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ALTERNATIVE RANGE CROSSING ROAD ROUTES

PRELIMINARY ANALYSIS COST BENEFIT CONSIDERATIONS

1. INTRODUCTION

Cummings Economics have been involved in Cost Benefit Economic Impact Analysis of road routes across northern Australia and in Papua New Guinea stretching back to the 1990s. This has included work on cost benefit analysis of upgrading the Kuranda Range Road in the late 1990s and in 2004. The firm is very familiar with standard road cost benefit analysis methodology and parameters used (see [Appendix 1](#)).

The question of assessing options for upgrading the range crossing between Cairns and Mareeba has become a matter of urgent community discussion with a number of alternative routes canvassed. To help consideration of the matter, the following offers some preliminary comment on the various routes being canvassed from a cost benefit analysis perspective.

2. ROAD COST BENEFIT ANALYSIS METHODOLOGY

2.1 COSTS

The identification of capital costs of constructing a road is something that is undertaken by civil engineers. However comparative capital costs will be dependent on the quality of road being constructed, length, gradient and curviness, and need for special structures like bridges and tunnels etc.

An important consideration in a major upgrading of an existing route such as the existing Kuranda Range route will be the extra costs involved of traffic disruption. New routes do not incur such costs and can be constructed more quickly.

2.2 BENEFITS

Standard road cost benefit analysis concentrates on measuring the savings resulting from the new road conditions compared with the old road conditions for road users mainly in terms of Economic Efficiency measured by savings in travel time, vehicle operating costs and accident costs. For each of these factors, there are established parameters that have been researched and calculated by national road research authorities and adapted to different conditions, e.g. urban/country, sealed/unsealed, straight/curved, flat/steep and so on.

2.3 PRESENT VALUES

The monetary value of benefits over the life of the project is brought to a 'Present Value'. This adds together the sum of benefits over the 'project period' with each year's benefits progressively discounted by a 'discount rate'. For example, an annual benefit of \$1 over a 30-year period at a discount rate of 4% per annum calculates to a 'Present Value' of about \$17 and at 3% per annum discount rate to about \$19. Thus, benefits occurring well into the future are heavily discounted.

Costs, over time (e.g. road maintenance), are also discounted in a similar way to bring costs to a 'Present Value'.

The whole exercise is carried out in 'real' values, i.e. inflation is not taken into account.

2.4 COST BENEFIT RATIOS

The 'Present Value' of benefits is then compared with the 'Present Value' of costs. A cost benefit ratio of more than 1 means that the calculated benefits exceed the calculated costs.

2.5 FURTHER ANALYSIS

Further analysis can be undertaken to look at costs and benefits of Environmental, Social and Economic Impacts, but these are often difficult to quantify. However social and economic impacts are usually heavily related to Economic Efficiency savings.

3. SPECIAL FACTORS IN RELATION TO THE RANGE CROSSING

3.1 ROAD ROUTE DISTANCE

One thing is clear in relation to Economic Efficiency benefits, the most direct route involving the shorter travel times, vehicle operating costs and less chance of accident costs can be expected to produce the highest level of benefits over time.

For the range crossings' cost/benefit calculations, the two major points of origin and destination are:

1) **Cairns Central Area:**

- Seaport
- Airport
- Portsmith Industrial Area
- Central Business District (CBD)
- East Coast Railhead
- Bruce Highway Roadhead.

2) **Mareeba:**

- Kennedy Highway Junction:
 - South to Atherton and the inland route to the south via Mt Garnet, via the Gulf Developmental Road to the Gulf and across into the Northern Territory;
 - West on the Burke Developmental Road to Chillagoe and the Lower Mitchell area;
 - North on the Mulligan Highway to Cooktown and the Peninsula Developmental Road.

The direct distance between central Cairns and Mareeba is about 30km. The current route via Kuranda is a distance of about 63km.

The range road is a vital link in servicing the billions of dollars generated by agricultural, pastoral, mining and tourism industries and a population of about 70,000 in the wider region.

