Vic Williamson

BANYULE LOCAL AREA TRAFFIC MANAGEMENT STRATEGY

Prepared for:

Strategic & Economic Development
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EXECUTIVE SUMMARY

Andrew O'Brien and Associates Pty Ltd has been engaged by Banyule City Council to develop a strategy for traffic management in local streets, including the formulation of suitable policies and procedures to guide future traffic planning and management decisions in the City of Banyule.

The project also included consultation with key stakeholders, including Strategic Planning and Traffic Engineering Officers from Banyule City Council, as well as the local community.

To provide the context for formulating suitable policies and procedures for local area traffic management, an assessment has been made of the existing Banyule road network including arterial roads, available crash statistics and existing local area traffic management in the municipality.

The arterial road network of Banyule is constrained by physical barriers such as rivers and the irregular layout places higher demands on non-arterial roads, including local streets. Improvements to the operation of the arterial road network are one of the keys to reducing the impact of traffic on local streets. There is unlikely to be any significant reductions in traffic using local streets if there is not an increase in the capacity of the arterial road network throughout Banyule.

An effective functional road hierarchy is essential for the planning and design of appropriate traffic management measures. A recommended functional road hierarchy for the City of Banyule has been developed incorporating two new road classifications, restricted traffic route and local crossing street.

The Strategy canvasses the variety of means available to address the management of local area traffic including education with regard to attitudes and behaviour of users of local streets; the management of travel demand to reduce the amount of traffic on local streets; regulation in relation to matters such as speed limits; changes to the physical environment in local streets (roundabouts, speed humps etc.); and improvements to the arterial road system. In order to successfully manage traffic in local streets, a range of these methods needs to be adopted.

Travel demand management measures have been developed in response to the recognition that it is no longer feasible to continue to provide for current or future travel demand simply by the construction of new transport infrastructure. It is recommended that Banyule City Council consider the introduction of a range of travel demand management measures to reduce the demand for private car travel.

There is generally widespread support for the blanket-wide introductions of reduced speed limits on local streets. The widespread introduction of a reduced speed limit of 50 km/h in association with increased education and enforcement has strong appeal as it has the ability to reduce speeds and improve safety by changing the driving culture on local streets without the need for extensive traffic management devices.

The options for physical traffic management initiatives include streetscape improvements which reduce vehicle speeds and improve safety as well as specific traffic management

devices. The report indicates that most of the existing physical local area traffic management treatments in Banyule have been appropriately designed and constructed to ensure that devices complement the character of the surrounding streetscape. Recommendations are also made with regard to the selection and design of physical traffic management initiatives with specific recommendations with regard to future traffic management treatments in Banyule which would provide safe and effective traffic control, while providing a visual contribution to the streetscape.

There are a range of techniques available to Councils for the management of local area traffic issues, particularly in relation to identifying and prioritising of traffic management measures.

A system for identifying and prioritising traffic management measures in local areas has been developed by Andrew O'Brien & Associates in association with Dr Ray Brindle of ARRB Transport Research. A procedure has been developed based on a set of warrants to objectively assess the need for, and priority of, physical traffic management measures that will address amenity issues in established residential areas. The term 'traffic warrant' is widely used throughout Australia to apply to levels of traffic or land use conditions at which intervention (either studies or actions) is 'triggered'. Warrants can be expressed in terms of thresholds for various criteria such as speeds, traffic volumes, crashes, 'offensive' traffic, and land uses.

It is recommended that the Banyule City Council adopt an objective system to identify and rank traffic management treatments based on 'warrants'. This system should be based on the best attributes of systems developed elsewhere in Australia and be refined to reflect traffic conditions in Banyule.

On the basis that 40 Local Traffic Precincts have been proposed as the basis for the prioritisation and treatment of local area traffic issues, a three pronged management approach is recommended utilising the recommended warrants system. The recommended traffic assessment process would identify whether a spot safety assessment, isolated street traffic study or area-wide Local Area Traffic Management Study is required. Standard processes for the conduct of the studies are also recommended.

It is also recommended that the Banyule develop a 'Spot Safety Program' to treat hazardous road locations. The proposed 'Spot Safety Program' focuses on the objective assessment of hazardous arterial and local road intersections and mid-block locations on the basis of identified crash history.

In regard to traffic management funding, the majority will be derived directly from Council as part of the existing Five-Year New Works and Services Program. Future funding for local area traffic management works should be based on the objective systems developed as part of this strategy including the Local Area Traffic Warrants System and Spot Safety Program, with highest priority given to safety related improvements in local streets.

A comprehensive list of recommendations is included in the final section of the report.

A separate Appendix accompanies the report and includes most of the technical data.

APPENDICES

1. INTRODUCTION

1.1 Background to Strategy

The City of Banyule was constituted in June 1994 and comprises all or part of the suburbs of:

Bellfield	Briar Hill	Bundoora
Eaglemont	Etham	Eltham North
Greensborough	Heidelberg	Heidelberg Heights
Heidelberg West	Ivanhoe	Ivanhoe East
Lower Plenty	Macleod	Montmorency
Rosanna	St Helena	Viewbank
Watsonia	Watsonia North	Yallambie

Banyule City Council is seeking to put in place a strategy for the management of traffic in local streets. The three former municipalities that made up Banyule had separate and different approaches to the management of local street traffic and there is a need to review those approaches and develop a coordinated strategy based on current "best practice".

Banyule's City Plan 1998-2001 included as a key strategic direction to:

'develop an effective, integrated transport system that anticipates local and regional needs'.

In June 1997 Council prepared a 'Background and Issues Paper' relating to its proposed Municipal Transportation Plan. The objective of the Plan in relation to local roads is:

'To provide a safe and efficient road network throughout the City that addresses the needs of residents in terms of access and amenity while allowing for the effective flow of traffic through the municipality'.

The key local street issues in relation to Banyule identified in the 'Background and Issues Paper' are:

- Usage of the local street network by through traffic.
- Speed of vehicles using the local street network.
- Provision of a safe and secure local road network.
- The manner in which Council deals with identified problems or complaints relating to the local road network.
- The interface between residential and non-residential uses.

1.2 Study Objectives

Based on the identified key issues, the overall objectives of this project are to develop a strategy that will:

- Reduce the use of local streets by through traffic and reduce traffic speed.
- Improve safety in local streets for all road users.
- Improve the amenity of residential areas abutting local streets.

1.3 Study Brief

Andrew O'Brien and Associates Pty Ltd was engaged by Banyule City Council to develop a strategy for management of local area traffic, including the formulation of suitable policies and procedures to guide future traffic planning and management decisions in the City of Banyule.

The study brief required the following actions to be undertaken:

- A review of the current capacity and operation of the arterial road network to assess whether low cost improvements can be introduced to reduce the incentive for motorists to use local streets to avoid delays on the arterial road network.
- An analysis of road crashes in Banyule for the period 1991 to 1997 inclusive, including an evaluation of the cost of crashes to the community and a comparison of crashes with other nearby municipalities.
- A review of the appropriateness of the existing Banyule functional road hierarchy to ensure that the function of each road is matched by its functional classification.
- A brief overview of a range of existing traffic management treatments installed in the City, including an assessment of their likely performance and any desirable improvements.
- An overview of existing traffic management practices and treatments in local areas throughout other municipalities in Australia and identification of practices likely to be applicable within Banyule.
- Recommend appropriate policies and procedures to guide the future implementation of local area traffic management treatments in the City.
- Recommend the nature and level of community participation in local area traffic management.
- Recommend a preliminary prioritised listing of local areas and routes for treatment, including a general estimate of cost.
- Recommend suitable treatments for future local area traffic management uses in the City.
- An overview of the costs of local area traffic management treatments and possible funding sources.
- Recommend an appropriate process of monitoring and review of the effectiveness of local area traffic management treatments and the performance of the road network, including the establishment of performance criteria.

The project also required consultation with key stakeholders including Strategic Planning and Traffic Engineering Officers from Banyule City Council and the local community. As part of the community consultation process a Draft Strategy Document was released for public comment. The Final Report has been prepared after consideration of all comments/submissions received regarding the Draft Report.

2. CONTEXT

2.1 Banyule Road Network

2.1.1 Arterial Road Network

The Banyule arterial road network has an irregular shaped layout, which is predominantly due to the constraints imposed by the presence of the Yarra River, Plenty River, Darebin Creek and the Hurstbridge railway line.

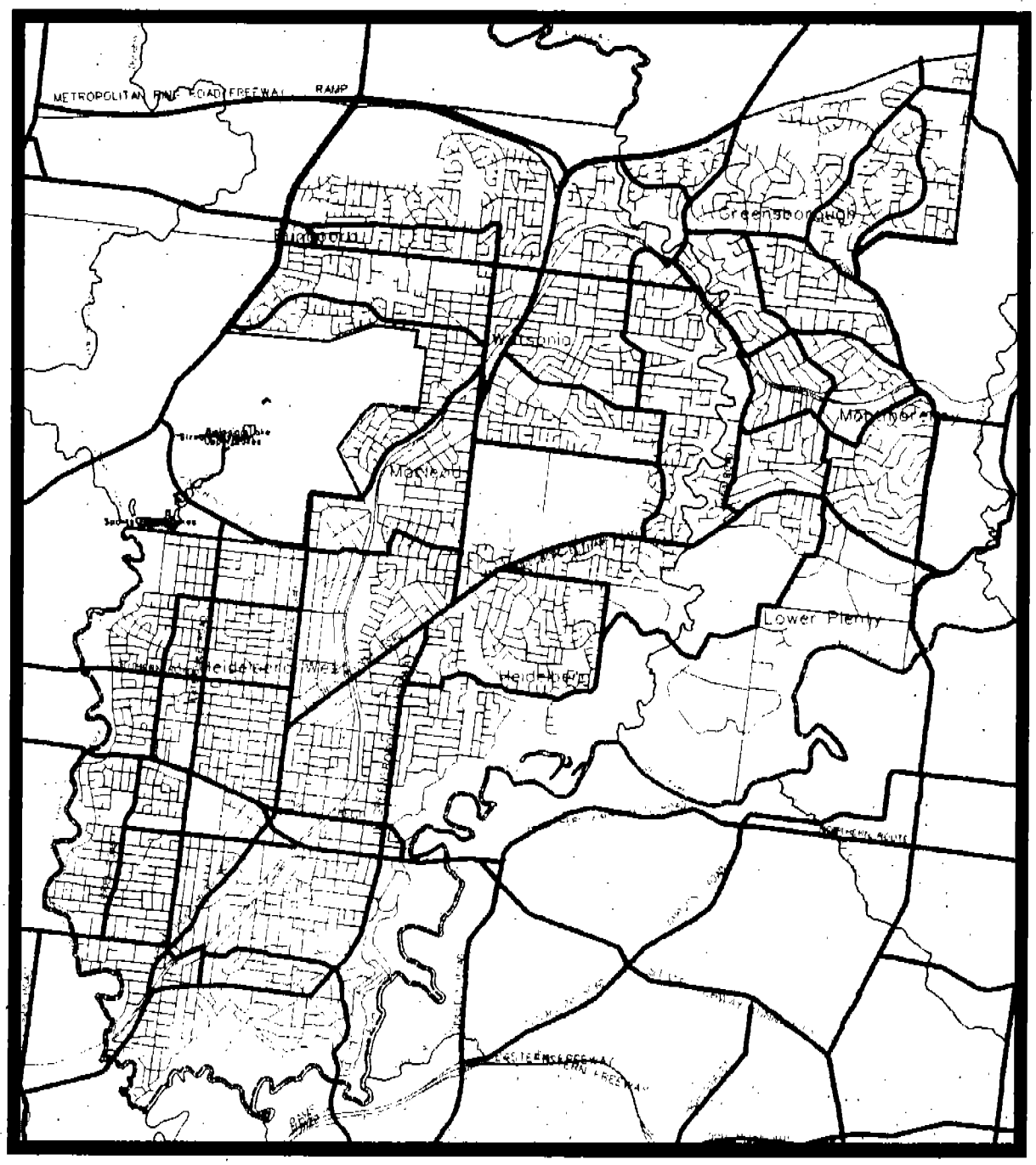


Figure 1 : City of Banyule Road Network

This has resulted in a deficient north-south arterial road corridor, with a high reliance placed on the Greensborough Road-Lower Plenty Road-Rosanna Road-Lower Heidelberg Road-Burke Road North route. The adjacent parallel arterial road routes of Plenty Road-Albert Street-Station Street-Darebin Road-Grange Road (within the City of Darebin) and the Fitzsimons Lane-Williamsons Road route (within the City of Manningham) are spaced at a distance of 4.3 kilometres and 5.6 kilometres from Rosanna Road respectively. Ideally arterial roads in middle-ring urban areas should be established in a grid manner at spacings of approximately 2 kilometres.

The East-west traffic demand is primarily catered for along the Bell/Banksia link, which links Bell Street and the Eastern Freeway (via Manningham Road and Bulleen Road) and the Northern Ring Road. Secondary east-west links include Grimshaw Street, Kingsbury Drive-Ruthven Street-Carwarp Street-Erskine Road, Southern Road-Lower Plenty Road-Main Road, Bridge Street-Sherbourne Road-Para Road and Lower Heidelberg Road-Heidelberg Road. Previous studies ('Heidelberg Traffic Strategy - 2001', Nelson English, Loxton and Andrews 1990) have identified the deficient east-west arterial corridor through Macleod (currently catered for along the Ruthven Street-Carwarp Street-Erskine Road route). There are no current plans to upgrade this route, which has substandard horizontal and vertical alignment for an arterial road route.

The wide spacing and the irregular layout and alignment of the Banyule arterial road network has created a disjointed arterial road network and has required some non-arterial roads to fulfill a higher traffic role than traditionally desired. The layout and development of the arterial road network in the Greensborough and Montmorency areas is particularly poor. The arterial network in this region is constrained by the terrain and the limited crossings of the Yarra River. Its layout has evolved from former stock routes rather than being formally planned.

In the short to medium term there are unlikely to be any major road infrastructure projects implemented within Banyule that will relieve traffic demand on the existing arterial roads. *'Transporting Melbourne'* proposed a range of major road infrastructure projects, based on the development of a 'Metropolitan Orbital Transport Corridor'. The proposed 'Orbital Corridor' does not specifically address the current deficiencies experienced along the north-south corridor through Banyule mainly due to the 'missing link' between Greensborough and Ringwood.

The link between Greensborough and Ringwood is unlikely to be considered for some time. In the interim, the existing roads (including Greensborough Highway, Lower Plenty Road and Rosanna Road) will need to cater for increasing traffic demands.

The demand for travel along the north-south corridor has increased as a result of the continuing development of the 'Northern Ring Road', and the Eastern Freeway, including the creation of a full diamond interchange at Bulleen Road. VicRoads proposes to carry out significant capacity and operational improvements to the section of Lower Plenty Road between Greensborough Highway and Rosanna Road, to cater for the increasing traffic demand.

The arterial roads in the Greensborough and Montmorency areas are overdue for upgrades to improve both capacity and safety. In particular, Bolton Street requires capacity improvements as it is serving an increasing north-south traffic role, in association with Fitzsimons Lane, to cater for increasing residential development to the north. The recent construction of a double right turn lane from Main Road into Bolton Street emphasises the increasing traffic role of Bolton Street. The provision of improved pedestrian crossing facilities across Bolton Street would also be desirable.

Sherbourne Road, Karingal Drive and Para Road also require capacity improvements to cater for increasing demands. Sherbourne Road experiences capacity problems on the bridge over the Hurstbridge rail line and at its intersection with Karingal Drive. A roundabout is proposed at the Sherbourne Road/Karingal Drive intersection and will provide a more equal sharing of priority between the two roads. It is understood that Council is also considering the future installation of roundabouts at the intersections of Para Road/Sherbourne Road and Para Road/Rattray Road. These roundabouts will provide a more equal sharing of priority and improve the safety of these intersections. The wide geometry of Sherbourne Road provides the opportunity to introduce a central median, either by linemarking alone or together with raised traffic islands and a shared parking/bicycle lane could also be provided along each kerb.

Major roadwork proposals on the arterial road network identified by previous studies ('North Eastern Metropolitan Regional Roads Strategy' Ratio Consultants 1997) include:

- The widening and realignment of Bell Street across Darebin Creek to increase capacity to three lanes in each direction.
- The creation of a double right-turn lane from Jika Street into Rosanna Road.
- The widening of Waterdale Road between Dougharty Road and Kingsbury Drive to provide two traffic lanes in each direction.
- The duplication of Waterdale Road between Altona Street and Dougharty Road.

VicRoads is currently conducting a major traffic study (the Northern Metropolitan Traffic Study) which aims to review and assess the adequacy of the arterial road network in the northern metropolitan region (at which Banyule is located). This study will most likely focus on traffic management improvements to the existing arterial road network and is unlikely to recommend any major new arterial road routes or river crossings.

As part of this project, the feasibility of introducing traffic management measures, such as new or extended 'Clearways' or 'No Stopping' zones, along the existing arterial road network has also been assessed. The aim of this assessment was to determine whether capacity improvements could be made to the existing arterial road network by the use of kerb lane management techniques.

In general, extended clearways are only recommended along roads that experience heavy traffic demands throughout the day and generate minimal demand for kerbside parking.

Arterial roads in Banyule that fall into this category include Lower Heidelberg Road (between Burke Road North and Burgundy Street), Rosanna Road, Bell Street, Jika Street-Dora Street, Lower Plenty Road (east of Rosanna Road, and west of Greensborough Highway), Greensborough Highway and Grimshaw Street.

The extension of existing clearway times along these routes would need to involve consultation with abutting property owners as well as VicRoads. However, in most cases minimal capacity gains would be achieved as kerbside parking seldom takes place along these routes during non-clearway times.

It would be undesirable to introduce or extend clearways through retail shopping strips (e.g. Heidelberg Central along Burgundy Street, Ivanhoe along Upper Heidelberg Road or East Ivanhoe along Lower Heidelberg Road) as the adverse impacts experienced by these centres (loss of parking and amenity) would outweigh any gains in traffic capacity.

In general, it is recommended that arterial road improvements in Banyule should focus on:

- improving intersection capacity and safety ie. additional turn lanes, extended right turn lanes, improved signal linking, partially/fully controlled turn arrows;
- creating additional midblock capacity on constrained routes ie. Bolton Street, and;
- enhancing on-road traffic management ie. line marking to create central medians and/or separate/shared parking and bicycle lanes, isolated road widening to create separate right turn lanes, and consistent parking management.

Improvements to the operation of the arterial road network are the key to reducing the impact of traffic on intermediate and local roads within Banyule. There is unlikely to be any significant reduction in traffic using local streets if there is not an increase in the capacity of the arterial road network.

2.1.2 *Intermediate Road Network*

The intermediate road network includes those non-arterial roads that cater for the movement of more than just local traffic. Intermediate roads such as Cameron Parade, Greenwood Drive, Elder Street, Wungan Street, Yallambie Road, Banyule Road, Rattray Road, Mountain View Road and McArthur Road all experience relatively high traffic demands, due mainly to deficiencies of the arterial road network.

2.1.3 *Local Road Network*

The layout of the local road network varies substantially throughout Banyule. There are the typical grid patterns in the older areas of Heidelberg, predominantly the areas west of Upper Heidelberg Road. There is the irregular layout of the Eaglemont and East Ivanhoe Walter Burley Griffin estates and the tributary road networks developed in the 1970's and 80's in the Yallambie, Bundoora and Greensborough neighbourhoods. These tributary networks are characterised by wide curvilinear

roads (eg. Yallambie Road, Wungan Street, Cameron Parade, Greenwood Drive, etc), that encourage higher traffic speeds, as well as the loop roads and culs-de sac.

The most recent residential developments (eg. Streeton Views Estate and areas in northern Greensborough) are generally developed on the principles of the Victorian Code for Residential Development (VicCode) and typically have narrower streets with in-built speed control.

2.2 Banyule Traffic Crash Review

2.2.1 *Introduction*

A review has been conducted of recorded casualty crashes occurring within Banyule during the period 1991 to 1997 inclusive. As part of this assessment crashes have been grouped into the following categories:

- arterial road/arterial road intersections *(sites with > 9 casualty crashes);*
- arterial road/non-arterial road intersections *(sites with > 9 casualty crashes);*
- non-arterial road/non-arterial road intersections *(sites with >3 casualty crashes);*
- arterial road links or midblock sections *(sites with >9 casualty crashes);*
- non-arterial road links or midblock sections *(sites with >4 casualty crashes).*

Whilst the arterial road intersections experience the greatest crash frequency, the primary contributing factor is likely to be their higher levels of traffic exposure. These sites are generally under the funding responsibility of VicRoads with limited scope for Council to fund and implement countermeasures. Notwithstanding this, Council can play a key role in identifying sites with high crash frequencies and developing feasible countermeasures.

Under VicRoads' guidelines for the identification and treatment of accident black spot sites, intersections with a minimum level of 3 casualty crashes in the previous three years or mid-block locations with a minimum of 3 casualty crashes per kilometre, are eligible for black spot funding. In reality, under current funding levels, sites with less than 10 casualty crashes per five year period are unlikely to receive VicRoads or Federal Office of Road Safety 'black spot' funding, unless the appropriate counter-measure has a high benefit to cost ratio.

Refer to Appendix A for a table of the key crash details on the Banyule road network.

2.2.2 *Arterial Road/Arterial Road Intersections*

All arterial road/arterial road intersections that experienced at least 10 casualty crashes during the period 1991 to 1997 inclusive were identified and ranked. The predominant crash types at each intersection have also been identified.

All of these intersections have previously been treated with traffic signals due to the high volumes of traffic passing through the intersections. Whilst the sheer level of traffic exposure is the main contributing factor to the relatively high frequency of

crashes at these sites, Council and VicRoads should conduct a review of the operation of each of these intersections to identify possible 'low cost' improvements.

Possible remedial treatments include the introduction of partially or fully controlled turn phases, the creation of new or additional lanes for critical movements, the banning of certain movements, improved pedestrian facilities, installation of red light cameras, banning of parking on critical approach/departure legs, overhead mast-arms, improved directional signage, etc.

2.2.3 *Arterial Road/Non-Arterial Road Intersections*

All arterial road/non-arterial road intersections that experienced at least 10 casualty crashes during the period 1991 to 1997 inclusive were identified and ranked. The predominant crash types at each intersection were also identified.

Approximately half of these intersections have also been signalised. The locations that generate the highest priority for treatment are the uncontrolled intersections of:

- ***Bell Street/Miller Street (15 crashes)***
  Consider the banning of right turns to/from Miller Street. This action may be strongly opposed by the proprietor of the petrol station located on the north-east corner of the intersection. The banning of right turns to/from Miller Street may require similar action at other nearby local streets adjoining Bell Street.
- ***Rosanna Road/Darebin Street (13 crashes)***
  Consider the creation of a separate right turn lane by widening Rosanna Road. It is understood that VicRoads is considering this action as part its proposed upgrading of Rosanna Road.
- ***Sherbourne Road/Calrossie Ave (12 crashes)***
  Council has plans to modify this intersection in 2000.
- ***Lower Plenty Road/Silk Street/Cantala Ave (12 crashes)***
  Current work on Lower Plenty Road will improve the intersection.
- ***Bell Street/Liberty Parade (12 crashes)***
  Requires further investigation into the potential causes of crashes.
- ***Upper Heidelberg Road/Thames Street/Darebin Street (10 crashes)***
  Consider banning right turns to/from Thames Street and movements directly between Thames and Darebin Street. The right turn movement is already banned during the period 6:30am to 9:00am weekdays. (The more recently created right turn lane into Darebin Street may have improved the situation.)

  Consider painting a 'tear-drop' shaped chevron island at the terminus of the right turn lane into Darebin Street. This will highlight the presence of the right turn lane (and improve driver compliance) and provide some refuge for pedestrians crossing Upper Heidelberg Road.

  In the longer term consider the widening of Upper Heidelberg Road to accommodate two lanes in each direction and a separate right turn lane into Darebin Street. A pedestrian refuge island may be able to be accommodated immediately north of Darebin Street.

- *Burke Road North/Boulevard intersection (14 crashes)*
  Has recently been successfully treated by banning right turns to/from The Boulevard and the reconstruction of this section of Burke Road North.

2.2.4 Non-Arterial Road Intersections

All non-arterial road intersections that experienced at least 4 casualty crashes during the period 1991 to 1997 inclusive were identified and ranked.

The intersection of McEwan Road and Outhwaite Road has experienced a high level of crashes, despite the presence of a roundabout at the intersection. This requires further investigation.

The intersection of Beverley Road and Louise Street has also experienced a high level of crashes, including three head-on crashes. Sections of Beverley Road have previously been treated with anti-skid panels and median islands. A treatment was installed south of Louise Street approximately 2 years ago which has reduced traffic speed at this location.

2.2.5 Arterial Road Mid-Block Sections

All arterial road mid-block sections, or links, with at least 10 casualty crashes during the period 1991 to 1997 inclusive were identified. The dominant crash types were also identified. Grimshaw Street has experienced a high level of crashes along much of its length. As expected, due to their length, traffic volumes and level of activity/potential conflict, Bell Street, Banksia Street, Lower Plenty Road and Rosanna Road have also experienced relatively high crash frequencies.

Rear-end collisions are often the dominant mid-block crash type, which may be attributable to inadequate left and right turn storage lanes, poor adherence to speed limits, poor street signage or poor signal coordination.

Council officers should liaise directly with VicRoads to identify suitable treatments to the arterial links with the highest crash frequencies.

2.2.6 Non-Arterial Road Mid-Block Sections

All non-arterial road links with at least 5 casualty crashes during the period 1991 to 1997 inclusive were identified. The dominant crash types were also identified.

Watsonia Road, Beverley Road and Banyule Road have all experienced high crash frequencies, with the latter two roads apparently suffering from poor alignment.

Council should focus on implementing effective countermeasures to address the non-arterial intersections and links with the highest crash frequency, where feasible solutions can be developed. A means of achieving this goal is for Council to develop a 'Spot Safety Program'. The development of such a program is discussed in Section 3.6.4 of this report.

2.3 A Functional Road Hierarchy

2.3.1 *Introduction*

In order to apply appropriate traffic management techniques to the road network in a logical and effective manner, it is necessary to develop a classification or hierarchy of roads to ensure that the primary purpose of each road is clearly defined. Appropriate traffic management techniques can then be identified and applied to support and reinforce the adopted classification.

There are two basic classification systems that can be used:

a) ***Administrative Classifications***
Based on the funding and administration responsibilities of each road; and

b) ***Functional Classifications***
Based on the function that each road serves.

The 'Administrative Classifications' include the Federal and State classification systems that determine funding, management and maintenance responsibilities for various roads. Administrative hierarchies include the categories of State Highway, Declared Main Roads, Local Roads and Undeclared Roads.

The 'Functional Classifications' include the categories of arterial, sub-arterial, collector and local.

Whilst there has been a tendency over recent years to attempt to match the two classification systems together, it is generally not feasible or appropriate to match the intermediate type roads. For example 'Local Roads' such as Studley Road (Eaglemont) and McArthur Road (Ivanhoe) cannot function as purely 'Local Roads'. The treatment of local roads and collector roads needs to be carefully considered because they can cater for through traffic, an arterial road function, and local traffic, a local road function, with conflicting requirements for each.

From a traffic management and transport policy viewpoint the 'functional classification' system is the key determinant in making rational, effective and equitable transport decisions in terms of future standards, treatment, priority and resolving conflicts between mobility and amenity.

2.3.2 *Functional Road Hierarchies*

Basic Principles

Dr Ray Brindle [1](1989) provides a detailed technical review and assessment of road hierarchies and functional classification systems and quotes from the Institution of Highways and Transportation (1987) which summarises the basic principles of a functional road hierarchy:

[1] Dr Ray Brindle was a Principal Research Scientist with ARRB Transport Research and has significant expertise in the areas of road network planning, Local Area Traffic Management and road safety.

> *"Most urban roads perform many functions besides those of providing passage for moving vehicles and pedestrians. These functions may be broadly categorised as environmental, access, local traffic and through traffic. Not all of these will need to be accommodated in any particular road but for the purposes of planning and design, the functions that a road should cater for need to be identified and relevant priorities assigned to them".*

Robert Morgan [2](1994) highlighted potential problems with this form of graded hierarchy:

- *It creates a broad range of intermediate roads (between those with a major traffic function and those with a minor traffic function) on which there is a major conflict between access and movement functions.*
- *It proves difficult to apply to existing networks for traffic management and other purposes. (e.g. the primary arterial road network in the City of Banyule also serves a substantial access function to abutting land uses).*
- *Residents often see the traffic function of a road in fairly simple terms such as "yes it should" or "no it shouldn't" carry through traffic.*

Road Hierarchy and Network Planning

Brindle and Morgan both agree that there are problems classifying the status of roads within the hierarchy using the conventional concepts of road function, traffic volumes and design characteristics. These parameters are rarely consistent enough to provide a rational basis for road classification.

Brindle suggested a simple rule:

> *"A road's place in the hierarchy is defined only by its role in the traffic network."*

This is a very important and relevant point in defining road classifications for the City of Banyule. The network role of the road in the overall City of Banyule road network is the critical factor in defining the status of the road rather than just its geometric standard and abutting land use.

As effectively stated by Morgan (1994):

> *"The road hierarchies should be established on the basis of the need for various roads at various locations in the network in order to provide an overall effective road network. Simply because a road is of a certain cross section or geometric design or has certain abutting land uses should not be taken into account in defining whether it may or may not be chosen as an arterial road or local street. These physical characteristics may determine how many of certain types of roads may be needed to perform a certain traffic function, but they should not be used to delete certain roads from the options".*

It is the road's role in the overall network that determines its desired function.

[2] Robert Morgan is a highly regarded traffic engineer with expertise in the areas of Local Area Traffic Management and road safety.

2.3.3 Existing Road Classification

Melbourne Metropolitan Board of Works Functional Road Hierarchy

The first effective functional road hierarchy developed for the City of Banyule, was established by the Melbourne Metropolitan Board of Works (MMBW) in their Hierarchy of Roads Study (1981). This study aimed to designate a functionally based road classification system on the basis of traffic using existing roads in the Melbourne metropolitan area.

