⸁raffic Calming a City.

⸴ngus W. Witherby,
ecturer in Transport Planning,
niversity of New England

⸳stract:

⸝vances in traffic management such as Local Area Traffic Management and its derivatives represent ⸳iecemeal approach to the question of coming to grips with the car in urban environments. A ⸝ently completed strategic plan for the city of Armidale, NSW, a town of some 25,000 people, ⸝posed a radical shift in the relationship of the city to the car. The study arose out of a need to cater ⸝ the long-term future urban and rural residential growth of the city but evolved into an attempt to ⸝e a new direction for the city under the banner of a Total Quality Environment. Developed with ⸝ng community support this plan recommended a long term strategy to traffic calm the entire city ⸝ues such as financial feasibility, political acceptability and engineering practicality are explored with ⸝ conclusion that the change is possible, desirable and achievable.

⸝tact Author:

⸝us Witherby
⸝rtment of Geography & Planning
⸝ersity of New England
⸝lDALE NSW 2351

phone: (067) 73-2821
(067) 71-1787

ATRF94

1. INTRODUCTION

To Traffic Calm a City

> "In the end, cultural change involving a revolutionary change from what society accepts now is required if the vision of 'traffic calming', in its widest definition, is to be realised " (WSROC, 1993, A9)

This paper describes the early stages of an attempt, in the City of Armidale, NSW, to achieve revolution by evolution - to bring about significant shifts in the relationship of a city to the car by operating in the 'eco-political' minefield of the full range of the 'Darwin Matrix' (Table 1) It is acknowledged that operating in this area should not be done lightly (WSROC, 1993, A7-9). Nevertheless, by adopting an evolutionary approach that attempts to keep changes to the physical road environment and community expectations largely in 'synch', it is considered that such change is possible on the scale of the small city.

The 'Darwin Matrix' (Table 1) recognises that the widest sense of traffic calming deals with more than modifications to the physical environment. It also deals with social and cultural change. The interrelationship of physical modifications with behavioural modifications is complex. It is still unclear whether enforcement (whether by physical means, legal sanctions or both) is a necessary precursor to behavioural change

Table 1 The 'Darwin Matrix'

SCOPE OF MEASURE	TYPE OF MEASURE	
	Physical/Environmental ('Technique') (Includes all physical and management measures to control level, route and speed of traffic)	Social/Cultural ('Ethos') (Includes both deliberate attempts to change community attitudes and other societal changes that may not be directly related to traffic matters and that may not be either deliberate or voluntary)
Local (street or neighbourhood)	Level I traffic calming techniques (e g speed control devices; 'green street'	Level I social change (e g neighbourhood speed watch; attitudinal change)
Intermediate (zone, traffic corridor, regional road)	Level II traffic calming techniques (e g SATM, parking policies, pedestrianised shopping areas)	Level II social change (e.g voluntary behaviour/mode choice change)
City-wide	Level III traffic calming techniques (e g. urban form manipulation, total system measures/policies)	Level III social change (e.g. cultural change, loss of choice, technological change)

(Source: adapted from WSROC, 1993, A7)

Through study of attempts such as those in Armidale it may be possible to gain better insight into these relationships Whilst local government in Armidale (and elsewhere) has been reasonably active in the area of physical change at the local level, we are only now seeing shifts from the top left of the matrix to the right and bottom right. As will be seen, even where there is significant support within a community for those shifts, achieving them involves a large number of stakeholders - not all of whom hold considered or internally consistent positions By actively working from the 'bottom-up' it is hoped that a community can be better primed and educated both to respond to and to initiate social and cultural change.

Background

The City of Armidale is located in the New England region of New South Wales, approximately half way between Sydney and Brisbane, and 115 km north of the major regional centre of Tamworth (Figure 1)   The town has a population of approximately 25,000 people including those residents of the surrounding Dumaresq Shire who live within a 10 km radius of the city   Armidale has two main industries; grazing and education, with tourism currently being developed as a third   The town forms a service centre role for the surrounding fine wool and beef areas. In education terms the town is home to the University of New England   In addition, the town has four private schools as well as the usual state schools   The former College of Advanced Education (once the Armidale Teachers College) is now part of the University of New England   The town also hosts a college of Technical and Further Education.

The physical disposition of the town is similar to many rural towns of similar size throughout New South Wales. Armidale is fortunate, however, to have avoided some of the major 'mistakes' of other towns. Commercial development in Armidale is concentrated on the CBD core which includes all major retailing facilities. There are no stand-alone single owner shopping centres of any significant size in Armidale. The main university campus is located on the fringe of the city, however a significant campus site also exists in the town (the former CAE site) The town is characterised by a fairly dense network of corner stores   Industrial development is concentrated in two main areas although there are some dispersed businesses scattered about the city as a whole. Figure 2 gives an overview of the land uses of Armidale   As with many other rural towns, Armidale is experiencing an emerging pressure for rural residential development on the periphery of the city. Increasing number of people are locating within the 10 km commuting radius' of the city (Cunningham and Witherby, 1994a)

