LOCAL GOVERNMENT TRANSPORT ADVISORY PANEL

GUIDELINES

The Local Government Transport Advisory Panel uses a specialist database developed by the South Australian Local Government Grants Commission (SALGGC) as a consistent framework to assist planning and prioritising road proposals. The Roads Infrastructure Database assists LGTAP in assessing candidate road proposals on an equitable basis, accounting for State and regional strategic planning processes and technical issues. (A copy of the Roads Infrastructure Database Project Report can be viewed on the Office for Local Government website at ***http://www.localgovt.sa.gov.au/projects***.) The database is managed by the SALGGC, which provides access to LGTAP.

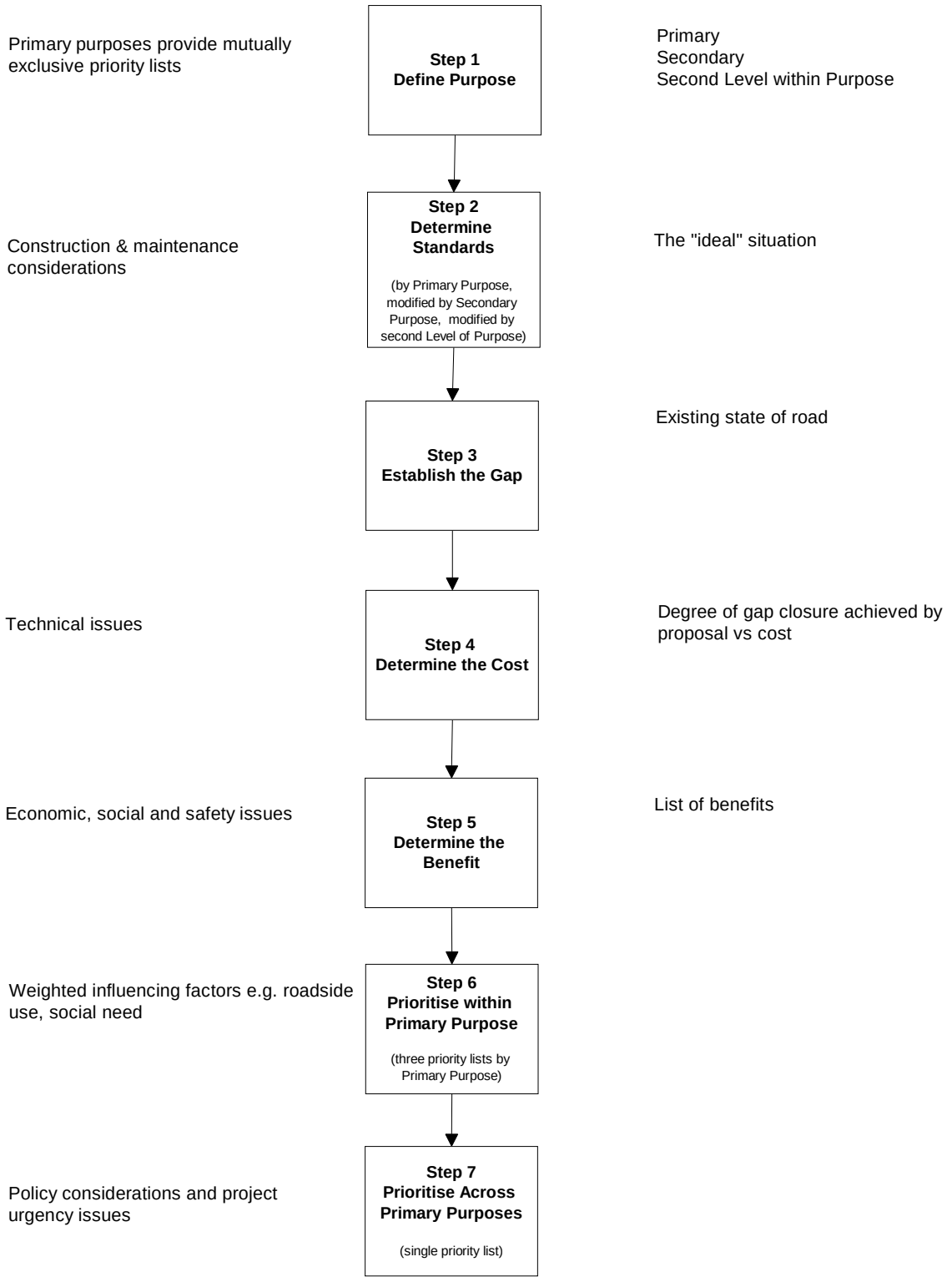
The following process [figure 1] describes the framework of this database as used by LGTAP for the assessment and prioritising of particular road proposals. The flow chart shows the key steps taken to assess an individual road proposal, ranging from determination of the primary purpose of the road through to establishment of its priority against other road proposals.