The stated primary objectives of the study were to:

- Protect residential and other sensitive areas from unnecessary traffic.
- Cater for through traffic on designated arterial roads.
- Reduce the inherent conflict between mobility and amenity.

The MMBW study developed terms and descriptions for each of the road categories with the aim that they would be adopted by all relevant agencies. These descriptions are listed below:

Freeways

Those roads with full access control and grade separated intersections, whose primary function is to service large traffic movements.

Primary Arterial Roads

Those arterial roads whose function is to form the principal avenue of communication for metropolitan traffic movements not catered for by freeways.

Secondary Arterial Roads

Those roads that supplement the Primary Arterial Roads in providing for through traffic movement, to an individually determined limit that is sensitive to both roadway characteristics and abutting land uses.

Collector Roads

Those non-arterial roads that distribute traffic between the arterial roads and the local street system, which provide local connection between arterial roads and which provide access to abutting property.

Local Access Streets

Those streets, not being arterials or collectors, whose main function is to provide access to abutting property.

The study acknowledged that in some cases there will be considerable difficulty in resolving transport and land-use conflicts. The approach taken was that the reality of conflicts would not be avoided simply by not designating the particular roads as arterials. It was noted that *"only by recognising the road's function and confronting such problems can an appropriate management plan be developed to reduce these conflicts"*.

Current Functional Road Hierarchy for the City of Banyule

The road classification within the City of Banyule has essentially evolved into a five level road hierarchy, based on State Highways, main roads (primary arterial roads), secondary arterial roads, collector roads and local streets.

A number of roads, for example, Studley Road and McArthur Road, have been intentionally defined as local streets. This action was taken to reduce the apparent attractiveness of these routes as bypasses to the arterial road network by removing their arterial or collector road status, so that they were no longer highlighted in street directories as desired traffic routes. Needless to say this action has had no significant impact on volume reduction on these routes.

Under the current classification system some 'local' streets are carrying in excess of 6,000vpd (e.g. Studley Road, McArthur Road, Main Street) and many are carrying over 4000vpd (e.g. Cape Street, Mc Dowell Street, Cherry Street, Greenhill Road).

A plan of the current road hierarchy for the City of Banyule is shown in Figure 2.

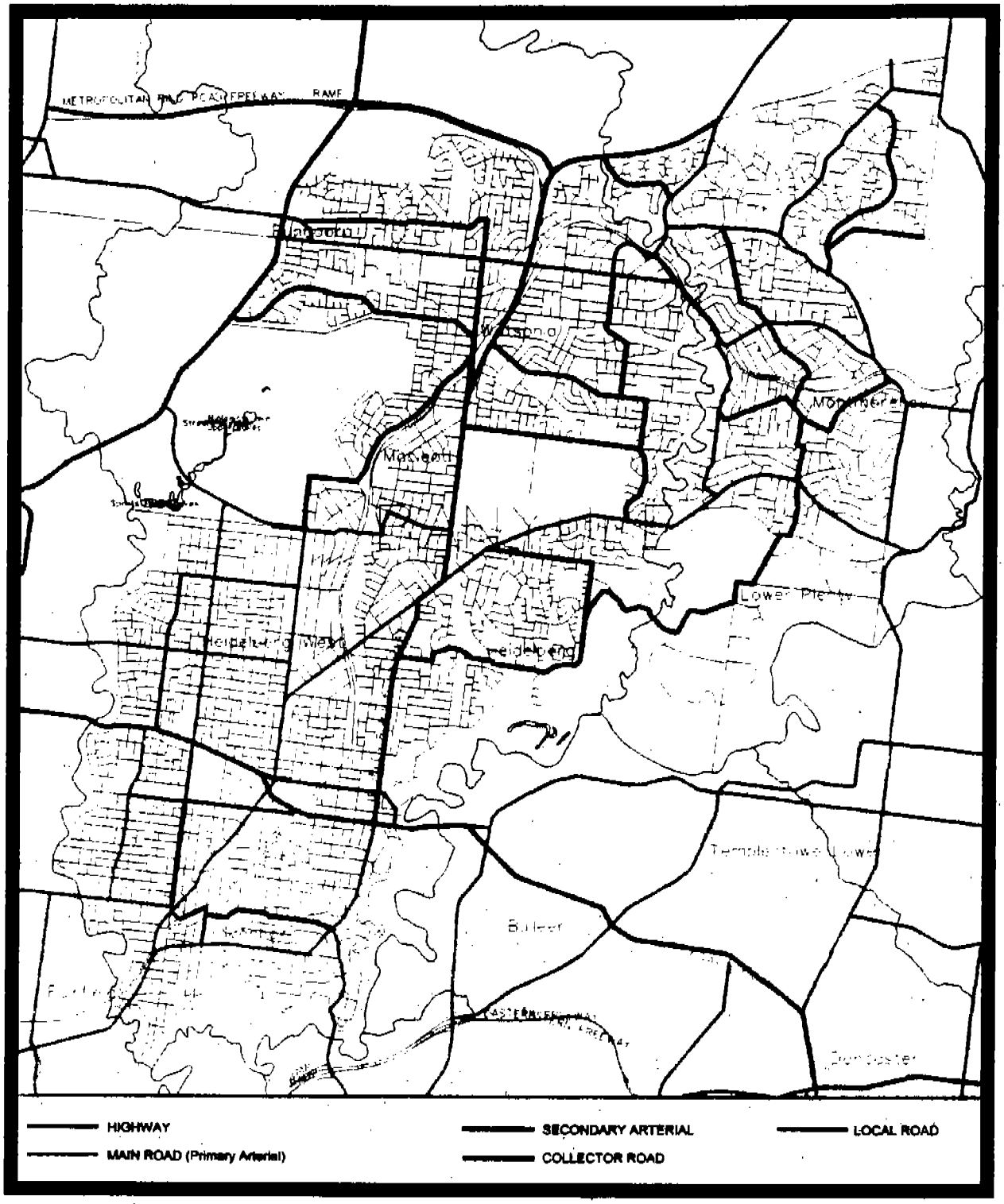


Figure 2 : Existing City of Banyule Road Hierarchy

2.3.4 The City of Banyule Road Network

In the overall interests of access, mobility and economic development, it is not feasible to significantly constrain the major road network and throttle the movement of traffic through the City of Banyule. This would inhibit local access, affect the operation of the major strip shopping centres, and encourage traffic to seek 'short cuts' along local streets. It would also potentially harm the economic development of the State.

Morgan highlights the consequences of constraining busy roads:

> *"Council may consider that the easiest option, when confronted by local pressure to reduce volumes on "busy" roads, is to agree to do so, by restrictive measures like road closures or access bans, etc. If this course of action is taken, experience shows that the following events will happen.*
>
> - *Firstly, it will raise the expectations of residents on these "busy" roads that their living conditions will be really improved. A traffic situation that was generally accepted, even if not liked, will no longer be accepted.*
> - *Even if all the "through traffic" is removed, local areas adjacent to these roads generate so much traffic (typically 8 to 10 vehicle trip ends per house per day) that the "busy" roads will stay fairly busy and will never be "quiet" streets. It is my experience that reductions of even 50% of traffic are soon forgotten by residents if the remaining volume is still above expected "local street" levels.*
> - *People in the nearby streets (who have not had the volume problem past their house) will be delayed getting in and out of the area by the closures or access bans. (There is always a trade-off between through traffic volumes and ease of local access).*
> - *Some local people will divert to other nearby streets for their access trips in and out of the area, upsetting residents in those streets.*
>
> *It makes more sense to deal with the expectations of residents on busy roads realistically, than to raise their expectations regarding a solution to their traffic volume problems and end up making life distinctly worse for most people in the area."*

A more rational approach, which supports Morgan's views, is to provide adequate capacity along designated traffic routes, and to simultaneously introduce appropriate traffic calming devices together with bicycle and pedestrian facilities along and across those 'traffic routes' which have sections of sensitive abutting land-use. For example, the treatment of a route, with restricted pavement widths, shared parking/bicycle lanes and road humps to control excessive speed, is arguably an appropriate strategy for accommodating, but not encouraging, traffic flow, whilst maintaining adequate amenity for abutting residential land-uses.

It is considered essential that routes such as Yallambie Road, Banyule Road, Watsonia Road and Studley Road be available to supplement the arterial road network during certain times of the day. However, it is also feasible to treat these streets with appropriate traffic calming devices to maintain adequate residential amenity. During periods of increased sensitivity (e.g. from 7:00pm to 6:00am) traffic signal timings could be modified so that these routes become less attractive for through traffic in comparison to the arterial road network during these times.

2.3.5 *Development of an Effective Road Classification System*

The development of an appropriate and effective road classification system for the City of Banyule should be based on the following:

- the existing road network and nature of abutting land-uses within the City of Banyule;
- the community's need for improved amenity in residential areas;
- the need to maintain and improve the quality of the vibrant strip shopping centres in the City of Banyule;
- the need to maintain and improve access for business, including industrial areas, in the City of Banyule;
- Council's transport goals and the wider transport policy goals of the State Government through VicRoads;
- a system for effectively managing the conflict between amenity and traffic function on 'difficult' routes.

The 'Road/Amenity Classification' system developed by Loder & Bayly for the Metropolitan Bayside Councils Corridor Traffic Study in Melbourne in 1980 and subsequently adopted by RoSTA, remains the most practical basis for making rational decisions about the often conflicting traffic and amenity functions.

This classification system was specifically developed to take account of both the traffic function and the abutting land-use activity and it recognises the inherent conflict between them. The system provides a classification framework that provides:

- consistency in resolving traffic management conflicts;
- proper recognition of both the traffic service and local amenity requirements of roads, and the inherent conflicts that occur;
- a rational approach to roads which cross municipal boundaries, considering both local and regional needs;
- a clear division of responsibility for roads which allows for local action and regional action;
- a rational basis for negotiation between authorities;
- a basis for decisions on compensating or moderating measures.

The Road/Amenity Classification system will only be an effective tool if realistic functional classifications are made to reflect the desired function of each street. For example, if a street such as Studley Road is to continue to function as an important traffic route and carry in the order of 6,000vpd then it is inappropriate, and counter-productive to the overall classification of the road network, to continue to classify it as a local street.

The resolution of conflict between traffic function and amenity can often be difficult but it should reflect the realistic function of the road having regard to its physical location and required role in the overall road network. For example, if many of the intermediate type roads within the City of Banyule were to continue to be classified as local streets then ideally their traffic volume should be reduced to a maximum of

3000 vehicles per day. If this occurred it would have significant consequences on the movement of traffic through the city, affect the operation of strip shopping centres and place greater traffic pressure on the true local street network.

It is also appropriate for roads to have different classifications along their length, reflecting changes in the sensitivity of abutting land-uses, roadway capacity, parking demand, etc. For example the section of Oriel Road between Livingstone Street and Bell Street has quite different characteristics compared to Upper Heidelberg Road between Livingstone Street and Bell Street, yet both are currently classified as primary arterial roads.

2.3.6 *Restricted Traffic Routes*

To realistically define the function of the number of intermediate type roads in the City of Banyule that carry in excess of 4000 vehicles per day, it is suggested that a new category be adopted. The new category is called 'Restricted Traffic Routes' and is defined as:

> *'Those roads which currently serve a local and regional traffic function to supplement the arterial road system during certain times of the day, which should be traffic management treated to improve safety and amenity, whilst still serving a traffic route function to support the operation of the arterial road network.'*

Andrew O'Brien and Associates Pty Ltd developed this category for a traffic management strategy that was conducted on behalf of the City of Yarra in 1996. Subsequently the classification has been adopted by that Council and is reflected in the revised functional classification of roads within the municipality.

These types of roads supplement the arterial road network during certain times of the day yet may have sensitive abutting land use, restricted road capacity, high parking demands, etc. For the effective performance of the overall road network these roads need to retain their current traffic carrying capacity, yet be treated by traffic management devices to improve safety and amenity, as required by the abutting land uses. The need and extent of treatment along these routes will vary according to their required traffic roles, extent of heavy vehicle traffic and sensitivity of abutting land use.

A set of objectives, design requirements and a list of possible treatments for 'Restricted Traffic Routes' are listed below:

Objectives

- Control high traffic speeds;
- Discourage significant regional traffic use during sensitive time periods i.e. at night;
- Maintain adequate residential amenity, even during peak traffic periods;
- Provide improved safety and amenity for pedestrians and cyclists;
- Provide controlled access across arterial roads;
- Create an attractive streetscape environment.

Design Requirements

- One traffic lane in each direction with ability for two lanes at intersections where delays occur;
- Retention of kerbside parking on both sides where feasible;
- Provision of painted bicycle lanes where feasible;
- Traffic signals or roundabouts at arterial road intersections (e.g. Sherbourne /Rattray);
- Mid-block pedestrian facilities where warranted;
- Smooth pavement surface.

Possible Treatments

- Painted parking/bicycle lanes;
- Speed humps;
- Roundabouts;
- Median/refuge islands;
- Kerb extensions/Road narrowing;
- Pedestrian crossings/signals;
- Streetscaping;
- Reconstruction/re-sheeting to provide smooth road surface.

Refer to Appendix B for plans of possible treatment options for 'Restricted Traffic Routes'. The ultimate treatment of individual 'Restricted Traffic Routes' should be determined following consultation with abutting residents and businesses, transport operators and emergency service authorities.

2.3.7 Road Funding Based On Classification

There is a long history in this State of a dichotomy between the financial classifications and the functional classifications of the arterial road network. At present VicRoads only contributes funding to roads that form part of the Declared Road network (ie. Freeways, State Highways and Main Roads which have been declared under the Transport Act 1983). Councils are required to fund works on all other roads, even though many of these roads perform an essential arterial road function.

VicRoads current range of funding and management responsibilities for the Declared Road network are summarised below:

Freeways

- Total funding and management responsibility.

State Highways

- Full funding of maintenance and reconstruction work on the carriageway and median and any activity related to through traffic such as signs, guard rails etc. (Council funds work behind the kerbline, such as indented parking).
- Control over all traffic management decisions, except parking control.
- Shared cost (VicRoads/Council on a 2:1 basis) of street lighting schemes that meet the appropriate VicRoads warrants.

Main Roads

- Shared funding and management arrangements with Council. VicRoads approve all Major Traffic Control Items on Main Roads. (Major Traffic Control Items include clearways, stop/give-way signs, roundabouts, traffic signals, pedestrian crossings, certain turn/entry prohibitions, etc). Council funds work behind the kerbline, such as indented parking. The proportion of VicRoads/Council funding varies.
- Council has full responsibility for parking control.
- VicRoads has control over traffic signal operation. (Council may have some maintenance responsibility of specific traffic signal sites).
- Shared cost (VicRoads/Council 2:1) of street lighting schemes that meet the appropriate VicRoads warrants.

Local Roads (All Undeclared Roads)

- Councils have full funding and management responsibility, including delegated approval for a number of Major Traffic Control Items.
- VicRoads has control over traffic signal operation. (Council may have some maintenance responsibility of specific traffic signal sites).

2.3.8 Road Funding Issues

The arterial road network within the City of Banyule is subject to high traffic volumes from regional traffic. Congestion and delays on the arterial road network forces traffic onto the non-arterial (undeclared) road network and these roads are required to supplement the arterial (declared) road network during peak periods.

As there are limited opportunities to significantly upgrade the capacity of the existing arterial road network within the City of Banyule, it could be argued that VicRoads should contribute funding to the maintenance of the undeclared road network where it provides vital support to the operation of the arterial road network.

A good example of this situation is Studley Road that provides an essential arterial road link to/from the City and the centre of Heidelberg. The intersection of Upper Heidelberg Road/Banksia Street is already unable to efficiently cope with peak period traffic demands. If Studley Road was significantly downgraded so that it could no longer perform a traffic route function, then the intersection of Upper

Heidelberg Road/Banksia Street would experience severe congestion with extended queues. Clearly VicRoads has a moral obligation to provide partial funding to these types of traffic routes.

This would allow additional road funding to be directed to roads such as Studley Road to provide an improved road surface for both vehicles and cyclists. At present Council is required to totally fund all maintenance and reconstruction works on these roads which are being damaged essentially by regional traffic.

Difficulties also arise when councils seek to retain the management control of certain undeclared roads to ensure that the needs of abutting residents and businesses are addressed, yet they don't have sufficient funding to ensure that the road is maintained in good condition.

All Melbourne metropolitan municipalities experience these situations and it is suggested that Council seek support from neighbouring municipalities to place political pressure on VicRoads to consider this type of funding arrangement.

2.3.9 Recommendations

A recommended functional road hierarchy for the City of Banyule has been developed incorporating the following road classifications:

- Freeways
- Primary Arterials
- Secondary Arterials
- Restricted Traffic Routes
- Local Crossing Roads
- Local Streets

The definitions for each of these categories are listed below:

Freeways

Those roads with full access control and grade separated intersections, whose primary function is to service large traffic movements, e.g. the Northern Ring Road.

Primary Arterials

Those arterial roads whose main function is to service large traffic movements and form the principal avenue of communication for metropolitan traffic movements. For example, Lower Heidelberg Road, Banksia Street and Main Road.

Secondary Arterials

Those roads that supplement the Primary Arterial Roads in providing for through traffic movement, to an individually determined limit that is sensitive to both roadway characteristics and abutting land uses. For example, Para Road, Southern Road, Oriel Road and Upper Heidelberg Road.

Restricted Traffic Routes

Those roads that currently serve a local and regional traffic function to supplement the arterial road system during certain times of the day. For example, Mountain View Road, Banyule Road, Wungan Street and Yallambie Road.

Local Crossing Roads

Those roads which fulfil a need to subdivide a local traffic area because, in one dimension at least, the area is too large to be reasonably circumnavigated by intra-suburban traffic. They should not be continuous across arterial roads. For example, Grand Boulevard, Graham Road, Finlayson Street and Liberty Parade.

Local Streets

Those roads that provide, almost exclusively, for local access and circulation. They are roads that do not provide any "through" function and they will not be included in any arterial networks.

The recommended road hierarchy for the City of Banyule is shown in Figure 3.

A road classification matrix table has also been developed to highlight the different road function categories that exist within the City of Banyule and how these roads can change in function along their length, subject to adjacent land-use activity and the traffic role of adjacent routes in the network. (Refer to Appendix C) This table shows the five distinct road classification categories, and within each of these categories the sub-classes that change according to land-use, road geometry, kerbside parking demand, impact of adjacent routes, etc. The table also includes actions for managing each of the various road categories plus broad speed and volume threshold ranges. These ranges should be viewed as desirable ranges rather than absolute maximum limits.

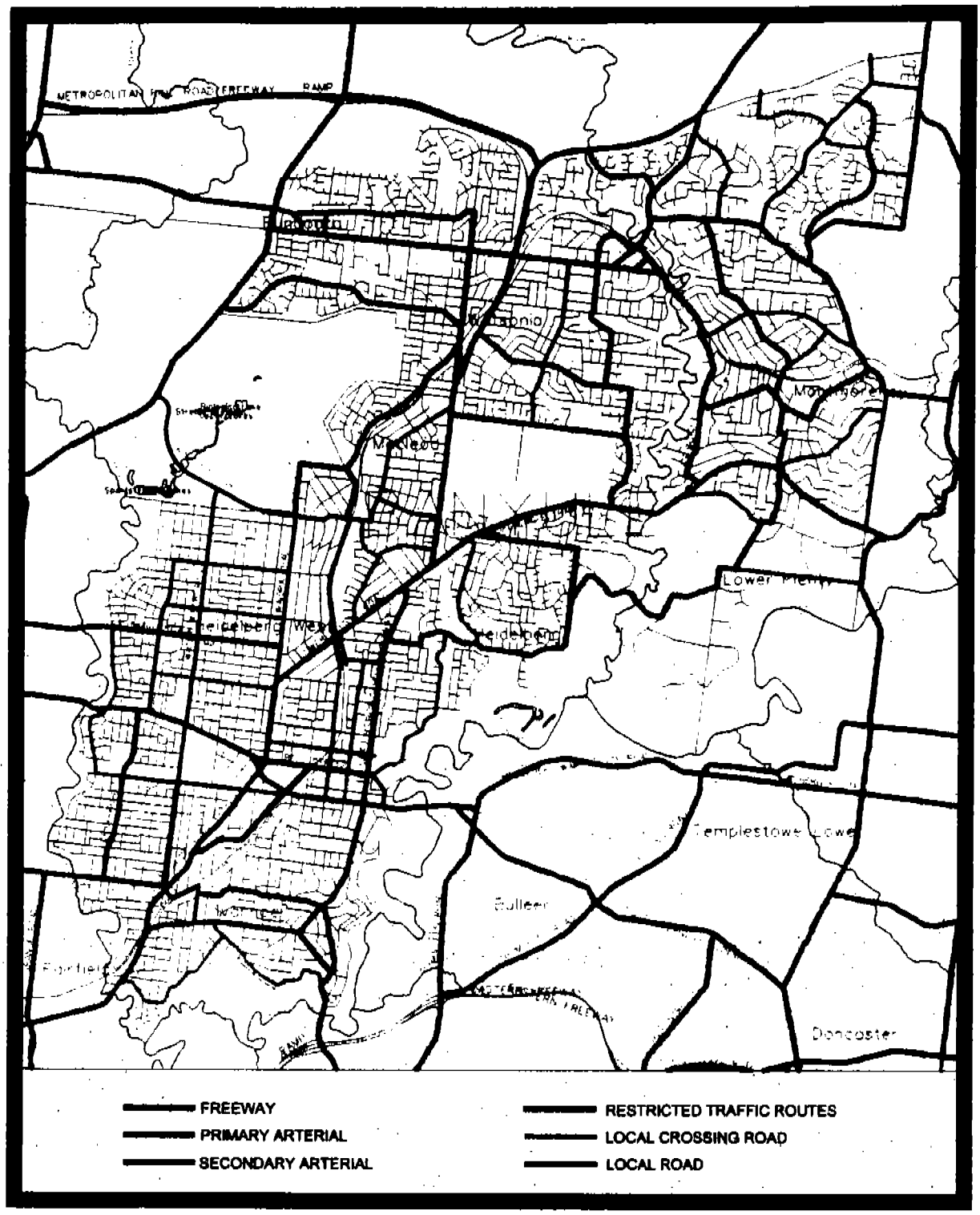


Figure 3 : Recommended Road Hierarchy for Banyule

2.4 Existing Local Area Traffic Management in Banyule

The three former municipalities that make up Banyule have all been involved in the identification and treatment of local street traffic problems to varying degrees, with the former City of Heidelberg having the most formalised structure for the identification and treatment of local street traffic problems.

The former City of Heidelberg had a formal and productive Local Area Traffic Management (LATM) program and strategy. The former Heidelberg municipality was divided into 41 LATM precincts and studies were undertaken in a large number of these precincts. Refer to Appendix D for details of these 41 precincts, a summary of the studies and works undertaken and a spreadsheet of recommended/implemented treatments.

A significant proportion of the former Heidelberg municipality was the subject of both formal and informal LATM studies and implemented actions. However, overall the former Heidelberg area was not saturated with traffic management devices and a reasonable balance between safety, traffic restraint, accessibility, amenity and the residential streetscape was achieved.

The Shires of Diamond Valley and Eltham adopted more informal strategies and tended to treat streets in isolation on the basis of resident complaints. Again a reasonable balance between the impact of traffic management and the surrounding environment was achieved.

The three former municipalities' approaches to the identification and treatment of local street traffic problems and the current practices of other municipalities throughout Australia will be reviewed and an objective, systematic and logical approach to the future identification and treatment of local street traffic problems within Banyule will be recommended.

Due to the deficient arterial road network in Banyule, the treatment of local street traffic problems has primarily been aimed at reducing high speeds, improving intersection safety and discouraging (rather than preventing) through traffic intrusion. Notwithstanding this, some 'hard' measures (road closures and turn bans) have been applied in some areas with success.

A relatively wide range of treatments have been installed in Banyule, including roundabouts, Watts profile road humps, raised pavements, angled slow points, median and splitter islands, T-intersection treatments, one-way streets, road narrowings and road closures. In addition, Banyule has a relatively high number of anti-skid rumble strip treatments. These have been applied at a number of locations, particularly along many curvilinear non-arterial roads, to address single vehicle 'run-off-the-road' type crashes.

A detailed review of specific management treatments in Banyule is provided in 3.5.3. In general, most of the traffic management treatments in Banyule have been appropriately designed and constructed to ensure that devices complement the character of the surrounding streetscape. It is important that Council continues to maintain attention to the appearance of the treatments in terms of the material used, extent of landscaping, and the presence of signage and linemarking.

3. MANAGEMENT OF LOCAL AREA TRAFFIC

3.1 Overview

The means available to address management of local area traffic are not limited to physical traffic management devices.

ARRB Transport Research conducted a public workshop as part of its recent review of Local Area Traffic Management processes. A range of educational, administrative and policy suggestions were raised as possible options or supplements to local area traffic management works, with the aim of reducing the speed and volume of traffic on local streets. A summary of these suggestions to reduce the speed and volume of traffic on local streets is provided below.

Education	Use of school programs, the media etc. to change attitudes e.g. to encourage better citizenship, responsible attitude; change heroes (not fast drivers); check attitudes.
Attitudes/behaviour	Changing the way people think and what they do when driving e.g. make drivers 'own the problem'; increase sensitivity to needs of vulnerable road users; help motorists to be aware of their speed and the conditions.
Peer group pressure	Changing behaviour through social pressure e.g. embarrass offenders by stickers, bells, lights; publicise names of people convicted of speeding in daily papers; make speeding socially unacceptable like smoking now is in Australia; awards and bumper stickers.
Community involvement	Direct community involvement in action to monitor and change behaviour e.g. local surveillance, monitoring and reporting; improve community spirit (to make other residents less anonymous).
Travel demand management	Regulation and management to reduce the demand for private car travel.
Regulation	Changes to laws e.g. blanket 50 km/h limit in local streets; heavy vehicle bans; variable speed limits, according to time and day.
Enforcement	Strict application of laws and police powers e.g. speed cameras; greater police presence; driver onus; loss of comprehensive insurance if at fault in a local street; higher penalties for speeding in local streets, where it is more dangerous.

Technical/mechanical	Changes to vehicles, automatic monitoring of vehicles etc. e.g. electronic interaction between vehicle and roadside monitors; smart cars which warn when limit is exceeded; use of helicopters for monitoring.
Environment	Create an environment that invites more careful behaviour.
Physical planning	Improving the land use/traffic system to reduce the need for car travel and its impacts.
Arterial improvements	Improving the arterial road network to induce a change in route from local street to arterial roads.

This list serves as a good basis for discussing alternative approaches to the management of local area traffic. These approaches should not be viewed in isolation, as to successfully manage traffic in local streets, a number of these initiatives will need to be adopted.

3.2 Education Programs

3.2.1 Introduction

Education programs should be directed at ensuring that all road users, be they pedestrians, bicyclists or drivers of vehicles, have the correct approach to the local street environment. People's attitudes and behaviour need to be modified to ensure that speeding in local streets is not acceptable to the community in which they live.

At the local level, education programs need to focus on specific groups in the community such as school children or families. To be successful, these programs require the support of road safety agencies like VicRoads, Victoria Police and the RACV, as well as Council.

A Local Road Safety Strategy can include multi-action programs to improve road safety within the municipality. By involving schools and community groups in the road safety strategy process, Council will engender the support and interest of the whole community. This can have a flow-on effect in relation to other Council objectives, such as improving the amenity of local precincts.

3.2.2 Recommendations

It is suggested that Council approach VicRoads and obtain information on what is required to set up a comprehensive education program within Banyule.

Council pursue the completion of a local Road Safety Strategy for Banyule.

3.3 Travel Demand Management

3.3.1 *Introduction*

Travel Demand Management (TDM) measures have been developed in response to the recognition that it is no longer feasible to continue to provide for current or future travel demand simply by the construction of new transport infrastructure. To date TDM has been primarily focused on initiatives to reduce the demand for private car travel.

The 'Travel Demand Management Guidelines' (AustRoads 1995) provide a comprehensive review of TDM objectives, principles, possible actions and details of actual TDM projects conducted locally and overseas. The guidelines acknowledge that local government has an important role in facilitating and implementing many TDM measures.

TDM aims to modify existing and future levels of total travel, travel characteristics, and energy consumption, through changing demands, and/or by changing supply or travel network capacity. Changes to either demand or supply can be targeted towards one or a combination of components, including time of day, type of user, location, mode of travel, frequency, route or cost.

The AustRoads guidelines define TDM as:

> *'Travel Demand Management is intervention (excluding provision of major infrastructure) to modify travel decisions so that more desirable transport, social, economic and/or environmental objectives can be achieved and the adverse impacts of travel can be reduced'.*

3.3.2 *Travel Demand Management Programs*

Examples of TDM projects conducted locally in Melbourne include:

- Transport Management Associations developed at Glenferrie/Swinburne and Tally Ho with the aim of encouraging car pooling, public transport and bicycle riding as a substitute to private car travel. Initiatives included travel kits, preferential parking areas for car-pools, a guaranteed ride home scheme, re-routing public transport routes and relocating stops and additional bicycle parking.
- These Associations have not proven to be as effective as initially hoped due to the reluctance of individuals to shift from the convenience and independence of private vehicle travel to car pooling options. In addition Tally Ho has a relatively high level of available parking and poor public transport accessibility.
- Trip Reduction Ordinances as part of permit conditions.
- Transit/High Occupancy Vehicles (HOV) lanes along the Eastern Freeway. These have been effective however they only target a small proportion of the motoring community.