The Strategic Plan

The Armidale and Dumaresq Councils (the city and surrounding Shire) through a joint planning committee, have resolved to update the district's long term strategic plan. The Department of Geography and Planning at the University of New England was invited to tender for the this job and was successful. The brief for the strategic plan was premised on the assumption that Armidale was facing a growth problem   This problem was perceived to be in two parts; firstly the need to identify new lands for residential subdivision on the fringe of the city and secondly the need to examine the implications of growth on the existing town   Initial investigations by the study team suggested that the premise of the study was fundamentally flawed. Armidale did not, in fact, have a growth problem With historical growth rates ranging between 0.47% and 1.7% and given the modest base population, coping with growth was well within the capacity of the city and its infrastructure   In fact, within the city boundaries approximately 20 years supply of
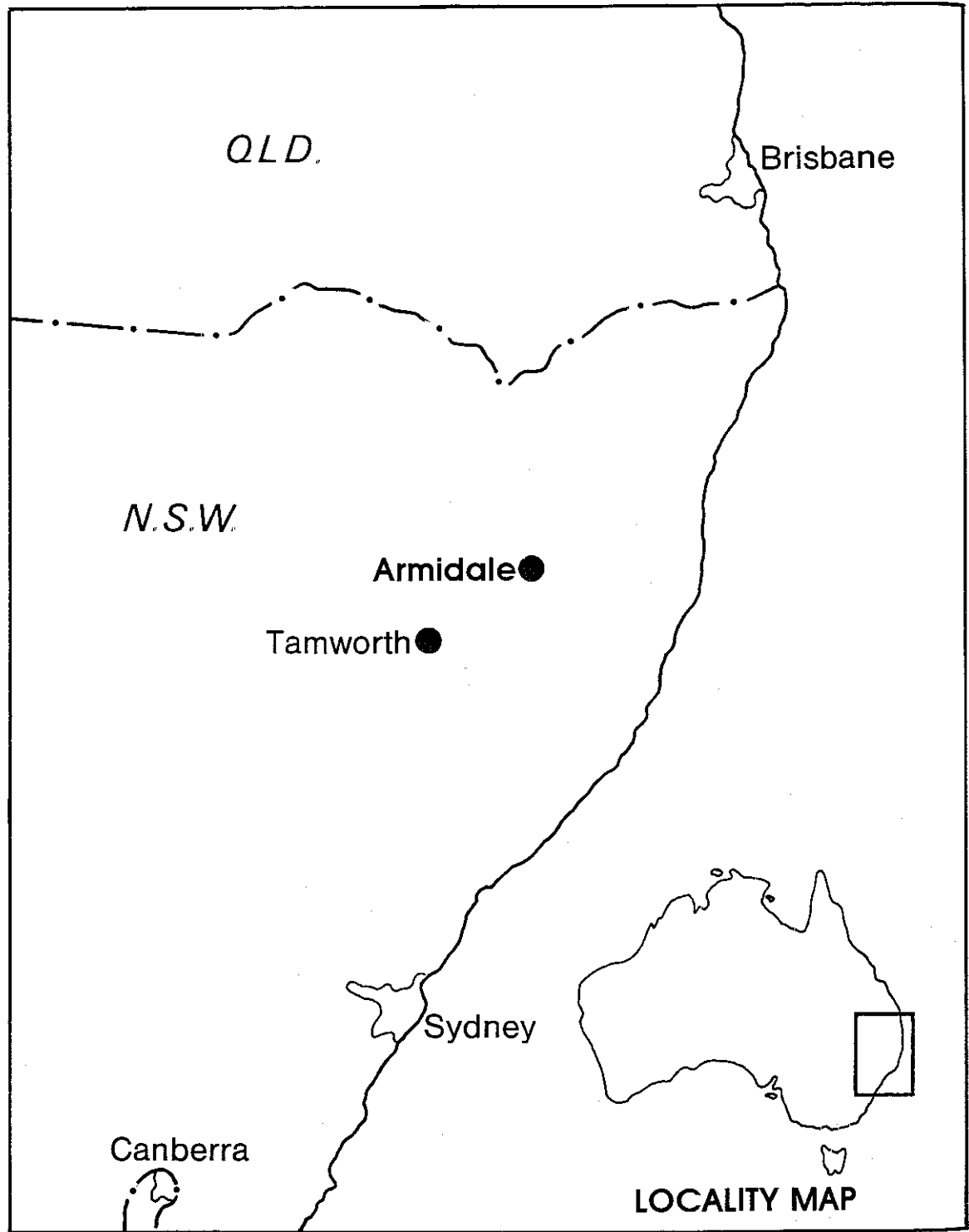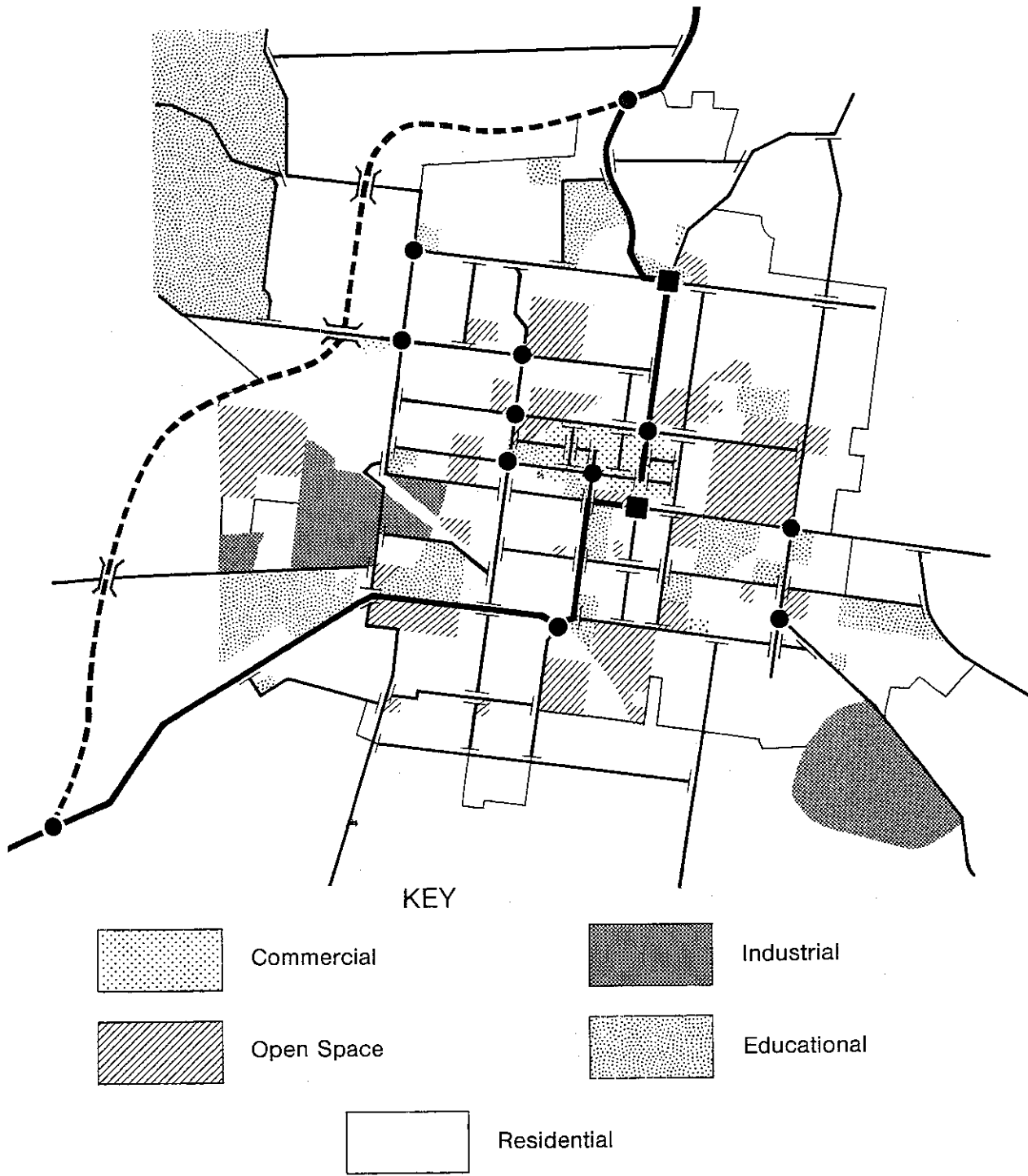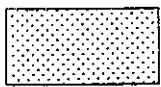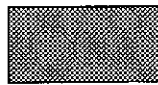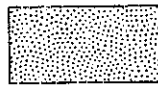
Fig.1

KEY
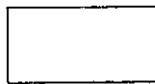
	Commercial		Industrial
	Open Space		Educational
	Residential		

Fig. 2

residential land for 'normal' subdivision existed before there was a need develop a growth corridor within the adjoining shire (Cunningham and Witherby, 1994a).