Prior to beginning this process in any application year, LGTAP will ensure that applications have met the basic requirements of legislation, Auslink and SLRP criteria where applicable. Generally, applications must include:

- Justification and objectives of the project, including a description of the functions of the road and any existing problems.
- A map showing the location of the project in the road network.
- Description of the nature and extent of the project, highlighting the principal aspects and aligning these with each of the “fit for purpose” categories, that is, freight, tourism, social.
- Points at which the proposal interlinks with other regional, State or Federal plans or policies. The LGTAP will in making its recommendations give due weight to available State Government plans such as South Australia’s Strategic Plan, State Planning Strategies, the State Infrastructure Plan and the State Transport Plan.

Further to these requirements, LGTAP will seek assurances that applications have been formed and submitted with the support of other Councils, regions or other partnering organisations, and that Councils and/or regions will contribute funding to the project.

THE ANALYSIS PROCESS



A brief description of each step in the analysis process follows. **Subsequent sections expand the description of each step and discuss underlying requirements that will assist in the completion of the "Standard Funding Application":**

Figure 1

Step 1 - Define Purpose

- The term "primary purpose" is used in order to incorporate the breadth of strategic activities and to address the range of varying design standards that will apply to different road proposals.

- For each of the primary purpose areas, a mutually exclusive priority list will be established.

- In addition to the primary purpose, each road may have one or two secondary purposes, that add weight to the importance of the road.

- Moreover, there may be one or more secondary levels of purpose, which will further affect "fit for purpose" standards.

Step 2 - Determine Standards

- For each primary purpose, and as further modified by the secondary level of purpose, a particular "fit for purpose" standard can be established. "Fit for purpose" can be defined as providing **minimum acceptable design/ construction standards** for the situation (i.e. a road has a specific purpose and is then built/maintained to a standard to enable it to be fit for purpose).

Step 3 - Establish the Gap

- By comparing the existing road standard against the defined "fit for purpose" standard, it is possible to determine the “gap”. The "gap" is therefore defined as the improvement in standard required to upgrade a particular road from its current standard to a standard that is fit for purpose.

Step 4 - Determine the Cost

- Once the gap is determined, it is possible to estimate the cost of improvements required to bring the particular road up to a standard which is fit for purpose. This "Cost to Close the Gap" is best equated to the cost of the proposed upgrade (as supplied in grants applications), as it is not practical to arbitrarily apply automated cost estimation techniques to estimate the cost to close the gap. *However, using "Cost of Upgrade" as an approximation for "Cost to Close the Gap" assumes that the upgrade proposal brings the road to a fit for purpose standard. This may not always be the case.*

Step 4A - Determine the Extent to which the Gap is Closed

- An assessment needs to be made of the extent to which any gap (between the current standard and the fit for purpose standard of a road) is closed by an upgrade proposal.

Step 5 - Determine the Benefit

- To assess the benefit of a particular proposal, consideration needs to be given to a range of influencing factors that define what benefits can be achieved by the proposal. The most important of these factors is the road's "significance", as defined within relevant council, regional and state transport strategies.

Step 6 - Prioritise within Primary Purpose

- By weighting the various influencing factors identified in Step 5, an initial prioritised list of proposals is obtained for each of the three primary purpose categories. This initial ranking by "weighted benefit" provides a general overview of the relative benefit of various proposals, but does not take into account the number of road users and other industry or community groups which benefit from the proposal, nor the individual cost of the proposal.

- By combining the weighted benefit with a measure of the road use (namely traffic volume), divided by road length and proposed cost, it is possible to come up with a second prioritised list. This list of "weighted benefit cost scores" will then indicate which proposals provide greatest "value for money" in terms of maximising benefits to the greatest number of users per km of road upgraded per dollar of cost.