- Buy-a-Bike schemes and public transport passes. These have been introduced at Moreland City Council as an alternative to the provision of a motor vehicle for staff.
- 'Flexicar' program to reduce the household dependency on the 'second vehicle' by offering alternative travel choices which can effectively and efficiently carry out the transport function. This may include car lease/hire programs, taxis, bicycles, public transport or walking. An integral part of the program is to demonstrate that the program will be financially beneficial to the participants (by highlighting the real costs of owning a second vehicle) as well as ensuring that the program is attractive and convenient to users. The Port Phillip City Council is currently developing a 'Flexicar' program for trial implementation in 2000.
- 'Travel Blending' program that is a tailor made program for each participant, which identifies appropriate travel mode choices for the various transport tasks of the participant. Previous 'travel blending' trials conducted in parts of Brisbane and Adelaide have reported initial reductions in household vehicle travel of about 20%.
- Port Phillip City Council is seeking to trial a 'Travel Blending' program in the area surrounding the Elwood Secondary College. The initial program is expected to cost in the order of $600,000 and funding has been sought from the State Government. The high cost of the program is due to the significant printing, staff resources and data collection and analysis required.
- Improved pedestrian/bicycle facilities, including shared off-road paths, the creation of separate painted bicycle lanes along arterial and intermediate roads and improved pedestrian links to/from major activity centres.
- Higher density 'Urban Village' development adjacent to major transport nodes and/or key activity centres to encourage the clustering of a range of residential, commercial and entertainment uses in order to minimise trip lengths and reduce the need for private vehicle travel.

Interstate and overseas experience includes programs such as:

- Transport Management Associations;
- Parking pricing and limitation polices;
- Car pooling;
- Road/congestion pricing;
- Taxation policies to restrain vehicle ownership and/or usage;
- Share-a-cab schemes;
- Variable work hours;
- Public transit subsidies;
- Telecommuting.

A car pooling system (Easy Share Australia Pty Ltd) has been established in Sydney during the past 12 months with the aim of being commercially viable and reducing

the dependence on private vehicle travel. Despite the technical sophistication of the system (being able to efficiently match participants with similar travel needs) and an extensive marketing campaign, the program has failed to attract sufficient participants to make it viable.

It has been acknowledged that further disincentives to private vehicle travel (e.g. congestion pricing, higher parking fees, etc), as well as additional incentives for car pooling (e.g. free parking, more HOV lanes, etc) will be required before such a system will be feasible.

3.3.3 *Recommendations*

It is recommended that Banyule City Council consider the introduction of a range of Travel Demand Management (TDM) measures to reduce the demand for private car travel. Possible initiatives include:

- Measures to reduce staff vehicle travel as a 'pilot' program to a wider community based program. These initiatives could include car pooling, public transport passes, subsidised bicycle purchase, variable work hours and telecommuting.
- 'Urban Village' development based around the Ivanhoe, Heidelberg, Rosanna, Watsonia and Greensborough railway stations to facilitate mixed-use development, with a focus on the creation of higher density residential development.
- The introduction of painted bicycle lanes or shared parking/bicycle lanes along the secondary arterial and intermediate road network (where feasible).
- Improved pedestrian facilities at shopping centres and major transport interchanges.
- Investigation of the feasibility of introducing 'Flexicar' and 'Travel Blending' initiatives. This should initially involve the monitoring of the success or otherwise of Port Phillip Council's initiatives in this area, as both schemes will be time consuming and expensive to implement. Unless the schemes prove to be successful in an inner area such as Port Phillip, with a Council committed to reduce the dependency on private vehicle travel, it is unlikely that they will be effective elsewhere.
- Ensure that public transport facilities are integrated with expanding residential development in the areas to the north and east of Banyule. This includes the extension of the heavy rail line from Epping to South Morang as well as the extension of the tram line along Plenty Road to South Morang. Bus services should also be developed to service new estates to the north such as Laurimar Park.
- Council should also continue to encourage public transport usage within Banyule. Initiatives which could be considered include public transport promotion campaigns, improved passenger shelters, improved co-ordination of services, improved frequency and coverage of bus services, real time information at public transport stops and the continued upgrading of transport modal interchanges such as the recent upgrading of the Heidelberg Railway Station and surrounds.

3.4 Non-Physical Traffic Management Initiatives

3.4.1 *Introduction*

There are several alternative traffic management initiatives that involve the installation of no physical treatments within the local road network. An outline of these initiatives is discussed below.

3.4.2 *Reduced Speed Limits on Local Streets*

There is now widespread support for the blanket-wide introduction of reduced speed limits on local streets from State and local government, the Victoria Police, bicycle groups and the RACV. The widespread introduction of reduced speed limits of 50 km/h, in association with increased driver education and enforcement, has strong appeal as it should reduce speeds and improve safety by changing the driving culture on local streets, without the need for extensive traffic management devices.

AustRoads published guidelines on speed limits during 1995 and this document supports the national introduction of a 50 km/h speed limit for local streets. The AustRoads recommendations were 'noted' by the Australian Transport Council and it was left up to individual states to adopt the recommendations.

The states of NSW and Queensland were the first to embark on the trial application of 50 km/h speed limits.

The NSW State Government arranged a 50 km/h trial on residential streets in a range of local government areas. A total of 26 Councils participated in the trials. The trials involved 50 km/h signs and painted logos on the precinct boundaries as well as substantial publicity. Before and after speed surveys indicated that the 50 km/h trial produces minor reductions in average speeds of 1.5 to 2 km/h. There was also a 7% reduction in casualty crashes in the trial areas.

Of the 26 Councils involved in the trial, 14 supported the retention of the 50 km/h speed limit, 3 Councils opposed the 50 km/h speed limit and the remaining 9 Councils were either undecided or not ready to comment. A telephone survey indicated that 66% of respondents (out of a survey of 5,160 people) supported the 50 km/h speed limit. However a newspaper survey found that 58% of respondents opposed the reduced speed limit. Of all NSW Councils, 45% support the 50 km/h speed limit, 37% oppose it and 18% are undecided. Greatest support is in the Sydney metropolitan area, with most opposition in the rural areas.

In Queensland a blanket-wide 50 km/h 'Local Street Speed Limit' commenced in March 1999 covering 11 Local Government Areas in the south/east region of the state. A 50 km/h blanket-wide unsigned speed limit has been applied to all 'local streets' (most non-arterial roads) in built-up areas. Advisory and reminder 50 km/h signs will be installed on the outskirts and within the 50 km/h area. A major $1.5 million publicity campaign advised the community of the introduction of the trial and the trial has generally received widespread support to date.

At this point of time in Victoria, state legislation allows individual Councils to seek VicRoads approval for signed 50 km/h speed limits in local streets or local areas. Under this system all local streets intersecting with arterial or intermediate roads (with 60 km/h speed limits or greater) would need to be signed. Refer to VicRoads 'Traffic Engineering Manual, Volume 1, Traffic Management - Speed Zoning Guidelines' for application and installation details.

It is now likely that 50 km/h speed limits will be introduced on a blanket basis across the metropolitan area, with legislation changes to minimise the extent of signage required. This action would allow for a reduced level of physical traffic management devices to be installed to control high speeds on local streets, but will require associated education and enforcement. Reduced speed limits of 40 km/h will still be available for streets that have been effectively treated with traffic management devices or past locations of sensitive land-use, e.g. schools, kindergartens, etc.

It is suggested that Banyule City Council lobby the State Government and VicRoads for the implementation of the 50 km/h legislation as soon as possible.

It is considered that the blanket-wide 50 km/h local street speed limits across the Melbourne metropolitan area, in association with an extensive publicity campaign and increased speed enforcement by the Police, will be required to produce any significant and sustainable speed reductions on local streets.

3.4.3 *Traffic Enforcement by Local Government*

The Municipal Association of Victoria (MAV) formed a Working Party in 1994 to investigate the feasibility of increasing Local Government powers to issue infringement notices for certain traffic offences. These offences primarily related to school crossings, No Entry, No Left/Right Turns, No U-turn infringements and running red lights. The Working Party included representation from the Police, Local Government, State Treasury and the State Attorney-General's Department.

Whilst local government is currently able to prosecute against these offences, the process is inefficient and time consuming on the courts. The Police strongly oppose the expansion of any powers to enable Councils to issue traffic infringement notices. The Police also acknowledge that they do not have the resources to devote adequate time and personnel to local traffic issues.

It is unlikely that Local Government will be given increased enforcement powers to issue infringement notices for traffic offences.

3.4.4 *Police and Speed Camera Enforcement*

Despite numerous requests in the past by Councils to relevant State Ministers and the Police for approval to be able to hire or purchase speed cameras for use on local streets, it remains unlikely that the Police will consent to this request.

A number of Queensland local government authorities also sought to use speed cameras to control speeds in residential streets, and expected that the revenue generated would meet the resource and operating costs of the speed cameras. Again it is unlikely that this request will be granted, as State Governments and Police authorities consider that Councils have an extra agenda in raising additional revenue.

In Victoria, speed camera surveillance will be contracted to the private sector, however this will still not open the way for Councils to operate cameras. The Police and the RACV both strongly oppose such a move, despite the RACV's support for reduced speed limits on local streets.

Over recent years, some Councils have funded the purchase cost of Police vehicles and/or radar speed guns in an effort to gain increased Police enforcement on local streets. This has only had limited success due to the lack of Police resources to patrol local streets.

Field trials in South Australia revealed that the extent of policing required to have a substantial and sustained effect on local street speeds is not feasible over the whole local street system.

3.4.5 *Intelligent Transport Systems*

This is a rapidly emerging area and it will have a significant role to play in traffic management in the future. Technology will be available both within the road system and on vehicles to control the movement of vehicles on the road network, in a similar manner to the vehicle detection systems proposed with the City Link project.

In local street areas this could take the form of:

- controlling the speed of vehicles within a local area to a maximum desirable speed (e.g. 40 km/h) within the area;
- directly debiting a fee/fine to a vehicle that passes through a local area, without an origin or destination in that area;
- inducing the vehicle horn/alarm to sound and/or lights to flash if a vehicle is travelling at an inappropriate speed along a street;
- introducing 'intelligent STOP signs' which force a vehicle to stop before proceeding past the stop line.

Many options will be technologically available, however it may be some time before this type of technology is politically acceptable to the community.

3.5 Physical Traffic Management Initiatives

3.5.1 Streetscape Improvements

Traditional residential streets can be modified by streetscape improvements that not only enhance the environmental quality and amenity of streets but can also reduce vehicle speeds and improve safety.

The 'Streetwise' publication (1993) provides a range of creative ideas for developing more informal streetscapes through the use of plant material, narrower carriageways, alternative pavement surfaces, etc. Relevant sections of 'Streetwise' related to the impact of streetscapes on traffic behaviour are presented below:

> *"... There is strong evidence to suggest that a driver's behaviour is influenced by the street environment..."*
>
> *"Landscaping is a softening option available to engineers to calm traffic and modify driver attitudes. Overhanging trees and natural, randomly planted vegetation create a special, relaxed ambience that can induce drivers to slow down, but they must not impede the vision of a motorist backing out of a driveway. Plantings can be used to create a gateway effect to a pedestrian priority place, to signal curves and bends, and to screen headlights."*

It is recommended that narrower carriageways and potentially different pavement materials be considered for all new residential subdivisions. Existing streets can be narrowed by the extension of the kerbs or the linemarking of shared parking/bicycle lanes.

3.5.2 Traffic Management Devices

ARRB Transport Research has recently conducted a review of Local Area Traffic Management throughout Australia for AustRoads. (The Final Report has yet to be released). The study surveyed 115 Australian and 30 New Zealand Local Government Authorities investigating their experience with Local Area Traffic Management. As part of this survey Traffic Engineers and Planners were asked to rank the various traffic management devices with regard to their effectiveness in reducing speed, accident occurrence and their effects on noise levels.

The study also considered the perceived acceptability of typical Local Area Traffic Management treatments by various user groups, made recommendations regarding device selection and scheme design and considered the impact of Local Area Traffic Management treatments on bus operations, emergency vehicle access and bicyclists.

A summary of the key issues arising from this study are listed below:

1. General Issues

- The 'common ground' definition of Local Area Traffic Management is defined as 'the use of physical techniques, streetscaping and other measures to influence traffic flow in order to create safer and more livable local streets'.

- 'Safety' is as much a qualitative criterion as a quantitative criterion ie. in low event environments (such as crashes on local streets) increasing the perceived level of safety can be as important as treating identified crash locations.
- Lack of clarity about desired outcomes is a common cause of poor scheme design. This can result in the inappropriate selection and design of treatments, with consequent community disappointment and backlash.
- The on-going monitoring and review of Local Area Traffic Management schemes rarely occurs, and if it does is not widely publicised. Consequently limited data is available on the performance of Local Area Traffic Management schemes. However, not all schemes are installed for measurable and objective purposes. In many cases the political process (level of community support/opposition) might provide the best measure of 'success'. The residents are also likely to provide the best indicator of the subjective objectives such as 'livability' and 'amenity'.
- Previous studies show that Local Area Traffic Management schemes, in general, meet the broad technical tests of speed and accident reduction.
- Consultation with residents in the treated street is usually high, with limited consultation with residents living in the adjacent streets.

2. Treatment Performance and Acceptability

- Roundabouts are considered the most effective treatment to address safety problems at local street intersections and produce high reductions in collisions. Roundabouts are also very effective as speed control devices as part of a Local Area Traffic Management or street scheme.
- Traffic Engineers and Planners generally regard roundabouts as the most effective device to produce a reduction in speed and crashes. Vertical displacement devices were rated second best, with horizontal displacement devices ranked third. The community also regarded roundabouts as the most acceptable forms of traffic control.
- Speed humps are an effective form of speed control. Passenger discomfort on 'flat-topped' and Watts profile humps at speeds of 15-25 km/h is minimal. The sinusoidal humps recently approved by VicRoads should reduce traffic noise impacts generated by traditional speed humps.
- There is evidence to support the assumption that the installation of speed humps will result in a significant reduction in traffic speed and consequently accident severity.
- Vertical devices are generally preferable to horizontal devices, particularly in terms of speed and crash reduction.
- The angled slow point is generally an effective means of reducing traffic speed, but driver behaviour is typically only modified at the device installation point. There are many examples of poorly designed angled slow points, which can create traffic hazards and diminish the quality of the streetscape.
- The general community response to Local Area Traffic Management is often one of tolerance rather than overwhelming enthusiasm. Surveys have shown high community approval for entry thresholds and roundabouts, with road humps

and angled slow points rated more highly by residents than motorists. People often have a love or hate attitude with road humps and angled slow points.

3. Buses and Emergency Vehicles

- There is conflict between accommodating the needs of buses and providing effective speed control. Often the streets that are suitable for buses encourage higher speeds (due to the width and connectivity). However, there are measures such as extended "bus" humps) that can be effectively applied along bus routes.
- Should aim to co-ordinate the location of traffic management devices with bus stops to minimise delays. Also, the higher the frequency of service, the fewer the number of devices or the gentler they should be.
- Roundabouts are generally acceptable to bus operators. Mountable sections are often required, especially when buses do right turns. Any mountable sections need to be reasonably flat (flatter than 1:20).
- Modifying the Watts profile humps to a height of 75mm (in lieu of 100mm) prevented damage to buses and kept vertical deflections in an acceptable range (0.6 to 0.7 g). Jarvis developed the bus humps (8m flat section, 100mm high and 1:20 ramps) which are generally acceptable for bus routes. However, need to consider the effect of 'low-floor' buses. These types of bus humps typically have poor speed reduction performance for standard motor vehicles.
- Single lane angled slow-points are generally unacceptable on bus routes, but two-lane angled slow points may be acceptable. Two-lane angled slow points may need a mountable section to slow cars. The Public Transport Corporation prefers parallel (not angled) two-lane slow points (but these have reduced effect in car speed reduction).
- In dealing with emergency vehicles there sometimes needs to be a trade-off between accident savings by speed reduction and increases in emergency service response times. However, Local Area Traffic Management measures should not be implemented if the emergency services object to the proposed measure.
- There is generally inadequate consultation between Councils and Bus Operators and Emergency Service Personnel.

4. Needs of Bicyclists

- Local Area Traffic Management treatments need not be incompatible with, nor hazardous for cycling. As traffic management in local streets seeks to reduce vehicle speed and volume it is in principle a pro-bicycle measure. However, it is essential that traffic management devices do not create potentially hazardous conditions for cyclists.

5. Noise Impacts

- There is minimal data available on the noise impacts of Local Area Traffic Management devices. Some data suggests that reductions in traffic speed and volume result in minor noise reductions. Traffic Engineers generally poorly understand the impact of Local Area Traffic Management devices on traffic noise.

In the climate of decreasing Council funding to local street traffic management devices (as is typically the case at many Councils), care needs to be taken to ensure that any lower cost devices still function safely and correctly, as well as making a positive contribution to the streetscape.

Brindle et al (1998) in their Draft Local Area Traffic Management report for AustRoads make the following relevant points about the design of traffic management devices:

> *"Much of the remedial local street activity by local councils has been successful and popular, but there are also many examples of poorly designed, unattractive treatments whose logic escapes the public. Adverse public reaction is not surprising. Apart from aesthetic and physical considerations, many of the current installations convey inconsistent and unclear traffic messages and excite criticism from drivers, pressure groups and even other professionals. The perceived shortcomings of much local area traffic management practice can be stated briefly:*
>
> - *Local area traffic management is often excessively 'device' orientated rather than 'problem and plan' orientated;*
> - *The engineering aspects of the treatments are often deficient; and*
> - *The peculiar nature of residential areas requires an understanding of the way people respond to changes imposed within their 'territory', and an openness of two-way communication about these changes (which are not always achieved)".*

3.5.3 Review of Specific Traffic Management Treatments in Banyule

A discussion of some specific traffic management treatments that have previously been installed within the City of Banyule is presented below:

1. Anti-Skid Transverse Panels

   This was an innovative treatment applied by the former City of Heidelberg to address crashes primarily occurring at low speed bends on the local street network. While only marginal reductions in speed were recorded at most sites (1 to 2 km/h), there appears to be a consistent reduction in crashes at most sites. There were some complaints about the noise impacts of the devices but there was general resident support for the panels.

2. Roundabouts and Road Humps

   These treatments have been applied extensively throughout the municipality to primarily address the speed and volume of through traffic on the local street network. Generally these devices have reduced the speed of traffic in the vicinity of the devices and reduced the number and severity of accidents at local road intersections. The installation of these devices is generally accepted by local residents who are experiencing significant speed and through traffic problems. However, there will be some residents who will experience increased noise levels.

3. Mid Block Slow Points

   These treatments have been applied in some local roads within the municipality. Generally they are effective at reducing traffic speed but driver behaviour is only

modified at the device installation point. These devices are more likely to become on-going maintenance problems as some drivers will knock and mount kerbs in an effort to pass through at a higher speed.

4. T Intersection Treatments

These treatments have also been applied in some local roads within the municipality. Generally they are effective at reducing traffic speed but again driver behaviour is only modified at the device installation point. These devices can create confusion for drivers as to the appropriate priority road and need to be well signed and clearly line marked.

3.5.4 Recommendations

Over recent years in Banyule there appears to have been a tendency to move away from proven speed control devices such as speed humps and raised pavement devices towards horizontal displacement devices such as T-intersection treatments and midblock slow points. While devices such as speed humps/raised pavements may have some negative impacts in terms of noise and driver annoyance, they have the benefits of proven speed control, relatively low installation cost, minimal impact to kerbside parking, and they provide some disincentive to through traffic.

Future traffic management treatments in Banyule should aim to provide safe and effective traffic control whilst providing a positive visual contribution to the streetscape. The type of treatments should be designed to the latest standards and incorporate the best practices available.

Based on a review of traffic management treatments used throughout Australia, it is recommended that the following treatments be adopted for regular use in the City of Banyule:

- Watts profile speed humps, raised pavement devices and sinusoidal speed humps. They should be generally installed in asphalt, possibly with a brick paved pattern, or in brick to match the general surroundings and/or other traffic management devices. They can be installed with or without associated kerb extensions or tree bays. Raised pavement devices can also be installed at intersections.
- Road narrowings by extending existing kerb lines at intersection and midblock locations, particularly along intermediate type roads, where the kerb extensions can protect parked vehicles as well as reducing the width of the travelling lane.
- Roundabouts for both intersection safety improvement and speed reduction. The roundabouts should be designed to provide adequate deflection to reduce entry speeds and should also aim to provide some opportunity for landscaping where feasible. Can be installed at both cross and T- intersections.
- Road narrowings by the use of tree bays within the road pavement, which can also be incorporated with traffic management devices (e.g. road humps).
- The creation of a central median along wide restricted traffic route roads, incorporating right turn lanes, pedestrian refuge areas and street tree planting.

- Anti-skid bars along the bends of roads that experience 'run-off the road' crashes and/or have adverse pavement crossfall. Their use should generally be limited to locations that have evidence of 'run off the road' collisions - usually due to poor skid resistance.
- Splitter islands to prevent corner cutting, reduce high entering speeds and improve pedestrian safety.
- Paved threshold treatments at the junction of arterial roads and local streets.

Based on the same review, the following treatments should be avoided, where possible:

- Angled slow points, as they have inferior speed reduction performance, can encourage aggressive driver behaviour and reduce on-street parking. These types of devices are often designed poorly and incorporate significant signage and linemarking. However, if well designed this device has some positive attributes and could be considered along certain streets (e.g. along bus routes, where conventional road humps are not permitted).
- Existing angled slow points can often be improved visually through appropriate landscaping and minimisation of existing signage. However, in cases where the devices have proven to be ineffective in speed control and are not supported by residents, they may need to be replaced by more proven speed reduction devices such as road humps (this occurred throughout the former City of Hawthorn).
- T-intersection deviation treatments (including reversal of intersection priority) as they have a high reliance on signage and can create driver confusion. Where devices have proven to be ineffective or have created a safety problem, they may need to be replaced by more proven devices such as raised intersection treatments.

The selection of the appropriate treatment will be determined by the following factors:

- The type and magnitude of the traffic 'problem'.
- The views of the residents in the street (and possibly from those in adjacent streets).
- The extent of available funds, including a possible contribution from residents.
- The presence of a bus route or a bicycle route.
- The geometry of the road network and intersections.
- The nature of the adjoining land uses.
- The views of bus operators and possibly emergency services.

The design of treatments should include the provision for pedestrians and cyclists where higher activity than normal is anticipated. For pedestrians, the provision of pedestrian refuges incorporated into treatments should be considered. For cyclists consideration should be given to allow riders to bypass devices or provision of lane widths wide enough to allow the safe passage of a cyclist and a vehicle, side by side.

Attention to design, materials and landscaping will be crucial in making the treatments aesthetically pleasing and gaining the support of the local community. The use of asphalt as the dominant material and the minimisation of unnecessary signs and linemarking, with greater reliance on the use of raised reflective pavement markers (RRPM's) and reflective bollards is recommended. The incorporation of appropriate vegetation (generally low groundcover planting) is also important.

It is also important to ensure that there is adequate street lighting in the vicinity of traffic management devices. Lighting should be to Code C1 standard in accordance with AS1158.1. The use of 70 watt high pressure sodium vapour lanterns is favoured for local street traffic management devices.

Refer to Appendix E for details of typical Local Area Traffic Management devices, as specified by Australian Standard AS1742.13-1991 Part 13, plus information related to treatment costs, applicability and effectiveness.

3.6 Traffic Management Systems

3.6.1 Overview

Andrew O'Brien and Associates Pty Ltd, in association with Dr Ray Brindle of ARRB Transport Research, conducted a study for the ACT City Services Group in 1997 aimed at developing an appropriate system for identifying and prioritising traffic management treatments in the ACT.

As part of this study a questionnaire survey was conducted of 144 Councils throughout Australia to determine information related to their level of local area traffic management involvement and what procedures had been developed to identify and rank candidate streets and areas for treatment.

In addition, ARRB Transport Research, with assistance from Andrew O'Brien and Associates Pty Ltd, has recently been involved in a review of Local Area Traffic Management Guidelines for AustRoads. This review involves an assessment of general Local Area Traffic Management performance, investigates the most effective and acceptable Local Area Traffic Management devices, examines the conflict between safe, comfortable and efficient bus operations and local street speed control, and considers the needs of emergency service vehicles and cyclists.

The outcomes of the above two studies are directly relevant to the Banyule Local Area Traffic Management Strategy.

3.6.2 The Traffic Warrant System

Background

The principal objective of the ACT study was to develop a procedure based on a set of warrants to objectively assess the need for, and priority of, traffic management measures which address amenity issues in established residential areas.

The term 'traffic warrant' is widely used throughout Australia and overseas to apply to levels of traffic or land use conditions at which intervention (either studies or actions) is 'triggered'. Warrants can be expressed in terms of thresholds for various criteria such as speeds, traffic volumes, crashes, 'offensive' traffic, and land uses.

The conclusions drawn from the surveys of Councils throughout Australia were:

- Most Councils that have or have had significant Local Area Traffic Management programs use warrant systems to assess the need for traffic management measures;
- The warrant systems used have many common elements and attributes;
- The basis of many of those systems can be used and applied in all areas using traffic management measures, whilst allowing flexibility for adaptation to allow for local conditions;
- There is reasonable consensus as to the level at which various criteria are considered to be 'a problem', but the warrants for implementing actions vary, often reflecting budget constraints.

After reviewing a wide range of warrant systems throughout Australia the criteria adopted in the warrants study for the ACT were:

- traffic speed — represented by the 85th percentile speed;
- traffic volumes — 24 hour two way or total volumes;
- crashes — including fatalities, injuries, and non-injuries as separate categories;
- activity generators — considered in terms of likely pedestrian and bicycle generation, especially by children, who potentially create high levels of interaction with vehicular traffic;
- heavy vehicles — expressed as a proportion of the total traffic volume.

An additional local factor included in the warrants was a discounting of scores in streets with wide verges. Noise was not used, as traffic volumes and heavy vehicle percentages provide a reasonable surrogate measure and noise data would generally be too costly to collect. A minimum specified level of community support for an 'agreed problem' was not included, as community support is more appropriate to acceptance of 'treatments' rather than 'problems'.

For the ACT study it was recommended that there be two forms of warrant and that either one of the warrants needs to be satisfied before there is 'an agreed problem':

- a single criterion warrant, and;
- a multi-criteria warrant.

The minimum requirements or cut-off scores for accepting a street or area as an agreed problem were proposed to be:

1. Single Criterion Warrant

   Where a single form of problem is critical, then a 'single criterion' warrant can be used, with the adopted minimum cut-off scores being:

   - 85%ile speeds - local streets >65 km/h, restricted traffic routes >70 km/h
   - traffic volume - local streets > 2500 vpd, restricted traffic routes > 4000 vpd

2. Multi-Criteria Warrant

   Problems can be either in individual streets or in an area. When the problem manifests in a complex way, then the multi-criteria warrant should be used. This warrant allocates points to various factors with a minimum cut-off score for an individual street and a slightly lower average cut off score for the worst ten streets in an area (or less if there is a lesser number of sensitive streets in the area).

Andrew O'Brien and Associates Pty Ltd subsequently adopted a similar warrants system for the City of Yarra, but adapted the type and magnitude of the criteria to reflect the substantially different road network and traffic demands experienced in an inner urban municipality in comparison to the conditions in the ACT. In general the City of Yarra experienced higher volumes, lower speeds, greater commercial vehicle intrusion, and higher proportions of through traffic and had shorter and narrower streets.

Similarly the effects of traffic conditions in Banyule would need to be reflected in any warrants based system developed for the City of Banyule.

Refer to Appendix F for a summary of Warrant Systems applied in various Councils throughout Australia.

A Warrants System for Banyule

It is recommended that Banyule City Council adopt an objective warrants based system to identify and rank traffic management treatments. This system should be based on the best attributes of systems developed elsewhere in Australia and be refined to reflect the particular traffic conditions within Banyule.

The following criteria are recommended for use in the proposed Banyule warrants:

- 85th percentile traffic speed;
- 24 hour traffic volume;
- Proportion of peak hour traffic volume;
- Proportion of heavy vehicles;
- Crash frequency - represented by fatalities, serious injury and casualties, reported accidents;
- Activity generators - on the basis of potential bicycle and pedestrian activity.

The above criteria have been selected on the basis of their relative ease of collection and analysis and for the reason that these factors directly determine the extent of the traffic problem.

Each criterion needs to be weighted, with higher weighting given to the more important criteria, typically traffic speed, volume, crashes and pedestrian activity. The weightings will also ensure that one particular factor (e.g. crashes) does not over-ride all other parameters.

The recommended warrants system also recognises that different street types and classifications should score differently for the same base data. E.g. 'Local Streets', including 'Local Crossing Street' should score points at lower thresholds for traffic speeds and volumes than 'Restricted Traffic Routes' or 'Intermediate' streets. For the Banyule local road network it is recommended that streets be classified into the categories of 'Local Street' including 'Local Crossing Street' and 'Intermediate', including 'Restricted Traffic Route'.

It would also be desirable to include both a single criterion and a multi-criteria warrant to allow streets that have a particular critical problem (e.g. an exceptionally high speed, whilst other parameters are within an acceptable range) to be addressed. E.g. for local streets an 85th percentile speed of 65 km/h or more should itself trigger a need for traffic management intervention.

The magnitude of the single-criterion warrants should be reviewed following initial data collection and a pilot program to assess the likely proportion of streets that may require treatment on the basis of one parameter. E.g. the speed threshold may need to be increased to 70 km/h if a significant proportion of local streets in Banyule have 85th percentile speeds in excess of 65 km/h.

Similarly the normal speed thresholds apply for a speed limit of 60 km/h. For streets with a speed limit of 70 km/h or greater the speed threshold values should be increased by the corresponding increase in speed limit.

Any warrants system developed for Banyule should ensure that data collection is kept to a minimum to direct most traffic management funds into treatments rather than into studies and extensive data collection and analysis. For these reasons 'traffic noise' and 'proportion of through traffic' should not be considered as criteria as they can be difficult and/or expensive to collect.

To support the recommended 'warrants' program, Council will need to conduct traffic tube counts to collect speed, volume and classification data for those streets and areas identified by the community, or known by Council officers, as having traffic problems. If the street is assessed as clearly not having a problem worthy of future treatment (due to its perceived low speed and/or volume due to the street geometry and connectivity), then a traffic count should not be pursued.

It is expected that Council will need to budget in the order of $6,000 for traffic counts (30 counts at $200 each) to support the program. The number of counts will be higher if it includes local areas, and may be reduced if recent traffic data is available in some of the 'problem' streets.

The following target values for weighting have been applied to each of the assessment criteria, bearing in mind that these weightings have been developed for the whole municipality:

- Speed : 20%
- Volume : 20%
- Peak hour volume : 15%
- Crashes : 20%
- Land use : 20%
- Heavy vehicles : 5%

Refer to Appendix G for details of the recommended 'Warrants System for Banyule'. It will be desirable for Council to refine the 'warrants' system to keep abreast of latest research and meet general community expectations.