A further focal point for traffic is Kuranda. A preliminary assessment of traffic volumes indicated that a substantial number of daily movements over the current range crossing terminated in the Kuranda area. It can be expected that about 6000 a day would travel to and from Mareeba on an improved route.

3.2 STEEP SLOPES AND ALTITUDE

Necessity to ascend steep mountain sides is also a special factor along with the altitude that vehicles must pass over. Steeper gradients slow traffic speeds, especially heavy transport. Tight bends also slow traffic. To achieve satisfactory gradients, roads ascending steeper mountain sides will need to stretch out over longer distances. For instance, although the highest point of the Kuranda Range Road at 410m is less than 3km direct distance from the base, it takes 7km of road at about an average gradient of just over 5% to reach the top.

3.3 TUNNELS

Tunnels are more expensive to build per km. But the cost can be justified if a tunnel avoids construction of a substantial length of road, especially roads that involve steep winding climbs. However, they need lower grades, have ventilation problems and safety constraints for carrying dangerous and oversize cargoes. A benefit can be the reduction of environmental impact. Typically, they are good for cutting short distances through hills. They are not good for climbing hills. If incorporated into a route, an alternative needs to be available to handle dangerous and oversize loads. The Kuranda Range crossing needs to efficiently cater for heavy transport vehicles including those carrying dangerous and oversize loads and thus tunnels would be a major negative factor.

3.4 ENVIRONMENT

Another obvious major consideration for this range road crossing is the environment, especially the fact that all potential routes pass through the Wet Tropics World Heritage Area. It should be noted that the width of the rainforest belt varies being wider in the south and the north and narrower in the Kuranda/ Speewah area. The current road was not designed and built to modern standards and any new route presents an opportunity to be built to modern environmental standards (see Appendix 2). Obviously, it is more desirable to have a route that minimizes environmental impacts.

3.5 CAIRNS URBAN AND INDUSTRIAL DEVELOPMENT

The layout of urban areas is also a factor. Apart from its tourism role, Kuranda has effectively become a dormitory suburb of urban Cairns. There would be benefits of deflecting urban growth from south of Cairns where it is taking up good agricultural land and threatening the viability of the Mulgrave Sugar Mill, to the near Tableland area. The major area identified in previous studies for urban development has been around the Koah area which also has climatic advantages of higher altitude. The 2004 study was driven by a desire to achieve this outcome. Shortness of distance to the Koah area would be of advantage. Appendix 3 shows distances relative to surrounding Cairns CBD.

The land-use pressures resulting in higher land costs on the coast for industrial land can be relieved by providing access that will mean that the suitability of Mareeba for industrial development to service wider regional markets is improved.

3.6 AN EFFICIENT HEAVY TRANSPORT ROUTE

Finally, there is another special factor in the consideration of this range crossing – that of providing an efficient heavy transport route between a hinterland area to a major regional service centre. The Cairns Tablelands range crossing by road is not paralleled by a rail freight route, unlike Brisbane, Rockhampton and Townsville. It should be noted that each of these rail routes is effectively subsidised by the State Government and this situation needs to be taken into account in any assessment of this range crossing by the State Government.

4. CONSIDERATION OF DIFFERENT ROUTES

SIX ROUTES CANVASSED (SEE MAPS APPENDIX 4)

4.1 QUAID RANGE ROAD

This option takes traffic between Cairns and Mareeba around a wide circuit to the north. This is not an efficient route to service Mareeba and the Tablelands area. Its only potential Economic Efficiency benefits would be for traffic to and from the Peninsula area and possibly to take some temporary pressure off the Kuranda and Rex Range Roads.

4.2 SADDLE MOUNTAIN ROAD

This proposal involves climbing the coastal range further north than the existing Kuranda Range Road and just north of McGregor Road and the James Cook University Cairns Campus. The original proposal involved tunnelling with a short tunnel under the rainforest area at its peak through to the Saddle Mountain Road to the Kennedy Highway just short of the Barron River Bridge. An option without a tunnel would ascend the ridge line a short distance further north to a height of only 390m. This option involves the development of a second two-lane/one-way route (up or down) that would see the existing Kuranda Range Road turned into a two-lane/one-way route in the opposite direction. A major benefit would be the avoidance of costs of traffic disruption on the existing Kuranda Range Road during the construction period.

