lajamanu turnoff	36	-	-	-	-	36
Lajamanu turnoff to Yuendumu	36	-	-	-	3	39

This would give an increase in the through visitor traffic from about 9,000 to 27,000, ie. up towards the currently indicated interlinkages between the Kimberley. This figure would imply a substantial growth in the interlinkage movements that would take place between the two areas.

5.3.9 Coaches

It is estimated that about 50 4WD adventure tour coaches pass along the route at present (ie. an average of about 0.13 per day). While there would be positives and negatives for this type of traffic expanding, it is likely to remain.

A sealed Tanami Road will provide a superior route for transport of intercity passengers between Alice Springs and the Kimberley area, especially to/from Broome for both residential traffic and visitors. The route will save about 1,000km in travel.

Given relatively low population in the Kimberley centres, services will depend in a substantial way on visitor demand, especially from backpackers who wish to move between the two regions. However, it should also be noted that Greyhound Australia can also play a role carrying high value agricultural produce such as mangoes as they currently do from the Top End.

Relevant services supplied by Greyhound Australia are as follows.

Adelaide / Alice Springs	Daily
Alice Springs / Darwin	Daily
Darwin / Broome	Daily
Perth / Broome	5 a week (daily except Tue & Sun)
Tennant Ck / Townsville	5 a week (daily except Tue & Sun)

The potential of a substantial demand for visitor movements on top of residents and supplementary produce freight means that a coach service could be viable but not seven days a week.

We have included estimates of coach movements being established at 2 days per week each way, ie. a total of 4 services a week carrying at an average of 35 per coach, about 7,000 a year. Most would be destined for Broome. Average saving in travel distance would be 1,100km for 6,000 and 272km for 1,000.

Coach traffic is not projected to grow strongly due to competition from budget air travel and a growth rate of 1% per annum is used.

5.4 TRANSPORT

5.4.1 Existing Heavy Vehicles

Total heavy vehicle movements have been estimated for various sections of the road in Appendix 2. The following estimates split up between traffic servicing mining, communities and cattle stations.

Estimated Current AADT's Heavy Vehicles				
Section	**Mining**	**Communities**	**Cattle Stations**	**Total**
Turnoff to Wolfe Ck	2.0	3.5	1.5	7
Wolfe Ck to Billiluna	2.0	3.5	1.5	6
Billiluna to Balgo turnoff	2.0	3.0	-	5
Balgo turnoff to Coyote Mine	2.0	-	-	2
Coyote to Lajamanu turnoff	1.0	-	-	1
Lajamanu turnoff to Granites	1.0	1.0	-	2
Granites to Yuendumu	8.5	1.5	-	10

5.4.2 Future Traffic Servicing Cattle Station, Mining & Servicing Communities

Looking into the future, traffic servicing mining along the road is expected to show variability over the 30-year project period, a decline and strong growth depending on world prices, but to show a reasonably strong long-term growth trend of 4% per annum.

Community heavy traffic is assumed to show a response to increased services to transport and tourism along the route to grow at 2% pa.

Cattle station traffic is expected to show a one-off growth only when the road is sealed to the levels set out in Section 5.1.2. A transport of feral horses is expected to develop but be limited to 5 years.

5.4.3 Inter-regional Road Transport

A sealed Tanami Road will open up a more efficient route for inbound freight to the region from Adelaide and south eastern Australia.

At present, freight to the Kimberley region from southern and eastern Australia moves via the following routes.

From Alice Springs/Adelaide/Melbourne - via Stuart Highway via Katherine
- via Perth

Savings on route via Katherine would be 272km to Kununurra and over 1,000km to Halls Creek and west of Halls Creek.

From Sydney - via Stuart Highway via Katherine
- via Tennant Ck

Savings on route via Tennant Ck for Kununurra is nil but Halls Creek and further west is over 600km.

Freight from Brisbane would still move via Katherine.

Obtaining accurate up-to-date figures for tonnages of general inbound freight into the Kimberley area, and where from, was difficult. The following seeks to identify available information with a view to reaching a reasonable estimate.

Inbound freight will include typical grocery and other freight for retail, building supplies, motor vehicles, furniture, and industry inputs, eg. to cattle, farming and mining industries.

The Kimberley Regional Transport Strategy produced in 1997 indicated inbound road freight to the Kimberley region of 166,000 tonnes (general freezer and other) from Perth and other parts south of the region and 100,000 tonnes from the Northern Territory and other States, ie. a total of 266,000 tonnes.

ABS Road Freight Movements Survey (2001) indicates inward movements into the Kimberley from Perth and South of 194,000 tonnes and from Northern Territory 56,000 tonnes, a total of 245,000 tonnes. This would include outward movement of produce from the Kimberley region and some outward movement of cattle to Darwin.

Background work for the Perth Darwin Corridor Study in 2006 indicates that freight on the Port Hedland to Broome Route is about 80 million tonne km a year, ie. about 130,000 tonnes and on the Kununurra / Katherine route about 40 million tonne km (ie. about 80,000 tonnes), ie. a total of about 210,000 tonnes. Again, this incudes outbound freight from the Ord estimated at to Perth 12,000 tonnes and via Katherine 25,000 tonnes. The indications are thus that inbound freight into Broome is of the order of 115,000 tonnes and from Katherine about 55,000 tonnes, ie. about 160,000 tonnes.

The indications are that the great bulk of this is for the mining industry, Ord farming inputs and the cattle industry and that general grocery and food was probably around 20,000 – 30,000 tonnes.

Road traffic counts for vehicles Class 9 and above (ie. Six Axle Articulated, B Double, Double Road Train and Triple Road Train) in 2008 were as follows.

AADT Vehicles				
Section		**Total**	**Heavy Class 9 & above**	
			No.	***%***
West of Timber Creek	In	105	12	*12%*
	Out	105	2	*12%*
	Total	**210**	**24**	***12%***
Broome Highway	In	336	20	*6%*
	Out	336	20	*6%*
	Total	**672**	**40**	***6%***

These would include outbound vehicles carrying Ord produce as well as empty vehicles moving out.

If the inbound vehicles were carrying general freight at average 35 tonnes per vehicle [(1)]. This would give inbound freight:

Via Broome .....256,000 tonnes
Via Kununurra .....155,000 tonnes
Total.....400,000 tonnes

[(1)] Note: Based on industry advice.

Estimates by Western Australia Transport Department on freight carried based on AADT's and vehicle classes for heavy vehicles for 2008 would put the total at east of Kununurra 200,000 tonnes and Broome Highway 300,000 tonnes.

This would include vehicles under Class 9 (eg. sand and gravel, small work vehicles, etc.). It would also include vehicles that are empty.

Assuming that inbound general freight was about half, would give a figure of:

Into Broome.....150,000 tonnes
Into Kununurra .....100,000 tonnes
Total.....250,000 tonnes

We thus have a range of information about inbound road freight.

	Into Broome tonnes	Into Kununurra tonnes	Total tonnes
1997 Regional Transport Strategy	166,000	100,000	266,000
2001 ABS Road Freight Study	194,000	56,000	245,000
2006 Corridor Study	115,000	55,000	160,000
2008 Derived from Road Traffic Heavy Vehicle Counts	256,000	155,000	400,000
2008 Main Roads Estimates	150,000	100,000	250,000
Average	**180,000**	**90,000**	**270,000**

The Tanami Road will result in substantial savings for inbound freight. The bulk of that coming up from the Adelaide / Melbourne area would switch onto the Tanami. There may be some swing to the Tanami from rail to Perth and north by truck.

The following works on 50,000 tonnes passing up the Tanami at an average vehicle load of 35 tonnes. This would result in about 4 heavy vehicle movements inward. Some of these would be reefers that would carry Ord produce outwards (see Section 5.1.4).

5.5 BUSINESS & TOURISM SERVICES & POPULATION GROWTH

5.5.1 Business & Tourism Services

There is significant employment generated by the need to service the road in Halls Creek (road maintenance, vehicle recovery services, fuel sales, vehicle repairs, and care and maintenance for Wolfe Creek Crater National Park, etc.)

There is very little employment along the unsealed sections of the road providing services to travellers.

This is mainly at points that sell fuel and supplies - Billiluna, Balgo, Rabbit Flat.

The Balgo Art Centre earns income from sales to road visitors.

There would also be limited employment at Yuendumu related to servicing traffic along the road including visitors.

Traveller and visitor sales support the road house at Tilmouth Wells including sale of art from Yuendumu.

Current total employment along the road (including Halls Creek and Yuendumu) is estimated to be about 30 full-time employees.

It is projected that upgrading the road to sealed standard will result in the following one-off increase in vehicles along the road requiring vehicle, traveller and tourism services.