Appendix G also includes Data Input details for the Warrants System. The input data for most of the above parameters into the 'warrants' spreadsheet is relatively straightforward. However, the assessment of crashes along a particular street needs to take account of the influence of the intersecting road in generating crashes at intersections, particularly for crashes at local street/arterial road intersections. For a T- junction this would equate to 33.3% (one of three legs) times the relative proportion of volume [e.g. 1,500 vpd (local street) / 15,000 vpd (arterial road)] times the crash frequency at the intersection.

Whilst the heavy vehicle parameter only has a small weighting it makes some allowance for the adverse impact of heavy vehicles. In areas that are subject to significant heavy vehicle intrusion it can have an influence in the overall rankings. Also this parameter is usually collected with normal speed and volume data and is readily input into the spreadsheet.

It is recommended that Banyule City Council adopt a warrant system to assess the need and priority for local area traffic management treatments.

It is also recommended that Banyule City Council obtain a copy of the ARRB Transport Research review of Local Area Traffic Management when the final report is released. The experiences of other Australian and New Zealand Local Government Authorities will be useful to assist in selecting appropriate Local Area Traffic Management treatments.

3.6.3 *Local Area Traffic Precincts*

Local Area Traffic Precincts are an important tool for the prioritisation and treatment of local area traffic problems. Local Area Traffic Precincts are generally bounded by arterial roads (major traffic routes) or natural or physical barriers (e.g. railway lines, rivers, etc.).

A total of 40 Local Area Traffic Precincts are recommended for the City of Banyule as shown in Figure 4. The size of these precincts varies substantially due to the irregular

layout of the arterial road network and the variations in the density and layout of the local street network. The former City of Heidelberg's 41 LATM precincts, where feasible, have been consolidated into larger areas that still have common characteristics and do not cross major physical boundaries.

Each of the 40 Local Area Traffic Precincts have been given a sequential number (starting at the top north/west corner of the municipality and moving towards the bottom south/east corner) as well as a precinct name. The name aims to reflect the general local suburb or dominant street or park in the area to make it easier for the local community to identify the area as part of any future traffic management studies. The suggested names for the Local Area Traffic Precincts are listed in Appendix H.

As discussed, from a funding and treatment point-of-view it would be undesirable to attempt to rank and ultimately treat all 40 Local Area Traffic Precincts. It would take at least 15 years to cover the Banyule municipality, cost a large sum of money (up to $200,000 per area) and require a high level of staff resources. It would also unduly delay the treatment of 'problem streets' within areas that have otherwise had few overall problems. Where possible 'problem streets' should be objectively ranked and treated in isolation.

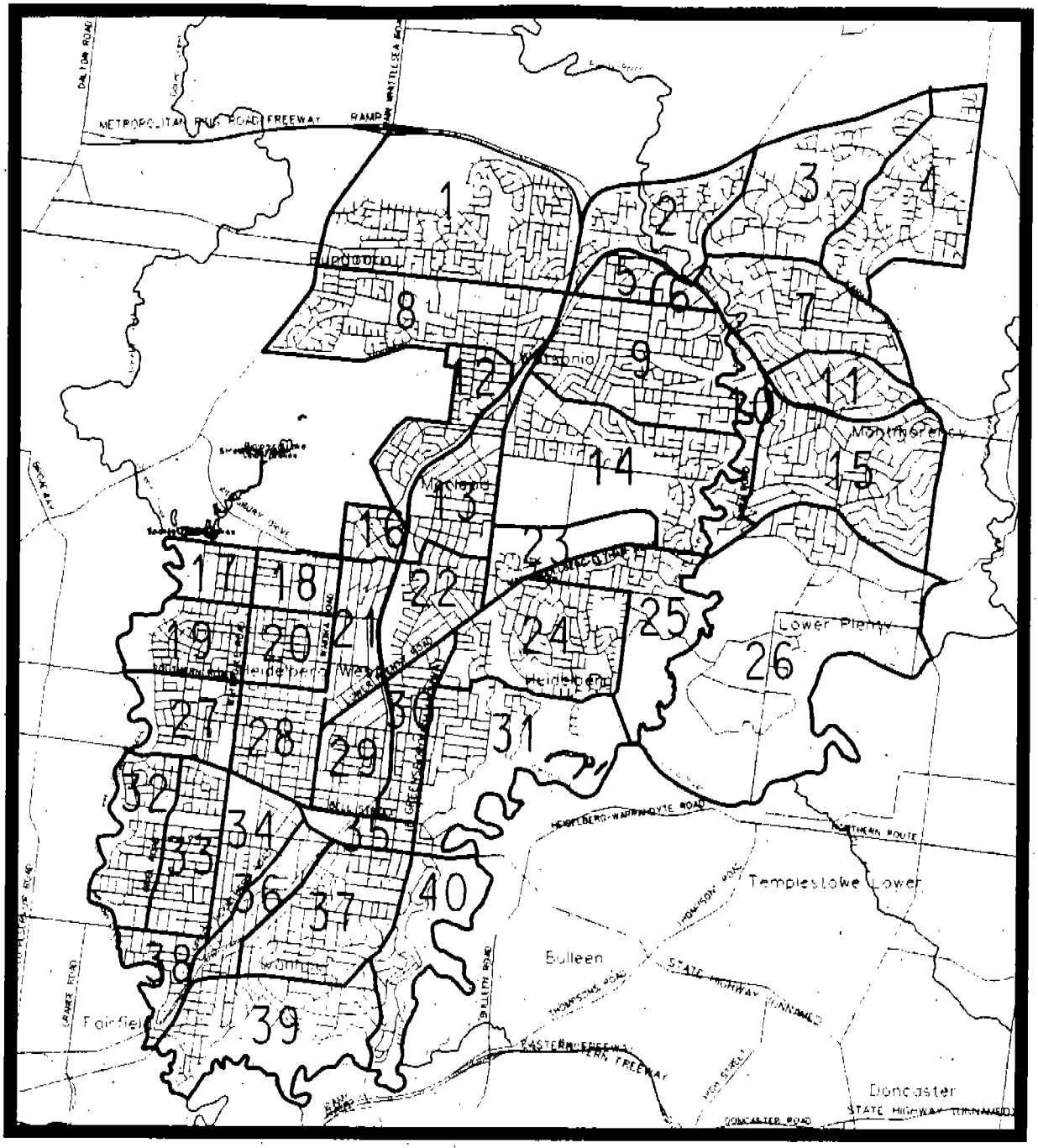


Figure 4 : Recommended Local Area Traffic Management Precincts

3.6.4 Assessment and Prioritisation

The 'warrants' system is used to objectively assess whether an area, street or specific location has a legitimate traffic problem and enables the prioritisation of future traffic management works. The recommended warrants based system for Banyule allows streets to be scored, either as part of a Local Area Traffic Precinct or individually. Appendix I provides a flow chart summary to guide Council's future assessment of traffic safety and amenity problems, whether they arise as a complaint from a member of the community or are a known existing traffic problem by Council officers. This flow chart provides a link between the three local street programs recommended:

- 'Local Area Traffic Management Studies';
- 'Individual Streets'; and
- 'Spot Safety'.

Irrespective of whether an area-wide or an individual street study is conducted it will be important to adopt a systematic planning process for the study. The strategy for the study needs to be focussed on the desired outcomes to be achieved from the scheme, and the effectiveness of the adopted actions towards that end. The process should also allow for input from planners and landscape architects. It is also important to monitor and review the impacts of the works to assess whether the project has been successful in meeting the objectives of the study. This information will also aid the design of future works.

Local Area Traffic Management Studies

A standard process should be adopted for the development, implementation and review of all future Local Area Traffic Management studies conducted in Banyule. Appendix J summarises appropriate procedures for conducting Local Area Traffic Management studies. This system is based on processes that have been successfully developed by the Boroondara City Council. It is recommended that the Banyule City Council develop and adopt a 'Charter' for the conduct of any future Local Area Traffic Management studies, on the basis of a previous successful charter developed by the Greater Dandenong City Council. Refer to Appendix K for details of a recommended 'Charter' for Banyule City Council.

For an area-wide Local Area Traffic Management study, traffic speed, volume and classification data will typically be required for up to 10 representative streets in the area. Candidate areas (as determined by Council officers on the basis of previous traffic problems and/or resident complaints) would be scored against one another. Due to the high costs of conducting effective such studies, including the data collection component, Council should attempt to minimise the number of area-wide studies. Instead the focus should be on individual street studies.

Detailed Local Area Traffic Management studies are relatively time consuming and resource intensive to conduct, mainly due to the extent of community consultation required to develop successful schemes. The need to conduct area wide traffic management studies should be assessed after an objective assessment has been conducted of local street problems to identify whether problems are widespread or

contained to specific streets. If the latter situation is the case it should be possible to focus on individual streets, as long as problems are not diverted to adjacent streets.

Individual Street Studies

Appendix L summarises appropriate procedures for conducting individual street projects. The system is also based on processes successfully developed by Boroondara City Council. In the areas of Banyule with an irregular local street network (as distinct from the traditional grid network) it is expected that traffic problems will generally be in the form of 'problem streets' rather than 'problem areas'. Typically the 'problem streets' will be along intermediate roads and higher order local streets, which often generate higher speeds and volumes due to their length and geometry. The identification of 'problem' streets should generally be based on those streets that have been identified by the community as exhibiting traffic problems, typically in terms of excessive traffic speed and/or volume or traffic safety problems.

For individual streets Council would arrange for suitable traffic data (volumes, speeds and classifications) to be collected along those individual streets that have previously been identified by the community as having unacceptable traffic conditions. These streets would then be ranked and assessed as to whether they can be treated in isolation.

Due to funding constraints and the likelihood of a lack of any significant traffic problems on a high proportion of the total local street network (due to the short length and/or discontinuous nature of many local streets) it will be desirable to treat problem streets in isolation where feasible. The feasibility of conducting individual street works will be dependent on the likelihood of any transfer of traffic to adjacent untreated streets. In some cases two or three parallel streets may need to be treated in tandem to avoid a redistribution of any problems.

The implementation of traffic management works on an individual street basis ensures that the problem streets can be effectively treated and avoids the need for the costly area-wide application of traffic management treatments. Notwithstanding this, in the more traditional grid networks of Banyule, where the treatment of one street is likely to shift the traffic demand to the next parallel street, it is more likely that an area-wide study will need to be carried out.

A Spot Safety Program

It is recommended that the Banyule City Council develop a 'Spot Safety Program' to treat hazardous road locations. The proposed 'Spot Safety Program' focuses on the objective assessment of hazardous arterial and local road intersections and mid-block locations on the basis of identified crash history.

The proposed 'Spot Safety Program' places greatest emphasis on the identification, prioritisation and treatment of intersection and mid-block locations on the non-arterial road network, which are generally under the responsibility of Council. The analysis identifies crash trends, possible contributing factors and potential corrective treatments.

It is recommended that Council conduct a crash analysis of the Banyule municipality on an annual basis using CRASHSTATS. (CRASHSTATS is a road crash data base developed by VicRoads, which contains all Victorian Road Crash Statistics from 1991 onwards, where at least one person was injured. It readily allows users to specify criteria to search for particular crash characteristics to provide for an analysis and review of crashes).

Remedial works should focus on treatable local road intersections with high crash rates as cost-effective solutions can often be developed for these sites.

It would also be desirable for the Banyule City Council to develop a complementary pro-active safety component to address sites that demonstrate crash potential due to site deficiencies. The pro-active component of the program should focus on sites that exhibit crash potential due to deficiencies in design, restricted visibility, etc., and/or evidence of frequent minor (property) damage crashes. These sites will generally be already known by Council officers through direct observation or by complaints from the community.

The priority for the pro-active treatment of deficient sites will be subjectively based due to the limited number of casualty crashes. This assessment will be based on the extent of community complaints regarding the safety of the location, the level of damage to existing signs, kerbs, fences, etc, evidence of frequent property damage crashes or near misses and the assessment of the inherent danger of the site by Council's Traffic Engineers.

Appendix M summarises a desirable process developed on the basis of a similar methodology established by the Boroondara City Council for the identification and treatment of 'Spot Safety' problems.

4. FUNDING SOURCES FOR LOCAL AREA TRAFFIC MANAGEMENT

The funding of traffic management works can be sourced from VicRoads, Council and the community. VicRoads generally only fund works on the declared main road network, with the exception of sites that meet accident Blackspot criteria (5 casualty crashes in 5 years) or sites that provide significant traffic capacity enhancements.

The Federal Blackspot Program also requires a minimum of 5 casualty crashes in 5 years and a benefit/cost ratio in excess of 5. Typically most of these sites will occur on the arterial and intermediate road network. To increase the number of sites that may be funded under this program Council can contribute to the cost of countermeasures to increase their benefit/cost ratio to in excess of 5. (E.g. a $30,000 Council contribution to a $100,000 roundabout or set of traffic signals may be the difference between the project being implemented or being left unfunded for years to come).

The bulk of traffic management funding will be derived directly from Council as part of the Five Year New Works and Services Program. Future funding for local street traffic management works should be based on the objective systems developed as part of this study for Local Area Traffic Management, Individual Street and Spot Safety projects, with highest priority given to safety related improvements.

Council officers typically determine the desired New Works and Services Program after considering a range of economic and social (community) factors and then seek Council endorsement of the recommended program. Ultimately the level of Council funding will be dependent on political considerations and desirably should be aimed at implementing works to address the highest ranking candidate sites based on a minimum warrants score.

For sites where it is determined that there is a traffic problem, but it is not of sufficient magnitude to justify funding in the short term, Council could allow the community to contribute funding to expedite installation of the works. Flexibility should be provided to allow community groups, such as schools or kindergartens, to contribute on an informal allocation basis.

Also for locations where the warrants for traffic management intervention are not met, or where pure streetscaping type work is sought, the local community could contribute to the full costs of the works (possibly including study resource costs). It would be essential that these latter works did not delay progress on the implementation of the high priority Council funded works.

Local community groups could also be given the option of funding the increased cost of higher quality traffic management devices (e.g. those using superior paving materials, incorporating significant drainage improvements, substantial landscaping, etc).

Contributions for traffic management works should also be sought from private developers in cases where proposed developments will generate traffic impacts in adjacent streets. Private sponsorship could also be sought to fund Local Area Traffic Management or Individual Street works.

5. SUMMARY OF RECOMMENDATIONS

The recommendations developed as part of the Banyule Local Area Traffic Management Strategy are summarised below:

Key Recommendations:

Arterial Road Network (2.1.1)

1. Specific arterial roads should be upgraded including:
   - Capacity and pedestrian crossing improvements to Bolton Street in conjunction with the Shire of Nillumbik;
   - Capacity improvements for Sherbourne Road, Karingal Drive and Para Road;
   - Major roadwork proposals as identified in ten North Eastern Metropolitan Regional Roads Strategy;
   - Investigation of the extension of clearways on Lower Heidelberg Road (between Burke Road North and Burgundy Street), Rosanna Road, Bell Street, Jika Street-Dora Street, Lower Plenty Road (east of Rosanna Road) , Greensborough Highway, Grimshaw Street, Main Road and Bolton Street;
2. Arterial road improvements should focus on:
   - Improving intersection capacity and safety;
   - Creating additional midblock capacity on constrained routes; and
   - Enhancing on-road traffic enhancement.

Casualty Crashes (2.2)

3. Council and VicRoads should continue to conduct a review of all arterial road/arterial road intersections to identify possible low cost improvements.
4. Specific works should be considered in relation to the following arterial road/non-arterial road intersections:
   - Bell Street/Miller Street;
   - Rosanna Road/Darebin Street;
   - Bell Street/Liberty Parade
   - Upper Heidelberg Road/Thames Street/Darebin Street
5. Further investigation should take place into the following non-arterial road intersection:
   - McEwan Road/Outhwaite Road; and
6. Council officers should liaise directly with VicRoads to identify suitable treatments to the arterial links with the highest crash frequencies.
7. Council should focus on implementing effective countermeasures to address the non-arterial intersections and links with the highest crash frequency where feasible solutions can be developed.

Functional Road Hierarchy (2.3.9)

8. Council should adopt a revised functional road hierarchy which incorporates the following road classifications:

   - Freeways;
   - Primary Arterials;
   - Secondary Arterials;
   - Restricted Traffic Routes;
   - Local Crossing Roads; and
   - Local Streets.

Education Programs (3.2.2)

9. Council approach VicRoads and obtain information on what is required to set up a comprehensive education program within Banyule.

10. Council pursue the completion of a local Road Safety Strategy for Banyule.

Travel Demand Management (3.3.3)

11. Consider the introduction of measures to reduce staff vehicle travel as a 'pilot' program to a wider community based program, including car-pooling, public transport passes, subsidised bicycle purchase, variable work hours and telecommuting.

12. Facilitate higher density housing close to public transport, commercial and community facilities in accordance with the Banyule Municipal Strategic Statement.

13. Investigate the introduction of painted bicycle lanes or shared parking/bicycle lanes along the secondary arterial and intermediate road network (where feasible).

14. Closely monitor the success, or otherwise, of Port Phillip Council's initiatives in introducing 'Flexicar' and 'Travel Blending' initiatives, with the aim of introducing similar initiatives at Banyule in the future.

15. Lobby the State Government to ensure that public transport facilities and services are integrated with expanding residential development in the areas to the north and east of Banyule.

16. Continue to encourage public transport usage within Banyule through initiatives such as public transport promotion campaigns, upgrading waiting facilities for passengers, improved co-ordination, frequency and coverage of bus services, real time information at major public transport stops and the continued upgrading of transport modal interchanges.

Reduced Speed Limits on Local Streets (3.4.2)

17. Lobby the State Government to make the necessary legislation changes as soon as possible to allow for the blanket 50 km/h speed limit in all local streets.

Intelligent Transport Systems (3.4.5)

18. Keep abreast of potential 'Intelligent Transport Systems' that may be applicable for future traffic management use of Banyule City Council.

Streetscape Improvements (3.5.1)

19. Narrower carriageways and potentially different pavement materials be considered for all new residential subdivisions.

20. Where appropriate, existing streets be narrowed by the extension of kerbs or the linemarking of shared parking/bicycle lanes.

Traffic Management Devices (3.5.4)

21. The following traffic management treatments should be adopted for regular use within the City of Banyule:

    - Watts profile speed humps, raised pavement devices and sinusoidal road humps.
    - Road narrowings by extending existing kerb lines at intersection and midblock locations, particularly along intermediate type roads.
    - Roundabouts for both intersection safety improvement and speed reduction.
    - Tree bays within the road pavement.
    - Central medians along wide intermediate roads.
    - Anti-skid bars along the bends of hazardous roads.
    - Splitter islands at intersections.
    - Paved threshold treatments at the junction of arterial roads and local streets.

22. The following treatments in Banyule should be avoided where possible:

    - Angled slow points.
    - T-intersection deviation and reversal of priority treatments.

23. Greater use be made of raised reflective pavement markers (RRPM's), reflective bollards and adequate street lighting in the vicinity of traffic management devices. It is also important to minimise unnecessary signs and linemarking.

24. The particular needs for cyclists and pedestrians should be considered before the installation of any traffic management treatments.

Traffic Warrant System (3.6.2)

25. Council should adopt an objective warrants based system to identify and rank those local streets which are experiencing traffic problems. The assessment criteria should comprise the 85th percentile traffic speed, 24 hour traffic volume, proportion of peak hour traffic, proportion of heavy vehicles, crash frequency and activity generators.

26. The warrant system parameters should be progressively refined to reflect the particular traffic conditions within Banyule and to meet the needs and aspirations of the local community.

27. Council should arrange for suitable traffic data (volumes, speeds and classifications) to be collected along streets that have previously been identified by the community as having unacceptable traffic conditions. These streets should then be ranked and assessed as to whether they can be treated in isolation. Where possible Council should avoid the need to conduct area-wide Local Area Traffic Management studies as they are resource and cost intensive.

Local Area Traffic Precincts (3.6.3)

28. A total of 40 separate Local Traffic precincts should be adopted for the City of Banyule. However Council should not attempt to rank and ultimately treat all Local Traffic precincts, as many have been satisfactorily treated and it would be costly in terms of staff resources to complete assessments of all areas. It would also unduly delay the treatment of individual 'problem streets' in areas that have few overall problems

Assessment and Prioritisation (3.6.4)

29. Adopt the recommended process for the development, implementation and review of all future Local Area Traffic Management studies in the Banyule City Council. Similarly the recommended process for treating individual streets where adverse traffic impacts are unlikely to be transferred to adjacent streets should also be adopted.

30. Adopt the recommended 'Charter' for the conduct of any future Local Area Traffic Management studies.

Spot Safety Program (3.6.4)

31. Adopt the proposed 'Spot Safety Program' to treat hazardous road locations. The 'Spot Safety Program' focuses on the objective assessment of hazardous arterial and local road intersections and mid-block locations on the basis of identified crash history.

32. Continue to conduct a crash analysis of the Banyule municipality on an annual basis using VicRoads CRASHSTATS data.

33. Develop a complementary pro-active safety component to address sites that demonstrate crash potential due to site deficiencies.

Funding Sources (4.)

34. Consideration should be given to contributing to the cost of desired countermeasures on the declared road network to increase their benefit/cost ratio to gain VicRoads funding in the short term.

35. Consider allowing the community to contribute funding on a 50:50 basis to expedite the installation of desired traffic management works. Also for locations where the warrants for traffic management intervention are not met, or where pure streetscaping type work is sought, the local community could contribute to the full costs of the works.

36. Consider giving the local community the option of funding the increased cost of higher quality traffic management devices (e.g. those using superior paving materials, incorporating significant drainage improvements, substantial landscaping, etc).

37. Consider allowing private sponsorship of Local Area Traffic Management and Individual Street works.

38. Continue to seek contributions for traffic management works from private developers in cases where proposed developments will generate significant traffic impacts in adjacent streets.

APPENDIX A

BANYULE CRASH ANALYSIS

"CRASHSTATS" Data for the Seven Year Period 1991 to 1997 Inclusive

Intersection Type	Location	No. of Casualty Crashes	Dominant Accident Types DCA's
Arterial/Arterial Intersections (sites with >9 casualty accidents)	Banksia St / Lower Heidelberg Rd	32	121(14), 130(9), 110(4), 131(3)
	Greensborough H'way / Grimshaw St	26	121(13), 131(7), 130(6)
	Bell St / Oriel Rd (North and South)	17	130(5), 102(4)
	Bell St / Upper Heidelberg Rd / Burgundy St	14	121(5), 130(4), 110(3)
	Bell St / Waterdale Rd	14	110(4), 121(3), 130(3)
	Main Rd / Para Rd / The Circuit	13	110(10)
	Main Rd / Para Rd	13	121(6)
	Rosanna Rd / Lower Plenty Rd / Brassey Ave	11	113(3)
	Southern Rd / Waterdale Rd	11	110(4), 121(3)
	Lower Heidelberg Rd / Burgundy St / Rosanna Rd	11	130(4), 121(3)
	Main St /St Helena Rd / Diamond Creek Rd	10	
	St Helena Rd / Karingal Dr	10	113(5), 121(3)
Arterial/Non-Arterial Intersections (sites with >9 casualty accidents)	Grimshaw St / Watsonia Rd / Macorna St	17	121(11)
	Banksia St / Dora St / The Boulevard	15	130(5), 131(3)
	Southern Rd / Liberty Pde	15	121(8)
	Bell St / Miller St	15	132(5), 121(4), 130(3)
	Walora Rd / Kingsbury Dr / Orr St	14	121(8)
	Bell-Banksia Link / Banksia St / Studley Rd	14	121(6), 130(3)
	Burke Rd Nth / The Boulevard	14	113(5), 120(3)
	Rosanna Rd / Darebin St	13	132(6), 121(4)
	Sherbourne Rd / Calrossie Ave	12	113(11)
	Lower Plenty Rd / Silk St / Cantala Ave	12	130(5), 121(3)
	Upper Heidelburg Rd / Banksia St	12	110(4), 121(4)
	Bell St / Liberty Pde	12	110(4), 131(3)
	Waterdale Rd / Altona St	10	100(3), 110(3)
	Bell St / Edwin St	10	110(3)
	Upper Heidelburg Rd / Thames St / Darebin St	10	113(3), 132(3)
	Burgundy St / Cape St	10	130(3)

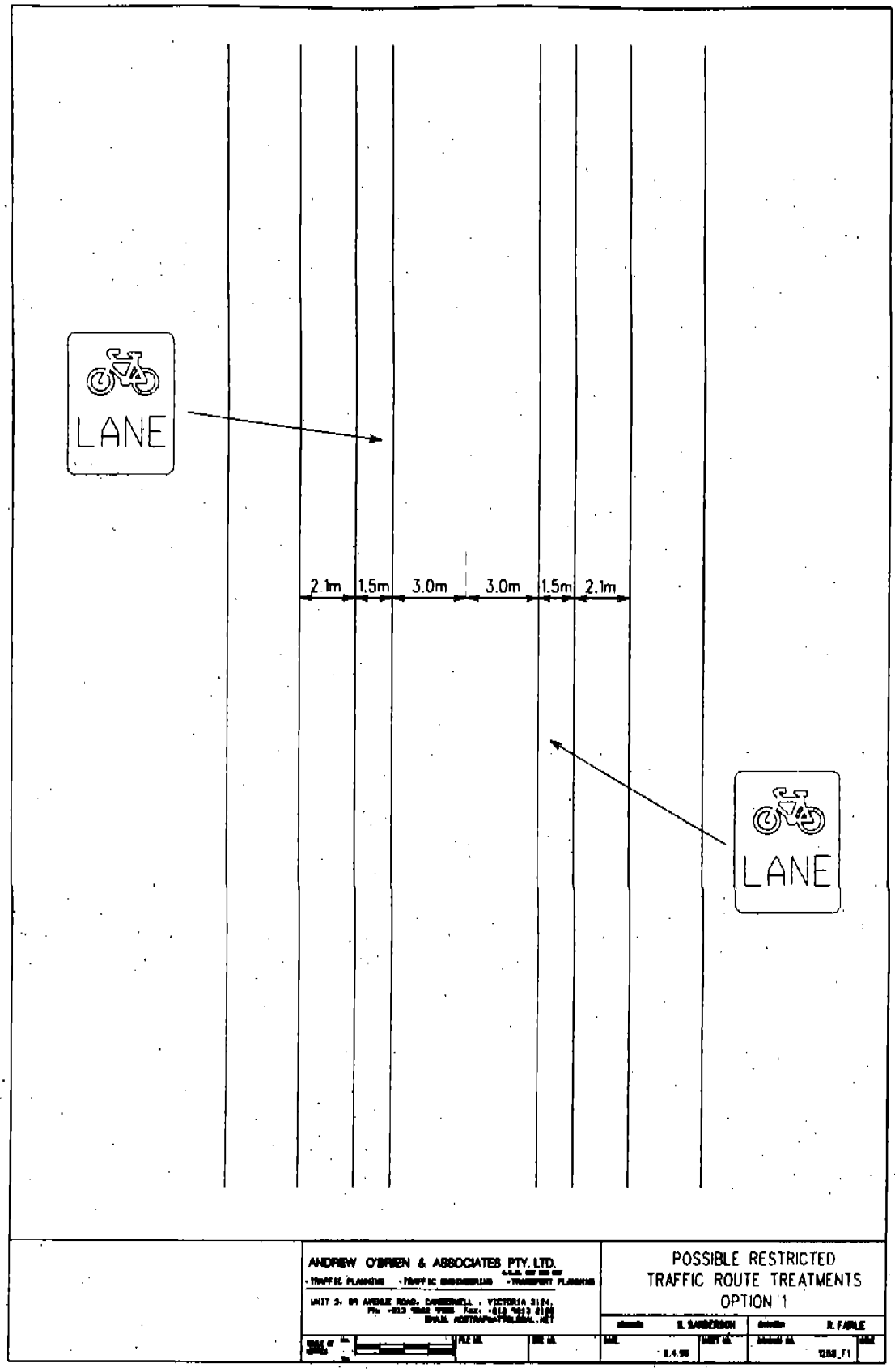
Intersection Type	Location	No. of Casualty Crashes	Dominant Accident Types DCA's
Non-Arterial/Non-Arterial Intersections (sites with >3 casualty accidents)	McEwan Rd / Outhwaite Rd	6	110(5)
	Beverley Rd / Louise St	5	120(3)
	Brown St / Hawdon St	4	110(4)
	Lillimur Ave / Mologa Rd	4	110(3)
	Wungan St / McNamara St / Cherry St	4	
	McDowell / Vermont Pde	4	110(3)
	Darebin St / Martin St	4	110(4)

Road Type	Location	Total no. of Casualty Accident	Segment	No. of Casualty Accident	Main Accident Types DCA's
Arterial Links (sites with >9 casualty accidents)	Grimshaw St	83	b/n Bent St & Oxford Dr	6	
			b/n Doidge St & Plenty Rd	5	
			b/n Adeline St & McDowell St	9	130(3), 132(3)
			b/n Horonda St & The Circuit	6	130(5)
			b/n Watsonia Rd & Dunn St	6	130(3)
			b/n Witney Way & The Concord	6	
	Bell St	61	b/n Edwin St & Miller St	9	
			b/n Gotha St & Eden St	5	121(3)
			b/n Orlel Rd & Plunkett St	7	130(4)
			b/n Waterdale Road & Coomalie Rd	6	130(4)
			b/n Waterdale Rd & Eden St	6	
	Banksia St	43	b/n Hawdon St & Cape St	6	130(4)
			b/n Cumberland St & Lower H'burg Rd	7	130(6)
			b/n Lower H'burg Road & The Boulevard	5	130(5)
	Lower Plenty Rd	39	b/n Eugene St & Yallambie Rd	5	
			b/n Grand View Gve & Beetham Pde	5	
			b/n Silk St & Greensborough Rd	8	130(5)
	Main Rd	39	b/n Grimshaw St & Halles St E	5	
			b/n Prosperity Rd & Kett St	6	171(4)
			b/n unnamed road & Para Rd	5	
	Rosanna Rd	36	b/n Brown Rd & Darebin St	7	
			b/n Burgandy St & Darebin St	5	130(4)
			b/n Lower Plenty Rd & Jones Cr	6	120(4)
	Plenty Rd	33	b/n Greenhill Rd & McLeans Rd	11	131(3)
			b/n Grimshaw St & Morwell Ave	9	130(3)
			b/n Oxley Ave & Greenhill Rd	5	130(3)
			b/n Settlement Road & Grimshaw St	6	
	Upp H'burg Rd	31	b/n Noel St & Ivanhoe Pde	6	
	Burke Rd	30	b/n The Boulevard & McArthur Road	5	
			b/n The Boulevard & Eastern Fwy	10	130(4), 182(2), 183(2)
			b/n Longstaff St & Quondolan Cl	5	
	Burgandy St	21	b/n Cape & Rosanna Rd	5	
	G'borough Rd		b/n Lower Plenty Rd & Finlayson St	5	130(4)
	G'borough B'pass	19	b/n Diamond Creek Rd & Grimshaw St	5	
			b/n Diamond Creek Rd & Metropolitan Rd	6	
	Waterdale Rd	18	b/n Ramu Pde & Crecy Ct	5	
	Para Rd	20			