This information resulted in a change of direction for the study. Instead of a study directed solely at locating new land for urban development (though this was still done) the focus of the study became the establishment of a future strategic direction of the city The study evolved into a attempt to find an 'umbrella vision' which would guide the city, including its growth, through the next 20 to 30 years This meant that the focus of the study was now on process handling growth, both in terms of objectives for newly developing areas and for the town itself

The Study Process

The study team, which included staff from both local councils, decided that the traditional consultant approach to strategic planning was unlikely to be successful in the Armidale context. Instead of the study producing a draft strategic plan prior to the commencement of significant public input, it was decided to evolve the study from the ground up, based on the views of the community in Armidale The study team's initial task was the collation of information packages which served to provide the people of the town with a potted summary of their town

The information package also included an 'issues' section but it did not suggest any solutions to or resolutions of those issues. This information package was made available to every household through the local print media as a lift-out section. Simultaneously with the dissemination of information about the town, the study team drew together a number of issue-based focus groups This included groups targeting such matters as land development, community and social services, environmental issues, the role of governments and the like These focus groups were supplemented by the use of community based meetings held in small scale non-threatening venues. In addition to these meetings, which were organised through the local media, a selection of ratepayers were approached at random and invited to attend further meetings (Cunningham and Witherby, 1994a).

Through the focus groups and community meetings a two way process occurred Information collated about the town was discussed with participants who, in turn, expressed their views and visions about Armidale's future to the study team. The final collation of information from this process and from the initial information exercise formed the draft strategy. Interestingly enough, the common thread from all groups - be they business community or environmentalist or resident - was the need for Armidale to promote and develop a quality living environment Through the course of the focus groups and community meetings the aim came to be linked to a quality physical environment as well. This lead to the draft strategy adopting the theme of the total quality environment for Armidale (Cunningham and Witherby, 1994a)

2. TRAFFIC AND TRANSPORT IN ARMIDALE

Background

Armidale's road layout is based on a traditional grid system typical of towns laid out during the mid 1800s. The town is at the junction of the New England Highway and the Grafton Road - a link through to the coast. The basic grid framework still forms the fundamental structure of Armidale's road system, notwithstanding growth at the perimeter over the intervening period It is only in the last few years that some signs

have emerged of a series of radial collector roads extending from the periphery of the town to service new subdivision areas.

Armidale is fundamentally a car based city. Nevertheless it is quite well serviced by public transport. The bus system in general is quite good by traditional rural standards and is run by single bus company. This company is highly proactive, advertises heavily and is willing to experiment with new routes and new ideas. The town is also served by a taxi service.

The journey to work mode split from the 1991 census follows:

Table 2   Journey to Work Mode Split, Armidale, 1991.

Mode	%
Bus	1.3
Taxi	0.8
Car as Driver	68.4
Car as Passenger	13.0
Motor Bike/Scooter	1.3
Bicycle	2.8
Walked	11.0
Other	1.2

Source: ABS (1993)

History

Up until the 1970's, Armidale's road system was based on the classic 'give way to the right' rule with otherwise uncontrolled intersections. Traffic volumes were small and driver speeds also quite low. The 1970's did, however, see the introduction of the first non-metropolitan mall in Australia - that being the central block of the main commercial business district.

During the 1980's a network of priority roads (a sub-arterial grid) was established. Roundabouts came into use as the major traffic management device and the council commenced construction of the spinal cycle network through the open space corridor bisecting the town. During this period intersection controls were also introduced (Figure 3).

The 1990's are seeing the installation of further roundabouts, improved legibility of the road hierarchy through intersection treatment and the construction of Armidale's first road constructed on very low speed principles. Almost a Woonerf in construction, this road is adjacent to the existing mall. The 1990's will also see completion of the Armidale Bypass and enhancement to cycling routes around the city.

Current Transport Issues and Problems

It must be stated that Armidale does not really have a traffic problem compared to metropolitan areas. Colloquially the rush hour is known by many people as the rush minute, although in practice a certain degree of congestion is experienced on roads to the University for about 15 minute in the mornings and afternoons. In addition, some roundabouts directly adjacent to the CBD core are beginning to experience congestion problems in mid-afternoons.
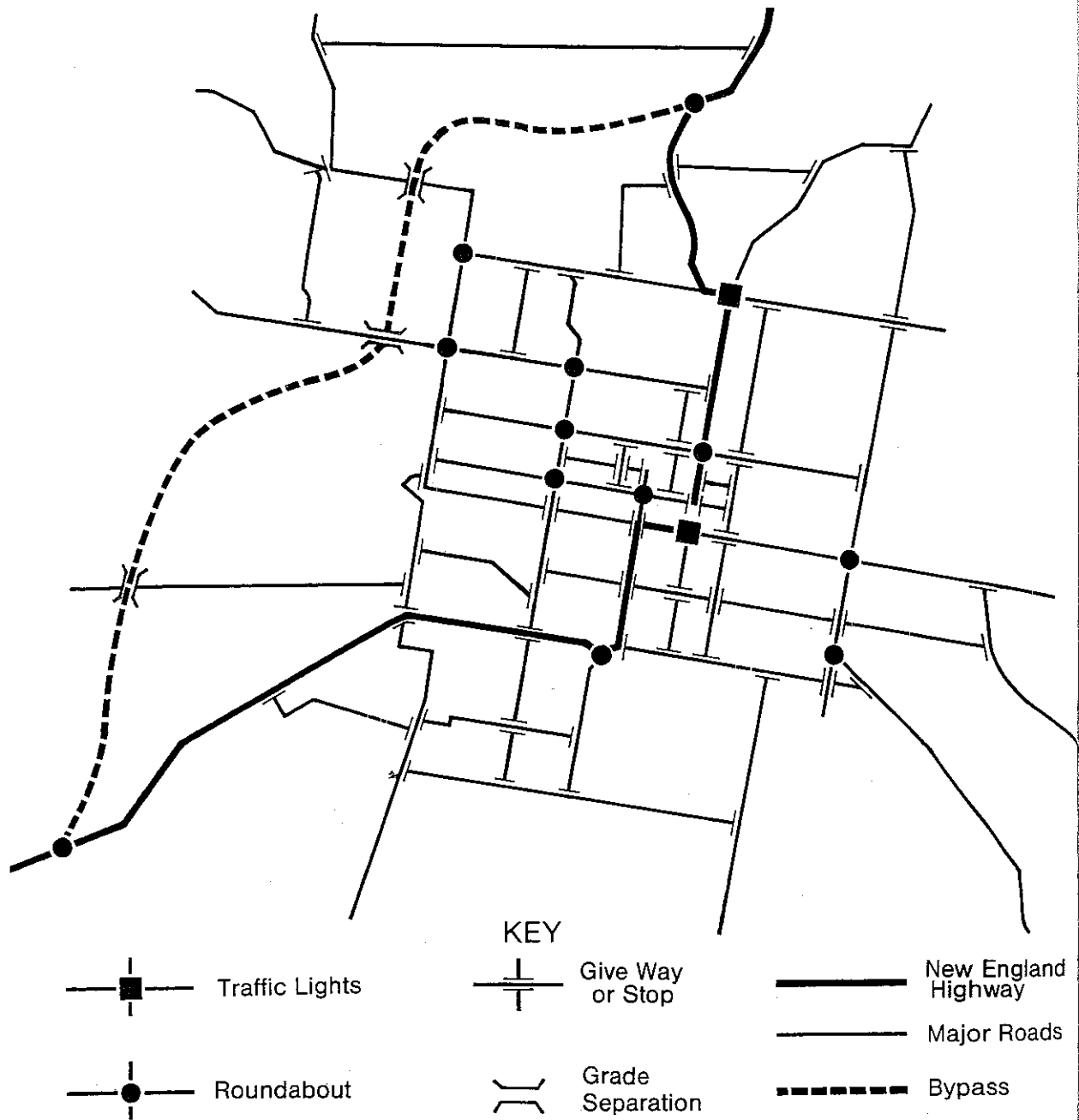
KEY