Increases in Light Vehicles After Upgrading													
	Interstate Private & Business		Tourism		Business		Communities		Stations		Total		
	Existing	New	Existing	New	Existing	New	Existing	New	Existing	New	Existing	New	% Increase
Turnoff to Wolfe Ck	-	5	18	57	5	5	8	9	4	4	35	72	+106%
Wolfe Ck to Billiluna	-	5	14	47	5	5	8	9	2	2	29	68	+134%
Billiluna to Balgo turnoff	-	5	12	46	4	4	6	7	1	1	23	63	+173%
Balgo turnoff to Coyote Mine	-	5	12	36	2	2	3	4	-	-	17	47	+176%
Coyote to Lajamanu turnoff	-	5	12	36	1	1	3	4	-	-	15	46	+206%
Lajamanu turnoff to Granites	-	5	13	39	2	2	5	6	-	-	20	52	+160%
Granites to Yuendumu	-	5	13	39	8	8	6	7	-	-	27	59	+118%
Average											**24**	**58**	**+142%**

Increases in Heavy Vehicles After Upgrading															
	Inter-regional Coaches		Mining		Community Supply		Cattle Stations		Horses		Interstate Transport		Total		
	Existing	New	Existing	New	Existing	New	Existing	New	Existing	New	Existing	New	Existing	New	% Increase
Turnoff to Wolfe Ck	0.1	0.6	2.0	2.0	3.5	3.5	1.5	1.8	-	0.5	-	8.0	7.1	15.9	+123%
Wolfe Ck to Billiluna	0.1	0.6	2.0	2.0	3.5	3.5	0.5	1.8	-	0.5	-	8.0	6.1	15.9	+161%
Billiluna to Balgo turnoff	0.1	0.6	2.0	2.0	3.0	3.0	-	1.2	-	0.5	-	8.0	5.1	14.8	+190%
Balgo turnoff to Coyote Mine	0.1	0.6	2.0	2.0	-	-	-	1.2	-	0.5	-	8.0	2.1	11.8	+462%
Coyote to Lajamanu turnoff	0.1	0.6	1.0	1.0	-	-	-	1.2	-	0.5	-	8.0	1.1	10.8	+882%
Lajamanu turnoff to Granites	0.1	0.6	1.0	1.0	1.0	1.0	-	1.0	-	0.5	-	8.0	2.1	11.6	+452%
Granites to Yuendumu	0.1	0.6	8.5	8.5	1.5	1.5	-	1.0	-	0.5	-	8.0	10.1	19.6	+94%
Average													**4.8**	**14.3**	**+198%**

The tables indicate an approximate increase of 120% in light traffic (over a doubling) and 190% in heavy traffic (almost a tripling).

Based on 30 jobs in servicing traffic along the road at present, estimated increase in employment of this nature is an increase of 133%, ie. 40 to 70.

Clearly this would result in development of facilities along the road including upgrade of road house in the Rabbit Flat/Lajamanu turnoff area (including development of cabin/motel style accommodation), further development of petrol station and service facilities at Billiluna at the junction of the Tanami Road and Canning Stock Route. Much of the development could be expected at Halls Creek and Yuendumu.

The increase in visitor numbers is especially expected to be strong and rise to be up around 40,000 in the Wolfe Creek/Balgo area (current estimated about 13,000 by road).

This is likely to stimulate improvements in tour guiding facilities and marketing this area.

The numbers passing along the length of the road could be expected to rise to about 25 – 30,000 visitors a year.

Value added per person employed is estimated at $60,000 and gives an extra value for 40 persons employed at $2.4m. Growth rate varies between different transport modes. It is estimated that average growth rate would be 2% per annum.

Calculation of Nett Present Value				
Discount Rate	**Growth Rate**	**Nett Discount Rate**	**NPV Factor**	**NPV**
4	2	2	22.71	$54,504,000
7	2	5	15.66	$40,716,000
10	2	8	11.10	$28,860,000

5.5.2 Population Growth

The substantial increase in tourism and servicing jobs can be expected to be absorbed by the existing population along the road and not result in a sharp rise. However, relatively high birth rates along with increased job opportunities could be expected to see population in communities increasing by 2% per annum and vehicle ownership and usage by a further 1% per annum.

5.6 INTER-REGIONAL PRIVATE & BUSINESS TRAFFIC

At present, there would be virtually no private and business traffic using the Tanami Road for inter-regional access between the Kimberley region and Alice Springs and points further south and east.

Sealing the Tanami Road will save over 1,000km for Kimberley population from Halls Creek and west and 272km for Kununurra traffic.

Estimating what the current private and business traffic might be at present between Kimberley and Alice Springs and further south via Katherine is not easy.

The private traffic will be mainly from the non-indigenous community that totals about 17,000. On the basis that in any given year, 25% of this population makes a private car trip outside the region and that 30% of this will be seeking to travel to and from Alice Springs and the south as opposed to Perth and to Queensland, Northern New South Wales, and that average vehicle occupancy rate is 2.2, total trips one way generated would be about 1.6 and 3.0 both ways.

The savings would be substantial however compared with travelling via Katherine of 1,000 km for residents Halls Creek and further west, and 272km ex the Kununurra area. On the basis of a 70/30 split, this would give an average of 825km.

Interstate business traffic that would divert across the Tanami is estimated at 0.5 per day originating Alice Springs and 0.5 per day originating Kimberley, ie. 1 per day involving 2 movements per day.

6.0 OTHER IMPACTS

6.1 THE SPECIAL POSITION OF THE INDIGENOUS COMMUNITIES

In economic terms, the indigenous communities have two special features.

The first is in effect an 'imperfect labour market' situation. People in Aboriginal communities have a special relationship with their 'country' and communities. Apart from any questions of workforce skills, rather than move way to where jobs are located, they prefer to stay.

This leads to a second feature that, in effect, is the equivalent to a 'regeneration' situation where creation of employment is especially needed and to a situation where governments can save large sums of money in special income support for these communities if employment can be generated.

Upgrading the road to sealed standard will improve prospects of real employment being generated:

- In providing services to transport, travel and tourism along the road.
- In enhancing the prospects of employment developing in mining and the pastoral industry.

The following table sets out information from the 2006 Census about workforce and the role of Commonwealth funded CDEP employment in communities along the Tanami Road. It includes in Western Australia, Balgo, Billulina and the surrounding Great Sandy Desert area. There were no figures for Mulan available due to confidentiality constraints. In the Northern Territory, the table includes Yuendumu, Yuelumu and outstations and Nyirripi and outstations.

	Western Australia	Northern Territory	Total
Population 15 yrs plus	457	753	1,210
Employed	161	197	358
(CDEP)	(131)	(120)	(251)
(Other)	(30)	(77)	(107)
Unemployed	14	31	45
Total Workforce	**175**	**228**	**403**
(Participation Rate – Workforce as % of Pop'n 15 plus)	(40%)	(31%)	(35%)
Total CDEP & Unemployed	**145**	**151**	**296**
(CDEP & Unemployed as % of workforce)	(83%)	(66%)	(73%)

The indications from the figures is that the Western Australia communities have a higher participation rate and a higher use of CDEP than those in the Northern Territory.

However, the indicated participation rate at 35% is extremely low. Usual figures range 60 – 70%. This indicates a high level of disguised unemployment.

The high dependence on CDEP reflects a strong lack of normal employment.

It is estimated that average CDEP recipient is supported by the government at a rate of about $12,500 per annum. On top of this, these communities have no rating base and receive larger payments per head for provision of local government services. On top of this is administration expenses. These are estimated to add a further 50%. This gives Commonwealth spending of $19,000 per person. This would translate to a total expenditure of $5.62m per annum.

If the upgrading of the road could reduce this by one-third, Nett Present Value of savings would be $32.4m at 4% discount rate, $23.2m at 7% discount rate, and $17.7m at 10% discount rate.

6.2 DEFENCE IMPLICATIONS

The usefulness of the road for defence purposes is obvious.

It will facilitate road supply into the Curtin Airbase at Derby.

The road provides a route for concentration of forces into the Kimberley area from the south well away from more vulnerable coastal routes.

6.3 SAFETY

We have not analysed in depth the safety impacts of upgrading this road. Previous analysis by Cummings Economics on similar roads in the Northern Territory and Western Australia gave safety benefits per km that would translate to a safety benefit on the Tanami Road of $8.68m at 4% discount rate, $6.23m at 7% discount rate, and $4.73m at 10% discount rate.

7.0 ANALYSIS

7.1 DIRECT BENEFITS

Appendix 3 gives detailed calculations of Direct Benefits in terms of operating costs in 2007 values.

The following sets out summary of Nett Present Benefits in 2007 values and then adjusted to 2009 values by use of Consumer Price Index Darwin.

Summary of NPV's, 2007 Values			
	4%	**7%**	**10%**
Light Vehicles			
Communities	10.2	6.9	4.9
Inter-regional Private	10.6	7.3	5.2
Business	10.8	7.9	5.7
Inter-regional Business	11.5	7.7	5.5
Tourist (Existing & Generated)	28.1	19.4	13.7
Inter-regional Tourist (Diverted)	99.9	67.1	48.2
Stations	2.1	1.4	1.0
	$73.2 m	**$117.7 m**	**$84.2 m**
Heavy Vehicles			
Cattle	8.9	6.4	4.8
Horses	0.9	0.8	0.8
Mining Transports	48.9	31.9	22.9
Community Supply/Other	11.5	7.7	5.6
Interstate Freight	133.4	87.2	62.4
Coaches	16.0	11.5	8.4
	$219.6 m	**$145.5 m**	**$104.9 m**
Total Direct			
2007 Dollars	**$392.8 m**	**$263.2 m**	**$189.1 m**
2009 Dollars (CPI Darwin)	**$421.1 m**	**$282.2 m**	**$202.7 m**

The major benefits of the road relate to its role as a more direct inter-regional tourism route and interstate freight transport route. These two factors together account for 62% of all benefits. Savings for mining transport was also of substantial importance .