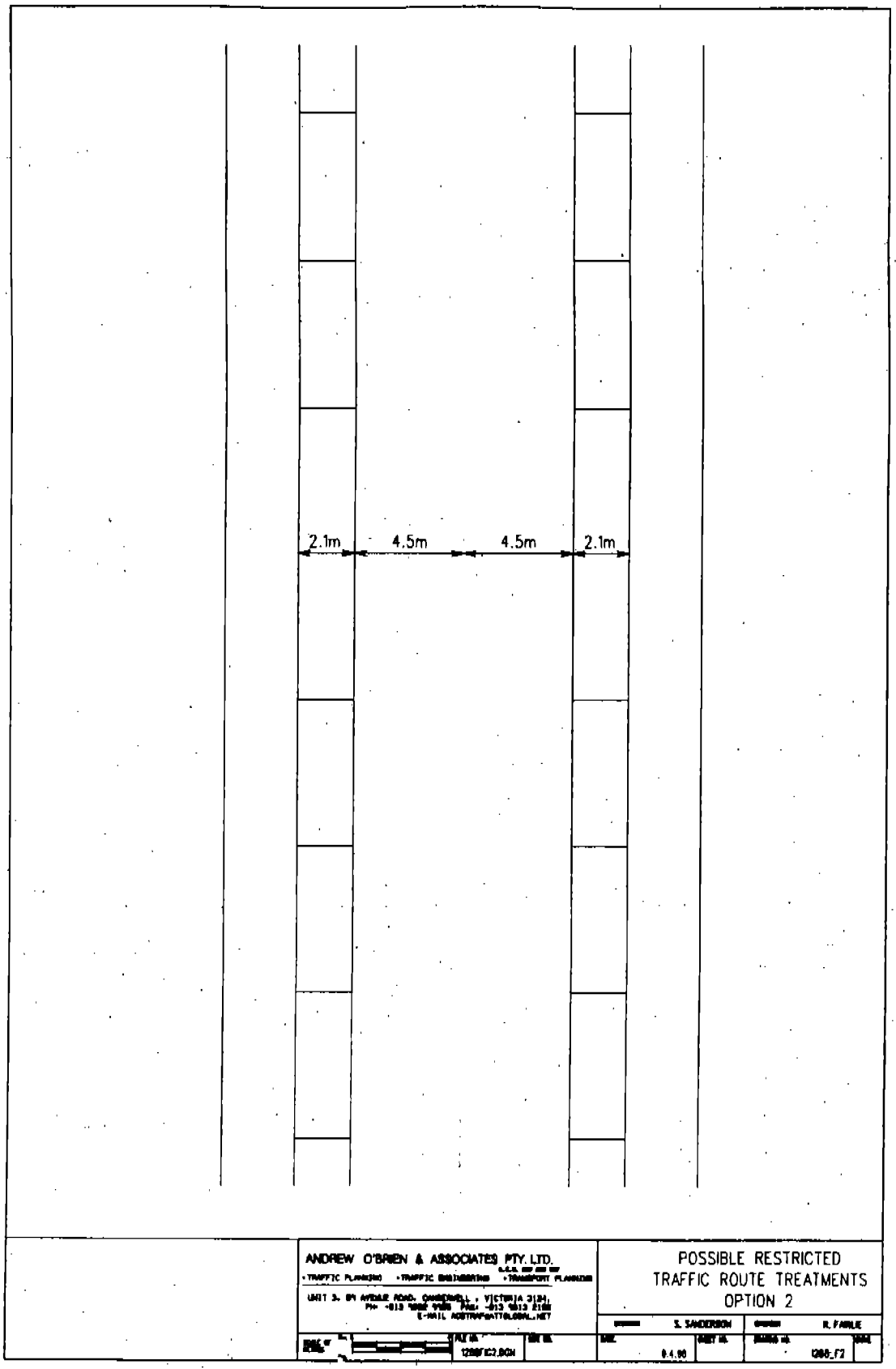
Road Type	Location	Total no. of Casualty Accident	Segment	No. of Casualty Accident	Main Accident Types DCA's
Non-Arterial Links (sites with >4 casualty accidents)	Watsonia Rd	13	B/n Tennyson St & Ibbottson St	4	
	Banyule Rd	12	B/n Beverley Road & Sussex Pl	4	
	Beverley Rd	11	B/n Burgandy St & Louise St	5	120(3)
			B/n Louise St & Buckingham Dr	3	
	Oriel Rd	9	B/n Bell St & Tobruk Ave	5	
	Henry St	6	B/n Nell St & Duncan Ave	3	
	The Boulevard	6			
	Dougharty Rd	5			
	Mountain View Rd	5			
	Yallambie Rd	5			
	Banksia St	4			
	Carwarp St	4	B/n Leith St & Erskine Rd	3	
	Elder St	4			
	Malahang Pde	4	B/n Wewak Pde & Coral St	3	
	Studley Rd	4			

APPENDIX B

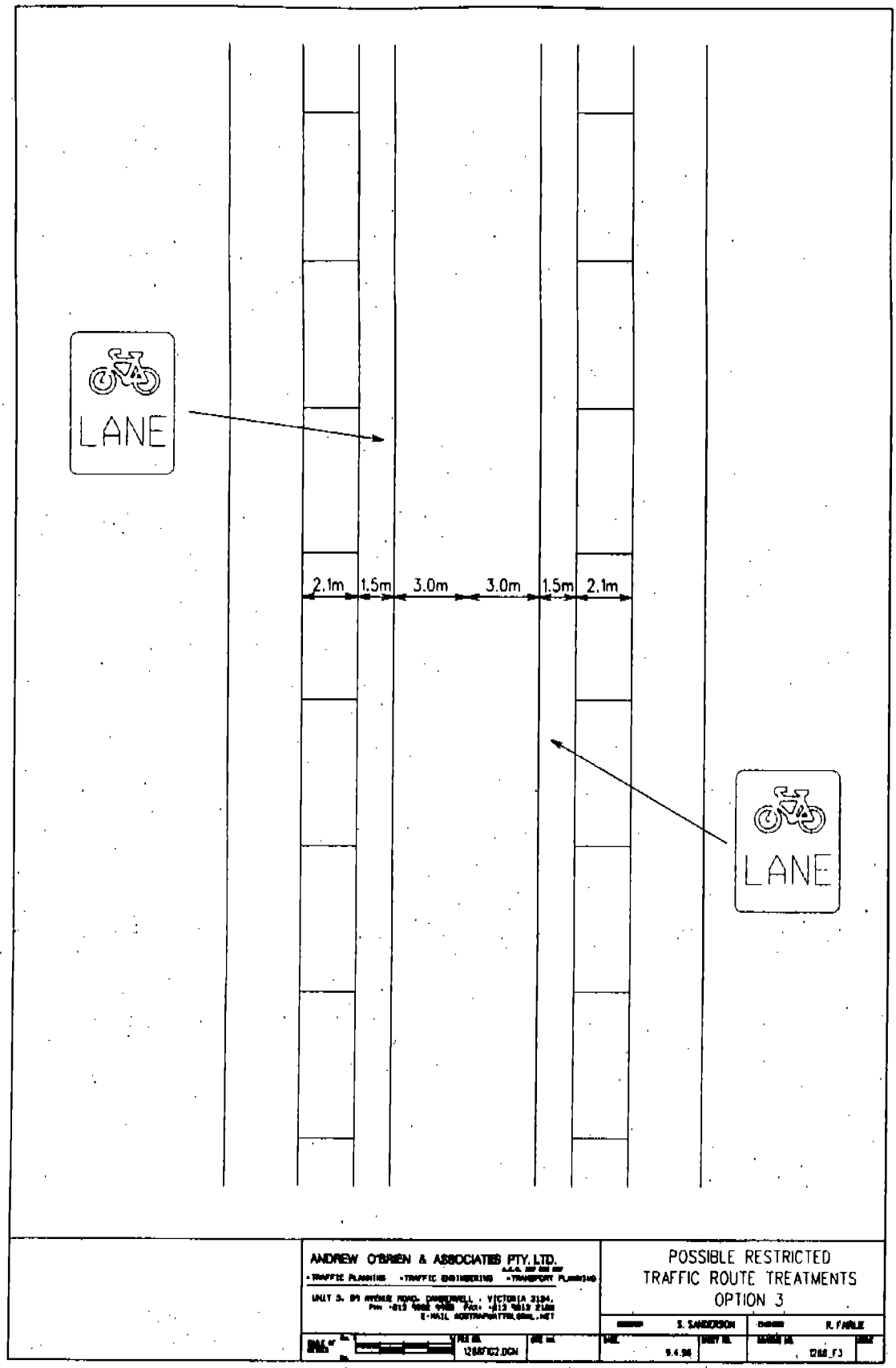
TREATMENT OPTIONS FOR RESTRICTED TRAFFIC ROUTES



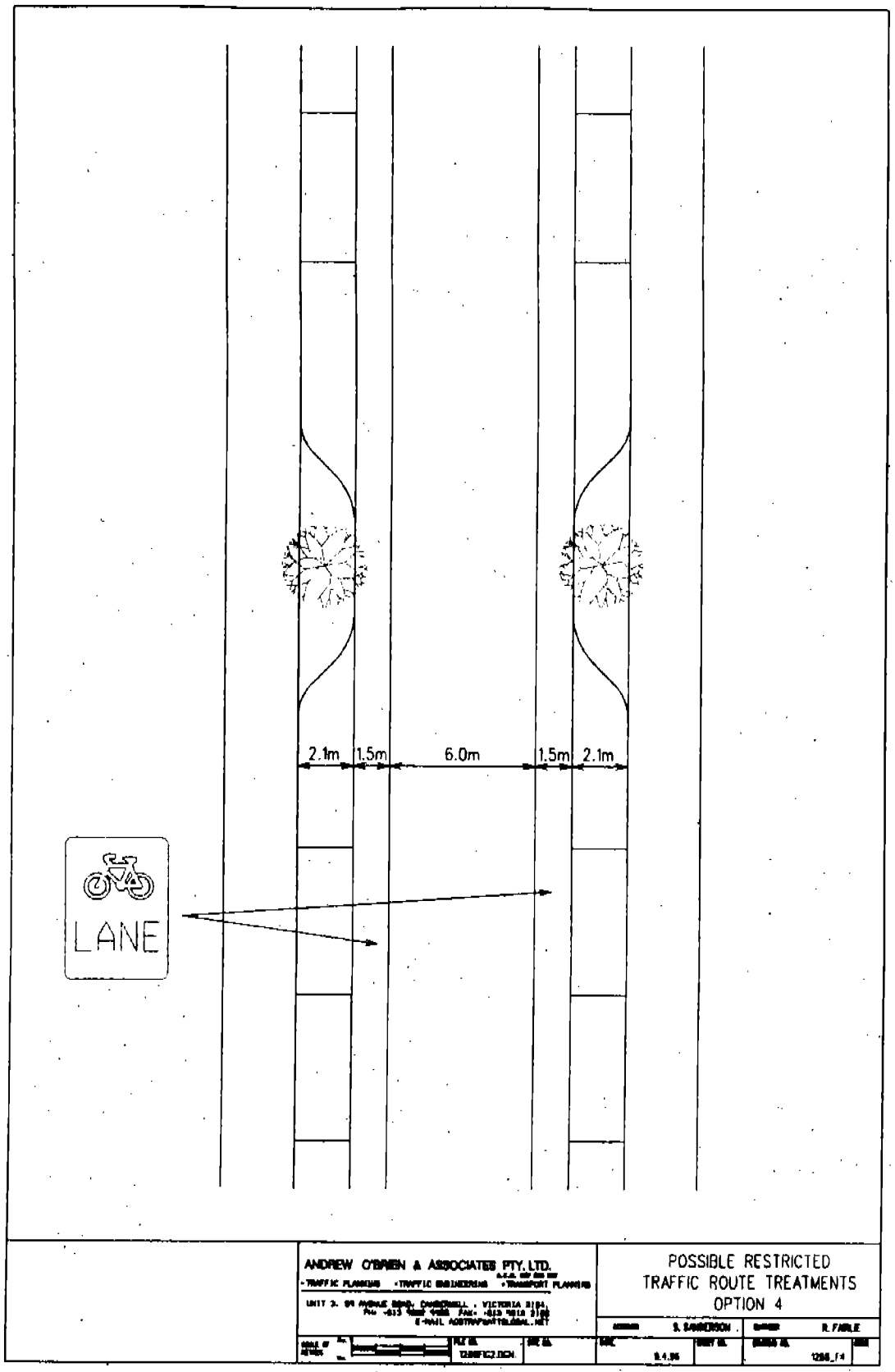
Restricted Traffic Route Treatment Option 1



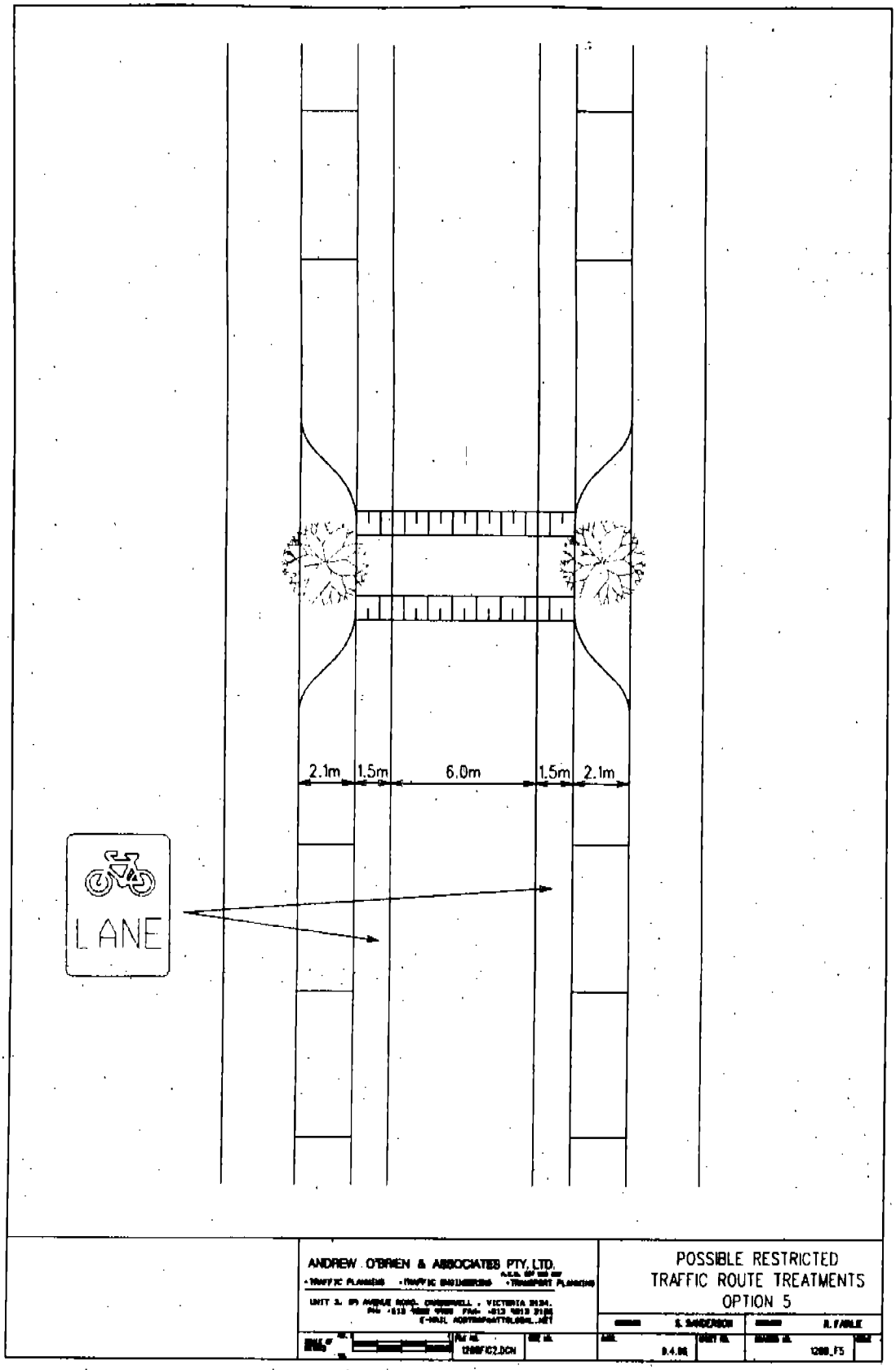
Restricted Traffic Route Treatment Option 2



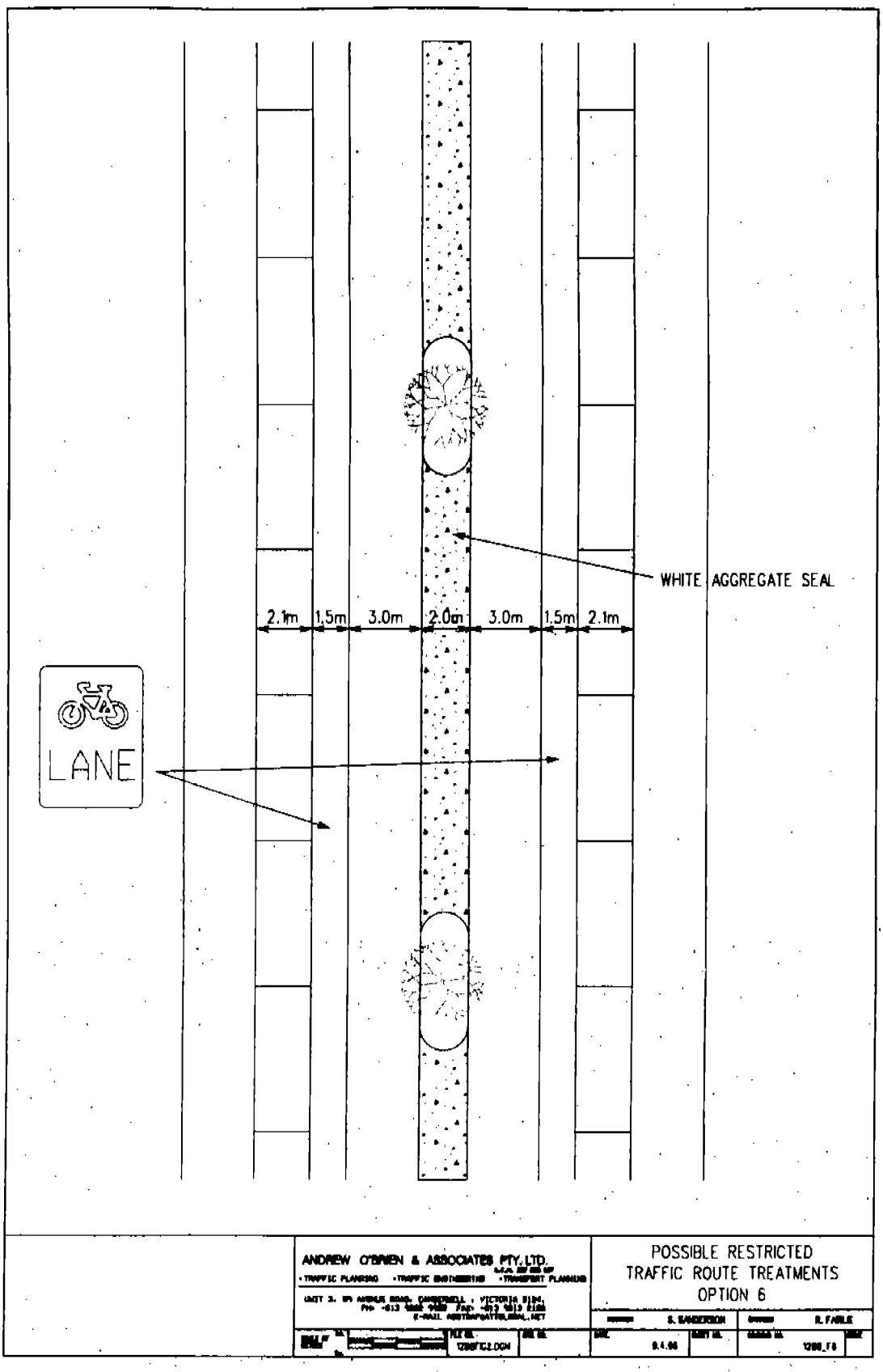
Restricted Traffic Route Treatment Option 3



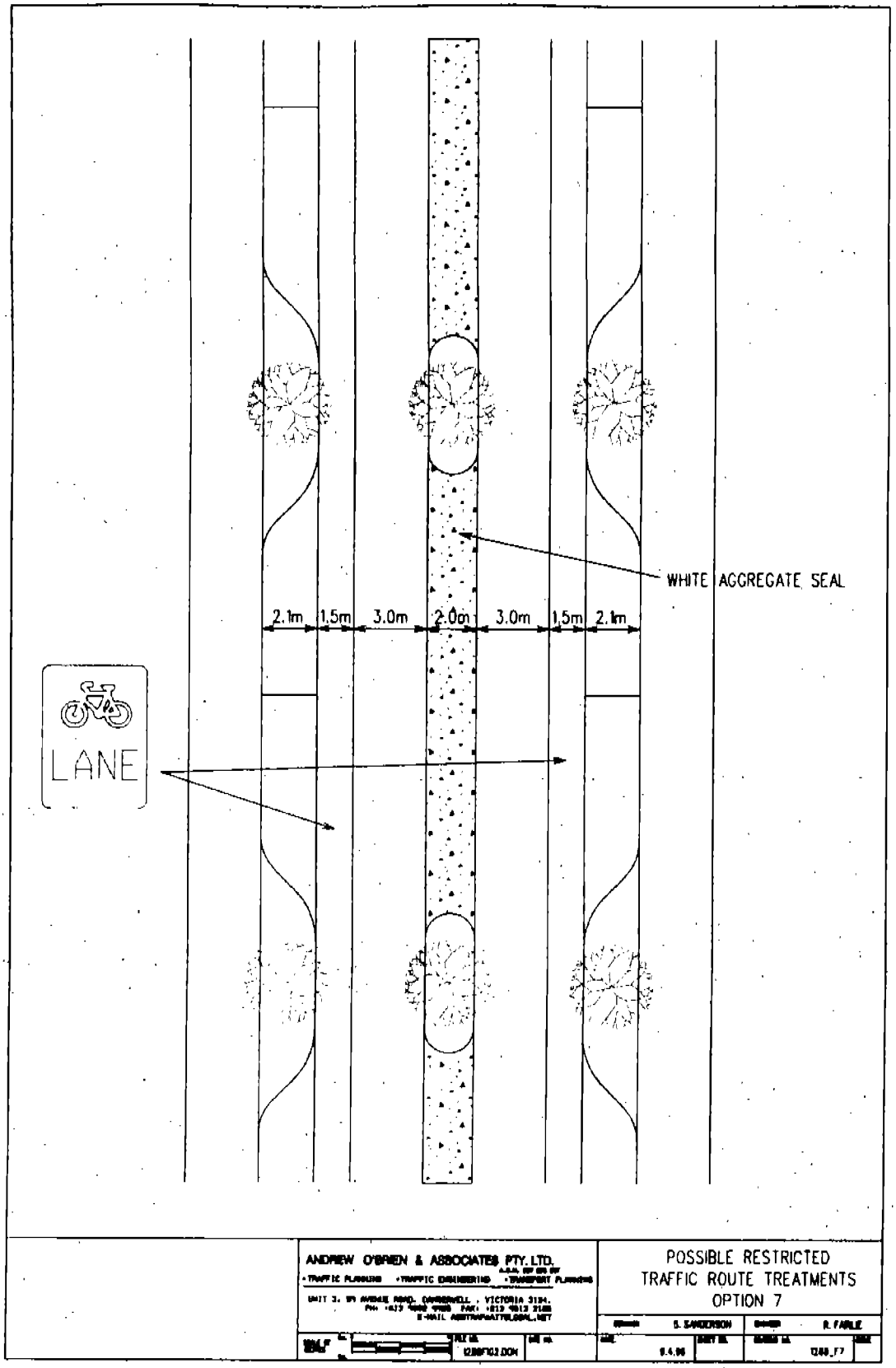
Restricted Traffic Route Treatment Option 4



Restricted Traffic Route Treatment Option 5



Restricted Traffic Route Treatment Option 6



Restricted Traffic Route Treatment Option 7

APPENDIX C

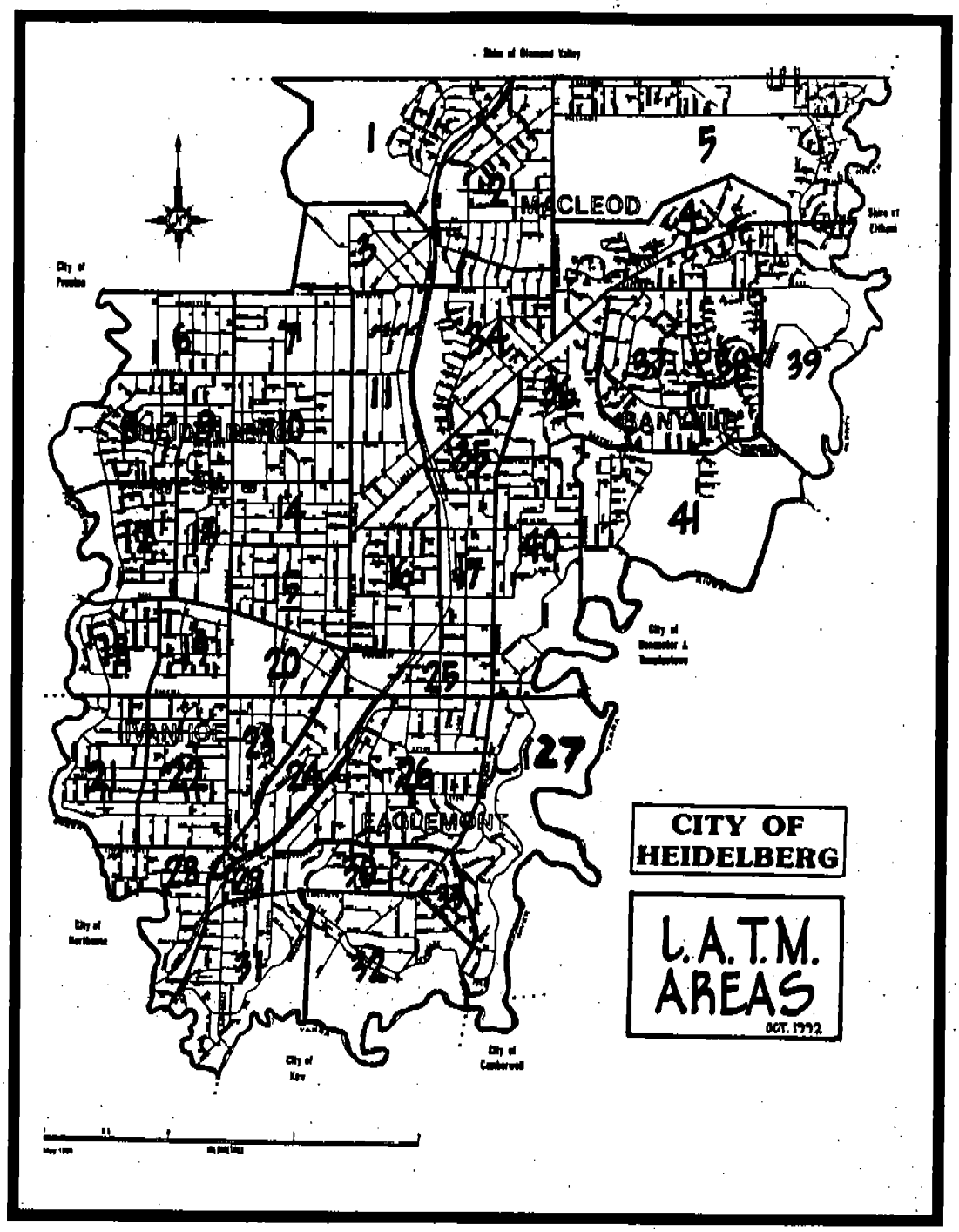
ROAD CLASSIFICATION TABLE

Classification		Traffic Function	Lane Use	Vehicle User Amenity	Neighbour / Pedestrian Amenity	How is it Achieved?		
Main	Sub-Class					Traffic Management Facilities	Volume	Speed (km/h)
Primary Arterial	1	State, Regional & District	Passive	High	Low	Clearways, Multiple Lanes, Access Control	15-60k	60-80
	2		Active	High	Low	Clearways, Multiple Lanes, Direct Access	15-60k	60-80
	3		Intense	High	Medium	Speed Control	15-40k	60
	4			High	High	Not achievable?	15-40k	60
Secondary Arterial	1	Regional & District	Passive	High	Low	Clearways, 4-lanes	10-15k	60-70
	2		Active	High	Low	Clearways, Off Peak Parking	10-15k	60-70
	3		Intense	Med	Medium	Speed Control, Kerbside Parking, 2 Traffic Lanes	10-15k	60
	4			Med	High	Speed Control, Kerbside Parking	10-15k	50-60
Restricted Traffic Route	1	Regional (Supplementary) District	Passive	Med	Medium	Kerbside Parking, Cycle Lanes	4-10k	50-60
	2		Active	Med	Medium	Parking, Physical Speed Control, Cycle Lanes	4-8K	50
	3		Intense	Low	High	Parking, Physical Speed Control, Cycle Lanes	3-6K	40-50
Local Crossing Road	1	District & Local	Passive	Med	Medium	Parking, Cycle Lanes, Speed Control	<4000	50
	2		Active	Low	High	Parking, Physical Speed Control	<3000	50
	3		Intense	Low	High	Parking, Physical Speed Control	<2000	40-50
Local Street	1	Local	Passive	Low	Medium	Parking, Speed Control	<2500	50
	2		Active	Low	High	Physical Speed Control, Parking	<2000	40-50
	3		Intense	Low	High	Intensive Speed and Volume Control, Parking	<1000	40

Road Classification Table

APPENDIX D

REVIEW OF HEIDELBERG LOCAL AREA TRAFFIC MANAGEMENT


MACLEOD
BANYULE
IVANHOE
EAGLEMONT
CITY OF HEIDELBERG
L.A.T.M. AREAS
OCT. 1992

AREA 1:

- No formal studies undertaken.
- Consideration given to the installation of additional roundabouts in Wungan Street, but no action taken.
- Council acknowledges the poor arterial road network in this region, with Wungan Street, Erskine Road and Ruthven Street required to share the traffic load.