Preliminary indications are that the distance travelled would be roughly similar to the existing road, perhaps a little bit further. There would be no distance saving and minimal travel time saving.

4.3 THE EXISTING KURANDA RANGE ROAD

Although Mareeba is a direct distance from Cairns of about 30km, this route involves a travel distance of about 63km from Cairns to Mareeba. The 2006 study identified that a 4-lane highway could be developed on this route but involving substantial costly bridging out from the mountain side to avoid deep benching into the mountain side. The existing Kuranda Range route has three sections presenting varying difficulties for construction of a 4-lane highway. The section from the bottom to the switchback bend that generally travels south is believed to pose the most difficulties. The next section from the switchback that generally trends north to the top just north of the Henry Ross lookout is believed to pose moderate difficulties. The remaining section that generally trends north-west to the Barron River Bridge, involves the least difficulties.

At the time, cost was estimated at about \$800m – in today's costs, probably of the order of \$1.4Bn. However, the new road did not reduce travel distance and did little to reduce travel times and vehicle operating costs, in the short run.

If the road was not improved, traffic clogging would occur that would seriously increase travel time costs, greatly increasing the benefits of the new road over time. However,

conventional cost benefit calculations would reduce these greater future benefits of the new road due to the application of discount rates.

Economic Efficiency Cost Benefit Analysis produced a 'Present Value' of benefits well short of the estimated costs. Estimates of benefits of diverting urban development on to the Tablelands area to avoid closure of Mulgrave Mill were included but total benefits still fell well short of the cost estimates.

Inquiries made at the time indicated that removing the additional costs of achieving environmental goals would not reduce the cost of the road by a great deal. Inquiries that tried to pinpoint the minimum cost that might be involved if the objective was just to allow B-double size heavy freight vehicles to operate on the route resulted in a rough opinion of the order of \$600m.

Concentrating on this route has a significant disadvantage of extra costs of construction activity to avoid impacts on traffic flows during the construction period.

A benefit of continuing to improve this route is that Wet Tropics' approvals are in place. Although it is believed that the legislation establishing Wet Tropics provides for other infrastructure development to go ahead.

The question of a 'toll' to offset costs was not explored. State Government policy at the time was that a 'toll' would only be allowed if there was an alternative route available.

Since 2006, a further complication has arisen of the high-level Barron River Bridge at Kuranda being in need of replacement. If this route is to remain the main route to the Tablelands, there will be a need to build a new high-level bridge over the Barron River capable of taking heavy vehicles at an estimated cost of about \$450m. It is believed that the major problem with the bridge at present is the volume of heavy transport using it and if an alternative route was developed that took heavy transport, the bridge would not need to be replaced for some time.

The existing road is heavily used as a scenic tourism route, and high volumes of traffic including large heavy transport does not mix well with tourism traffic.

4.4 SMITHS TRACK ROUTE

This route envisages turning off from the Western Arterial Road on the southern side of Kamerunga Bridge heading along the slopes of North Peak switching back and forth then passing over the railway line and then to run along the side of the North Peak slopes west above the railway line. The route would then pass at an elevation of about 348m, roughly 800m away from Stoney Creek Falls, continue west to a second ridge elevation of 408m then down a short distance to the existing Speewah area, and then proceed west to come out north of the Davis Creek Bridge crossing to join the Kennedy Highway.

ALTERNATIVE RANGE CROSSING ROAD ROUTES Some Preliminary Comment on Cost Benefit Considerations

The route is estimated to save a distance of the order of 16km to most of the central Cairns area compared with the existing Kuranda Range route for traffic to and from the Mareeba/Tablelands area.

Based on Economic Efficiency Cost Benefit parameters, distance savings would save major travel time and vehicle operating costs of the order \$50m per annum and \$1.5Bn over 30 years. On top of this would be potential accident cost savings.