7.2 WIDER ECONOMIC BENEFITS

Wider economic benefits identified in this study relate to 'regeneration effects' of:

a) Creation of employment along the road.

b) Savings in government special support expenditure, especially CDEP in indigenous communities.

The following also summarises:

c) Secondary Benefits to Mining.

d) Safety Benefits.

Discount Rate:	4%	7%	10%
Creation of employment	$54.5 m	$40.7 m	$28.9 m
Reduction in Commonwealth Support Expenditure	$32.4 m	$23.3 m	$17.7 m
Secondary Benefits Mining	$60.0 m	$39.2 m	$28.1 m
Safety	$8.7 m	$6.2 m	$4.7 m
Total	**$155.6 m**	**$109.3 m**	**$79.4 m**

7.3 CALCULATION OF MONETISED BENEFIT COST RATIO

Discount Rate:	4%	7%	10%
Direct	421.1	282.2	202.7
Wider	155.6	109.3	79.4
Total	**576.7**	**391.5**	**282.1**
Less NPV Increased Maintenance Costs (2009 values)	38.7	27.7	21.1
Nett Benefits	**538.0**	**363.8**	**251.0**
Capital Cost (Resource Pricing)	158.9	158.9	158.9
Benefit Cost Ratio	**3.38**	**2.29**	**1.62**

The indications a that the monetised benefit cost ratio is a very robust 3.38 at 4% discount rate, still robust at 7% (2.29) and still positive at 10% (1.62).

7.4 SENSITIVITY

The foregoing analyses for sensitivity to discount rates.

The major uncertainty relates to the current level of inbound freight movements that currently occur into the Kimberley area. There is a further question about the proportion that comes from the Adelaide, Melbourne and Sydney area. The foregoing works on a conservative figure of about 30% only. (By comparison, about 60% of Ord outbound freight goes in this direction.) However, if the figure is reduced by 40%, the NPV reduction would be $57.4m at 4% discount rate ($37.5m @ 7% discount rate) and ($26.8m @ 10% discount rate). BCR's would still remain positive throughout. It would take it down from 1.62 to 1.41 at the 10% discount rate.

There is a question about the extent of coach services that would develop. However, even if no coach movements developed, BCR would be affected only marginally, 0.1 percentage points at 4% discount rate.

UPGRADING THE TANAMI ROAD

Economic Impact Study

Ref: J2247
November 2009

APPENDICES

APPENDIX 1

BUSINESSES/ORGANISATIONS CONTACTED

- 3D Resources
- Anna Plains Station, Kimberley Representative of North Australia Beef Research Council
- Australian Trucking Association NT
- Bain Transport - Darwin
- Baz Industries – Halls Creek
- Broome Chamber of Commerce
- Broome Visitors Information Centre
- Bulka Station
- Central Land Council – Alice Springs
- Chamber of Commerce – Halls Creek
- Chemtrans – Darwin & Chairman Australian Trucking Association NT
- Chemtrans - Townsville
- Department of FaHCSIA - NT
- Department of FaHCSIA - WA
- Department of Transport WA
- Derby Visitors Centre
- Elders – Alice Springs
- Elders – Broome
- Frank Wise Institute
- Freightwest
- G & S Transport
- Go Go Station
- Halls Creek Visitor Information Centre
- Holcim – Alice Springs
- Isa Freight Express
- Kalari Transport
- Kimberley Area Consultative Committee
- Kimberley Development Commission
- Landmark – Broome
- Main Roads WA – Derby office
- Matilda Zircon
- Mindibungu Aboriginal Corporation – Billiluna
- Mt Denison Station
- Mulan Community

BUSINESSES/ORGANISATIONS CONTACTED Cont'd

- Navigator Resources
- Newmont Mining Corporation
- Northern Uranium
- Northfuels
- NT Cattlemen's Association
- NT Department of Infrastructure & Environment
- NT Department Regional Development, Primary Industry, Fisheries & Resources
- NT Livestock Exporters Association
- NT Regional Livestock Biosecurity
- Pastoralists & Graziers Association of WA
- Rabbit Flat Roadhouse
- Reward Minerals
- S.Kidman & Co Ltd
- Shire of Derby West Kimberley
- Shire of Halls Creek – Administration
- Shire of Halls Creek – Engineering
- Shire of Halls Creek – Roadworks
- Sophie Downs Station
- Suplejack Station
- Tanami Gold NL
- Tanami Transport
- Territory Camels
- Thundelarra Exploration
- Toll – Alice Springs
- Toll West - Kununurra
- Tourism Central Australia
- WA Department Agriculture & Food
- WA Department Agriculture & Food
- Windy Hills Stud & Abattoir
- Wirrimanu Aboriginal Corporation – Balgo
- Youga Walla Station

APPENDIX 2

EXTENT & COMPOSITION OF EXISTING TRAFFIC ON THE TANAMI ROAD

1. GENERAL

The following sets out data, information and analysis aimed at establishing the current level and type of vehicle traffic using the road.

2. WESTERN AUSTRALIA SECTION

2.1 TRAFFIC COUNTER INFORMATION

Shire of Halls Creek has placed traffic counters on the road at three locations.

1) Just after the turnoff from the Great Northern Highway.

   This measures the total traffic moving onto and from the Tanami Road at the northern end.

2) Just north of the turnoff to Wolfe Creek Crater.

   Apart from through traffic, this will include tourist traffic moving from Halls Creek to Wolfe Creek Crater and returning (short term data only).

3) Just north of the Billiluna turnoff.

   Apart from through traffic, this will also include traffic coming in from and going out to the Canning Stock Route.

Unfortunately, no road count data was available for the section through to the Balgo turnoff and further on. The road count data available is also restricted to the period May to October 2009 for the turnoff counter and Billiluna counter as follows.

Average Count	May	Jun	Jul	Aug	Sep	Oct
Turnoff	44	53	77	63	56	39
Billiluna	-	31	42	57	58	-

Only a short period of counts was available for Wolfe Creek Crater location in late May/first half of June. This data indicates a relationship over this period of Turnoff 52, Wolfe Creek 45 indicating a drop off of about 7 vehicles per day.

The daily pattern for the turnoff and Billiluna counters work through to averages of:

Turnoff = av 6 months May to Oct…….. 55

= av 4 months June to Sep……. 62

Billiluna = av 4 months June to Sep……. 47

This makes Billiluna during the period June to September 75% of the Turnoff. Apart from station traffic along the road, the drop would mainly be due to visitor traffic going out to Wolfe Creek Crater and returning. It seems likely that during this period, the attraction at Wolfe Creek Crater could be creating of the order of 6 to 10 vehicle movements a day, ie. 3 to 5 going out and coming back.

The following seeks to estimate what the figures might be for the rest of the year.

2.2 ROAD CLOSURE EFFECTS

The road (especially at the higher rainfall Kimberley end), is subject to significant road closure periods.

Analysis of data on road closures supplied by Shire of Halls Creek over years since 2001 splits the road into 4 segments:

1) Turnoff to Ruby Plains.
2) Ruby Plains to Sturt Creek.
3) Sturt Creek crossing.
4) Sturt Creek to Northern Territory border.

By and large, road closures will affect the whole length of the road but with occasional episodes where the Sturt Creek crossing is flooded affecting and closing Sturt Creek crossing to Northern Territory border and occasional periods where Balgo turnoff to Northern Territory border is closed or restricted more than the rest of the road.

The data indicates the road is reliably open to all traffic four months, July/August/September/October, with only very occasional restrictions to 4WD only in September/October.

In most years, November will see a mix of the road being open and restrictions to 4WD only and lighter trucks.

December sees the road mainly closed or restricted to 4WD's only and lighter trucks. January and February sees the road closed with in some years, some periods 4WD's only.

March/April generally sees a mix of restrictions to 4WD only and light trucks, with occasional years open and some with periods completely closed.

May/June sees a mixture with some years open, others with restrictions to 4WD light trucks only.

Overall, the pattern is:

Open all vehicles.....4 months – July/Aug/Sep/Oct
Closed all vehicles .....2 months – Jan/Feb
Mixture open/restricted to 4WD light trucks only 3 months – May/June/Nov
Mixture closed/restricted to 4WD light trucks only 3 months – Dec/Mar/Apr

These road closures will affect current movements along the road, especially of non-4WD light vehicles and heavier trucks.

The effects of short periods of road closure in the May/June period can be seen in the vehicle count figures supplied by Shire of Halls creek for 2009.

		May	June	July
Av daily vehicle movements	Turnoff	44	53	77
	Billiluna	n/a	31	42
Adjusted for road closures	Turnoff	56	59	86
	Billiluna	n/a	45	70
Reduction in daily movements due to road closure effects	No. Turnoff	- 12	- 6	- 9
	Billiluna	n/a	- 14	- 28
	% Turnoff	- 21%	- 10%	- 10%
	Billiluna	n/a	- 31%	- 40%

The much greater impact at Billiluna can be attributed to effects being greater further on along the road but especially on community traffic. Much of the community traffic is non-4WD vehicles. Communities also have a larger discretionary travel element.