- Note that whilst it is technically possible for the "weighted benefit cost score" list to be used to compare road upgrade proposals across the state, it is not considered advisable to do so. The influence of "traffic volume" and "cost per km" factors vary considerably across LGA Regions, and even across councils within regions. The weighted benefit cost score will therefore be used as a tool for differentiating road upgrade proposals that otherwise show similar "weighted benefits". This can be applied within individual LGA Regions and/or across (or even within) individual councils

Step 7 - Prioritise Across Primary Purposes

- To determine priorities between each of the primary purpose areas, policy and project urgency considerations will need to be applied. The LGTAP will undertake this step manually, using the three "priority within purpose" lists based on weighted benefits, as generated in Step 6.

1. Development of Purpose

a) Primary Purpose

Three primary purpose categories have been developed as a basis for this approach, namely:

FREIGHT

- *Facilitates industry development by linking key industries to major transport routes and contributes to efficient movement of large volumes of heavy freight vehicles.*

TOURISM

- *Provides access to tourism sites and locations, and enables people to view scenic attractions in a safe and enjoyable manner.*

SOCIAL

- *Provides for community development and equitable access to community facilities, whilst minimising the impact of heavy vehicles on the community.*

While a particular road proposal may have one primary purpose, say **FREIGHT**, it may well have a secondary purpose, such as providing for a **SOCIAL** purpose by linking communities within the regional area. This factor will assist the LGTAP in determining an appropriate "fit for purpose" standard for the road and to enable roads with multiple purposes to be weighted accordingly when determining benefits.

b) Second Level within Purpose

Following the determination of key primary purpose categories, there is often a second level within each purpose that will impact on design standards. For example, the use of B-Doubles will require a higher standard with respect to road geometry than normal commercial vehicles.

A set of second levels within each purpose category has been developed which involve a number of specific design standards. It is important to note that there is some overlap between these second levels of purpose and their associated primary purpose categories (e.g. "Commercial" appears in the "Freight" category of primary purpose, while "Commercial / Bus" appears in both the "Tourism" and "Social" categories).

The second levels for each of the primary purpose categories are as follows:

FREIGHT

- Commercial
- B-Double
- Road Train
- Overmass/Overdimension

TOURISM

- 4 Wheel Drive
- General Passenger
- Commercial / Bus
- Bicycle Route

SOCIAL

- General Passenger
- Commercial / Bus
- Bicycle Route

2. Determination of "Fit for Purpose" Standards

This step employs a **planning tool** to look at a broad range of minimum performance standards. These collectively create a basis for quantitatively assessing whether a particular road is "fit for purpose". It is **not an engineering tool** for use in designing new or upgraded roads, because it cannot reasonably address the many qualitative considerations and detailed site investigations necessary to fully define all requirements for safe and efficient operation of a particular road.

The proposed set of standards listed in this section have been settled on after an extensive, though not necessarily exhaustive, literature search of available state, federal and some overseas road/traffic design standards.

Before considering which standards to apply, it is necessary to recognise that road/traffic design standards vary considerably between "metropolitan" and "rural" situations. However, the term "metropolitan" can often mean just the Adelaide region, whereas many regional cities and towns in South Australia also contain roads for which a metropolitan standard of road/traffic design should apply. Thus, the terms "built up area" and "non built up area" are used, rather than metropolitan and rural. These terms are then consistent with the extensive work already carried out by the Local Government Grants Commission in defining all local government administered roads within South Australia as being in "built up" or "non built up" areas.

In addition to knowledge of any particular road's primary purpose, second level within purpose, and whether or not the road is in a built up area, details of various traffic parameters are required before appropriate standards can be determined. The critical parameters are:

- Traffic volume (in AADT - Annual Average Daily Traffic per Aust Roads Definition)
- Heavy vehicle loading (expressed in "Equivalent Standard Axles" i.e. ESA's, for the design life of the pavement),
- Presence of parking/cyclists (built up areas only), and
- Speed environment.

Applications must also include surface type (i.e. simply "surfaced" vs "unsurfaced") as a further initial parameter before standards can be applied.