■ Traffic Lights	⊥ Give Way or Stop	▬▬ New England Highway
● Roundabout	⊐⊏ Grade Separation	─── Major Roads
		▬ ▬ ▬ Bypass

Fig. 3

The city does have a number of intersection 'black spots' generally associated with the New England Highway which bisects the town, or the major sub-arterials. Cyclist safety is also emerging as a significant issue particularly with the proliferation of roundabouts in the city. Public concern is beginning to be expressed about local area traffic management devices that are being introduced to the city road grid with some resistance developing.

As with most other non-metropolitan areas in New South Wales, speed around schools is also becoming an issue of strong community concern, and Armidale has recently had 40 km/h school speed zones introduced.

The final issue is the opening of a bypass and the impact this will have on the Armidale community. Having waited some 40 years from the time the original corridor was identified, Armidale is now working on coming to grips with its impact. Whilst no-one will miss the night-time heavy trucks, the community does not want to lose the current car-based transient visitors.

3. INTERACTION BETWEEN THE STRATEGIC PLAN AND TRAFFIC AND TRANSPORT ISSUES

One of the most significant results of the strategic planning process was the fact that it 'called forth' a coalition of all the environment groups existing within the town. The environmental movement was able to present a coordinated, researched and carefully thought through approach to all the issues identified in the strategic planning process.

The issue of 'traffic calming' (as defined by Day quoted in Engwicht, 1992, 118) was introduced to the strategic planning agenda by the University team as a means of dealing with car growth within the city in the medium to long term in a way that was compatible with the emerging 'quality of life' agenda. It was suggested that in the medium to long term Armidale should strive for a 60 km/h speed limit on access-denied collector roads, a 40 km/h speed limit on collector and sub-arterial roads with residential frontage and a 25 km/h speed limit on 'pure' residential roads. These limits were to be achieved as the result of a combination of progressive physical modifications to the road environment combined with education leading (hopefully) to a behavioural and cultural shift in approach to the car (Cunningham and Witherby, 1994a).

The coalition of environmental groups latched on to the traffic calming concept and made a major well-researched submission on the issue. Strong parallels can be drawn between the activities of the environmental groups on this issue and the work of Citizens Advocating Responsible Transport (CART), a residents action group in Brisbane (Engwicht, 1992). The issue received prominent media coverage when the results of the strategic plan document collation were released. In fact, the traffic calming plan took 'top billing' making the front page of the local paper and sparking a number of media interviews.

In parallel with the move by the coalition of environment groups to support traffic calming in the wider residential community, a number of other traffic and transport issues raised by the strategic planning process were being addressed. These issues focused in particular on the central business district of Armidale, on the balance between cars and pedestrians for that area and the perceived difficulties in access that may result should pedestrianisation be significantly extended.

The business community basically formed into two groups. Survey results (McNeil, 1993) indicate that a majority of the business community (approximately 75%), are in

favour of enhanced pedestrianisation of the CBD core provided that accessibility (particularly for those with limited mobility) can be maintained. A smaller group is firmly opposed to expanded pedestrianisation, taking the more traditional line that with less cars driving past they will lose business Some of this negative perception may well be attributed to the construction of the speed limited route to the east of the original mall which was constructed during the depths of the recession. A lobby group has now been formed, however, to exclude traffic from the central business district and is promoting an alternative electric transit system in the pedestrianised areas (Hanna, P, Armidale business leader and investor, pers. comm) This has been described as an electric tram although it is not anticipated that it will run on rails.

A third strand to the view of car usage in the city is the question of traffic around sensitive areas such as schools   A Roads and Traffic funded project has looked at the question of the 40 km/h school speed zones around New South Wales. That study, carried out by the University of New England, was piloted in Armidale and produced mixed results, with many sites showing little compliance (Cunningham and Witherby, 1994b). This is despite considerable parent and media attention to this issue This issue raises the important point that people's avowed beliefs regarding the use of the car in society may not match their behaviour. Button (1993) attributes this to the failure of road pricing to adequately cost the externalities of an individual's car usage In other words, we want other people to modify their behaviour so we are free to continue without modifying our own.

Where to from here?

Need for a formal Transport Study

Armidale does not, at this stage, appear to require a formal transport study based on the traditional examination of trip-making patterns in the city. Preliminary investigations during the preparation of the strategic plan suggested that maximum traffic volumes on the existing two-lane network were unlikely to exceed 10-12,000 vehicles per day within the next 20 years on even the most optimistic growth scenario

The single largest trip attractor (the University of New England) dominates the journey to work trips in the city. Congestion associated with the University is very modest at the present time, affecting the surrounding road network for only about 30 minutes per day. The University is unlikely to experience significant growth in student numbers and employees on the main campus

Thus Armidale does not have a present (or predicted future) capacity problem in engineering terms Rather, the need in Armidale is for a coherent set of policy directions dealing with environmental capacity to accommodate the car within the context of other planning objectives. These policies can be assembled under the banner of 'traffic calming' - i e a focus on total quality of life as it is affected by the car - as proposed in the Engwicht's use of this term

Transport Plans and Transport Policy

Armidale does not have, at the present time, a single document which could be described as a transport plan Instead, a number of initiatives are proceeding in parallel, linked together through the strategic process and the strategic planning document The basic strategies which are currently being considered or are underway are listed over Following them in brackets is their position in relation to the 'Darwin Matrix'.