2.3 OTHER FACTORS

Other factors in seeking to estimate flows for the remainder of the year include:

- While station traffic both light and heavy will peak in the dry winter months, it will continue during the wet season to some extent.
- Non-4WD community vehicle movements will be especially vulnerable.
- There will however, be a substantial amount of non-discretionary movement during the other months stemming from the need to transport supplies to communities and mines, and service provision to communities.
- Through tourism traffic is likely to be highly concentrated in the months of June to September and commence dropping off strongly during October and start moving again in May.

2.4 HEAVY VEHICLES

Road count data indicated that in May/June, heavy vehicles were about 12% – 14% of total. Regular heavy vehicles include:

- 1 triple per week by GB Roberts to Coyote/Granites ex Perth.
- About 70 cattle road trains a year.
- Fuel – 2 per week to communities and mines.
- 1 triple freezer a week to communities
- Local movements of cattle trucks, eg. Ruby Plains.
- Exploration vehicles including drill rigs, heavy equipment used by the mining industry.

In the following, we have provided for heavy vehicle movements to be about 8 per day at the Turnoff in peak months and 4 per day in January/February.

2.5 LIGHT VEHICLES

Interviewing among persons using the road regularly indicated the following:

- That about 80% of light vehicles during the tourism season were tourist vehicles. We have provided for tourist vehicles to peak up to over 70% of light vehicles in June.
- Composition of other light vehicles was estimated to be about 50% community. The following models 40 – 50%.
- It was estimated that 20% or more were business, especially government vehicles to the indigenous communities. (This had risen since the 'intervention' and the following models 30%.)
- The remainder were station vehicles. The following uses about 20%.

2.6 ESTIMATES AT THE HALLS CREEK TURNOFF

Based on the foregoing, we have estimated the following average daily vehicle movements by month at the Halls Creek turnoff.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	An Av
Heavy vehicles	**5**	**5**	**7**	**7**	**7**	**7**	**8**	**8**	**8**	**8**	**7**	**7**	**7.0**
Light vehicles													
Tourist	5	5	5	15	20	25	50	38	29	20	5	3	**18.1**
Business	4	4	4	4	5	6	6	6	6	6	4	4	**4.9**
Communities	6	6	8	8	8	9	9	9	9	9	8	8	**8.1**
Stations	3	3	4	4	4	4	4	4	4	4	4	4	**3.8**
Sub Total Light vehicles	**18**	**18**	**21**	**31**	**37**	**44**	**69**	**57**	**48**	**39**	**21**	**19**	**35.0**
Total	**23**	**23**	**27**	**38**	**44**	**53**	**77**	**63**	**56**	**47**	**28**	**26**	**42.0**

These have been rounded to AADT's of Heavy vehicles 7, Tourist 18, Business 5, Communities 8, Stations 4.

2.7 ESTIMATES AT OTHER POINTS

The indications are that the factors affecting traffic patterns along the road south of the turnoff will be:

- A gradual diminution of station traffic, especially south of Ruby Plains, Wolfe Creek Crater and Billiluna.
- A drop off of tourist traffic south of Wolfe Creek Crater, especially due to the return visitation from Halls Creek to the crater.
- Tourist traffic coming into/going down the Canning Stock Route. There will be some that will also go down or come up the Tanami. However, it is believed that most who do this will travel up to Halls Creek to replenish.
- Tourist traffic past Billiluna can be expected to be almost entirely moving through to or from Yuendumu and Alice Springs with a minor drop off using the Lajamanu Road.
- While Billiluna, Mulan and Balgo have a strong link with Halls Creek creating much of the traffic on the road from Balgo and Billiluna north, there is substantial movement between this group of communities. Much of this is believed to use back roads in preference to the Tanami Road, especially if it has not been graded and is corrugated.
- Most of the business traffic will terminate at the communities with only a small proportion going on to Coyote and further.
- Most of the heavy vehicle traffic will terminate at the stations and communities, but significant traffic will go onto the Coyote Mine and some through to the Granites.

Based on the above and on the information in the next section on the Northern Territory side, we have estimated composition of traffic along the Western Australia section of the road as follows.

	Turnoff	Wolfe Ck Billiluna	Beyond Billiluna to Balgo turnoff	Balgo turnoff to Coyote	Coyote to border
Heavy vehicles	**7**	**6**	**5**	**2**	**1**
Light vehicles					
Tourist	18	14	12	12	12
Business	5	5	4	2	1
Communities	8	8	6	3	3
Stations	4	2	1	-	-
Sub Total Light vehicles	**35**	**29**	**23**	**17**	**16**
Total	**42**	**35**	**28**	**19**	**17**

3. NORTHERN TERRITORY

3.1 TRAFFIC COUNTER INFORMATION

Northern Territory has traffic counters on the Tanami Road.

1) 16km west of the Stuart Highway (sealed section).
2) 8km north of the Papunya Road turnoff (ie. about 60km short of Tilmouth Springs Road House on the sealed section. This will include traffic to the Yuendumu area as well as further out.
3) 50km west of Yuendumu on the way to the Granites. This will include traffic to the Granites and further on and through traffic.

AADT's are as follows.

	2002	2005	2008	Av An Gwth 2002-2008
16km west of Stuart Hwy	118	113	115	Nil
	2002	**2004**	**2008**	
8km north Papunya turnoff	65	62	82	4.0% pa
	2002	**2004**	**2008**	
50km west of Yuendumu	30	56	37	3.5% pa

3.2 ROAD CLOSURE INFORMATION

Road restriction information for 2008 indicated closure due to flooding on 1 day in November and water over road on 1 day in December with about 40 days of "with caution restriction" in November and December.

3.3 HEAVY VEHICLES

Vehicle composition readings were as follows for the location north of Yuendumu.

	Light	Light with caravan	Total Light	Heavy
July	60%	14%	**74%**	**26%**
August	72%	9%	**81%**	**19%**

This data indicates a fairly heavy presence of heavy vehicles in busy months. Discussions with transport operators indicate an annual average of 30%. Based on this and the traffic counter figures, a split up of light and heavy vehicles is suggested as follows – Light (73%) 27, Heavy (27%) 10.

It is likely that the bulk of the heavy vehicles would be for the Granites Mine with a few for Coyote. The heavy vehicles will include some tourist coach type vehicles.

3.4 LIGHT VEHICLES

A significant proportion of the light vehicles that are business vehicles seem also likely to terminate at the Granites.

There will be community vehicle numbers moving between Yuendumu, Lajamanu and the Balgo area communities. It was reported that alcohol restrictions at Halls Creek and in the communities are leading to some traffic to and from the Rabbit Flat Road House.

Tourist vehicles are likely to be mainly 4WD's driving through the road one way or another.

Discussions at the Rabbit Flat Road House indicate that the number of light tourist vehicles coming through are about as follows.

April/May ..... 10 – 20 a day
July/Aug/Sep ..... Up to 50 a day
Sep/Oct ..... 5 – 10 a day
Nov/Dec/Jan/Feb/Mar ..... Negligible

Based on the above, we estimate average number is about 13 a day. A few would divert up to Lajamanu and the Buntine Highway.

It is estimated that about 50 coaches come through each year.

Based on the above information, it is estimated that traffic on the Northern Territory section of the Tanami Road is as follows.

	Yuendumu to Granites	Granites to Lajamanu turnoff	Lajamanu turnoff to NT border
Heavy vehicles	**10**	**2**	**1**
Light vehicles			
Tourist	13	13	12
Business	8	2	1
Communities	6	5	3
Sub Total Light vehicles	**27**	**20**	**16**
Total	**37**	**22**	**17**

APPENDIX 3

CALCULATION OF DIRECT BENEFITS & COSTS

1.0 INTRODUCTION

The following calculates direct benefits and costs of upgrading the Tanami Road using the methodology and cost parameters set out in the NSW Road Transport Authority Economic Analysis Manual, 2007 prices.

It should be noted that the cost parameters used are adopted from ARRB Transport Research Ltd, "*Road User Costs for Use in Economic Evaluation of Road Expenditures*".

The States of WA and QLD have their own computer programmes. However, inquiries indicated that these programmes were likely to be similar in methodology and be largely based on the same ARRB cost parameters.

Standard project life of 30-years and a long term real discount rate of 4% is used along with 7% and 10%. Benefits in 2007 prices have been adjusted by Consumer Price Index Darwin to reflect 2009 values. (Increase 7.2%.)

1.1 OPERATING COSTS

1.1.1 Transfers

A point of difference in analysing costs and benefits can relate to "transfer" costs and "resource pricing", ie. the treatment of taxes, especially indirect taxes. There is an argument that such tax components of market prices are not used in obtaining the relevant input but are returned to the community through government programmes. It is thus regarded as a "transfer" payment from one individual to another and should not be included in the price of the input and that the "resource price" should not include the tax. The NSW RTA parameters exclude indirect taxes and are based on "resource pricing". This means that to be consistent capital and maintenance costs need to be valued nett of GST.