Suggestions:

- Consider installation of additional roundabouts along Wungan Street (possibly at Glenmore Street and Nicholls Street) and at Devonshire Drive/Herbert Street. These will allow easier access to the intersecting streets, slow traffic and further deter through traffic outside of the peak periods.
- Consider replacement of painted central median with a single continuous centre-line and parking lanes along both sides (with intermittent kerb extensions).

AREA 2:

- Acer Wargon conducted the 'North Macleod Traffic Study' in 1994 to assess the level of external traffic intrusion into Area 2 and to recommend possible solutions. They concluded that the infiltration of external traffic was small and no remedial treatments were required.
- Council acknowledged the lack of continuity of east-west traffic routes across Greensborough Highway and the resultant traffic problems this created.
- The median treatment in Greensborough Highway opposite Torbay Street has been effective in reducing traffic volumes in Torbay Street (3,600vpd to 2,500vpd).
- The roundabout at the Erskine Road/Carwarp Street intersection created access difficulties for large trucks turning right. Anti-skid panels were installed at the roundabout to address a problem with vehicles losing control at the roundabout.
- Anti-skid panels also installed along Ruthven Street and Finalyson Street.

Suggestions:

- No major changes recommended.

AREA 3:

- No formal studies undertaken.
- Concern with the camber and skid resistance of the Wungan Street/Cherry Street roundabout. An extensive level of anti-skid panels was installed on the approaches and within the roundabout to address these problems.

Suggestions:

- Reassess the need for the level of anti-skid panels to be reinstated in the future at the Wungan Street/Cherry Street roundabout.

AREA 4:

- No formal studies undertaken.
- No issues of any significance.

AREA 5:

- No formal studies undertaken.
- Public meetings held in December 1990 and May 1991 to discuss traffic management along Yallambie Road. Resident concerns related to safe pedestrian access across Yallambie Road, truck traffic, speed and volume of traffic along Yallambie Road and the operation of the existing traffic management devices.
- Recommended action involved the staged implementation of roundabouts at the intersections of Binowee Avenue, Wendover Place and Janice Street (these roundabouts have subsequently been installed).
- Some residents sought the easterly extension of Elder Street to Para Street - this was (appropriately) rejected by Council.

Suggestions:

- The ultimate treatment of Yallambie Road with a series of roundabouts has been effective. Previous slow-points installed along Yallambie during the 1980's were not successful and were rejected by the residents.
- No major changes recommended.

AREA 6:

- No formal studies undertaken.
- Some concern with the illegal movement of traffic against the one-way restrictions in many of the streets in the Heidelberg West Industrial Area. Signing improvements made to improve adherence to restrictions.

AREA 7:

- No studies or major works undertaken.

AREA 8:

- 'Olympic Village Traffic Study' conducted by consultants in 1990. The study focussed on pedestrian and bicycle safety.
- A series of median islands installed along Alamein Road and Liberty Parade to control speed and improve pedestrian safety and access.
- A traffic island at the Alamein Road/Dougharty Road intersection to prevent right turns to/from Alamein Road.

- A roundabout installed at Dougharty Road/Oriel Road to replace the previous flashing pedestrian crossing.

Suggestions:

- Review the effectiveness of the median island treatments along Alamein Road and Liberty Parade. The alternative future installation of roundabouts at key intersections along these routes or road humps along Alamein Road may be a more effective treatment.

AREA 9:

- No studies or major works undertaken.

AREA 10:

- Turnbull Fenner Pty Ltd conducted an LATM study of the area, June 1994, in association with a Resident's Committee. Recommended treatments included thresholds, road narrowings, splitter islands, reversal of intersection priority, raised pavements and parking bans. Most of these treatments have progressively been installed. The changes to intersection priority were not proceeded with due to the perceived conflict and confusion they may create.
- A roundabout was installed at the McEwan Road/Outhwaite Road intersection.
- Turnbull Fenner suggested options for the realignment of the Lawson Parade/McEwan Road intersection.

Suggestions:

- Assess resident's level of satisfaction with the implemented traffic management treatments. It is possible that additional speed control is warranted along Porter Street and McEwan Road.
- Consider the installation of a roundabout at the intersection of Dougharty Road/McEwan Road.

AREA 11:

- Adams Henty and Associates conducted an LATM study of the area (1994) in association with a Resident's Traffic Committee. Recommended treatments included raised pavements, roundabouts, modified T- junctions, splitter islands, rumble strips and linemarking/signage changes.
- Some of these traffic management treatments have been installed. The recommended raised pavements along Ellesmere Parade have been modified, with one 'fish eye' slow point island installed. One raised pavement has been installed in the area.

Suggestions:

- Re-assess the desirability of installing raised pavements as recommended by Adams Henty and Associates. They have proven effectiveness as speed reduction devices and are relatively low cost treatments.

AREAS 12, 13 and 14:

- No studies or major works undertaken.

AREA 15:

- Turnbull Fenner Pty Ltd conducted the 'Altona Street Traffic Study' in early 1995. Recommended treatments included a roundabout at Altona Street/Dresden Street, traffic islands and a 3 tonne load limit along Altona Street between Edwin Street and Upper Heidelberg Road.
- The whole Area 15 has been treated with a comprehensive range of traffic treatments including splitter islands, road humps, roundabouts and a road closure.

Suggestions:

- No further works required at this stage. Monitor the effectiveness of the completed works.

AREA 16:

- No formal studies undertaken.
- Roundabouts installed at key intersections along Brown and Darebin Streets to improve safety and reduce speed.
- Kerb extensions installed along Darebin Street.

Comments:

- The traffic management treatments installed along Darebin and Brown Streets are appropriate and have been well designed. It appears that no further works are required in the short term.

AREA 17:

- No studies or major works undertaken.

AREA 18:

- In-house LATM studies of Areas 18 and 22 commenced in 1986. The implementation of actions arising from both studies occurred progressively over some eight years.

Suggestions:

- Review the outstanding treatments recommended in the Area 18 LATM Scheme to assess whether they still need to be implemented.

AREA 19:

- No formal studies undertaken.
- Concerns with traffic speed in Perkins Avenue. Recommendation that no action be undertaken in Perkins Avenue until an LATM Scheme is carried out for the area (1991).
- Parking restrictions were installed in Perkins Avenue in 1991/92 to reduce traffic congestion associated with Banksia Secondary College.
- Two intersection treatments have been installed.

AREA 20:

- No formal studies undertaken.
- Road closures established in Forster Street, Linden Avenue and Myrtle Street, initially for a trial period of three months (1991), following construction of the Bell/Banksia link project.

AREA 21:

- No formal studies undertaken.
- Painted/physical median treatments installed along Liberty Parade at key intersections.

Suggestions:

- Consider the future installation of T- intersection roundabout treatments at key intersections along Liberty Parade in lieu of the existing median treatments.

AREA 22:

- In-house LATM studies of Areas 18 and 22 commenced in 1986. The implementation of actions arising from both studies occurred progressively over some 8 years. The raised pavements along streets intersecting the Donaldson's Creek shared path were installed during 1994.
- Anti-skid panels installed on both approaches of Bond Street to the Athelstane Grove intersection (October 1994) to reinforce priority to Athelstane Grove as part of an intersection priority reversal treatment. Concerns raised in 1996 that vehicles were still failing to give way.

Suggestions:

- Limit the use of anti-skid panels to locations that experience single vehicle 'run-off-the-road' crashes (e.g. Beverley Road). Use small roundabouts rather than the reversal of intersection priority.
- Overall this area has been treated appropriately.

AREA 23:

- Formal study conducted in 1992 in association with a Resident Traffic Committee.
- A wide range of treatments were recommended including a roundabout, one-lane speed humps, raised pavements, double angled slow point, T-intersection channelisation and a road closure. Only some of the treatments have since been implemented.

Suggestions:

- Reduce the variation of treatments installed within the one local area. In this area a mix of roundabouts and raised pavements would be more appropriate.

AREA 24:

- No formal studies undertaken.
- 'No Standing' restrictions installed along part of Marshall Street during school peak times to reduce congestion associated with Ivanhoe Girls Grammar School (1991).

AREA 25:

- Eaglemont LATM Scheme established in 1988/99 following the construction of the Bell/Banksia link. Treatments included left and right turn bans from Banksia Street and Lower Heidelberg Road respectively during the morning peak period (7:00 to 9:00am) and roundabouts at the intersections of Cape Street/Castle Street and Durham Street/Hawdon Street.
- Median installed in Durham Street at Mount Street to prevent corner cutting (May 1992).
- Painted median island installed in Mount Street near Yarra Street to improve pedestrian safety.

Comments:

- The peak period turn bans appear to have been effective and the roundabouts match the streetscape. The overall scheme has been successful as the traffic management treatments are not obtrusive and do not detract from the quality of the Eaglemont streetscape.

AREA 26:

- No formal studies undertaken, however a range of traffic management treatments have been installed in the area. Treatments include roundabouts along Maltravers Road at The Righi, Ashby Grove and Locksley Road, speed humps in Outlook Drive, The Righi and Ormond Road, road realignment along Ormond Road and a threshold device and anti-skid treatments in Maltravers Road.

Comments:

- The roundabouts along Maltravers Road are attractive and effective. The threshold treatment has limited effectiveness as the narrowed lanes remain too wide to reduce traffic speed and there is no change in vertical alignment. The anti-skid bars are worn and require replacement or removal.
- The other treatments in the area appear to be effective.

AREA 27:

- Council officers developed traffic management options to reduce the speed and volume of traffic in Glenard Drive and Mossman Drive. A public meeting was held in March 1995 to discuss the options. It was recommended that the treatments be installed in stages with the aim of preventing the intrusion of through traffic (by introducing peak period turn bans) rather than just reducing speed.

AREA 28:

- Area 28 LATM Scheme developed by consultants Acer Wargon Chapman. The scheme involved a range of treatments including splitter islands, raised pavements, channelisation, and the closure of Wallace Lane. Most of the treatments have been installed.

Comments:

- No further action required at this stage.

AREA 29:

- A formal LATM Scheme was developed by a consultant in association with a Residents Traffic Committee (mid 1993). Recommended treatments included raised pavements in Waterdale Road and Clarence Street, splitter islands in Toora and Linton Streets and changes to parking restrictions. These treatments have since been implemented.
- The consultant recommended that the ramp grade of the Clarence Street raised pavements be made at a slope of 1:10, which does not conform to VicRoads requirements.

Suggestions:

- Consider the need for treatment of the Waterdale Road/Norman Street/Kiernan Avenue intersection. Assess whether a roundabout would be feasible.
- Ensure that the ramp grades of the Clarence Street raised pavements conforms to the VicRoads requirement of 1:12.
- Overall no other treatment is required in this area at this time.

AREAS 30 AND 31:

- No studies or major works undertaken.

AREA 32:

- Traffic management options developed for The Boulevard/Wilfred Road intersection, including a roundabout and road narrowings (1995/96). Council opted to install a trial temporary road narrowing treatment. This treatment was later modified and installed in permanent materials (1997).
- The permanent treatment incorporated flush brick paving, median islands and a kerb extension along the south side (incorporating a bicycle bypass lane).
- Raised pavement devices have previously been installed along Warncliffe Road.

Comments:

- It is considered that a roundabout would be a preferential treatment to the road narrowing option installed at The Boulevard/Wilfred Road intersection in terms of improving road safety and reducing traffic speed along The Boulevard.
- The narrowing option retained traffic lane widths of 3.4m with flush brick paving, which will have minimal impact on speed reduction.

AREAS 33 AND 34:

- No studies or major works undertaken.

AREA 35:

- The Rosanna/Banyule Roads Traffic Management Strategy was developed by Council officers in 1993. The strategy involved left and right turn bans into streets on both sides of Rosanna Road between Station and Millicent Streets, possible speed humps in Douglas Street and Glenhilda Road, a road closure in Alfreda Avenue and a possible roundabout at the Grove Road/Station Road intersection. Apart from the closure of Alfreda Avenue at Rosanna Road, most of these treatments have yet to be installed.
- An anti-skid treatment has been applied to the Station Road/Turnham Avenue intersection in association with median islands (1992).

Suggestions:

- Review the status of this study and assess why most of the treatments are yet to have been installed.

AREA 36:

- Arup Transportation Planning conducted the Banyule/Viewbank Traffic Study during 1993/94 in association with a Resident Traffic Committee (covers Areas 36, 37, 38 and 39). The recommended scheme involved a range of treatments, including roundabouts, T- intersection treatments, kerb extensions, raised pavements, road narrowings and painted centre-lines.

Suggestions:

- The recommendations and treatments arising from the study appear to be appropriate, although there is a propensity for the use of T- intersection devices. Small roundabouts or midblock raised pavements may be more effective.
- There is no reason why the Banyule/Viewbank Traffic Study needed to cover four separate LATM areas. Areas 36, 37, 38 and 39 could be aggregated into the one LATM area.

AREA 37:

- Forms part of the Banyule/Viewbank Traffic Study conducted by Arup Transportation Planning. Consultants Tunbull Fenner Pty Ltd were commissioned to design some of the treatments.

AREA 38:

- Forms part of the Banyule/Viewbank Traffic Study. In a refinement of the scheme traffic management devices were proposed for Rutherford Road. The options involved Watts profile speed humps and/or T-intersection channelisation treatments. Median islands were proposed for Winston Road.
- Most of these treatments have yet to be installed.

AREA 39:

- Also forms part of the Banyule/Viewbank Traffic Study.

AREA 40:

- Adams Henty and Associates conducted an LATM study of the area (1995) in association with a Resident's Traffic Committee. Recommended treatments included raised pavements, including five raised pavements along Beverley Road, a modified T- junction and anti-skid bars.
- The T- junction treatment at Beverley Road/Greville Road was subsequently deferred indefinitely and the raised pavements did not proceed along Beverley

Road due to the high traffic volumes along the road (12 hour traffic volume in excess of 4,000 vehicles). Alternative treatments for Beverley Road involved a roundabout at Greville Road and a series of modified T- junction treatments and median islands (1997). Some of these treatments have since been installed.

Comments:

- The raised pavements are considered an appropriate treatment for Beverley Road as it experiences problems with excessive traffic speed and 'run-off-the-road' type crashes and its southern section has no abutting residential activity. Speed humps can be effectively applied along certain higher volume roads (e.g. Rathmines Road, Hawthorn and Highett and Elizabeth Streets in Richmond).

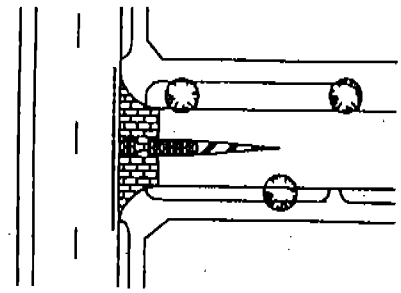
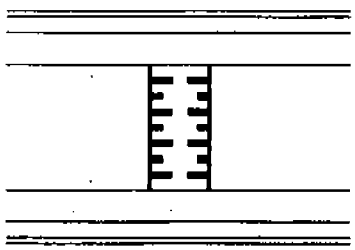
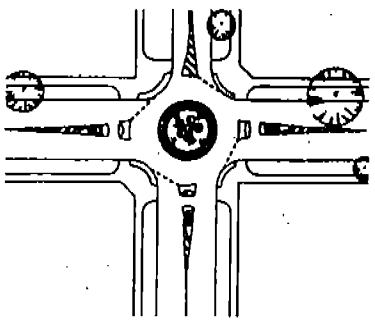
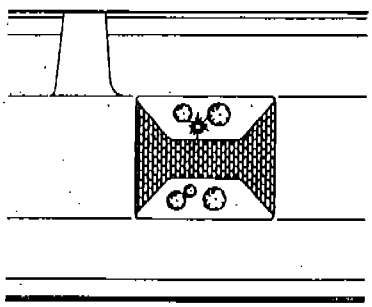
AREA 41:

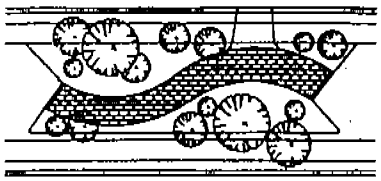
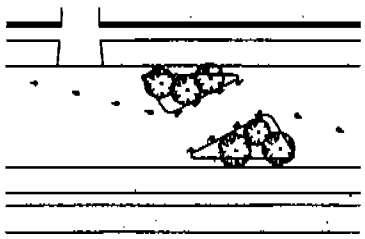
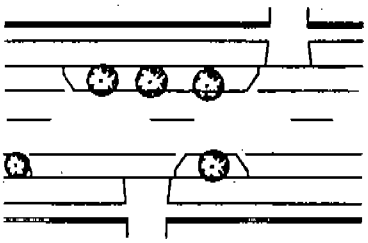
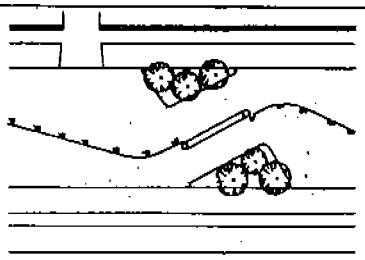
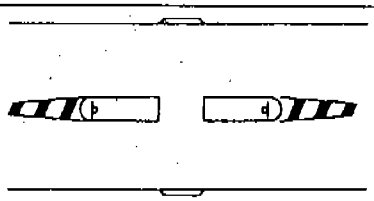
- No studies or major works undertaken.

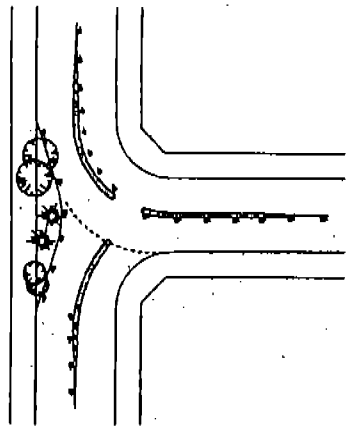
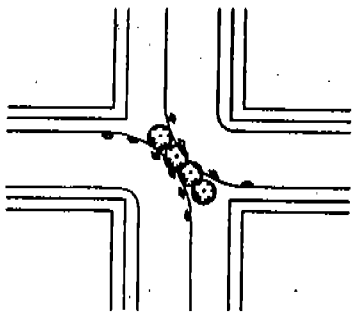
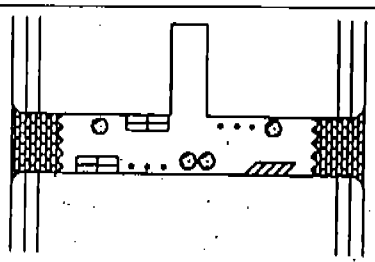
There are no details of any LATM studies previously conducted in the former municipalities of Diamond Valley and Eltham.

APPENDIX E

LOCAL AREA TRAFFIC MANAGEMENT DEVICE ASSESSMENT

LATM Device	Advantages	Disadvantages
 1. Perimeter (threshold) treatment	• Provides a positive indication that a driver is leaving the arterial road system and entering a local area. • Reduces entry speeds. • Can provide a useful staging for pedestrians. • Provides a landscaping opportunity.	• Low speed turns from the arterial road may affect traffic flow on the arterial road
 2. Road hump	• When correctly positioned, it reduces vehicle speeds in the vicinity of the hump. When used in a series, it reduces speeds over the entire length of the street. • Through traffic is often discouraged from using the street. • It is a relatively low cost device to install and maintain.	• May increase noise due to braking, acceleration and vertical displacement of vehicles. • Reduces the 85th percentile speeds but may leave unaffected the small percentage of high speed vehicles.
 3. Roundabout	• Reduces the number of conflict points in an intersection. • Reduces vehicle speeds through the intersection. • Provides orderly and continuous flow of traffic. • Clarifies priority and simplifies decision making. • Increases conspicuity of the intersection.	• May be restrictive for some larger service and emergency vehicles unless the roundabout is mountable. • May involve considerable construction costs, especially if land acquisition is required. • May increase noise because of extra gear changing. • May require special lighting at an added cost.
 4. Single-lane slow point	• Reduces speed near the device. • When used in series it reduces overall speed. • Discourages through traffic. • Imposes minimal inconvenience to local residents. • Increases pedestrian safety. • Provides a landscaping opportunity.	• Landscaping needs to be maintained to ensure that visibility is not blocked. • It is contrary to driver expectations if used in isolation. • There is possibility of increased noise. • Can be hazardous for vehicular traffic and cyclists if not designed and maintained correctly. • Confrontation between opposing drivers arriving simultaneously could create problems.

LATM Device	Advantages	Disadvantages
 5. Driveway Link	• As for (4) • Provides greater visual obstruction than (4). • Can provide opportunity for substantial landscaping.	• May restrict emergency vehicles. • May increase the area to be maintained by residents. • Cost can be considerable because of its length. (Best installed when the street is due for reconstruction.)
 6. Single-lane angled slow point	• As for (4).	• As for (4). May restrict emergency vehicles.
 7. Two-lane slow point	• Causes only minor inconvenience to local users. • Regulates parking and serves to protect parked vehicles. • Can be used at intervals to produce landscaping scheme.	• Not very effective in reducing speeds. • Not very effective as a visual obstruction.
 8. Two-lane angled slow point	• As for (4), except that the increase in pedestrian safety may be smaller.	• As for (4). • It is usually less effective in controlling speeds than other devices. • May restrict emergency vehicles. • Is not very effective as a visual obstruction.
 9. Mid block island	• Provides a refuge for pedestrians and cyclists crossing the street. • Visually enhances the residential streetscape when landscaped.	• Will not reduce speeds by as much as a vertical displacement device, or other horizontal displacement devices.

LATM Device	Advantages	Disadvantages
 10. Modified Intersection	• Reduces vehicle speeds in the vicinity of the device. • Can lower vehicle speeds along the length of the street when placed in series. • May discourage through traffic along the top of the 'T'. • May be used to reinforce changes in priority resulting from alterations to the positioning of STOP signs or GIVE WAY signs.	• Can be hazardous for vehicular traffic and may cause confusion regarding intersection priority if not correctly designed. • Must be designed to accord with State regulations.
 11. Road closures (a diagonal closure is illustrated)	• Eliminates through traffic. • Provides landscaping opportunities. • Reduces conflict points if used at an intersection. • Increases pedestrian safety.	• May inconvenience residents in gaining access to their properties. • Can shift traffic volumes to adjacent streets. • May inhibit access by emergency vehicles.
 12. Shared zone	• Provides a low speed environment, which is safer for pedestrians and cyclists. • Can improve amenity without affecting access. • Provides for flexibility of parking layouts.	• High cost.

Source : Australian Standard AS174.13 Part 13 : Local Area Traffic Management

TECHNIQUES AVAILABLE

DESIRED STRATEGY	SIGNPOSTING TECHNIQUES						ROUTE DIVERSION TECHNIQUES					VEHICLE OPERATION TECHNIQUES											OTHER TECHNIQUES				
A. TRAFFIC VOLUMES AND ROUTE STRATEGIES	PRIORITY SIGNPOSTING AT INTERSECTIONS	SPEED LIMITS – STATUTORY	SPEED LIMITS – ADVISORY	MOVEMENT BANS – GENERAL/SPECIFIC CLASSES	PARKING CONTROLS	ROUTE SIGNPOSTING	ONE-WAY STREETS	CHANNELISATION – INTERSECTION	FULL ROAD CLOSURES	PARTIAL ROAD CLOSURES	PATHWAY LINKS	ANGLE NARROWINGS – SLOW POINTS	STRAIGHT NARROWINGS – SLOW POINTS, GATEWAYS	SPEED HUMPS – WATTS PROFILE, RAMPS	PAVEMENT TREATMENTS – PAVING BLOCKS COLOURED AGGREGATE	MODIFIED STREET ALIGNMENT	ROUNDABOUTS	LINEMARKING	WOONERF	SHARED USE ZONES	MODIFIED PARKING LAYOUT	LIGHTING	SAFETY FENCING	PEDESTRIAN CROSSINGS	STREET PLANTING	LOCAL TRAFFIC PRECINCTS
1. Reduce vehicle volumes – general	+	o	o	++	o	+	+++	++	+++	++	o	++	++	++	o	+	+	o	o	+	+	o	o	o	o	o
2. Reduce vehicle volumes – trucks	+	o	o	++	o	++	+++	++	+++	++	o	+++	+++	++	o	+	++	o	o	+	+	o	o	o	o	o
3. Improve pedestrian circulation	o	o	o	+	o	o	o	o	+	+	+++	o	o	o	-	o	o	o	++	++	o	o	o	+	o	o
4. Improve cyclist circulation	o	o	o	o	+	+	o	-	++	+	+++	±①	±①	o	-	o	-	o	+	+	o	o	o	o	o	o
5. Improve vehicle circulation	o	o	o	-	+	++	–	-	–	-	o	o	o	o	o	o	o	o	o	-	-	o	o	o	o	o
B. DRIVER BEHAVIOUR STRATEGIES																										
1. Increase driver awareness of local environment	o	+	+	+	+	o	o	+	+	+	o	+	+	+	+	+	o	o	+++	+++	+	+	+	+	++	++
2. Simplify driving task	+	o	o	+	o	+	+	+	-	+	o	-	-	o	o	o	+	+	–	–	o	+	o	+	o	o
3. Visually reinforce desired motorist behaviour	o	o	o	o	o	o	o	o	o	o	o	+	+	o	++	+	o	o	+++	+++	o	o	+	o	++	++
4. Integrate traffic components	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	+++	+++	o	o	o	o	o	o
C. VEHICLE OPERATION STRATEGIES																										
1. Reduce maximum speed	+	+	+	o	o	o	o	+	+	+	o	++	+	++	+	++	+	o	+++	+++	+	o	o	o	+	o
2. Reduce average speed	++	+	+	o	o	o	o	++	++	++	o	+++	++	+++	+	++	++	o	+++	+++	+	o	o	o	+	o
D. RISK REDUCTION STRATEGIES																										
1. Segregate traffic components	o	o	o	+	o	+	o	o	o	o	++	–	–	o	o	o	o	+	–	–	o	o	o	o	o	o
2. Reduce vehicle involved conflicts	+	o	o	+	o	o	+	++	++	+	o	–	–	o	o	o	+	+	–	–	o	o	o	o	o①②	o
3. Reduce pedestrian involved conflicts	o	o	o	+	o	o	o	+	+	o	+++	o	o	o	o	o	o	o	–	–	o	o	+	+	o	o
4. Reduce cycle involved conflicts	+	o	o	+	+	+	+	++	+	+	+++	±①	±①	o	o	o	±①	+	–	–	o	o	+	o	o	o
E. ENVIRONMENTAL STRATEGIES																										
1. Scope to improve streetscape	o	o	o	o	o	o	o	+	++	+	o	++	++	+	++	++	++	o	+++	+++	+	o	o	o	+++	o
2. Creation of open space	o	o	o	o	o	o	o	o	+	+	o	o	o	o	++	+	o	o	+++	+++	o	o	o	o	o	o
3. Personalise streetscape	o	o	o	o	o	o	o	o	+	+	++	+	+	+	++	++	o	o	+++	+++	o	o	o	o	+++	o
F. SECONDARY EFFECTS																										
1. Affect on parking	o	o	o	o	±①	o	o	-	-	-	o	–	–	-	o	o	-	o	+	+	+	o	-	-	o	o
2. Device related noise	-	o	o	o	o	o	o	o	o	o	o	±①	±①	±①	-	o	o	o	o	o	o	o	o	o	o	o
3. Changes in accessibility	o	o	o	-	o	o	-	-	–	-	+	o	o	o	o	o	o	o	o	-	o	o	o	o	o	o
4. Degree of self enforcement	-	-	–	–	-	-	±①	+	+++	+	++	++	++	+++	++	+++	+++	-	+	+	-	o	+	-	o	+

1. Design should allow for cyclist movement along the kerb if vehicle volumes are likely to be high.
2. Large roundabouts may require separate cycle paths around their perimeter to segregate cyclists from other traffic.
3. Street planning must not add additional hazards into the street environment by poorly located planting or inappropriate plant species.
4. May be used to improve parking conditions for one group at the expense of other groups, e.g. resident parking schemes.
5. Depends on the section length and traffic volumes, short lengths of low volume one way streets are difficult to enforce.
6. Vehicle noise is possible if motorists accelerate and break heavily between devices. Spacing of devices and general street appearance are important to give an image of a low speed area.