1. Pedestrianise the central business district completely, whilst ensuring adequate peripheral parking, disabled car access and alternative 'clean' transport from the peripheral parking areas through the CBD area (Hickey, J, Armidale and District Chamber of Commerce, pers. comm.) (Local scope, Level I, II and to an extent III physical/environmental changes, level I and II social/cultural change)

2. Consider the implementation of a local government based 'community service obligation' payment to the local bus operator to assist their proactive efforts to improve mode split towards public transport (Harold, J, Mayor of Armidale, pers. comm). (City-wide scope, level III physical/environmental changes, level II social/cultural change)

3. Develop a transport plan for the University of New England to reduce car dependence by people travelling to this single largest employment node in the city. Aspects such as car pooling, reducing parking availability on campus and farther encouragement and provision of facilities for cycling are under review (Armidale Student's Association, pers. comm ; Upton, 1994) (Intermediate scope, level I and II physical/environmental changes, level I and II social/cultural change)

4. Program, over a 20 to 30 year period, the reconstruction of the complete road system of city of Armidale under LATM/Green Street principles. This reconstruction would occur as and when roads fell due for reconstruction in the normal course of events (Cunningham and Witherby, 1994a). (City-wide scope, level I, II and III physical/environmental changes, level I, II and to an extent III social/cultural change).

5. Maintain the current land use pattern of the concentrated CBD core and encourage further development in medium density housing in and near the CBD area. In addition develop measures that assist the retention of the corner store network throughout the city (Cunningham and Witherby, 1994a) (City-wide scope, level III physical/environmental change, level II and III social/cultural change)

6. All new subdivision areas be constructed on Green Street principles from day one with those areas more remote form the city being connected by denied assess collectors as well as cycling, walking and public transport routes (Cunningham and Witherby, 1994a) (Local scope, level I physical/environmental change, level I social/cultural change).

As can be seen, the range of measures currently under consideration or underway cover all cells of the "Darwin Matrix". A number of measures do not, however, fall neatly into one category or another. It is the growing understanding of this that should facilitate the active move away from the top left corner of the matrix. In addition, the need to detect and understand the changes inherent in level III social/cultural changes (i e the 'involuntary' changes) is growing in importance. This is because without such understanding traffic calming measures have little chance of working effectively

4. IMPLEMENTATION

Implementation of these strategies is discussed under the headings of engineering practicality, financial feasibility and political feasibility.

Engineering Practicality

Malling

In terms of pedestrianising the CBD core, Armidale already has extensive experience through its mall construction programs. The engineering issues associated with pedestrianisation are therefore well understood

LATM/'Traffic Calming'

With the proposal to speed-modify the entire street network, the engineering experience is not so direct, although the experience with the east end mall and with existing local area traffic management (LATM) devices will assist. It is important, however, to draw the distinction between the use of LATM devices as traditionally applied in NSW and the total street modification being proposed. Local area traffic management in NSW has basically consisted of inserting a number of discrete physical devices into the road network (NSW RTA, 1988).

As is becoming clear from discussions with the Armidale community, there is increased resistance to further implementation of these devices in this fashion. It is suggested that this is occurring for several reasons. The first, and major reason, is that the road environment with this style of implementation of LATM is sending mixed signals to the driver. This is clear when typical speed profiles for a discrete device LATM managed street are examined, as shown in Figure 4. This is not a new issue, but is one which should continue to receive attention at the practitioner level. The second is the perception that these devices are both pedestrian and cyclist unfriendly. Although cyclists and pedestrians represent only a fairly small proportion of the total journey to work trips, (see Table 2) they are a quite vocal lobby, particularly when combined with the non-journey to work cyclists and pedestrians

The type of speed modification being examined for Armidale is looking to the modification of the total road environment so that the driver receives a consistent set of messages about the appropriate speed for that environment. It is based on the principles espoused in Westerman, et at (1993) in their work *Sharing the Main Street*. Speed modification is achieved through signage, road width and alignment, landscaping and non-car street uses all having the same design speed objective. This should achieve a more consistent speed and consequently lower driver frustration (Figure 4).

That this can work successfully - even on a single road segment in a commercial area - has been demonstrated beyond doubt through the east end mall treatment in Armidale The task here is to refine and enhance these evolving Main Street style treatments for use in residential areas. Examples of possible treatments for more heavily trafficked roads are shown in Figures 5a and 5b. Residential roads would adopt 'Green Street' principles within the existing carriageway as they fall due for reconstruction

New Subdivisions

Increased attention to 'green street' planning principles and experience in other local government areas such as Coffs Harbour suggests that retro-fitting speed-modified streets to the network presents no particular engineering problems. This also shows that the majority of drivers are able to cope with piece-meal introduction of these streets and modify their behaviour appropriately (Geoplan 350, 1994)
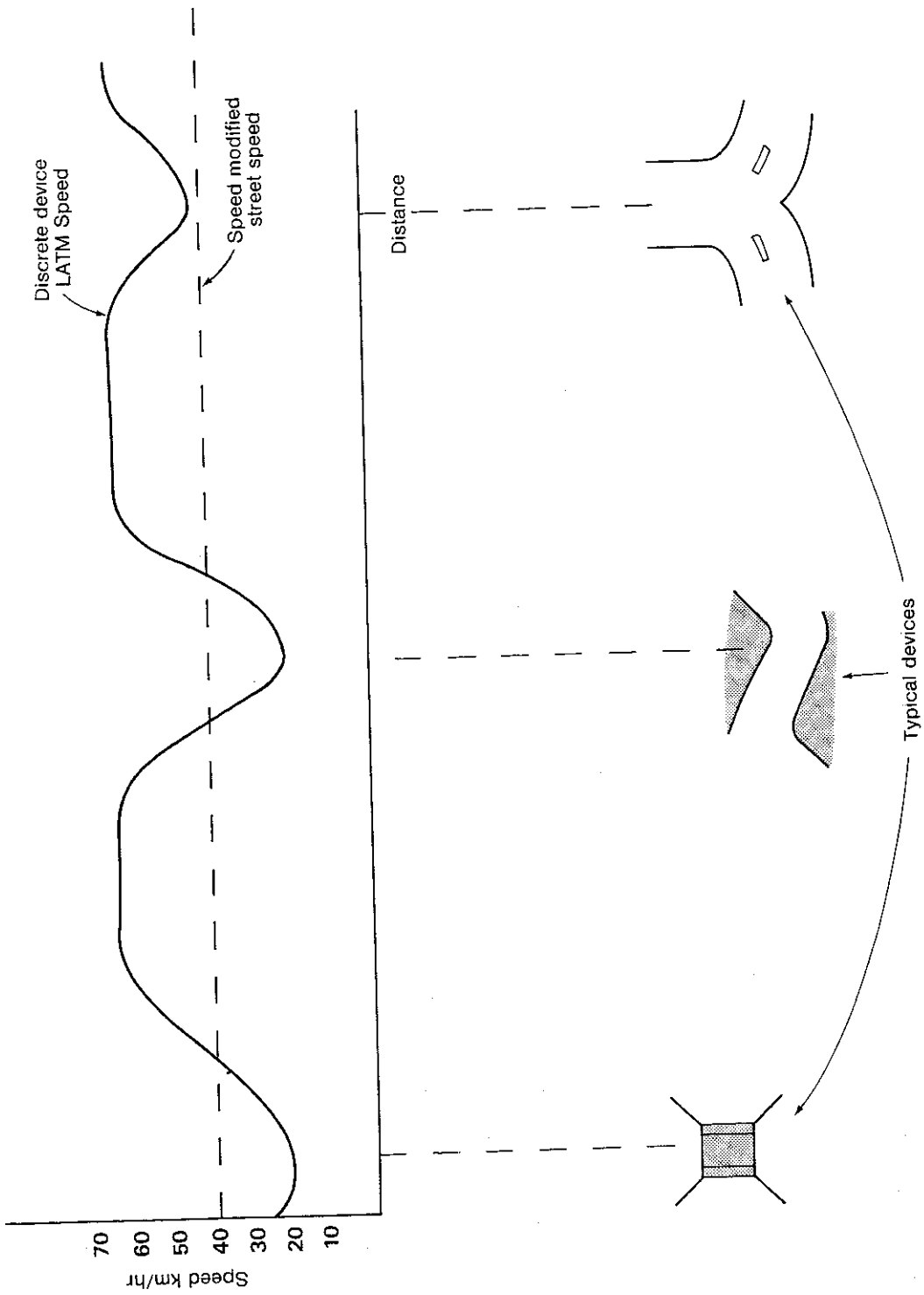
Fig.4