1.1.2 Fuel Costs

Fuel costs along the Tanami Road and at both ends Alice Springs and Halls Creek are generally substantially above those of national rural averages. Thus, standard savings in operating costs are likely to underestimate the true savings.

1.1.3 Vehicle Operating Costs Per Km & Travel Time Savings

The figures used are national averages and no allowance has been made for operating costs in the area in question being higher, especially for locals who are obliged to purchase parts and services locally.

Fuel costs are generally substantially higher in these areas than national averages. Cost of 4WD 16" tyres in Halls Creek were $300. Break down recovery costs can be extremely high and time consuming. Time problems can also relate to obtaining parts which need to be flown in at substantial cost. Many of the light vehicles being used are 4WDs with higher costs than the average light vehicle. The figures used are thus conservative.

The roads in question are generally over flat ground with long straight sections and few curves and have low traffic levels. Vehicle operating costs per km used assume:

(a) That there is low traffic on the road and road capacity ratio is 0.
(b) That the roads are flat and are at base Grade 2%.
(c) That the roads are all at base curvature.

The tables used are as follows :-

TABLE – VEHICLE OPERATING COSTS FOR RURAL ROADS - TOTAL VEHICLE OPERATING COSTS FOR BASE GRADE 2% & BASE CURVATURE CONDITONS – cents/km (2007 PRICES)

LIGHT VEHICLES - ROAD VOLUME CAPACITY RATIO = 0

Speed	Road Surface/Pavement Conditions										
km/h	E	G1	G2	G3	G4	G5	S1	S2	S3	S4	S5
10	57.7	50.0	47.1	44.8	43.6	42.9	41.9	39.8	38.1	36.9	36.2
20	49.3	41.6	38.6	36.3	35.0	34.3	33.4	31.2	29.4	28.1	27.3
30	46.5	38.9	35.9	33.6	32.3	31.5	30.7	28.4	26.7	25.4	24.6
40	45.6	37.9	34.9	32.6	31.3	30.5	29.6	27.4	25.7	24.4	23.6
50	45.4	37.7	34.7	32.3	31.0	30.2	29.4	27.1	25.4	24.1	23.2
60	45.6	37.9	34.9	32.5	31.2	30.4	29.6	27.3	25.5	24.2	23.3
70	45.9	38.2	35.1	32.8	31.5	30.7	29.9	27.6	25.8	24.5	23.6
80	46.5	38.8	35.8	33.4	32.1	31.3	30.5	28.2	26.4	25.1	24.2
90	47.4	39.7	36.6	34.3	33.0	32.1	31.3	29.0	27.2	25.8	24.9
100	48.5	40.8	37.7	35.3	34.0	33.1	32.3	30.0	28.1	26.7	25.8
110	49.6	41.8	38.8	36.4	35.0	34.2	33.4	31.1	29.2	27.8	26.9
120	51.0	43.2	40.1	37.7	36.3	35.5	34.7	32.3	30.4	29.0	28.0

HEAVY VEHICLES - ROAD VOLUME CAPACITY RATIO = 0

Speed	Road Surface/Pavement Conditions										
km/h	E	G1	G2	G3	G4	G5	S1	S2	S3	S4	S5
10	305.0	267.2	264.3	251.4	242.6	235.7	245.9	229.6	218.7	209.6	202.4
20	236.3	198.4	195.3	182.3	173.2	166.1	176.8	160.1	148.9	139.5	131.9
30	210.3	172.5	169.6	156.7	147.9	140.9	151.3	135.0	124.1	115.0	107.6
40	200.2	162.5	159.7	146.9	138.1	131.2	141.5	125.3	114.5	105.5	98.3
50	194.5	156.9	154.0	141.3	132.5	125.7	135.9	119.7	109.0	100.0	92.8
60	192.2	154.6	151.7	139.0	130.2	123.4	133.5	117.4	106.6	97.7	90.5
70	192.2	154.4	151.5	138.7	129.8	122.9	133.2	116.9	106.0	96.9	89.6
80	192.6	154.9	152.0	139.1	130.2	123.4	133.6	117.3	106.5	97.4	90.1
90	194.3	154.4	153.5	140.6	131.6	124.7	135.1	118.7	107.7	98.5	91.1
100	196.1	158.3	155.3	142.4	133.5	126.6	136.9	120.5	109.6	100.4	93.0
110	199.0	161.1	158.1	145.2	136.2	129.2	139.6	123.2	112.1	102.9	95.4
120	201.4	163.4	160.3	147.4	138.3	131.3	141.8	125.2	114.1	104.7	97.2

TABLE – VALUE OF TRAVEL TIME – RURAL

Vehicle Type	Occupancy	Value of Travel Time Savings ($/person.h)	Value of Travel Time Savings ($/veh.h)	Freight* ($/veh.h)
Private Car	1.80	11.55	20.74	0.00
Business Car	1.38	36.95	51.06	0.00
Light Commercial	1.30	22.64	29.43	0.58
Heavy Commercial	1.00	23.89	23.89	15.25
Road Trains	1.00	24.89	24.89	35.79

** Benefit to freight consignees, as distinct from vehicle operators, for improved travel time.*
Source : RTA NSW Economic Analysis Manual.

Number of persons per private car relevant to the Highway is taken to be tourist 2.1, other 2.2, ie. higher than the 1.7 used by RTA NSW. Tourist vehicles almost invariably have 2 persons and a family segment would add to this figure. Many community vehicles will carry more than 2 people on local trips.

Value of travel time for coaches is estimated as per a heavy commercial vehicle without a freight component, but including $/person hour travel time savings for passengers at a per person rate as for private cars of $11.55 per person hour. Thus, a coach carrying an average of 25 passengers would have a one-hour travel time saving of $23.89 for the driver plus 25 x $11.55 = $289 for the passengers.

Vehicle operating costs for triple road trains are estimated at 50% more than heavy vehicles in the above tables.

Allowance for inflation 2009 on 2007 is made in the final phase of calculations when with Nett Present Values of benefits adjusted upwards by 7.3% (increase Sep Q 2009 over Sep Q 2007 Darwin) to provide an NPV in 2009 values.

1.2 ROAD SURFACES

Vehicle operating costs are affected by road surfaces. The RTA NSW Manual specifies six unsealed road surfaces :-

E.....Earthen – No gravel
G1 .....Very poor gravel
G2 .....Poor gravel
G3 .....Fair gravel
G4 .....Good gravel
G5 .....Very good gravel

Following advice from road authorities and observations of the road, we have classed the following distances along the Tanami Road as being in the following categories :-

E.....Earthen.....698
G2 .....Poor gravel.....54

It should be noted however, that the condition of gravel roads depends a great deal on the underlying soil types.

It is assumed the road surface upgraded to is S3 level.

1.3 TRAVEL TIMES

Based on various discussions and information and field inspection, we have estimated travel speeds will improve as a result of the upgrading as follows.

	Current		If Sealed	
	Truck	Light Veh	Truck	Light Veh
Halls Creek turnoff to Balgo turnoff	60 kph	70 kph	100 kph	110 kph
Balgo turnoff to Border	60 kph	70 kph	100 kph	110 kph
Border to Granites Mine	60 kph	70 kph	100 kph	110 kph
Granites Mine to Yuendumu	70 kph	80 kph	100 kph	110 kph

1.4 ACCIDENT COSTS

Consideration of road safety aspects is given in Section 6.5.

1.5 DELAYS

Upgrading of the Tanami Road to sealed standard will cause a major reduction in delays due to the road being closed. This is covered in Section 6.4.

1.6 DUST

There will be significant benefits from reduction in dust effects that will especially result in much greater willingness to use the road by tourists and heavy transports, especially refrigerated vehicles.

1.7 DIFFERENT TYPES OF GROWTH FACTORS

There are three different growth elements relevant.

The first is the on-going natural growth in the population/market generating that type of traffic. In calculating the stream of impacts from the upgrading over a 30-year period, it is appropriate to include this growth in full. In the following, we have generally referred to this as "natural growth". Included in this is a propensity for vehicle use to grow faster than population. This is important with indigenous communities whose vehicle ownership has previously been low.

There are however, two types of "one-off" growth in relation to this road that it is important to distinguish between.

The first is "generated" growth. For instance, people in the communities may decide that with the upgrading, it is more worthwhile owning vehicles and taking them on the road. Cheaper transport costs may lead mining companies/suppliers to so structure their affairs that they will use the transport system more. Conventional practice in benefit cost analysis is to only count half the benefit stream resulting from that "generated" growth. In practice, it is very difficult to estimate "generated" growth and by and large only included in the following analysis in a limited way.

The other very important type of "one-off" growth for this road however, comes from a situation where traffic is already moving between two points (let us say heavy transport between Adelaide and Melbourne and the Kimberley region) using another route (say via Katherine). For this traffic, the Tanami will provide a more efficient route. This "one-off" growth is referred to as "diverted" traffic. In these cases, it is possible to calculate the savings involved. There will be positives of savings in travel distances and times. However, there could also be some negatives (eg. the differences between travel on different grades of surfaces over some sections).