There would be cost savings of avoiding impacts on traffic disruption on the existing route during the construction period of a new road. The existing Kuranda Range Road would remain as a scenic tourism and community access road to Kuranda, especially with heavy road transport vehicles diverted from it.

The route avoids crossing the Barron River, and with heavy traffic diverted from the Kuranda route a new Barron River bridge may not be needed for some time.

The route along the slopes of North Peak above the railway line passes through less sensitive vegetation. The amount of rainforest to be traversed would appear to be only 3km with possibility of special environmental treatment such as overpasses similar to recent construction of the Toowoomba bypass road (see [Appendix 2](#)).

This route would have an added major benefit in providing more direct access to new residential area development through to the Koah area south west of Kuranda. Koah would be about the same distance from the Cairns CBD as Palm Cove and the Gordonvale area.

If bridging over the railway line is proven to be too difficult, there would be a possible alternative of leaving the western arterial to pass over Tunnel Hill at the northern end of Mooroolool Mountain and crossing the Redlynch Valley to ascend the range south of the switchback on the Kuranda rail in the Jungara area and then ascending along the side of the North Peak slopes above the railway line. This option would save about 1km travel distance.

Distance of the new road would be about 20km with a relatively short escarpment ascent and relatively small bridges over Upper Stoney Creek and the Clohesy River.

The route from the Kamerunga Bridge travels a substantial distance up the slope away from housing in the suburbs of Stoney Creek and Redlynch.

4.5 THE REDDICLIFFE ROUTE

This route leaves the Cairns Western Arterial Road to pass across Tunnel Hill at the northern end of Mooroolool Mountain to turn south and then cross the Freshwater Valley in an area without housing to ascend the range in the vicinity of Boral Quarries to a peak elevation of 520m then descending to the existing Clohesy River Road that follows the Clohesy River north-west to eventually join the Kennedy Highway at the same point as the Smiths Track route just north of Davies Creek crossing.

Peak elevation of 520m compares with the Kuranda Range Road and Smiths Track route of about 410m. Initial estimates were that this route would cut off about 20 minutes in travel time between Mareeba and Cairns focal points.

However, the route ascends to an elevation higher than the existing Kuranda Range Road and a more detailed examination of contours and elevations indicates that to achieve gradients similar to the Kuranda Range Road, a 10km winding ascent road would be needed. Estimated distance saving is 11km compared with Smiths Track 16km.

This route avoids any large river crossings and passes from Davies Creek and the Cairns Western Arterial Road through government reserves and would open up substantial areas west of the range in open forest country for urban development like the Smiths Track option.

Based on Economic Efficiency Cost Benefit parameters, distance savings would save major travel time and vehicle operating costs of the order \$30m per annum and \$900m over 30 years. On top of this would be potential accident cost savings.

A new road would avoid traffic disruption during construction. The existing Kuranda Range Road would remain as a scenic tourism and community access road to Kuranda, especially with heavy road transport vehicles diverted from it.

The route would travel through approximately 10km of rainforest in the Wet Tropics World Heritage area.

Distance of the new road would be about 30km with smaller bridges across Freshwater Creek and some crossings of the Clohsey River.

The Reddicliffe route gives access to the potential urban settlement area of Koah.

There are some issues with the route passing relatively close to housing in the upper Redlynch Valley and at Tunnel Hill.

4.6 THE BRIDAL TRACK ROUTE

Of the original proposal a detailed map of this potential route is not available in the public arena and involved a tunnel through the Lamb Range escarpment.

A variation without a tunnel would turn off the Bruce Highway between the suburbs of Bayview Heights and Mt Sheridan, ascend the Lamb Range escarpment to a height of 456m and traverse the range a distance, to cross Freshwater Creek north from the Copperload Dam wall.

A bridge would be needed to cross over Freshwater Creek. After the bridge generally following in the vicinity of the Bridle track the road would need to ascend to a height of approximately 564m, drop to around 518m, and then need to ascend back to about 692m, then through to the Kennedy Highway at Davies Creek Road.