Financial Feasibility

Malling

Malling or pedestrianisation, is an expensive exercise. The East End Mall, which included complete treatment with pavers and landscaping, for example, cost in the vicinity of $400,000 (Gow, S, Chief Town Planner, Armidale City Council. pers comm) The Armidale community has demonstrated, however, that it has the financial capacity to undertake these works This is evident through the on-going expansion of pedestrianised areas in the city

Speed Modified Streets

Reconstruction on speed modified principles does cost more than 'standard' reconstruction. Information from Coffs Harbour City Council suggests that the cost of reconstructing on speed modified or 'green street' principles compared to normal principles is in the order of 10-15% greater, of which some 20% are landscaping costs. (Kitching, P, Design Engineer, pers. comm) These costs do not pose any real financial barrier to reconstruction on holistic principles provided that the work is carried out as part of the normal street reconstruction programme

Community Service Obligations

Community Service Obligations are now becoming an accepted way of making explicit the degree of subsidy inherent in the maintenance and operation of a public transport system. Whilst such subsidies from local government were common in the United Kingdom (Moseley, 1979) they are very rare in NSW except for support for 'Community Bus' schemes (Regan, L, public transport consultant, pers. comm)

The ability of local government in NSW to support such payments is highly dependent upon the attitude of the bus companies involved Information from the private bus industry suggests that the marginal cost of an extra bus kilometre is about $0.58c for a 42 seater bus, assuming a vehicle with driver is available If additional vehicles are required to be purchased, run and amortised, the cost increases to around $1 17c per kilometre (Price Waterhouse, 1991)

If it is assumed that the local operator has vehicles available, and if it is further assumed that the frequency of service on all routes is doubled (providing a half-hour service to most of the town; a 15 minute service on some routes and a 7.5 minute service on the "College Shuttle" route) this would equate to an additional operating cost of some $261 per week day (marginal cost) or some $503 per week day (full cost).

Although fare revenue would, in part, offset this, experience elsewhere in NSW suggests that at best, modest overall increases in patronage are likely (Hensher, 1993). If a 10% increase in patronage is assumed, and given an average ticket price of $1.20, then the nett cost to local government would be in the order of $117 per day marginal cost or $359 per day if all costs are included In practice, costs would likely lie somewhere in between these two extremes, with the annualised costs (week days only) being in the order of $30,500 (marginal costing) and $93,300 (full costing).

In view of the current low mode-split to public transport, these costs are, on the face of it, sufficient at this stage to render the concept of CSO's untenable On the other hand, if the substantial gains in service were able to be achieved for the marginal costing figure, this amount could be sustainable in terms of the 'promotion' effect - not to mention the
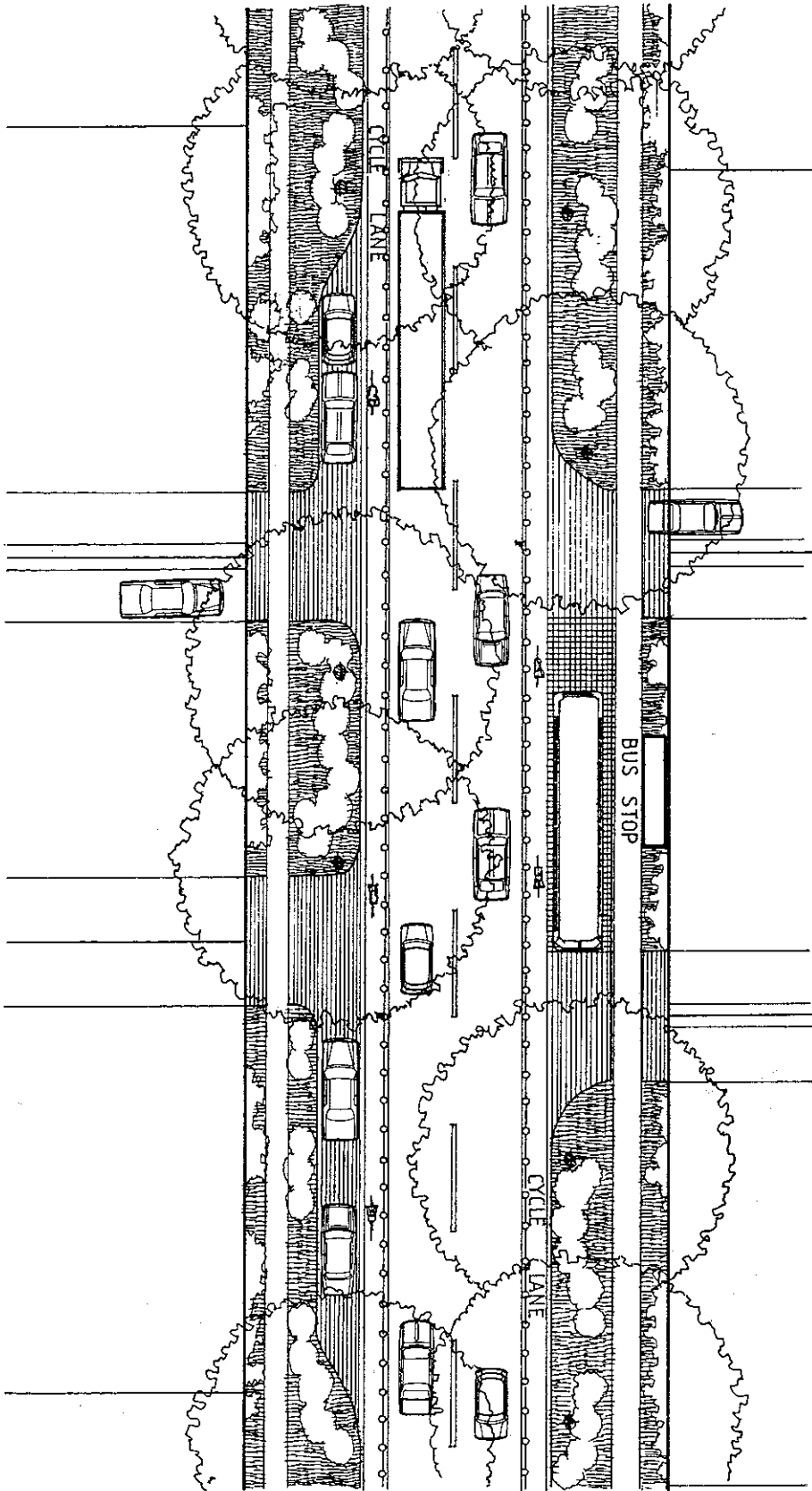
Fig 5a. Indicative treatment speed modified sub-arterial road