In the following, the benefits are first valued by savings between travelling over the road in its present condition and travelling over the upgraded road, ie "on-road" savings. Analysis is then extended to estimates of cost savings of moving over the Tanami route compared with the previous less efficient route, ie. "diverted" traffic growth. "Diverted" growth can also occur from other means of transport, especially for coach visitors using this road from air transport. For this type of "diverted" traffic, we have assumed that the cost benefit is equivalent to the "on-road" vehicle operating cost savings.

1.8 BASE CASE & OTHER SCENARIOS

The following constructs a base case expected scenario and then measures the impacts of the upgrading.

2.0 CALCULATION OF DIRECT BENEFITS

(A) Light Vehicles

2.1 Communities

Community traffic is expected to experience a 20% one-off 'generated' growth brought to account at 50%, ie. a nett 10% and to experience growth over the project period at 3% per annum (population 2% pa. and increased vehicle usage 1% pa.). Average persons per vehicle used is 2.2.

The following tables give estimated operating cost savings and travel time savings.

Operating Cost Savings							
Section	**Change in surface**	**Est op cost ¢ per km**	**Change ¢**	**Length of road**	**Saving per veh**	**No. veh per day**	**Savings per annum**
Turnoff to Wolfe Ck	E to S3	45.9-29.2	16.7	111	18.54	8.8	**$59,551**
Wolfe Ck to Billiluna	E to S3	45.9-29.2	16.7	41	6.85	8.8	**$22,002**
Billiluna to Balgo turnoff	E to S3	45.9-29.2	16.7	48	8.02	6.6	**$19,320**
Balgo turnoff to Coyote Mine	E to S3	45.9-29.2	16.7	64	10.69	3.3	**$12,880**
Coyote to Lajamanu turnoff	E to S3	45.9-29.2	16.7	99	16.53	3.3	**$20,000**
Lajamanu turnoff to Granites	E to S3	45.9-29.2	16.7	102	17.03	5.5	**$34,188**
Granites to Yuendumu	E to S3	45.9-29.2	16.7	200	33.40	6.6	**$80,461**
	G2 to S3	36.9-29.2	7.7	54	4.16	6.6	**$10,021**
Total							**$258,423**

Travel Time Savings							
Section	**Length of road**	**Travel time Hr**	**Travel time savings**	**Savings per veh**	**Savings per veh**	**No. veh per day**	**Savings per annum**
Turnoff to Wolfe Ck	111	1.59-1.01	0.58	25.41	14.74	8.8	**$47,344**
Wolfe Ck to Billiluna	41	0.59-0.37	0.22	25.41	5.59	8.8	**$17,955**
Billiluna to Balgo turnoff	48	0.69-0.44	0.25	25.41	6.35	6.6	**$15,297**
Balgo turnoff to Coyote Mine	64	0.91-0.58	0.33	25.41	8.39	3.3	**$10,106**
Coyote to Lajamanu turnoff	99	1.41-0.90	0.51	25.41	12.96	3.3	**$15,610**
Lajamanu turnoff to Granites	102	1.46-0.93	0.53	25.41	13.47	5.5	**$27,041**
Granites to Yuendumu	254	3.18-2.31	0.87	25.41	22.11	6.6	**$53,263**
Total							**$139,272**

Total Savings	**$397,695**

Calculation of NPV				
Discount rate	**Growth factor**	**Nett discount rate**	**NPV Factor**	**NPV of Savings**
4%	3%	1%	25.74	$10.237 m
7%	3%	4%	17.29	$6.877 m
10%	3%	7%	12.41	$4.93 m

2.2 Inter-regional Private Travel

In Section 5.6, it was estimated that the road would result in a diversion of private trips by Kimberley residents to Alice Springs and the south from the Katherine route at about 3 movements per day with a savings of:

2 @ 1,100 km = 2,200 km
1 @ 272km = 272 km
Total **2,472 km**

This would involve the following savings:

Operating Costs

2,472km per day @ 29.2¢/km x 365 days =	$264,368 pa.

Travel Time

2,472km ÷ 160km/hr = 22.5 hours @ $24.75 x 365 days =	$203,259 pa.
Total Savings	**$467,627 pa.**

Calculation of NPV				
Discount rate	**Growth factor**	**Nett discount rate**	**NPV Factor**	**NPV of Savings**
4%	2%	2%	22.71	$10,619,809
7%	2%	5%	15.66	$7,323,038
10%	2%	8%	11.10	$5,190,660

2.3 Business Travel

No one-off increase in business traffic is expected. However, a 3% per annum increase is projected. Travel cost savings for business are much higher per hour but average passenger numbers per vehicle lower.

Operating Cost Savings							
Section	**Change in surface**	**Est op cost ¢ per km**	**Change ¢**	**Length of road**	**Saving per veh**	**No. veh per day**	**Savings per annum**
Turnoff to Wolfe Ck	E to S3	45.9-29.2	16.7	111	18.54	5	**$33,835**
Wolfe Ck to Billiluna	E to S3	45.9-29.2	16.7	41	6.85	5	**$12,501**
Billiluna to Balgo turnoff	E to S3	45.9-29.2	16.7	48	8.02	4	**$11,709**
Balgo turnoff to Coyote Mine	E to S3	45.9-29.2	16.7	64	10.69	2	**$7,803**
Coyote to Lajamanu turnoff	E to S3	45.9-29.2	16.7	99	16.53	1	**$6,033**
Lajamanu turnoff to Granites	E to S3	45.9-29.2	16.7	102	17.03	2	**$12,432**
Granites to Yuendumu	E to S3	45.9-29.2	16.7	200	33.40	8	**$97,528**
	G2 to S3	36.9-29.2	7.7	54	4.16	8	**$12,147**
Total							**$193,988**

Travel Time Savings							
Section	**Length of road**	**Travel time Hr**	**Travel time savings**	**Savings per veh**	**Savings per veh**	**No. veh per day**	**Savings per annum**
Turnoff to Wolfe Ck	111	1.59-1.01	0.58	$51.06	29.61	5	**$54,038**
Wolfe Ck to Billiluna	41	0.59-0.37	0.22	$51.06	11.23	5	**$20,495**
Billiluna to Balgo turnoff	48	0.69-0.44	0.25	$51.06	12.77	4	**$18,644**
Balgo turnoff to Coyote Mine	64	0.91-0.58	0.33	$51.06	16.85	2	**$12,300**
Coyote to Lajamanu turnoff	99	1.41-0.90	0.51	$51.06	26.04	1	**$9,505**
Lajamanu turnoff to Granites	102	1.46-0.93	0.53	$51.06	27.06	2	**$19,754**
Granites to Yuendumu	254	3.18-2.31	0.87	$51.06	44.42	8	**$129,706**
Total							**$264,442**

Total Savings	**$458,430**

Calculation of NPV				
Discount rate	**Growth factor**	**Nett discount rate**	**NPV Factor**	**NPV of Savings**
4%	3%	1%	25.74	$11,799,988
7%	3%	4%	17.29	$7,927,172
10%	3%	7%	12.41	$5,688,658

2.4 Inter-regional Business Travel

This is estimated at 2 per day that would divert over the Tanami from the Katherine route with savings of:

1.3 @ 1,100 km =	1,430 km
0.7 @ 272km =	190 km
Total	**1,620 km**

This would involve the following savings:

Operating Costs

1,620km per day @ 29.2¢/km x 365 days = $172,660 pa.

Travel Time

1,620km ÷ 110km/hr = 14.72 hours @ $51.06 x 365 days = $274,335 pa.

Total Savings **$446,995 pa.**

Calculation of NPV				
Discount rate	**Growth factor**	**Nett discount rate**	**NPV Factor**	**NPV of Savings**
4%	3%	1%	25.74	$11,505,651
7%	3%	4%	17.29	$7,728,544
10%	3%	7%	12.41	$5,547,208

2.5 Tourism

There are three streams of savings.

The first relates to existing traffic along the road.

The second relates to 'generated' traffic as a result of the upgrading, especially on excursion from Halls Creek to Wolfe Creek Crater and the Balgo area and return.

The third relates to existing traffic that will benefit from diverting over the shorter Tanami route.

Overall underlying growth rate is projected at 2% per annum.