LEGEND

o No Effect
\+ Positive effect
\- Adverse effect

} More marks (indicate greater effect)

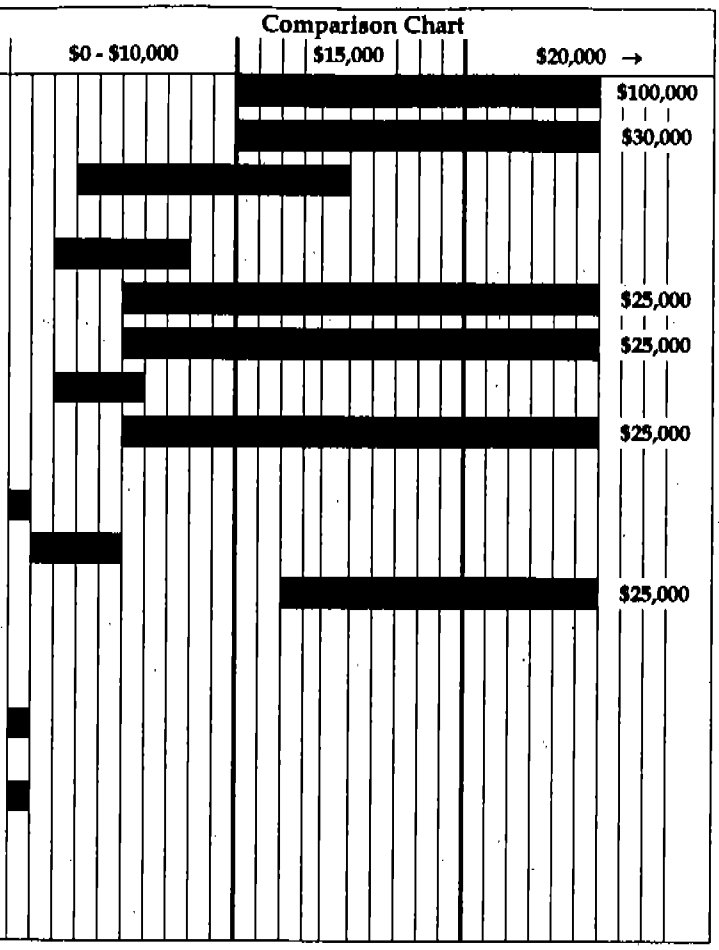
Effectiveness of Devices / Treatments to Address Common Local Traffic Problems

Source : Federal Office of Road Safety 'Towards Traffic Calming' (1993)

BROAD AIMS			ACTIONS	DEVICE TREATMENT
IMPROVE RESIDENTIAL AMENITY	DIMINISH AREA-WIDE IMPACT OF CAR	IMPROVE SAFETY	Eliminate Conflict Points and Blackspots	1. Roundabout 2. Road Closure, Partial Closure 6. T-Deviation 8. Driveway Entry 7, 10, 11, 16 Pedestrian Crossing Treatments 12. Impellor 15. Reverse Stop Sign / 4 Way Stop Sign - Traffic Signals - One Way Street
			Eliminate Through - Traffic, Lower Traffic Volumes	2. Road Closure, Partial Closure 5. Single Lane Angled Slowpoint - One Way Street
			Lower Speeds	3. Platforms, Raised Thresholds 4. Speed Humps 5. Angled Slowpoints 6. T-Deviations 8. Driveway Link 9. Wombat Crossing 12. Centre Blisters
			Eliminate Through Trucks	2. Road Closure, Partial Closure 5. Single Lane Angled Slowpoints - Load Limit
			Narrow Traffic Lanes	5. Angle Parking with Angled Slowpoints 7. Neckings, Kerb Blisters 16. Shared Bicycle/Parking Lanes
			Diminish 'Gun Barrel' Effect	2. Road Closure, Partial Closure 5. Angled Slow Points with Offset Travel Path 8. Driveway Link 13. Serpentine Travel Path
			Restrict Non-Resident Parking	- Resident Parking Permits - Parking Time Limits
			Provide for Non-Motorised Movement, Public Transport	7, 10, 11, 16 Pedestrian Crossing Treatments 17. Bus Adaptations 18. Bicycle Adaptations
			Break Continuity of Bitumen Pavement	9. Rumble Strips across Travel Path 13. Narrowed Pavement / Serpentine Street 7. Landscaped Kerb Blisters - Vary Pavement Surface Colours
			Create Open Space	1. Road Closure 5. Extended Slowpoints
			Compliment Character of Area and Housing Styles	- Plant Appropriate Vegetation Species - Include Appropriate Street Furniture Styles, Paving
			Personalise Spaces	5. Offset Slowpoints on Entry 9. Rumble Strips on Entry - Group Planing, Contour Landscaping
			Eliminate Statutory Right-of-Way of Vehicles	14. Shared Zone

Relating Devices/Treatments to Actions Required to Address Common Local Traffic Problems

Local Area Traffic Management Devices	Construction Cost (2000 $)
1. Roundabout	15,000 - 100,000
2. Road Closure	10,000 - 30,000
3. Threshold/Flat-Topped Hump	4,000 - 15,000
4. Road Hump	3,000 - 8,000
5. Angled Slow Point	6,000 - 25,000
6. T-Deviation	6,000 - 25,000
7. Necking	3,000 - 6,000
8. Driveway Entry/ Link	6,000 - 25,000
9. Rumble Strip	$25/bar installed
10. Median Island	2,000 - 5,000
11. Impellor	12,000 - 25,000
12. Narrowed Pavement	NA
13. Shared Zone	NA
14. Speed & Priority Signs	$400 ea. installed
15. Road Markings	$3/m or $30/sq.m
16. Bus Adaptions	NA
17. Bicycle Adaptions	NA



Notes on Maintenance

- Devices constructed in concrete are considered to have the lowest on-going maintenance cost.
- Devices constructed using bitumen or pavers have a much higher on-going maintenance cost, particularly under heavy loading situations.
- Street furniture, signs and landscaping are all susceptible to damage and therefore contribute to the on-going maintenance costs.
- Horizontal deflection devices often require the pavement to be reinforced to allow for the side pressures exerted by vehicle tyres.
- Whilst devices such as rumble bars and road markings are relatively cheap to install, their effectiveness relies on up-keep to a suitable standard.

Source : Federal Office of Road Safety 'Towards Traffic Calming (1993)

APPENDIX F

TRAFFIC MANAGEMENT WARRANTS AT OTHER COUNCILS

CITY OF BRISBANE, QUEENSLAND

Characteristics of Municipality

Largest Council area in Australia with over 6000 km of road and 650 km² of developed urban area.

Summary of Warrants System

Based on a mandatory requirement of 350 reported crashes per 100 million vehicle-kms of travel for a local traffic area. Also includes amenity parameters of truck movements, traffic volumes and speeds to prioritise those areas that meet the mandatory crash rate.

Main Features

- Applies to local traffic areas rather than individual streets. Streets could only be treated on an individual basis following an area-wide LATM study process;
- A sum of $5.2M was allocated for LATM works for 1996/97 compared with $3.2M in 1995/96 and only $300,000 in 1991/92 when the current formal LATM program was established;
- A previous crash rate of 500 reported crashes per 100 million vehicle-kms was established in 1992 to significantly cull the previous demand for LATM projects which was running at about 40 requests per month. The high crash rate requirement resulted in only about 1 per cent of candidate areas meeting the mandatory requirement. This measure has been reduced in recent years to 350 crashes per 100 million vehicle-kms, and could be further reduced in the future to allow amenity based concerns to be addressed;
- Also requires 60 per cent or greater approval from residents for the proposed traffic management treatments.

Details of Warrants System

Refer to the table on next page.

LATM PROJECT - LISTING GUIDELINES

CATEGORY OF ACCESS	GUIDELINES FOR INCLUSION OF PROJECTS IN LATM PROGRAM (2)						
	Mandatory Requirements	Non-mandatory Requirements					
	Reported traffic crashes in associated Street Network	Max volume of trucks (Tonnes) in any 8 hr period on an average business day is greater of:		Max total traffic volume (vehicle movements) on an average business day is greater of:		Max values of observed statistical sample of vehicle speeds on an average business day, kph	
		Truck Move-ments	Prop. of AWDT (2)	In any 2hr period	In 24 hr period	85th %tile	Mean
Neighbourhood	350 reported traffic crashes per 100 million	120	2%	300 (1)	3000 (1)	60	55
Local	Vehicle kms of travel in the street network	50	1%	150	1500	50	45

NOTE :

1. This is for undivided 2 lane street. For a median divided, 2 lane street, these volumes may be doubled, depending on street geometry.
2. Additional weighting needs to be given to these criteria when there is an associated through-traffic component e.g. when through traffic > 10% on Local Streets and 25% on Neighbourhood Streets.
3. AWDT = Average Week Day Traffic = Sum of daily traffic Monday to Friday inclusive divided by 5. As an alternative, use 24 hour count on the average weekday.
4. Presently 500 (which is at least twice that for most major traffic routes).

N.B. 500 reported traffic crashes/100 million vehicle kilometres is equivalent to about an average of 1.5 reported crashes per year over a one kilometre length of street carrying about 1000 vehicles per day.

350 reported traffic crashes/100 million vehicle kilometres is equivalent to about an average of 1.0 reported crashes per year over a one kilometre length of street carrying about 1000 vehicles per day.

City of Brisbane's Warrants - Listing Guidelines

CITY OF PARRAMATTA, NSW

Characteristics of Municipality

Parramatta is the seventh largest LGA in Sydney with a population of about 132,000 people and covers an area of 60 km² with a total road network length of 567 km.

Summary of Warrants System

An Amenity Program has been established and is aimed at prioritising expenditure on measures to improve residential amenity. A checklist has been developed to assess the relative priority of particular streets and is based on speed, volume, accidents, heavy vehicles, community representations, pedestrian activity, road alignment and parking conditions.

Main Features

- The Amenity Program is implemented on a 50% cost sharing arrangement with the Roads and Traffic Authority;
- Priority is determined by the number of criteria on the checklist that are met. This could result in a number of streets generating the same score, which then requires more detailed analysis;
- Allows for streets to be grouped into Council ward boundaries for a more equitable allocation of funds.

Details of Warrant System

Refer to attachment covering the next 3 pages.

To enable all the issues to be prioritised on an equitable and just basis, the following checklist is used to produce a list of issues that will fall in 1 of 8 categories.

The checklist is as follows :

		Yes	No
1.	Is speeding a problem? (a) if local street, 85th percentile speed > 60kph (b) if Intermediate road, 85th percentile speed >65kph	☐	☐
2.	Is the volume of traffic a problem? (a) local road vph > 200 (b) Intermediate road vph > 1000 (c) sub arterial vph > 2000 Source: Traffic Authority of NSW 1987	☐	☐
3.	Are accidents a problem? accident rate at the site > 1.87 accident/million vehicle kilometres The average accident rate for NSW in 1989 was 1.87 accidents/million vehicle km of travel for local streets. Source: Economic Analysis Manual RTA, 1990	☐	☐
4.	Is the presence of heavy vehicles a problem? Percentage of heavy vehicles > 3%	☐	☐
5.	Have representations been made regarding this issue? Large community support? Petition from the majority of residents? Councillor/MP requests?	☐	☐
6.	Does the area generate pedestrians? Near a school? or Near a hospital? or Near a shopping centre? or Near a recreation facility? or Near a bus stop? or Near a railway station stop? or	☐	☐

Extract from City of Parramatta's Guideline Application Example

		Yes	No
7.	Does the road alignment cause problems?	☐	☐

Alignment :

Sight distance, 100 metres?
Gun barrel effect?

8.	Are parking manoeuvres causing traffic flow/safety problems	☐	☐

A preliminary investigation is to be made by site observation to determine the severity of the problem by using the assessment criteria presented above.

The checklist will be used for each issue that has been identified. The issues with the highest number of "yes" responses to the questions relating to the problems will have the highest priority.

This, in effect, means that there will be numerous issues which will have the same priority ranking. In order to further refine the list, issues will be broken down based on its geographic location (on a ward basis) and prioritised again by looking at the number of accidents.

For example, in priority group 1 (the highest priority group) there may be 12 issues with 3 issues from each ward. To further refine the list in each ward, the issues with the most number of accidents or the highest accident rate will be investigated first.

Worked example

The following are a list of streets in the Parramatta LGA for which there is data available to answer the questions in the checklist:

	Criteria Number								
Street Name (Location)	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**Total**
Blaxcell Street, Granville	✓	✓		✓	✓	✓	✓		6
Bogalara Road, Toongabbie	✓		✓		✓				3
Buckleys Road, Winston Hills	✓	✓			✓	✓	✓		5
Calder Road, Dundas	✓		✓		✓	✓	✓		5
Clyde Street, Granville	✓	✓		✓	✓	✓	✓		6
Constance Street, Guildford				✓	✓				2
Constitution Road, Old Toongabbie			✓	✓	✓		✓		4
Excelsior Street, Granville	✓		✓	✓	✓	✓	✓		6
Gladstone Street, North Parramatta	✓			✓	✓	✓	✓		5
Kirby Street, Dundas	✓	✓	✓	✓	✓	✓	✓	✓	8
Langdon Road, Winston Hills	✓	✓			✓	✓			4

Extract from City of Parramatta's Guideline Application Example (cont.)

	Criteria Number								
Street Name (Location)	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**Total**
Lanhams Road, Winston Hills	✓				✓	✓	✓		4
Lavinia Street, Granville	✓		✓		✓	✓			4
Manson Street, Telopea				✓	✓	✓			3
Marian Street, Guildford	✓	✓	✓	✓	✓	✓			6
Model Farms Road, Winston Hills	✓	✓			✓		✓		4
Moxhams Road, Winston Hills		✓			✓	✓	✓		4
Peter Parade, Old Toongabbie	✓			✓	✓		✓		4
Reilleys Road, Winston Hills	✓				✓				2
Sorrell Street, North Parramatta		✓	✓		✓	✓			4
South Street, Rydalmere	✓	✓	✓	✓	✓	✓	✓		7
Sturt Street, Dundas	✓		✓	✓	✓	✓			5
Wigram Street, Harris Park	✓	✓	✓	✓	✓	✓	✓		7

There are many more issues than those shown in this small table. These are only used to show how the system works.

As can be seen from the table the locations have varying number of totals. The issues with the **higher total number** of marks will be investigated first.

It should be stressed that this is only a very small number of issues. With all the known issues and the new ones that will be raised, there will be very many problems and there will be several with the same priority ranking. There will be a need to fine tune those issues with the same priority ranking. This can be done by first splitting the problems into the ward areas and then looking at the total number of accidents.

The limited resources of Council will be spent on investigation of those issues with the highest priority.

From the example given Kirby Street, South Street, Wigram Street will be investigated first followed by Blaxcell Street, Clyde Street, Excelsior Street and Marian Street. Depending on the number of higher priority issues and available Council resources, the lower priority issues may never be investigated.

Extract from City of Parramatta's Guideline Application Example (cont.)

CITY OF STONNINGTON, VICTORIA

Characteristics of Municipality

Encompasses the former municipalities of Prahran and Malvern, which covers the suburbs of South Yarra, Toorak, Prahran and Malvern.

Summary of Warrants System

Applies a wide range of assessment criteria based on traffic volume, speed, through traffic and accidents for different street types (Local Crossing Road, Wide Carriageway Local Access Streets and Narrow Carriageway Local Access Streets).

The warrants were developed by the former City of Prahran in December 1991 based on the need to develop a better system for the allocation of limited funds for traffic management.

Main Features

- Is not a rigid system and provides opportunity for technical and political input for those streets that are borderline about whether or not they have a specific traffic problem. Additional data related to traffic noise, resident concern and the consequences of taking no action are assessed for the borderline streets.
- Applies to individual streets but allows local areas to be ranked on the basis of the cumulative score allocated to each area;
- Accounts for different types of street geometry to reflect the increasing sensitivity of traffic impacts on narrow local streets.

Details of Warrants System

Refer to Tables on the next three pages.

TRAFFIC SPEED CRITERIA

Local Crossing Roads

Duration of Assessment	Parameter Measured	No Problem If?	Is a Problem If?
Highest Hourly Volume	85th Percentile Speed (kph)	< 60 kph	> 65 kph
Highest Hourly Volume	Number of vehicles exceeding 60 kph	< 25 vehicles	> 50 vehicles
7am - 7pm (Daily)	85th Percentile Speed (kph)	< 60 kph	> 65 kph
7 am - 7 pm (Daily)	Number of vehicles exceeding 60 kph	< 250 kph	> 500 vehicles
7pm - 7am (Evening)	85th Percentile Speed (kph)	< 60 kph	> 65 kph
7pm - 7am (Evening)	Number of vehicles exceeding 60 kph	< 125 vehicles	> 250 vehicles

Wide Carriageway Local Access Streets

Duration of Assessment	Parameter Measured	No Problem If?	Is a Problem If?
Highest Hourly Volume	85th Percentile Speed (kph)	< 55 kph	> 60 kph
Highest Hourly Volume	Number of vehicles exceeding 55 kph	< 15 vehicles	> 30 vehicles
7am - 7pm (Daily)	85th Percentile Speed (kph)	< 55 kph	> 60 kph
7 am - 7 pm (Daily)	Number of vehicles exceeding 55 kph	< 150 kph	> 300 vehicles
7pm - 7am (Evening)	85th Percentile Speed (kph)	< 55 kph	> 60 kph
7pm - 7am (Evening)	Number of vehicles exceeding 55 kph	< 75 vehicles	> 150 vehicles

Narrow Carriageway Local Access Streets

Duration of Assessment	Parameter Measured	No Problem If?	Is a Problem If?
Highest Hourly Volume	85th Percentile Speed (kph)	< 50 kph	> 55 kph
Highest Hourly Volume	Number of vehicles exceeding 50 kph	< 15 vehicles	> 30 vehicles
7am - 7pm (Daily)	85th Percentile Speed (kph)	< 50 kph	> 55 kph
7 am - 7 pm (Daily)	Number of vehicles exceeding 50 kph	< 150 kph	> 300 vehicles
7pm - 7am (Evening)	85th Percentile Speed (kph)	< 50 kph	> 55 kph
7pm - 7am (Evening)	Number of vehicles exceeding 50 kph	< 75 vehicles	> 150 vehicles

TRAFFIC VOLUME CRITERIA

Local Crossing Roads

Duration of Assessment	Parameter Measured	No Problem If?	Is a Problem If?
7am - 7pm	Flow	< 5000	> 5500
HHV	Flow	< 330	> 380

Wide Carriageway Local Access Streets

Duration of Assessment	Parameter Measured	No Problem If?	Is a Problem If?
7am - 7pm	Flow	< 2000	> 2200
HHV	Flow	< 170	> 220

Narrow Carriageway Local Access Streets

Duration of Assessment	Parameter Measured	No Problem If?	Is a Problem If?
7am - 7pm	Flow	< 1000	> 1100
HHV	Flow	< 170	> 220

THROUGH TRAFFIC CRITERIA

Street Class	Duration of Assessment	Parameter Measured	No Problem If?	Is a Problem If?
Local Crossing Road	HHV	Percentage of Through Traffic	< 50%	> 55%
Local Crossing Road	7am - 7pm	Percentage of Through Traffic	< 50%	> 55%
All Local Access Streets	HHV	Percentage of Through Traffic	< 30%	> 33%
All Local Access Streets	7am - 7pm	Percentage of Through Traffic	< 30%	> 33%

ACCIDENT RECORD CRITERIA

Street Class	*Duration of Assessment*	*Parameter Measured*	*No Problem If?*	*Is a Problem If?*
Local Crossing Road	*Previous 5 Years*	*Fatalities*	*0*	*> 1*
		Personal Injury Accidents	*< 3*	*> 4*
		Property Damage Accidents	*< 5*	*> 10*
Wide Carriageway Local Access Streets	*Previous 5 Years*	*Fatalities*	*< 0*	*> = 1*
		Personal Injury Accidents	*< 0*	*> 2*
		Property Damage Accidents	*< 3*	*> 5*
Narrow Carriageway Local Access Streets	*Previous 5 Years*	*Fatalities*	*< 0*	*> = 1*
		Personal Injury Accidents	*< 0*	*> = 1*
		Property Damage Accidents	*< 1*	*> 2*

In applying each of the assessment criteria to determine whether traffic management works are warranted, the decision process would be:

- *"any one of the speed criteria satisfied - > Speed Problem exists;*
- *any one of the volume criteria satisfied - > Volume Problem exists;*
- *any one of the through traffic criteria satisfied - > Through Traffic Problem exits;*
- *any one of the accident criteria satisfied - > Accident Problem exists;*

and

- *Speed Problem Exists - > Traffic Management Works warranted;*
- *Accident Problem Exists - > Traffic Management Works warranted;*
- *Volume & Through Traffic Problem exists - > Traffic Management Works warranted;*
- *Volume problem only exists - > Traffic Management Works not warranted;*
- *Through Traffic problem only exists - > Traffic Management Works not warranted."*

CITY OF KNOX, VICTORIA

Characteristics of Municipality

Large developing residential area on eastern fringe of the Melbourne metropolitan area.

Summary of Warrants System

Objective warrants initially developed for the treatment of individual streets in 1984 and significantly refined in 1992. Based on a point scoring system for a range of traffic parameters, including accidents, volume, speed, land use and road geometry.

Main Features

- Applies to individual streets only rather than area wide LATM schemes. Streets can be treated individually if they are unlikely to create any significant traffic impacts on adjacent streets. This system has been effectively applied for 12 years without the need to do area wide LATM studies.
- A sum of $200,000 has been allocated for LATM works for each year over the past four years, which allows about 1.5 streets to be treated per annum.
- A cut-off of 20 points is applied to cull the list of potential candidate sites. The current list incorporates 16 streets and is reviewed every two years.
- The classification of a road is not currently used in the assessment of candidate streets, however this may be incorporated in the future.

Details of Warrants System

Refer to table on the following page.

KNOX CITY COUNCIL
LOCAL AREA TRAFFIC MANAGEMENT PROGRAM

Street Name	Street Width (m)	Street Length (m)	Bus Route Nos.	Traffic Volume (12hr) (1)	85%ile Speed (2)	School or Cross-ing (3)	Reserve (4)	Local Road Class'n (5)	State Accident Record 1991-95 inclusive (6) O I	S I	F	Road Geom. (7)	Priority	Point Total
Argyle Way	11.3	1600	757	2920	66.2	PS PR XGx2	P A Rx2	C	4	2	0	CV	1	64
Sasses Avenue	9.1	1100	737	3190	67.3	PR XG	-	C	5	1	0	ST	2	53
Power Road (A)	7.6	1050	-	3000	65	-	-	C/X	3	3	0	ST	3	52
Chandler Road (B)	7.6	450 *	755	2710	61.5	XG	R	X	4	2	0	ST	4	48
Borg Crescent *	7.6 - 10.0	1400	757	2480	67	-	P	C	0	2	2	CV	5	47
Amesbury Ave *	10	970	-	3200	65.3	PR SE XG	-	C	3	1	0	CV	6	46
Mount View Road	7.6	1000	-	1360	69	SE	R	X	3	2	0	ST	7	45
Mountain Gate Dr.	7.6	1600	755	2280	72.5	-	A P	C	4	1	0	ST	8	44
Templeton Street	10	1000	738	5000	67	PS XG	A R	C	2	1	0	ST	9	36
George Street *	10	1500	757	3000	65	PR XG	-	C	3	0	0	ST	10	33
Mowbray Avenue	10	1200	757	3840	65.8	XG	Px2	C	3	0	0	CV	11	33
Cathies Lane *	11.3	1600	631	6460	68.3	PS (priv)	-	X	2	1	0	ST	12	32
Renou Road *	11.3	1700	757	4300	67	-	R	C	3	0	0	CV	13	32
Liberty Avenue *	11.3	1370	Telebus	2860	73.5	PS PS XG	R	C/X	1	0	0	CV	14	27
Dandelion Drive	11.3	4800	Telebus	3270	64.8	-	A P R	C	0	1	0	CV	15	24
Johnson Drive *	10	850	753	1170	68	XG	-	C	1	1	0	ST	16	21
Bridgewater Way *	11.3	1200	634 Telebus	5070	64.8	-	P	C	1	0	0	CV	17	19
Phyllis Street	7.6	750	-	1150	56.6	PS PR XG	R	C	0	1	0	ST	18	18
Stewart Street	9.3	1020	-	1500	67.2	-	P	X	0	0	1	ST	18	17
Bona Vista Road	7.8	900	-	1610	63.2	-	-	C	2	0	0	ST	20	17
Pine Road	8.3	800	664	2230	63	-	-	C	0	1	0	ST	21	14
Seebeck Road	7.8 - 10.0	1500	Telebus	1450	64	-	R	C	1	0	0	CV	22	14
Devenish Road *	10	900	-	700	62.4	-	-	C	1	0	0	ST	23	10
Wallace Road (W) *	11.3	830	-	3380	64.1	-	-	C	0	0	0	CV	24	10
Grayson Drive	7.6	860	753	790	64	-	-	C	1	0	0	ST	25	9
Farnham Road	7.6	1100	-	720	59.3	-	R	C	1	0	0	ST	26	8
Western Road	7.6	800	753	1220	53.8	-	P	C	0	0	0	ST	27	4
Sinclair Road	7.6	700	-	400	55.1	-	P	C	0	0	0	ST	28	2

POINT ALLOCATION & LEGEND

* New referral

Streets within the shaded area are below the 20 points cut-off.
Although priorities are allocated they are only indicative only.
These streets will be included in the next biannial review.

(A) Section from Woodmason Road to Dorset Road only Road only.
The balance is industrial zone.

(B) Section from Floriston Road to Albert Avenue only.
The balance is access to offices and Boronia Mall Shopping Centre.

(1) Vol (12hrs)
0-1000 = 0
1001 - 2000 = 1
2001 - 3000 = 3
>3000 = 5

(2) Speed 85th %ile
00 - 59.9 km/h = 0
60.0 - 64.9 km/h = 3
65.0 - 69.9 km/h = 5
70.0 km/h or more = 7

(3) School or Crossing
Pre-school (PS) = 2
Secondary (SE) = 3
Primary (PR) = 4
Crossing = 1

(4) Reserve
Passive (P) (no play equip) = 1
Active (A) (sporting ground) = 1
Recreational (R) (with play equip) = 2

(5) Classification
Intermediate Road (C)
Minor Road (M)
Local Crossing Road (X)

(6) State Accident Record
Other (minor) injury (OI) = 6
Serious Injury (SI) = 8
Fatality (F) = 10

(7) Road Geometry
Straight (ST) = 0
Curvilinear (CV) = 2

CITY OF GREATER GEELONG, VICTORIA

The City of Greater Geelong uses two different systems for the identification and ranking of traffic problems in individual streets and local areas. The 'Stonnington' system is used for the local street network, whilst a point scoring matrix system which was initially developed by the City of Portland, Oregon, is used to rank local traffic areas on the basis of treatable crashes, land use and a combined speed/volume ratio.

Safety

S1 Reported Accidents/5 yrs/km² x 3 acc. nos. x 10 points
S2 "Treatable" Reported Accidents/5 yrs/km² x 10 acc. nos. x 20 points

Land Use

L1 Number of primary schools in area : 150 points
L2 Number of secondary schools in area : 100 points
L3 Number of residential streets in area used by industrial area : 10 points each for traffic 250m of street
L4 Number of residential streets in area used for major shopping : 20 points each for centre access 250m of street

Traffic Speed/Volume

Table A sets out a proposed "Point Score" matrix which addresses speed and volume together. Each street segment of 250m (or part thereof) with more than 1500 vpd and/or speeds in excess of those in the table which obtain a score, can be assessed and included in the overall point score total for the area.

Usage of Table A is simple. For example, a street in a 50 km/h speed zone, of 400m length, carrying 3500 vpd with a V50 of 54 km/h and a V85 of 61 km/h would score:

- 9 (Table A) x 2 (length units) = 18 points

Local Area Analysis

Each Local Area can be analysed using each of the three Criterion Categories. A typical local area (e.g. Area No. 3) might produce:

- land use: 1 primary school 150 points
  800m of street affected by industrial traffic 40 points
- safety: 25 accidents/km²/5yr 250 points
  12 "treatable" accidents/km²/5yr 240 points
- speed/volume total for all (27 segments) "problem" streets 321 points
- total point score for Area No. 3 Total =1011 points

Volume Range	Speed Range Increment	Observed V50 or V85 speeds						
		40 km/h Speed Limit		50 km/h Speed Limit		60 km/h Speed Limit		Point Score
		V50	V85	V50	V85	V50	V85	
500-1500 vpd		<40	<45	<45	<50	<55	<60	0
OR	+5	40-45					60-65	1
50-150 vph	+5	45-50					etc.	2
	+5	50-55						3
	+5	55-60						4
1500-3000 vpd		<40	<45	<45	<50	<55	<60	2
OR	+5							4
150-300 vph	+5							6
	+5							8
3000-5000 vpd		<35	<40	<45	<50	<50	<60	4
OR	+5							8
300-500 vph	+5							12
	+5							16
5000-8000 vpd		<35	<40	<40	<50	<50	<60	6
OR	+5							12
500-800 vph	+5							18
	+5							24
8000+ vpd		<35	<40	<40	<50	<55	<65	8
OR	+5							16
800+ vph	+5							24
	+5							32

Table A - Determination of Point Scores for Each "Problem" Street in a Local Area

APPENDIX G

RECOMMENDED WARRANT SYSTEM FOR BANYULE

Traffic Parameter	Value	Points for a Street or Road	
		Local Street	Intermediate Road
Single Criteria 85th Percentile Speed		>65 km/h	>70 km/h (for 60 km/h speed limit)
Multi-Criteria			
Traffic Speed 85th Percentile Speed	>50 >55 >60 >65 >70 >75 >80	3 9 15 24 33 45 60	0 1 6 12 18 27 40
Traffic Volume 24 hour Volume	>1000 >1500 >2000 >2500 >3000 >4000 >5000	10 15 20 25 30 40 50+10 per 1000	0 0 2 3 5 10 15+5 per 1000
'Rat-run' Traffic Peak hour %age of 24 hour volume (not included in score)	>10% >11% >12% +4 per%	4 8 12	0 4 8
Crash data (5 year period) Per fatal / serious injury Per casualty / reported crash	Points per crash	15 10	15 10
Heavy Vehicles per percent of total traffic	Points per % above 3%	2	1
Activity Generators	Bicycle Route Passive Industrial Residential Playground Primary School Secondary School Retail Transport Interchange	6 0 2 5 7 10 8 8 8	4 0 0 2 5 8 6 6 6

Recommended Warrant Criteria and Weightings for Banyule

DATA ENTRY REQUIRED FOR WARRANTS INPUT TABLE

The warrants spreadsheet file is named "1896wrnt.xls" and is run through Microsoft Excel software. The following table indicates what information is required to be entered into the "Input" worksheet of the spreadsheet file.