ALTERNATIVE RANGE CROSSING ROAD ROUTES

Some Preliminary Comment on Cost Benefit Considerations

While it would cut off distance and travel time between the transport focal points of Cairns and Mareeba compared with the Kuranda Range Road, distance would appear to be marginally better than the Reddicliffe route. However travel times and vehicle operating costs would be affected by the need to pass over a number of substantially higher points.

While the tunnel section through the Lamb Range avoids disturbance of rainforest, the overall route is through a much wider expanse of rainforest than the others.

Distance of the new road would be about 32km but with substantial additional costs of a tunnel, a substantial bridge over Freshwater Creek in the vicinity of the Copperlode Dam wall and a small bridge to cross Davies Creek.

The Bridle Track route is not as well located to provide access to the potential urban settlement in the Koah area.

There are some issues with the route passing relatively close to housing between Bayview Heights and Mt Sheridan suburbs.

5. CONCLUSIONS

It is fairly clear from this preliminary analysis that the alternative routes to the Kuranda Range Road, of Smiths Track, the Reddicliffe and Bridle Track routes provide a substantial ongoing Economic Efficiency benefits for traffic moving between Cairns and the Tablelands with the Smiths Track route providing of the order of savings of \$50m a year and \$1.5Bn over a 30-year period.

By comparison, the upgrading of the Kuranda Range Road or the construction of the alternative Saddle Mountain Road do not provide any economic efficiency benefits in travel distance and only marginal savings in travel times at present. However, if the upgrading does not take place and progressive clogging of the Kuranda Range Road occurs as traffic builds up over time, the value of travel time savings as a result of upgrading will increase into the future.

The alternative routes avoid crossing the Barron River and if heavy traffic is diverted to these routes the high cost of replacing the Barron River Bridge could be delayed for some time.

The indications are that the Smiths Track option would be the lowest cost of the three alternative routes. The Smiths Track route option involves road construction of about 10km less distance than upgrading of the Kuranda Range route from its base at the bottom of the range to the junction of Smiths Track with the Kennedy Highway.

Of the alternatives, the Smiths Track route involves the least distance through rainforest areas. At only 3km, it presents an opportunity to economically adopt world's best practice for traversing rainforest areas.

It should be noted that this is a preliminary assessment aimed at informing further assessment of this question. It has been aided by an ability to use modern computer mapping to trace potentially viable road routes, elevations and distances.

Further studies would be needed in relation to roadwork engineering and potential costs and environmental assessment.

Further studies would be needed to refine calculation of Economic Efficiency benefits and consequent Social and Economic Impacts.

Appendix 1

Cummings Economics - Previous Cost Benefit Economic Impact Studies

Papua New Guinea

Proposed Trans Island Highway, Port Moresby to Lae.

Interstate.

Outback Way, Boulia QLD to Laverton WA, via Alice Springs and Uluru.

Tanami, Halls Creek WA to Alice Springs NT.

Savanah Way, Normanton to Borroloola.

Queensland

Peninsula Development Road.

Mulligan Highway (Cooktown Road).

Cooktown Coast Road, Cape Tribulation to Wujal Wujal.

Kuranda Range Road.

Springmount Road, Mareeba.

Burke Developmental Road, Mareeba to Kowanyama, Cloncurry to Normanton.

Dixie Road, Normanton to PDR via Dunbar.

Ootann Road, Triple Link, Kennedy Highway via Almaden to Mareeba.

Gulf Developmental Road.

Lynd Junction, Einasleigh, Forsayth, Georgetown Link.

Hann Highway (Kennedy Developmental Road) Lynd Junction to Hughenden.

Iffley Road, Julia Creek to Normanton.