Projected Tourist Vehicle Numbers per Day					
Section	(a) Existing	(b) Generated Increase (Total)	50%	(a) & (b)	(c) Diverted
Turnoff to Wolfe Ck	18	(15)	7.5	25.5	24
Wolfe Ck to Billiluna	14	(9)	4.5	18.5	24
Billiluna to Balgo turnoff	12	(10)	5	17	24
Balgo turnoff to Coyote Mine	12	-	-	12	24
Coyote to Lajamanu turnoff	12	-	-	12	24
Lajamanu turnoff to Granites	13	(2)	1	14	24
Granites to Yuendumu	13	(2)	1	14	24

Savings Existing Plus Generated

Operating Cost Savings							
Section	Change in surface	Est op cost ¢ per km	Change ¢	Length of road	Saving per veh	No. veh per day	Savings per annum
Turnoff to Wolfe Ck	E to S3	45.9-29.2	16.7	111	18.54	25.5	**$172,561**
Wolfe Ck to Billiluna	E to S3	45.9-29.2	16.7	41	6.85	18.5	**$126,725**
Billiluna to Balgo turnoff	E to S3	45.9-29.2	16.7	48	8.02	17	**$49,764**
Balgo turnoff to Coyote Mine	E to S3	45.9-29.2	16.7	64	10.69	12	**$46,822**
Coyote to Lajamanu turnoff	E to S3	45.9-29.2	16.7	99	16.53	12	**$72,401**
Lajamanu turnoff to Granites	E to S3	45.9-29.2	16.7	102	17.03	14	**$87,023**
Granites to Yuendumu	E to S3	45.9-29.2	16.7	200	33.40	14	**$170,674**
	G2 to S3	36.9-29.2	7.7	54	4.16	14	**$21,258**
Total							**$747,228**

Travel Time Savings							
Section	Length of road	Travel time Hr	Travel time savings	Savings per veh	Savings per veh	No. veh per day	Savings per annum
Turnoff to Wolfe Ck	111	1.59-1.01	0.58	$25.41	14.74	25.5	**$137,196**
Wolfe Ck to Billiluna	41	0.59-0.37	0.22	$25.41	5.59	18.5	**$37,746**
Billiluna to Balgo turnoff	48	0.69-0.44	0.25	$25.41	6.35	17	**$39,402**
Balgo turnoff to Coyote Mine	64	0.91-0.58	0.33	$25.41	8.38	12	**$36,704**
Coyote to Lajamanu turnoff	99	1.41-0.90	0.51	$25.41	12.96	12	**$56,765**
Lajamanu turnoff to Granites	102	1.46-0.93	0.53	$25.41	13.47	14	**$68,832**
Granites to Yuendumu	254	3.18-2.31	0.87	$25.41	22.11	14	**$114,515**
Total							**$491,160**

Total Savings	**$1,238,388**

Calculation of NPV				
Discount rate	Growth factor	Nett discount rate	NPV Factor	NPV of Savings
4%	2%	2%	22.71	$28,123,791
7%	2%	5%	15.66	$19,393,156
10%	2%	8%	11.10	$13,746,107

Savings – Inter-regional Diverted

Diversion savings for visitors are estimated at a saving of 1,100km for 70% and 272km for 30%, an average of 857km.

This would involve the following savings:

Operating Costs

852km per veh @ 29.2¢/km x 24 veh x 365 days = $2,192,137 pa.

Travel Time

852km ÷ 110km/hr = 7.79 hours @ $24.75 x 24 veh x 365 days = $274,335 pa.

Total Savings **$3,881,087 pa.**

Calculation of NPV				
Discount rate	**Growth factor**	**Nett discount rate**	**NPV Factor**	**NPV of Savings**
4%	2%	2%	25.74	$99,899,179
7%	2%	5%	17.29	$67,103,994
10%	2%	8%	12.41	$48,164,290

2.6 Stations

Existing station vehicle movements are projected to expand at an average of 2% per annum due to increased turnoff.

Over the 3-year project period, this works out at a growth of about 2% per annum.

Operating Cost Savings							
Section	**Change in surface**	**Est op cost ¢ per km**	**Change ¢**	**Length of road**	**Saving per veh**	**No. veh per day**	**Savings per annum**
Turnoff to Wolfe Ck	E to S3	45.9-29.2	16.7	111	18.54	4	**$27,068**
Wolfe Ck to Billiluna	E to S3	45.9-29.2	16.7	41	6.85	2	**$5,000**
Billiluna to Balgo turnoff	E to S3	45.9-29.2	16.7	48	8.02	1	**$2,927**
Balgo turnoff to Coyote Mine	E to S3	45.9-29.2	16.7	64	10.69	-	**-**
Coyote to Lajamanu turnoff	E to S3	45.9-29.2	16.7	99	16.53	-	**-**
Lajamanu turnoff to Granites	E to S3	45.9-29.2	16.7	102	17.03	-	**-**
Granites to Yuendumu	E to S3	45.9-29.2	16.7	200	33.40	-	**-**
	G2 to S3	36.9-29.2	7.7	54	4.16	-	**-**
Total							**$34,995**

Travel Time Savings							
Section	**Length of road**	**Travel time Hr**	**Travel time savings**	**Savings per veh**	**Savings per veh**	**No. veh per day**	**Savings per annum**
Turnoff to Wolfe Ck	111	1.59-1.01	0.58	$51.06	29.61	4	**$42,939**
Wolfe Ck to Billiluna	41	0.59-0.37	0.22	$51.06	11.23	2	**$8,198**
Billiluna to Balgo turnoff	48	0.69-0.44	0.25	$51.06	12.77	1	**$4,661**
Balgo turnoff to Coyote Mine	64	0.91-0.58	0.33	$51.06	16.85	-	**-**
Coyote to Lajamanu turnoff	99	1.41-0.90	0.51	$51.06	26.04	-	**-**
Lajamanu turnoff to Granites	102	1.46-0.93	0.53	$51.06	27.06	-	**-**
Granites to Yuendumu	254	3.18-2.31	0.87	$51.06	44.42	-	**-**
Total							**$55,798**
Total Savings							**$90,793**

Calculation of NPV				
Discount rate	**Growth factor**	**Nett discount rate**	**NPV Factor**	**NPV of Savings**
4%	2%	2%	22.71	$2,061,909
7%	2%	7%	15.66	$1,421,818
10%	2%	10%	11.10	$1,007,802

(B) Heavy Vehicles

2.7 Coaches

Coaches are estimated to involve 4 movements a week with an average of 30 passengers and diversion savings of 70% 1,100km and 30% 272km, average 852km.

A coach is taken as a heavy vehicle with driver for operating costs and a driver plus 30 persons for travel time savings.

Growth factor is taken at 1% pa. only.

Operating Costs - Savings

852km @ 109.6¢/km x 4 per week x 52 weeks = $194,229 pa.

Travel Time - Savings

852km ÷ 100km/hr = 8.52 hrs
Driver 1 @ $23.89 x 8.52 hrs x 4 per week x 52 weeks = $10,584 pa.
Passenger 30 @ $11.55 x 8.52 hrs x 4 per week x 52 weeks = $614,056 pa.
$624,637 pa.

Total Savings **$818,866 pa.**

Calculation of NPV				
Discount rate	**Growth factor**	**Nett discount rate**	**NPV Factor**	**NPV of Savings**
4%	1%	3%	19.60	$16,049,774
7%	1%	6%	14.04	$11,496,879
10%	1%	9%	10.20	$8,352,433

2.8 Cattle

The expected change in movement of cattle is composed of a mixture of influences including expansion of cattle numbers along the road, diversion of movements of cattle for live exports from Darwin to Wyndham, and flows of cattle ex Kimberley to southern meatworks.

The following simply assumes that the savings relate to 'on-road costs' for the number of trucks that will move over the road when sealed.

Operating Cost Savings							
Section	**Change in surface**	**Est op (1) cost ¢ per km**	**Change ¢**	**Length of road**	**Saving per veh**	**No. veh per day**	**Savings per annum**
Turnoff to Wolfe Ck	E to S3	288.3-164.4	123.9	111	137.5	1.8	**$90,338**
Wolfe Ck to Billiluna	E to S3	288.3-164.4	123.9	41	50.8	1.8	**$33,376**
Billiluna to Balgo turnoff	E to S3	288.3-164.4	123.9	48	59.5	1.2	**$26,061**
Balgo turnoff to Coyote Mine	E to S3	288.3-164.4	123.9	64	79.3	1.2	**$34,733**
Coyote to Lajamanu turnoff	E to S3	288.3-164.4	123.9	99	122.7	1.2	**$53,743**
Lajamanu turnoff to Granites	E to S3	288.3-164.4	123.9	102	126.4	1.0	**$46,136**
Granites to Yuendumu	E to S3	288.3-164.4	123.9	200	247.8	1.0	**$90,447**
	G2 to S3	227.6-164.4	63.2	54	34.1	1.0	**$12,447**
Total							**$387,221**

(1) Note: Triple = Truck plus 50%.

Travel Time Savings							
Section	**Length of road**	**Travel time hr**	**Travel time savings hr**	**Savings per veh hr**	**Savings(1) per veh**	**No. veh per day**	**Savings per annum**
Turnoff to Wolfe Ck	111	1.85-1.11	0.74	$60.68	44.90	1.8	**$29,499**
Wolfe Ck to Billiluna	41	0.68-0.41	0.27	$60.68	16.38	1.8	**$10,762**
Billiluna to Balgo turnoff	48	0.80-0.48	0.32	$60.68	19.42	1.2	**$8,506**
Balgo turnoff to Coyote Mine	64	1.07-0.64	0.43	$60.68	26.09	1.2	**$11,427**
Coyote to Lajamanu turnoff	99	1.65-0.99	0.63	$60.68	38.23	1.0	**$13,954**
Lajamanu turnoff to Granites	102	1.70-1.02	0.68	$60.68	41.26	1.0	**$15,060**
Granites to Yuendumu	254	4.23-2.54	1.69	$60.68	102.55	1.0	**$37,431**
Total							**$126,639**

(1) Note: Road train including freight.

Total Savings	**$513,860**

Calculation of NPV				
Discount rate	**Growth factor**	**Nett discount rate**	**NPV Factor**	**NPV of Savings**
4%	-	4%	17.29	$8,884,639
7%	-	7%	12.41	$6,377,003
10%	-	10%	9.43	$4,845,700

2.9 Horses

The following provides for 3.5 road trains per week, ie. 0.5 per day for 5 years only.