SYMMETRICAL

1·8   3·5   3·5   1·8
6·5   6·5

ASYMMETRICAL

5   3·5   3·5   8

HIGHWAY OR
TRUCK ROUTE

5·5   1·2   3·3   3·3   1·2   5·5

MEANDERING
CARRIAGEWAY

1·8

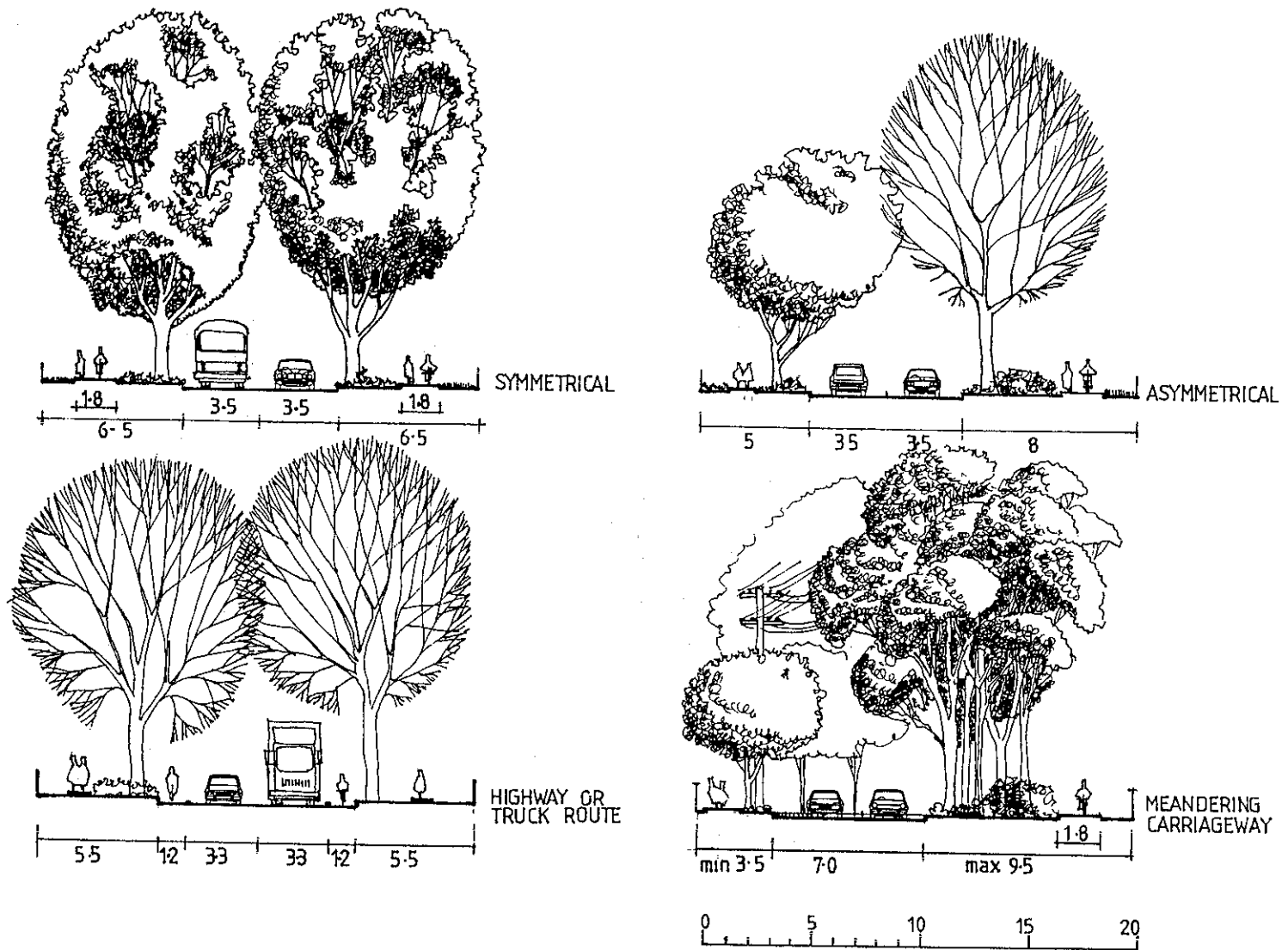min 3·5   7·0   max 9·5

0   5   10   15   20

Fig 5b. Indicative treatment speed modified sub-arterial road

social advantages of providing better transport services to the transport disadvantaged within the community.

In the longer term (perhaps over a 5 year period) patronage may increase to a sufficient extent to render ongoing CSO's unnecessary. This would require an increase of some 20-30%. Although this percentage change may appear large, in numerical terms the increases are relatively modest, requiring (at the marginal costing level) some 100 additional trips per day. This would equate, for instance, to 50 people changing their mode of travel to work from car to bus. This suggests that CSO's could be a useful method of attracting patronage provided that the CSO provider was willing to commit to a sufficiently long period for travel patterns to adjust.

New Subdivision Construction

Costs involved in new subdivision construction are not likely to be significantly greater than for conventional subdivision (JVFMAH, 1992). It is important, however, that local government pay particular attention to reducing the burden of unnecessary costs on subdividers.

The UNE Transport Plan

The University of New England Transport Plan is not likely to involve large direct or indirect costs - at least in the preparation of the plan. Adequate skills exist within the University Community to prepare such a plan 'in house'. Costs of implementation are also likely to be manageable, with the coordination of pool cars etc. being absorbed within existing administrative functions. Direct construction costs will, however, need to be met. At present these are uncosted.

Political

It is becoming clear that there is cross-community support from all sectors of the Armidale community for changes and modifications to the way in which the city deals with the motor car. That support is being evidenced from the business community, the university community and the general community. It must be clearly acknowledged, however, that there is also opposition. This opposition is based on the three areas of cost, accessibility/convenience and 'rights'.