The choice of "surfaced" vs "unsurfaced" is not, however, completely unrestricted. Common sense, and engineering judgement, has been used to apply some restrictions, such as:

- only "Category A - Formed and Sheeted" unsurfaced roads (as defined in the LGA's Unsurfaced Roads Manual) should be permitted as an option in built up areas;
- only "Category A - Formed and Sheeted" unsurfaced roads should be permitted as an option for roads in non built up areas with "freight" as the primary purpose; and
- only "Category D - Tracks" unsurfaced roads should be permitted as an option for roads with "tourism" as the primary purpose and "4WD" as the second level within that purpose.

Considering the above factors, it is possible to select appropriate standards for defining whether a road is fit for its purpose. These standards have been grouped under four fundamental headings, namely:

a) Speed Environment

Design speed is a key standard which applies in both "built up" and "non built up" areas, collectively reflecting such fundamental parameters as vertical profile, horizontal geometry and site distance, all leading to a particular safe travel speed.

In built up areas, the average flow speed (both in off-peak conditions and in peak hour) reflects the degree of congestion in the road segment, collectively reflecting the capacity of the cross-section layout (through lanes vs mixed through/turning lanes), capacity of intersections and number of access points onto the road.

b) Dimensions

Carriageway width (general) is a measure of the overall width of the road surface required to safely handle the type and volume of traffic. Carriageway width (bridges) provides an added measure of the minimum clearance requirement for points of

restricted access (and high construction cost) where shoulders may not be cost effective to provide.

Lane width is a measure of "through lane" requirements, particularly as they apply to multi-laned roads. Lane width is highly dependent on traffic volumes, and the presence of a high percentage of heavy vehicles, such as on freight routes. In built up areas, allowing room for on-street parking and/or cyclists can add up to 2.1 metres to the recommended width of the kerbside lane on a freight route, where at least one through lane is required. (Bicycle and freight movements are incompatible. Consideration should be given to providing for cycling movements on the adjacent road network or with off-road facilities, where this is not possible, the width above applies.)

In non built up areas, shoulder width is also a key dimension, reflecting the need to allow vehicles room for pulling off of the main carriageway (such as due to a breakdown), or to recover in the event of accidentally running off the main carriageway. The standard for shoulder width increases significantly with increase in traffic volume. Whilst for normal circumstances shoulders do not need to be sealed, designated cycle routes require between one and three metres of sealed shoulder (depending on the speed environment) in addition to normal sealed carriageway requirements. Sealed shoulders can also be worthwhile on some sections of road to reduce the risk of run-off road crashes.

Height clearance is a major consideration for freight routes, and also where buses (commuter or tourist) use the route.

c) Geometry

Whilst basic geometric considerations are covered by "design speed" under the speed environment heading, special consideration needs to be given to horizontal curve radius (particularly in hilly areas where isolated curves can be very tight) due to the problems of heavy vehicle tracking (corner cutting) creating a significant safety risk for on-coming vehicles.

Vertical grade is also a key consideration, particularly for freight routes, because of the high safety risks associated with the large uphill speed differential between commercial vehicles and cars, and the potential for loss of control (including break failure) on steep downhill grades (similarly for routes used by vehicles towing caravans).

In built up areas, critical to the movement of large vehicles (freight and, occasionally, buses) is intersection turning radius, while roundabout lane width and roundabout radius are also two major considerations for safe movement of commercial vehicles and buses.

d) Strength/Durability

Traditionally, pavement strength has not been directly specified, but has been reflected in design pavement depths chosen after site investigation of sub-soil conditions, knowledge about the available sub-base and/or base course material strengths and traffic loading predictions have been taken into account. Such a methodology is very site specific. As a more practical alternative, this report specifies pavement deflection as an indicator of overall pavement strength.

Whilst suitable for surfaced roads, pavement deflection is not a suitable indicator of pavement strength for unsurfaced roads. As an alternative, road quality categories (defined in the Local Government Association of SA's "Managing Unsealed Roads in

South Australia" publication) are proposed. These categories range from a graded track (Category D) through to a fully formed and engineered road (Category A).

Individual bridge/culvert mass limits are a second important strength related design consideration. Often, the overall route classification may be down-graded due to one or two isolated bridges having a lower capacity and being unable to be bypassed.

Surface roughness has been included as a measure of strength related performance of a road pavement as it ages. Although some examples of high roughness counts reflect initial poor construction standards, it is generally more likely that high roughness is a sign of a deteriorating pavement which manifests itself in general deformation, rutting and high levels of pavement defects. High roughness of a road surface also has a potential economic cost to vehicles using the road, particularly heavy vehicles, in terms of extra wear and tear on the vehicle and possible damage to the load.