Operating Cost Savings							
Section	**Change in surface**	**Est op [1] cost ¢ per km**	**Change ¢**	**Length of road**	**Saving per veh**	**No. veh per day**	**Savings per annum**
Turnoff to Wolfe Ck	E to S3	288.3-164.4	123.9	111	137.5	0.5	**$25,093**
Wolfe Ck to Billiluna	E to S3	288.3-164.4	123.9	41	50.8	0.5	**$9,271**
Billiluna to Balgo turnoff	E to S3	288.3-164.4	123.9	48	59.5	0.5	**$10.859**
Balgo turnoff to Coyote Mine	E to S3	288.3-164.4	123.9	64	79.3	0.5	**$14,472**
Coyote to Lajamanu turnoff	E to S3	288.3-164.4	123.9	99	122.7	0.5	**$22,393**
Lajamanu turnoff to Granites	E to S3	288.3-164.4	123.9	102	126.4	0.5	**$23,068**
Granites to Yuendumu	E to S3 G2 to S3	288.3-164.4 227.6-164.4	123.9 63.2	200 54	247.8 34.1	0.5 0.5	**$45,223** **$6,223**
Total							**$156,602**

(1) Note: Triple = Truck plus 50%.

Travel Time Savings							
Section	**Length of road**	**Travel time hr**	**Travel time savings hr**	**Savings per veh hr**	**Savings[1] per veh**	**No. veh per day**	**Savings per annum**
Turnoff to Wolfe Ck	111	1.85-1.11	0.74	$60.68	44.90	0.5	**$8,194**
Wolfe Ck to Billiluna	41	0.68-0.41	0.27	$60.68	16.38	0.5	**$2,989**
Billiluna to Balgo turnoff	48	0.80-0.48	0.32	$60.68	19.42	0.5	**$3,544**
Balgo turnoff to Coyote Mine	64	1.07-0.64	0.43	$60.68	26.09	0.5	**$4,761**
Coyote to Lajamanu turnoff	99	1.65-0.99	0.63	$60.68	38.23	0.5	**$6,977**
Lajamanu turnoff to Granites	102	1.70-1.02	0.68	$60.68	41.26	0.5	**$7,530**
Granites to Yuendumu	254	4.23-2.54	1.69	$60.68	102.55	0.5	**$10,715**
Total							**$44,710**

(1) Note: Road train including freight.

Total Savings	**$201,312**

Calculation of NPV				
Discount rate	**Growth factor**	**Nett discount rate**	**NPV Factor (5 yrs)**	**NPV of Savings**
4%	-	4%	4.452	$896,241
7%	-	7%	4.100	$825,379
10%	-	10%	3.791	$763,174

2.10 Local Heavy Vehicles

Local heavy vehicles using the road include those to communities and to mines and general truck movements including road maintenance, exploration vehicles.

The following analyses mining as triples and community movements as trucks although there are possible overlaps.

Mining

Mining vehicle movements are estimated to have savings as follows:

Operating Cost Savings							
Section	**Change in surface**	**Est op cost ¢ per km**	**Change ¢**	**Length of road**	**Saving per veh**	**No. veh per day**	**Savings per annum**
Turnoff to Wolfe Ck	E to S3	288.3-164.4	123.9	111	137.5	2.0	**$100,375**
Wolfe Ck to Billiluna	E to S3	288.3-164.4	123.9	41	50.8	2.0	**$37,084**
Billiluna to Balgo turnoff	E to S3	288.3-164.4	123.9	48	59.5	2.0	**$43,435**
Balgo turnoff to Coyote Mine	E to S3	288.3-164.4	123.9	64	79.3	2.0	**$57,889**
Coyote to Lajamanu turnoff	E to S3	288.3-164.4	123.9	99	122.7	1.0	**$44,785**
Lajamanu turnoff to Granites	E to S3	288.3-164.4	123.9	102	126.4	1.0	**$46,136**
Granites to Yuendumu	E to S3	288.3-164.4	123.9	200	247.8	8.5	**$768,800**
	G2 to S3	227.6-164.4	63.2	54	34.1	8.5	**$105,795**
Total							**$1,204,299**

Travel Time Savings							
Section	**Length of road**	**Travel time hr**	**Travel time savings hr**	**Savings per veh hr**	**Savings[(1)] per veh**	**No. veh per day**	**Savings per annum**
Turnoff to Wolfe Ck	111	1.85-1.11	0.74	$60.68	44.90	2.0	**$32,777**
Wolfe Ck to Billiluna	41	0.68-0.41	0.27	$60.68	16.38	2.0	**$11,957**
Billiluna to Balgo turnoff	48	0.80-0.48	0.32	$60.68	19.42	2.0	**$14,177**
Balgo turnoff to Coyote Mine	64	1.07-0.64	0.43	$60.68	26.09	2.0	**$19,046**
Coyote to Lajamanu turnoff	99	1.65-0.99	0.63	$60.68	38.23	1.0	**$13,954**
Lajamanu turnoff to Granites	102	1.70-1.02	0.68	$60.68	41.26	1.0	**$15,060**
Granites to Yuendumu	254	4.23-2.54	1.69	$60.68	102.55	8.5	**$318,161**
Total							**$425,132**

(1) Note: Includes road train including freight.

Total Savings	**$1,629,431**

Calculation of NPV				
Discount rate	**Growth factor**	**Nett discount rate**	**NPV Factor**	**NPV of Savings**
4%	4%	0%	30.00	$48,882,930
7%	4%	3%	19.60	$31,936,848
10%	4%	6%	14.04	$22,877,211

Community & Other Local Heavy Vehicles

Community and other local heavy vehicle movements are estimated to have savings as follows:

Operating Cost Savings							
Section	**Change in surface**	**Est op cost ¢ per km**	**Change ¢**	**Length of road**	**Saving per veh**	**No. veh per day**	**Savings per annum**
Turnoff to Wolfe Ck	E to S3	192.2-109.6	82.6	111	91.69	3.5	**$117,133**
Wolfe Ck to Billiluna	E to S3	192.2-109.6	82.6	41	33.87	3.5	**$43,269**
Billiluna to Balgo turnoff	E to S3	192.2-109.6	82.6	48	39.65	3.0	**$43,417**
Balgo turnoff to Coyote Mine	E to S3	192.2-109.6	82.6	64	52.86	-	**-**
Coyote to Lajamanu turnoff	E to S3	192.2-109.6	82.6	99	81.77	-	**-**
Lajamanu turnoff to Granites	E to S3	192.2-109.6	82.6	102	84.25	1.0	**$30,751**
Granites to Yuendumu	E to S3	192.2-109.6	82.6	200	165.2	1.5	**$90,447**
	G2 to S3	153.5-109.6	43.9	54	23.71	1.5	**$12,981**
Total							**$337,998**

Travel Time Savings							
Section	**Length of road**	**Travel time hr**	**Travel time savings hr**	**Savings per veh hr**	**Savings[(1)] per veh**	**No. veh per day**	**Savings per annum**
Turnoff to Wolfe Ck	111	1.85-1.11	0.74	$39.14	28.96	3.5	**$36,996**
Wolfe Ck to Billiluna	41	0.68-0.41	0.27	$39.14	10.57	3.5	**$13,503**
Billiluna to Balgo turnoff	48	0.80-0.48	0.32	$39.14	12.52	3.0	**$13,709**
Balgo turnoff to Coyote Mine	64	1.07-0.64	0.43	$39.14	16.83	-	**-**
Coyote to Lajamanu turnoff	99	1.65-0.99	0.63	$39.14	24.68	-	**-**
Lajamanu turnoff to Granites	102	1.70-1.02	0.68	$39.14	26.61	1.0	**$9,713**
Granites to Yuendumu	254	4.23-2.54	1.69	$39.14	66.15	1.5	**$36,217**
Total							**$110,138**

Total Savings	**$448,136**

Calculation of NPV				
Discount rate	**Growth factor**	**Nett discount rate**	**NPV Factor**	**NPV of Savings**
4%	3%	1%	25.74	$11,535,021
7%	3%	4%	17.29	$7,748,271
10%	3%	7%	12.41	$5,561,368

2.11 Interstate/Regional Freight

The savings in interstate freight come from diversion of substantial movements over a much shorter route - 1,100km for Halls Creek and Kimberley areas further west, and 272km for Kununurra. On the basis of 30% Kununurra and 70% other, average is 852km.

Vehicles will be triple road trains and long-term growth can be expected to be 4% per annum.

Operating Costs - Savings

852km @ 123.9¢/km x 8 veh per day x 365 days = $2,984,741 pa.

Travel Time - Savings

852km @ 100km/hr = 8.25 hrs x $60.68 x 8 veh per day x 365 days = $1,461,781 pa.

Total Savings **$4,446,522 pa.**

Calculation of NPV				
Discount rate	**Growth factor**	**Nett discount rate**	**NPV Factor**	**NPV of Savings**
4%	4%	0%	30.00	$133,395,606
7%	4%	3%	19.60	$87,151,831
10%	4%	6%	14.04	$62,429,590