	HEADING	DATA REQUIRED
Column A	Street Name	Name of street surveyed
Column B	Location	Section of street surveyed
Column C	Street Class	Class of street i.e. Local (L) or Intermediate (I)
Column E	Street Length	Length of street required for calculating crash rates
Column F	85th Percentile Speed	from traffic survey results
Column G	Traffic Volume (24 hr)	from traffic survey results
Column H	Peak Hour Percentage	from traffic survey results
Column I	No. of Fatality crashes	from accident records
Column J	No. of Casualty crashes	from accident records
Column K	Heavy Vehicle Percentage	from traffic survey results
Column L	Activity Generator - highest	Highest trip generator e.g. schools, shops, bike paths, etc.
Column M	Activity Generator - second	Second highest trip generator

The data may be entered straight into the spreadsheet, or alternatively a form can be used for easier data entry. To call up the form, click <Data> from the pull down menu bar and then click <Form...> and the form will appear to show each record individually and can be used to input <New> records.

Once the data has been entered, the 'Output' worksheet automatically allocates the points score for each field and then calculates final total points score and ranks, but does not sort, the streets based on the total points score. The 'Input' and 'Output' worksheets are linked, therefore to maintain the integrity the output data, no alterations should be made to the 'Output' worksheet.

Below are the base data contained within the spreadsheet.

85th %ile		
Value	Local	Intermediate
0	0	0
50	3	0
55	9	1
60	15	6
65	24	12
70	33	18
75	45	27
80	60	40

Peak Hour %Vol		
Value	Local	Intermediate
0	0	0
10	4	0
11	8	4
12	12	8
13	12	12
14	16	12
15	20	16
16	24	20
17	28	24
18	32	28
19	36	32
20	44	36
21	48	44

24hr Vol		
Value	Local	Intermediate
0	0	0
1000	10	0
1500	15	0
2000	20	2
2500	25	3
3000	30	5
4000	40	10
5000	50	15
6000	60	20
7000	70	25
8000	80	30
9000	90	35
10000	100	40
11000	110	45
12000	120	50
13000	130	55
14000	140	60
15000	150	65
16000	160	70
17000	170	75
18000	180	80
19000	190	85
20000	200	90

Heavy Vehicles		
Value	Local	Intermediate
0	0	0
1	0	0
2	0	0
3	2	1
4	4	2
5	6	3
6	8	4
7	10	5
8	12	6
9	14	7
10	16	8
11	18	9
12	20	10
13	22	11
14	24	12
15	26	13
16	28	14
17	30	15
18	32	16
19	34	17

Crashes		
Value	Local	Intermediate
Per Fatality / Serious Injury	15	15
Per Casualty / Crash	10	10

Activity Generators		
Activity	Local	Intermediate
Bicycle route	6	4
Passive	0	0
Industrial	2	0
Residential	5	2
Playground	7	5
Primary school	10	8
Secondary school	8	6
Retail	8	6
Transport Interchange	8	6

APPENDIX H

LOCAL AREA TRAFFIC MANAGEMENT PRECINCT NAMES

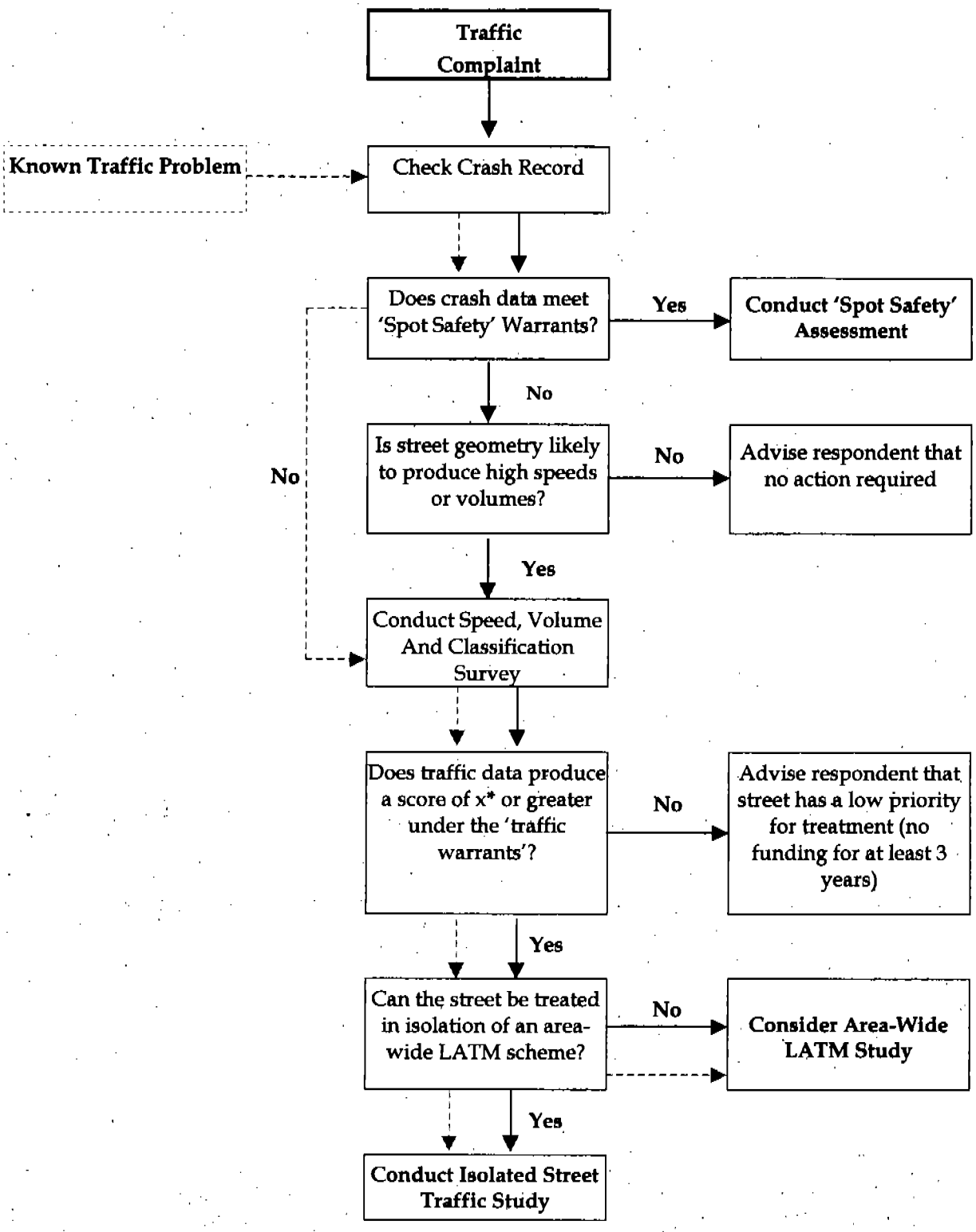
BANYULE LOCAL AREA TRAFFIC MANAGEMENT PRECINCTS

Precinct Number	Suggested Name
1	Bundoora
2	Kalparrin
3	Greenhill
4	St Helena
5	Lorimer
6	Greensborough
7	Briar Hill
8	Greenwood
9	Henry
10	Plenty River
11	Sherbourne
12	Dunvegan
13	Strathallan
14	Yallambie
15	Montmerency
16	Jacka
17	Heidelberg West
18	Northern
19	Olympic
20	Outhwaite
21	Rosanna
22	Golf Links
23	Streeton
24	Viewbank
25	Castleton
26	Lower Plenty
27	Oriel
28	Altona
29	Warringal
30	Station
31	Beverley
32	Liberty
33	Donaldsons
34	Banksia
35	Heidelberg
36	Studley
37	Eaglemont
38	Rockbeare
39	Ivanhoe
40	Ivanhoe East

APPENDIX I

TRAFFIC ASSESSMENT PROCESS

TRAFFIC ASSESSMENT PROCESS



* To be determined by Council (subject to the level of available funding).

APPENDIX J

LOCAL AREA TRAFFIC MANAGEMENT PROCESS

LOCAL AREA TRAFFIC MANAGEMENT PROGRAM

Purpose of Program

To develop a systematic process for the conduct of area-wide LATM studies, with significant community input.

As discussed, area-wide LATM studies can be resource and cost prohibitive and should only be considered where traffic problems are evident across a residential precinct. If the problems can be isolated to a small number of problem streets, then they are best treated in isolation, if practicable.

It is likely that some residential areas of Banyule will need to be treated as part of LATM studies and the following process should be considered to ensure that the community has ownership of the problem 'identification' and treatment.

Description of Process

1. ***Determine Area For Treatment***

   Council determines candidate areas for treatment based on level of complaints about adverse traffic conditions, traffic volumes, speed and accident data, the creation of new major traffic generators in the area, etc., and the inability of the 'Spot Safety' program to address the issues.

   On the basis of the adopted 'Warrants Program' determine the LATM area with the highest point score (based on the assessment of up to 10 representative streets in each area).

2. ***Establish LATM Study***

   Conduct study using in-house staff or use a consultant. If a consultant is used develop a Brief for the study and select appropriate consultant.

3. ***Data Collection***

   Collect required traffic volume, speed and accident data. Conduct origin/destination study if necessary. Seek traffic concerns from residents via a letter-drop of area advising of the conduct of the study.

4. ***Public Meeting(s)***

   Conduct a public meeting(s) to advise interested residents, organisations, etc of further details of the study and to elect a Resident Traffic Committee that is representative of the whole area. Also use the meeting to identify/confirm traffic problems in the area.

5. ***Development Of Draft Scheme***

   The Resident Traffic Committee determines the objectives of the proposed scheme and develops a Draft LATM Scheme based on data and traffic problems already identified. The Committee should use Council guidelines developed for the implementation of the Spot Safety program to identify candidate locations for appropriate treatment.

6. ***Consultation On Draft Scheme***

   Letter-drop all households in area and hold a public display of Draft Scheme. Consult with relevant authorities and organisations. Show conceptual designs of all treatments to potentially affected property owners and identify potential impacts in regard to parking loss, access difficulties, increased noise, etc.

7. ***Development Of Recommended Scheme***

   Based on responses to the Draft Scheme, Council officers/consultants, with input from the Resident Traffic Committee, develop a Recommended Scheme for Council approval. If the Recommended Scheme is substantially different to the Draft Scheme further consultation with the community will be required.

8. ***Adoption Of Scheme By Council***

   Advise all respondents to Draft Scheme and any subsequent respondents of the presentation of the Resident Traffic Committee's report to Council and invite them to attend Council's Standing Committee Meeting. Advise the whole area of the Recommended Scheme and its date of presentation to Council's Standing Committee Meeting by a notice in the Council newsletter and/or the local press.

9. ***Preparation Of Detailed Designs***

   Prepare detailed designs of the treatments of the adopted scheme. Consult with directly affected residents, bus companies, emergency services, etc.

10. ***Implementation of Scheme***

    Arrange implementation of adopted Scheme.

11. ***After Study Data Collection***

    Collect further traffic volume and speed data at a minimum of six months after completion of the Scheme (unless there are specific traffic problems) to assess the effectiveness of the Scheme. Only undertake further widespread consultation/survey if there is a specific need.

12. ***Review Scheme***

    Subject to available resources, review the impact of the Scheme with the Resident Traffic Committee and assess whether it meets the original objectives of the Scheme.

    If Scheme is considered satisfactory by the Resident Traffic Committee and/or Council then no further action is required and Scheme is complete. If the Scheme

requires further refinement and/or additional treatments go to the next stage, Step 13.

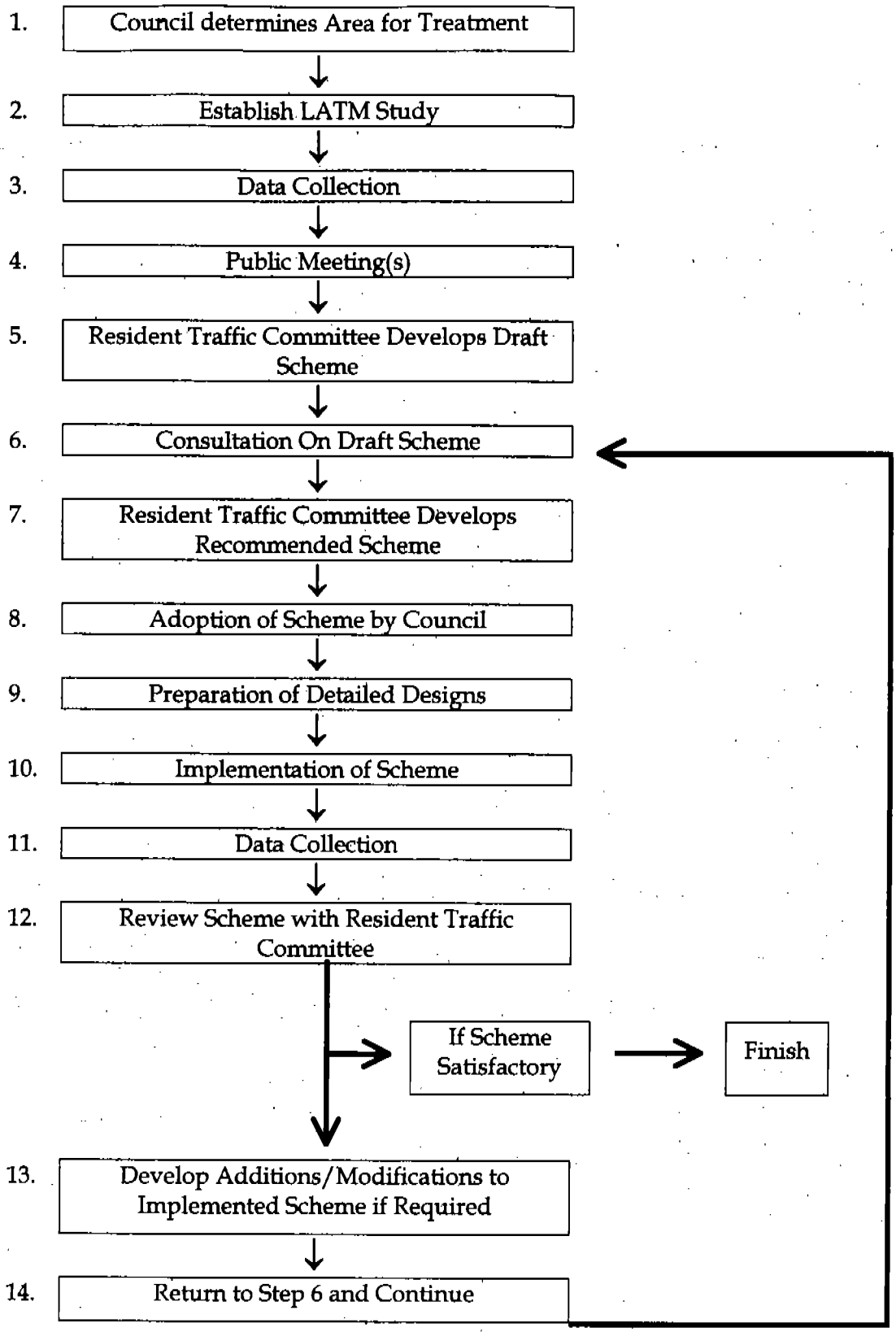
13. ***Develop Modifications/Additions To Scheme***

In association with the Resident Traffic Committee, modify existing. treatments and/or develop additional treatments to assist the Scheme to meet the original objectives.

14. ***Return To Step 6 and Continue***

Undertake further consultation and ultimately seek Council adoption of changes/additions to the original Scheme. Go through Steps 6 to 12 until a satisfactory Scheme (according to Council) has been developed and implemented.

A flow chart of this process is shown on the following page.



Flow Chart of Local Area Traffic Management Process

APPENDIX K

LOCAL AREA TRAFFIC MANAGEMENT CHARTER

CHARTER FOR LOCAL AREA TRAFFIC MANAGEMENT STUDIES

1. ***Preamble:***

   The Banyule City Council has resolved to liaise with the residents and business owners in the local area to assist in the development of Local Area Traffic Management strategies under the terms of reference below.

2. ***General:***

   The appointed Resident Traffic Committee shall prepare proposals and, where appropriate alternative proposals within its terms of reference, for ultimate submission to Council.

3. ***Structure:***

   The Resident Traffic Committee shall comprise of a maximum number of community members (normally 8, dependent upon size of local area), elected by the community at a public meeting, all Ward Councillors and Council officers. A Chairman and Secretary shall be elected from the community members. Any consultant appointed by Council shall assist and advise the committee.

   The community representatives shall be elected on the basis of one person, resident in the area, representing the people from each of the sub-areas delineated on the study area map (In mixed use areas, representatives of industrial or commercial areas need not be resident in the area).

4. ***Voting Rights:***

   Only members elected to the Committee shall have the right to vote on matters brought before the Committee (i.e. the community representatives).

5. ***Replacement of Members:***

   A member who, without apology, is absent from three consecutive meetings shall cease to be a member of the working committee. Any resident of sub-area in which the vacancy occurs may nominate as a replacement representative. Where two or more nominations occur, one shall be elected by the vote of the working committee members.

6. ***Terms of Reference:***

   The Resident Traffic Committee shall prepare plans and proposals relating to traffic management and parking within the study area. Any major departure from these terms of reference shall require the consent of Council.

7. ***Meetings:***

   Meetings shall be held at a frequency as determined by the Committee. The Committee, keeping in mind Council's preference for orderly and accessible public involvement at meetings shall formulate rules of meetings. The chair of the meetings may be rotated amongst the community representatives.

8. ***Role of Resident Traffic Committee Members:***

   To represent their sub-areas within the Committee, to report proceedings of meetings to their sub-areas and to relay the opinions of the sub-areas to the Committee on all matters pertaining to the study. To consider feasible options and offer recommendations on traffic management in the subject area.

9. ***Role of Council Officers:***

   To liaise with the Committee on all matters of administration, including the provision of reasonable typing and copying services and to provide the group with data and technical advice on any matter falling within the working committee's reference.

10. ***Final Decision:***

    The Committee will undertake a strategy facilitation role only.

APPENDIX L

INDIVIDUAL STREET PROCESS

INDIVIDUAL STREET TRAFFIC MANAGEMENT PROGRAM

Purpose of Program

Council regularly receives complaints from residents of local streets regarding traffic speed and/or volume in their street. The complaints are investigated with the view to identifying streets that have adverse traffic conditions that would unduly affect residential amenity and that can be treated in isolation without causing a redistribution of traffic into other local streets.

For the purpose of the process, an 'Individual Street Traffic Treatment' is defined as an isolated treatment which is proposed to address concerns of residents in local streets with respect to traffic speed, volume or crashes which do not meet the guideline's 'Spot Safety' projects and where the street or streets can be effectively treated in isolation of an area-wide LATM scheme.

Description of Process

The 'Individual Street Traffic Treatment' process is described as follows:

1. Complaint

   Preliminary identification of problem through letter of complaint, receipt of petition or telephone call.

2. *Collection of Traffic Data*

   If relevant traffic data is not available, traffic surveys are undertaken to obtain data.

3. *Assessment of Traffic Data*

   The traffic data is assessed to determine the ranking of the street on the basis of the adopted 'warrants' program.

   Traffic treatments should not be considered for installation in the street(s) in isolation of a Local Area Traffic Management Study if it is expected that traffic problems will be transferred to untreated streets.

   Professional judgement is used to determine whether the street can be treated in isolation or whether there is likely to be a redistribution of traffic to other streets as a result of the treatment. For these cases the matter should be reported to Council with the view to deferring the treatment until a Local Area Traffic Management Study of the affected area is undertaken.

   If the street(s) can be treated in isolation then concept plans of suitable treatment options, with preliminary cost estimates, are to be prepared.

4. ***Priority and Funding***

The project is prioritised in accordance with the adopted 'warrants' program and listed for funding consideration in order of priority in the next budget.

The priority of each unfunded project should be reviewed annually with additional traffic counts taken if it is likely that conditions in each street have changed substantially.

5. ***Public Consultation***

Following advice that funding is available for a particular project, the residents of the street affected by the adverse traffic conditions will be consulted through a questionnaire.

The questionnaire should canvass the following matters:

- Resident perceptions of traffic conditions in the street.
- The preferred treatment type and location(s).
- Resident acceptance of a treatment being constructed in front of their property.

If there is no clear support of any particular treatment proposal then a meeting(s) should be held with residents to develop a preferred treatment proposal, if any, for the street.

6. ***Adoption by Council***

The result of the public consultation phase is to be reported to Council for formal approval of a preferred treatment proposal or abandonment of the project as the case may be. Following Council's consideration of the matter, residents are advised of Council's decision together with a program of when construction will commence.

7. ***Implementation***

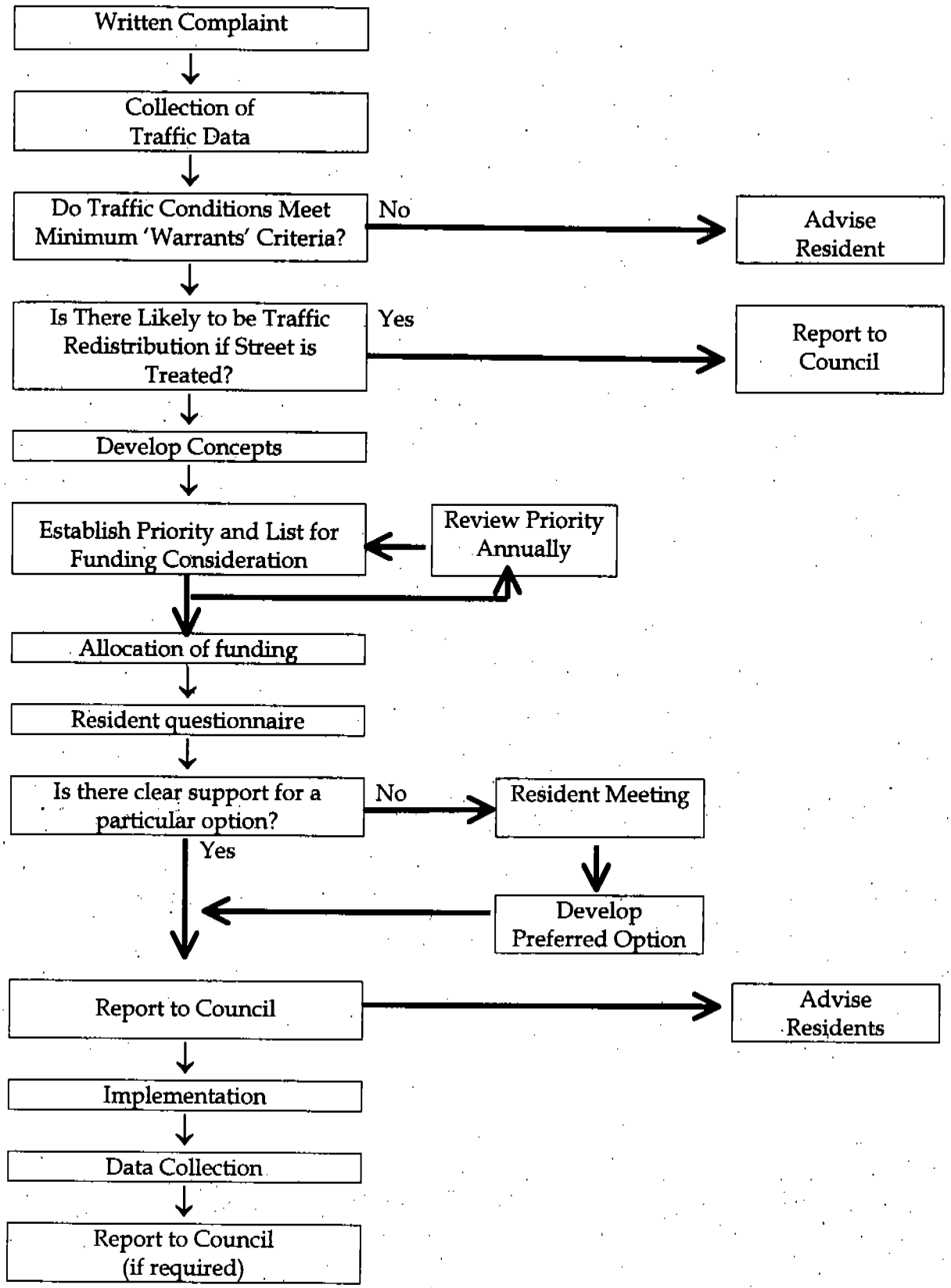
The adopted 'Individual Street Traffic Treatment' is constructed.

8. ***After Study***

Relevant traffic data is collected and assessed to determine what changes have occurred to traffic conditions.

The 'Individual Street Traffic Management' process is represented in the Flow Chart shown on the following page.

RESIDENTIAL AMENITY TRAFFIC MANAGEMENT PROGRAM FLOW CHART



APPENDIX M

SPOT SAFETY PROGRAM

DRAFT SPOT SAFETY IMPROVEMENT PROGRAM

Purpose of program

The need to provide this service is derived from an obligation of Council, as the Highway Authority, to maintain a safe road environment. This requires continual monitoring of the road network and accident records to identify locations with a significant accident frequency which may require remedial action. Demand is generated from a pro-active assessment and by concerns raised by the community.

The State Accident Record available annually from VicRoads is used as the basis for accident location assessment. The assessment can be supplemented through use of Police accident report forms (if available) to assist with accident causes.

Annual Assessment of State Accident Record

An annual assessment of the State Accident Record is undertaken using CRASHSTATS to identify accident locations with the view to improving safety. The process involves the preparation of a priority listing based on the frequency of reported casualty accidents occurring over the preceding five year period under each of the following categories:

- Arterial Road Intersections
- Arterial Road Links
- Local Streets
- Specific Categories
  (e.g. Pedestrians, Cyclists, Trucks, Buses, Motor Cycles, Trams and Trains)

In assessing the frequency of accidents at a particular location due regard is given to the number of vehicles per day using the road and in the case of arterial road links the length of the road link. A list is prepared that includes the top 10 locations within each category at which the accidents rate can realistically be addressed.

The locations that have been treated in the preceding five years are monitored to assess the effectiveness of the treatment.

Investigation of accidents on Declared Main Roads should be undertaken in consultation with VicRoads.

Investigation of Potential Accident Sites Identified by Community Concerns

The accident record of a particular location may be investigated in response to concerns raised by the community. It is likely that locations with a serious accident problem will be identified as part of the annual assessment. Some locations of concern to residents might have only a minor problem which can be addressed immediately, if warranted, by simple low cost measures such as line marking or signs.

The site will be investigated and assessed in the context of the priority listing of sites. The complainant is to be advised of the outcome of the investigation and action, if warranted, to be taken on the matter.

Process for Addressing Top 20 Accident Locations

The process for addressing accident sites in the categories listed above varies as described below.

Arterial Road Intersections

- Investigate in detail the nature of accidents occurring at each of the top 10 locations that have not been treated in the preceding five year period.
- Consider options to improve safety and develop a preferred option(s) through consultation with VicRoads for Declared Roads. Concept plans for sites that have a high priority and potential for treatment are to be prepared for discussion purposes.
- If the preferred option(s) alter the functional characteristics of the intersection, the matter is reported to Council with the view to seeking formal approval from VicRoads (for Declared Roads) for the proposed modifications.
- List the proposal for funding consideration.
- On advice that funding is available program the implementation of the proposal.
- The public should be consulted on the proposal during the detail design stage. The level and extent of the consultation will need to be assessed for each proposal.

Arterial Road Links

- Investigate in detail the nature of accidents occurring at the top 10 locations that have not been treated in the preceding five year period.
- Consider options to improve safety and develop a preferred option(s). Concept plans for sites that have a high priority and potential for treatment are to be prepared for discussion purposes. If the preferred option involves traffic management on a Declared Road the proposal is to be developed through consultation with VicRoads.
- Proposals affecting accessibility into/from an adjacent local area should not be considered in isolation of a Local Area Traffic Management Study.

- If the preferred option(s) alter the functional characteristics of the road, the matter is reported to Council. The public may have to be consulted and considered in developing an appropriate option. Council will need to seek formal approval from VicRoads for the proposed modifications on Declared Roads.
- List the proposal for funding consideration.
- Following advice that funding is available, program the implementation of the proposal.
- The public should be consulted on the proposal during the detail design stage. The level and extent of the consultation will need to be assessed for each proposal.

Local Streets

- Investigate in detail the nature of accidents occurring at each of the top 10 locations/streets that have not been treated in the preceding five year period.
- Consider options to improve safety and develop a preferred option(s). Concept plans for sites that have a high priority and potential for treatment are to be prepared for discussion purposes. Due regard should be given to constraints such as excessive cost for service alterations, land acquisition and property access.
- If treatment is warranted ahead of a Local Area Traffic Management Study, the matter is to be reported to Council with the view to recommending a specific solution for its listing on the Local Street Spot Safety Improvement Program of approved treatments.
- This list will form the basis of funding applications to Council in its budget deliberations and to VicRoads under its local road funding program.
- Following advice that funding is available for a particular project, the residents of the streets affected by the proposal will be consulted through a questionnaire. The questionnaire should canvass resident perceptions of traffic conditions in the street with regard to safety and assess support or otherwise of the proposed treatment(s). If there is no clear support for the proposal then a meeting should be held with residents to discuss the proposal and develop a preferred option.
- The results of the public consultation phase is reported to Council for formal approval of the proposal. Following Council consideration of the matter, residents affected by the proposal are advised of Council's decision together with a program of when construction works will commence if the proposal is to proceed.
- Following construction of the treatment, the site will be monitored as part of the annual assessment of the State Accident Record to monitor the success of the treatment.

Specific Categories
(e.g. Pedestrians, Cyclists, Trucks, Buses, Motor Cyclists, Trains and Trains)

- Investigate in detail the nature of accidents occurring at each of the top 10 locations that have not been treated in the preceding five year period. Locations identified under these specific categories may also be identified under one of the other three categories above.

- Consider options to improve safety and develop a preferred option(s). Concept plans for sites that have a high priority and potential for treatment are to be prepared for discussion purposes. If the preferred option involves traffic management on a Declared Road or the installation of a Major Traffic Control Item without delegation approval to Council, the proposal is to be developed through consultation with VicRoads.