The attached spreadsheet lists, as columns, the above 17 standards and then establishes individual "fit for purpose" levels for each relevant standard against each combination of primary purpose, second level within purpose, built environment and surface type. Not all standards apply to each purpose/category combination. In addition to the actual standards, the spreadsheet identifies where traffic parameters influence the standard. The spreadsheet also lists relevant references, highlighting the source of information upon which the selected standard has been based.

3. Establishment of the Gap

The 17 individual standards discussed in the previous section collectively define the "fit for purpose" standard of a particular road. These same parameters, *from a planning viewpoint,* provide the basis for defining the current state of a road. Note that, apart from measuring pavement deflection and surface roughness, no other pavement condition or seal condition measurements, or maintenance standards, are suggested. This is because the methodology in this report is focussed upon the ability of a road to safely and efficiently meet its purpose, *not* what physical condition the road is in, unless that physical condition has reached such a state of disrepair that it directly impacts upon the road's ability to meet its purpose.

In order to establish the gap between current condition of the road and its "fit for purpose" standard, councils will need to supply data on relevant traffic parameters and on the current standard of the road. Traffic parameters required are the traffic volume and heavy vehicle loading, along with (for built up areas only) the presence of parking/cyclists and (for unsurfaced roads) the general speed environment. Note that traffic parameters should be supplied for the conditions expected within a two to five year timeframe, *not* current conditions, since the reason for many roads requiring an upgrade is the expected increase in traffic loading resulting from planned developments, not just current traffic loads.

By comparing "fit for purpose" standards with current standards, the gap in the ability of the road to meet its purpose is established.

4. Determination of the Cost to Close the Gap

The gap between current and fit for purpose standards represents an economic cost in terms of the inability of individual roads within the road network to meet suitable standards for safe and efficient operation in line with their defined purpose. However,

quantifying that cost requires an understanding of the individual situation for each road, since the gap in standard may be caused by many varying factors. Therefore the cost to close the gap should be derived from individual council estimates of the road upgrade proposals as contained in grant applications, rather than some holistic formula which attempts to put a broad dollar value on the gap using arbitrary (non site specific) parameters.

Before a cost to close the gap can be adequately defined using this method, any proposed upgrading of the road (and its associated cost) must be tested against the fit for purpose standards. This is because it cannot automatically be assumed that a particular proposal will close all aspects of the gap in standards. Councils will therefore be required to define the standards achieved by the proposed upgrade, using the same (up to) 17 standards defined earlier, and also provide their estimate of the percentage of the gap which is closed by the upgrade proposal.

Once the above information is supplied, a modifying factor can be applied to the upgrade's proposed cost, to obtain a closer approximation of the total cost to close the gap. The proposed modifying factor is:

Cost to Close Gap = Upgrade Cost / % of Gap Closed

As an example, a proposed upgrade which only closes 80% of the identified gap in standard would result in the "cost to close gap" being 25% greater than the upgrade cost.

This method for determining the cost to close any gap in standards is clearly an approximation, which cannot ultimately replace a detailed assessment of costs on a site specific basis. However, it will be a valuable planning tool for the purpose of assessing and prioritising road grant applications, where it is clearly impractical to perform a detailed independent analysis of the cost to close the gap in standards for every proposal submitted.

5. Determination of Factors Influencing Benefits

The relative potential benefits of any proposed road upgrade are derived from a series of "benefit influencing factors". These influencing factors, in turn, impact on the priority of each proposal.

Influencing factors have been categorised into six key areas. Each key area has been weighted according to its relative importance in determining the overall benefit of road upgrade proposals. In the case of the "Economic" area, further individual weightings have been applied to the three sub-areas of road user benefits, community benefits and road owner benefits. Within each area (or sub-area in the case of the "Economic" area), influencing factors have been given equal importance in determining the percentage of that area (or sub-area) weighting which should be applied for any given road upgrade proposal.

The key areas, sub-areas and specific influencing factors are as follows:

a) SECONDARY PURPOSE (10%)

Does the road offer ?