Whilst the costs are significant, it is expected that the benefits will also be significant. Not only would reduced private car usage result in financial benefits to the residents of Armidale, but the establishment of Armidale as a model town for traffic calming principles would be a major drawcard to Armidale's tourist industry. The town of Davis, California, provides an excellent role model as to what can be achieved.

In terms of accessibility and convenience, it needs to be clearly acknowledged that the car is the single device which provides this best within the urban environment. Where a town (such as Armidale) does not have 'a traffic problem', the community will need to be convinced that any moves to redress balance between the private car and the pedestrian will not be at the cost of accessibility - particularly for those of restricted mobility such as the aged.

The essential point here is that the proposal to traffic calm the city does not imply restrictions on access. It is anticipated that the basic connectivity of the network will be maintained. The impact will on vehicle speeds and vehicle use, not on vehicle access. Although the central business district core is proposed as an exception to this rule the

provision of a cheap and exceedingly frequent public transport system connecting car parks with the major business areas is expected to provide a real alternative to car based accessibility. Car based accessibility for disabled people can still be retained.

In terms of convenience, the argument has been put forward that traffic calming will result in a significant increase in travel times, including for emergency vehicles. Observations of vehicle speeds throughout Armidale suggest that median vehicle speeds across much of the city are already below 60 km/h. Thus lowering the speed limit is unlikely to have a significant impact on travel times. The 'worst case' scenario would be traversing the city diagonally from one corner to the other. At most it is anticipated that traffic calming measures would add approximately 2 to 3 minutes to such a trip. Emergency vehicles are constrained by traffic for much of the time. Although a marginal increase in travel times might be expected, the risk of this posing a threat to life and property must be weighed up against the very real increases in safety on the road system occasioned by lower speed limits.

The key issue is really about changing driver expectations as to what speed they can travel. Whilst the city limit remains at 60 km/h drivers expect to be able to drive at that speed. They will therefore feel frustration if circumstances such as traffic congestion or LATM devices conspire to render that speed impossible. In terms of 'rights' there appears to be a group of drivers within the community who feel they have a right to drive at 60 km/h irrespective of the role or function of the street. They resent any perceived interference with this right or anything that may suggest that the driver needs to modify their behaviour to take into account other road uses. Driver and community education will produce a growing group of drivers who tend to treat driving as a privilege rather than a right. This shift could be reinforces through local efforts.

Consideration of these areas of opposition to the proposal outlined suggests the following:

Changing the communities attitude to vehicular use, both on environmental and safety grounds, is an educative and interactive process of community development. Ideas put forward by the community to government need to be operationalised in a manner which is engineeringly, financially and politically feasible. At the same time government has an equal obligation to relay information to the community on which they can make sound judgements about the issues being discussed.

5. CONCLUSIONS

Traffic Calming the City of Armidale involves a multi-pronged approach acting across the entire scope of Brindle's 'Darwin Matrix' (Table 1). The process is still, to an extent, fragmentary, however the strategic plan provides the 'hook' around which a more detailed and developed policy can be developed with the close involvement of the community.

By moving carefully and progressively on a number of fronts, keeping physical modifications generally in step with or slightly ahead of community expectations, it is considered that Armidale has a real chance of success in being Australia's first traffic calmed city. The key physical/environmental and behavioural/social factors have an existing base to develop from. Although in part this can be attributed to a relatively rare combination of circumstances, i e the University, the fact that Armidale is a small rural town and its experience with innovative initiatives in the past, it is considered that Armidale could be an useful example for the rest of rural Australia.

In considering the application of these ideas in a metropolitan context, this is obviously a different ball game. The problems posed by the motor vehicle are much more severe and there are limited opportunities to deal with individual areas within the larger urban fabric as completely as is proposed for Armidale. In large part this is caused by the fact that local areas often experience major traffic problems not of their own making. Engwicht (1994) believes that society will, in the next 10 to 15 years, experience a shift in attitude to the private vehicle significant enough to be called the end of the auto age. He considers that, just as with changes to community attitudes on smoking, a realisation throughout the community of the negative externalities with the car will swing public opinion in terms of the role the car should play. Whilst there is a possibility that the next 10-15 years will mark a watershed in thinking, it is difficult at this stage to share Engwicht's view. It is unlikely that the car will cease to be come part of the Australian urban fabric. Dependence on the motorised vehicle will, for the foreseeable future, be part of our society. Nevertheless, that vehicle will not and should not assume the prominent position that it has today.

If a change in view is to occur, Australia will need models - models which demonstrate the practical implications of these changes. Armidale could be such a model.

Acknowledgments

References

Australian Bureau of Statistics (ABS) (1993) *The Australian Census of Population and Housing, 1991* (AGPS: Canberra)

Button, K J (1993) *Transport Economics* (2nd Edition). (Edward Elgar: Aldershot)

Cunningham, C J and Witherby, A W (1994a) (eds) *The Armidale/Dumaresq Strategic Plan* (Armidale and Dumaresq Councils Joint Planning Committee: Armidale)

Cunningham C J and Witherby, A W (1994b). *40 km/h School Speed Zones - Fantasy or Utility?* Report to the NSW Roads and Traffic Authority (Unpublished)

Engwicht, D (1992) *Towards an Eco-City: Calming the Traffic* (Envirobooks: Sydney).

Engwicht, D. (1994) *The Reclaiming Tour* Pamphlet outlining a recent tour to the USA, Canada and Brazil (David Engwicht Consultancy: Brisbane)

Geoplan 350 (1994) "Resident Attitudes to Traffic Calming". *Report to Coffs Harbour City Council by third year planning students of the University of New England.* (Unpublished)

Hensher, D. (1993) "Evaluation of the Shellharbour Transport Project: Progress Report" *Report to Shellharbour Municipal Council* (Unpublished)

Joint Venture for More Affordable Housing (JVFMAH), (1992) *Australian Model Code for Residential Development, Edition 2* (AGPS: Canberra)

NSW Roads and Traffic Authority (RTA) (1988) *Guidelines for Traffic Facilities* (NSW Roads and Traffic Authority: Sydney)

McNeil, J, (1993) "The Beardy Mall West Proposals" *Student report to Armidale City Council on resident and business attitudes to a series of pedestrianisation proposals* (Unpublished)

Moseley, M J, (1979) *Accessibility The Rural Challenge* (Methuen: London)

Price Waterhouse, (1991) A computer model for simulating private bus costs for school child transport in NSW developed for the NSW Department of Transport (Unpublished)

Upton, E J, (1994) "Security Corner" *Smith's Weekly"* No 11, 18th March, 1994 (University of New England Information Office: Armidale)

Westerman, H L; Black, J A; Brindle, R; Luckovich, T & Sheffield, D (1993) *Sharing the Main Street* Report No CR132 (NSW Roads and Traffic Authority and Federal Office of Road Safety)

WSROC (1993) *Towards Traffic Calming A Manual of Implemented Experience* Report No CR 126 (Federal Office of Road Safety and the Western Sydney Regional Organisation of Councils Ltd)