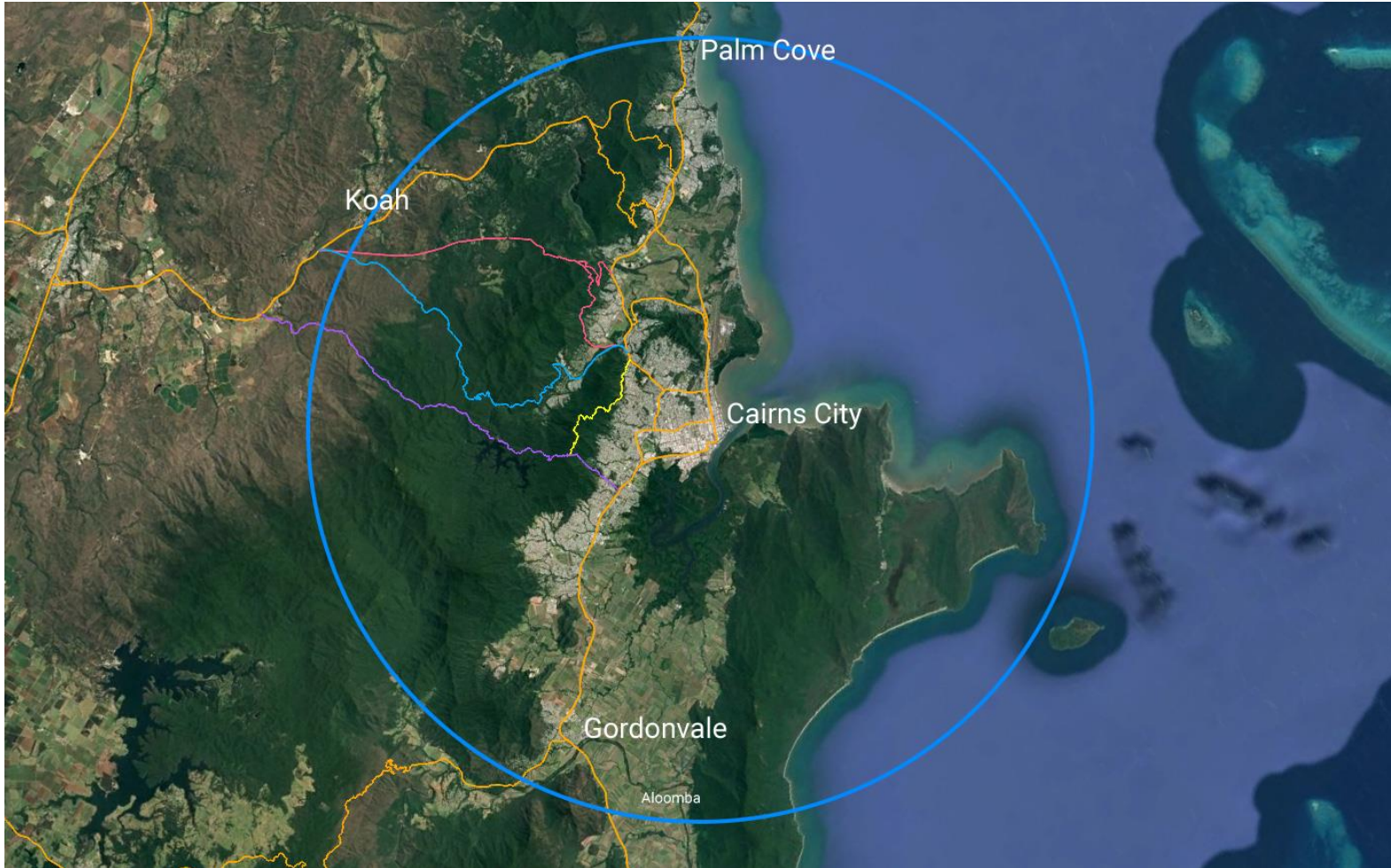
Appendix 2: Examples of Modern Road Construction Viaducts



Appendix 2 Cont: Examples of Modern Road Construction Cut-ins



Appendix 3: MAP – Koah Comparative Distance from Cairns



Appendix 4: MAP – PROPOSED OPTIONS (Saddle Mountain, Kuranda, Smiths Track, Reddicliffe & Bridle)



Appendix 4 Cont: MAP – PROPOSED OPTIONS (Saddle Mountain, Kuranda, Smiths Track, Reddicliffe & Bridle)