- One secondary purpose (e.g. freight, tourism or social) in addition to the primary purpose
- Two secondary purposes (e.g. freight, tourism or social) in addition to the primary purpose

b) REGIONAL SIGNIFICANCE (25%)

Does the road have ?

- Community significance (i.e. part of a formal council transport strategy)
- Regional significance (i.e. part of a regional transport strategy)
- State significance (i.e links in with a state freight or tourism strategy)

c) ECONOMIC (20%)

Does the road proposal provide a ?

Road user benefit (10%), such as:

- Reduce delays and operating costs for heavy vehicles
- Provide direct access to major industrial developments, freight generators and specific facilities such as grain silos, wineries, processing plants, etc
- Facilitate a higher classification of freight movements (e.g. commercial to B-double)
- Facilitate direct access for intermodal transport operations
  - Rail
  - Sea
  - Air
- Assist export of products by improving quality (market condition) and reducing impacts of dust, etc
- Provide direct access to new industrial precincts

Community benefit (5%), such as:

- Benefit regional employment and sustain communities
- Assist attraction of economic investment to region

Road owner benefit (5%), such as:

- Reduce the road maintenance effort

d) ACCESS (15%)

Does the road proposal?

- Reduce traffic congestion
- Link areas of particular land uses to strategic routes
- Provide a higher standard alternative route
- Complement the existing arterial road network
- Provide improved access to key population centres
- Ensure communities are not isolated by flooding
- Act as a collector road for local traffic and for heavy traffic
- Provide all weather access
- Provide access to other types of transport as a passenger intermodal connector
  - Bus
  - Rail
  - Air

e) SAFETY (20%)

Does the road proposal?

- Reduce conflicts between tourist, freight and commuter traffic
- Contribute to safer travel and reduced accidents
- Provide safe overtaking opportunities and reduce frustration and fatigue
- Reduce exposure to travel risk
- Provide access for school buses
- Provide access for emergency services
- Remove traffic from city/town areas
- Reduce road roughness and potential dust hazards
- Reduce the impact of roadside hazards such as culverts and overhanging trees

f) ENVIRONMENTAL (10%)

Does the road proposal?

- Reduce environmental pollution
  - Air
  - Noise
  - Water
- Minimise impact of heavy vehicles on local community
- Reduce reliance on road transport and encourage other forms of transport
- Incorporate revegetation or bushcare activities or reduce the impact of another corridor on wildlife.

6. Prioritisation within Primary Purpose

As previously stated, this initial ranking by "weighted benefit" provides a general overview of the relative merits of various proposals, with maximum priority given to those proposals with regional and/or state significance that have the most individual benefits. The ranking does not take into account the number of road users and other industry or community groups which benefit from the proposal, nor the individual cost of the proposal. However, the results reasonably accurately reflect the current evaluation process applied by LGTAP. It is therefore recommended that the "weighted benefit within primary purpose" priority lists be used as the main criteria for ranking of road upgrade proposals.

In order to differentiate proposals that show much the same weighted benefit score, it is proposed that the above weighted benefit score also be expanded as follows:

a) Multiply the weighted benefit score (wb) by the traffic volume (tv) using the route (in AADT). This applies the individual benefits of the proposal to each user of the route, to provide a "total road user benefit" score. At this point, the formula will clearly be biased towards more highly trafficked roads, which is not unreasonable. Note that broader benefits to the economy and/or community are not specifically included, having already been covered in the original weighted benefit score.

b) Divide the total road user benefit score by the "cost to close gap / road length (rl) to be upgraded (in km)". This will effectively "normalise" the total road user benefit score on a "per $ per km" basis, so that lower cost proposals, or those where a relatively long length of road is being upgraded, will have their benefit score elevated.

Noting that the "cost to close gap" has previously been defined as being equal to "upgrade cost (uc) / % of gap closed (gc)", then the components of the formula described above can be brought together as follows:

weighted benefit/cost score = wb x tv x rl x gc / uc

Using the above "weighted benefit/cost score", new priority lists within primary purpose can be generated. These will indicate which proposals offer the greatest "value for money" on a "road user benefit per $ per km" basis. However, as previously stated, it is important at this stage to only apply the weighted benefit/cost score as a means of differentiating proposals within individual LGA Regions, or across (or within) individual councils. Other factors still need to be considered for inclusion before such a score could be unilaterally applied in establishing state-wide priority lists.