TRANSPORT-SPECIFIC URBAN DESIGN

KOBUS MENTZ

SEPTEMBER 2015

PREFACE

Over the past 20 years we have seen how the design of street networks, motorways, and transport systems can profoundly influence the quality of our cities and settlements, how they grow, and how sustainable they truly are. Movement networks and systems have the ability to facilitate exchange, stimulate economic activity, and connect communities, whilst being environmentally responsive. Or, conversely, they can segregate communities, induce wasteful travel and pollution, diminish employment opportunities, and degrade living environments.

We have tried to play our part in our region by directing our efforts toward delivering change both from the bottom-up as well as top-down.

BOTTOM-UP CHANGE

In the mid-1990s we started vigorously advocating for fine grain connected-up street networks and delivered one of the first housing projects purposely done in this manner since the 1960's at Ranui in Watakere. This unassuming project for Housing New Zealand has a network of two-way streets with 5 metre widths between parking bays or tree pit indentations, instead of 11 meters. At the same time, along with Barry Rae, we produced the first medium density design guide for David Mead at Waitakere City Council which captured these standards along with early traffic calming and low impact water quality measures. Gradually these guidelines were replicated by several councils across the country and are now commonplace.

The street layouts and designs for our medium density demonstration projects at Harbourview in Waitakere and Eastgate in Manukau also served as an exemplar for the industry, especially after both projects sold well and had achieved the top ratings for urban design and user liveability in an independent survey by the then Auckland Regional Council.

These approaches were embedded in a number of growth and new town projects across Auckland, for which we did the first structure plans such as Flatbush (now Ormiston), the Massey North Town Centre (alongside Westgate), and the North-western Growth Area including Hobsonville. Working with Waitakere City we helped to develop a pre-application design advisory process, where developers' early concepts were reviewed and improved through design guidance. The novelty was actually trying to help them increase yields while improving designs and responses to the public realm. Other councils followed and the processes gradually evolved into the current urban design panels. Over the years dozens of would-be cul-de-sac layouts were converted into connected-up networks.

TOP-DOWN CHANGE

Our first foray into delivering change from the top-down started in 2005, by then tensions between the Government and the then Transit New Zealand (Transit) had developed significantly, the then Prime Minister took a personal interest applying pressure on the agency to be more responsive to local needs.

To broaden the thinking with the transport fraternity I was invited to deliver a two hour key-note address at Transit's annual conference, widely attended by transport professionals. At that stage Transit was asking for submissions on the Planning Policy Manual Supplement (PPMS) document, which reflected conventional traffic-centric thinking with little regard to land-use integration. I based my keynote on the PPMS, offering an alternative, substantiated view. It was a provocation for many who had over the years applied the conventions I was discrediting. Shortly after the conference I was asked to present this talk to Transit's senior management, and later I designed and delivered a series of training courses on 'transport-specific urban design' around the country for Transit and Land Transport New Zealand (LTNZ). Local authority officers and private professionals were included.

A more meaningful understanding of the interrelationship between higher order roads, urban economics, the environment, and social issues was now developing. By the time we undertook the Greater Christchurch Urban Development Strategy, Transit NZ was partnering as a joint client for the project, not an adversarial stakeholder to be consulted.

In 2006 Auckland City Council approached us to deliver the Liveable Arterials project. This city-wide strategy had to meaningfully incorporate social and environmental outcomes as well as serve as an explicit guide to the corridor plans that followed. We invented a methodology as there were no international precedents. All disciplines were taught to design their own 'ideal arterial network' and distinctions were made between the functional differences of the arterials.

The next year we facilitated Auckland's Regional Arterial Road Plan which encompassed six territorial authority areas. Again we designed an original methodology, introducing a means of triangulating between the movement value, proximity value, and role of each corridor, thereby identifying where there were legitimate 'place tensions' to be resolved during the corridor planning stage.

Other projects followed such as Transmission Gully in 2008 where the workshop process achieved a consensus between five local authorities, the regional council, and two government agencies in three days. A $275m saving was made as well as significant biodiversity linkages and community access improvements. More recently in 2013 we led a strategy process involving New Zealand Transport Agency (NZTA), Auckland Transport, and Auckland Council to determine a preferred corridor for the East West Link, resulting in an outcome that will cause less community severance and environmental harm, and delivers high transport functionality. In 2014 this was followed with a strategy for Mill Road, which stretches from Manukau City to Papakura and takes in Drury and Karaka, Auckland's major future growth areas.

FUTURE CHALLENGES

Over 20 years we have seen thinking change significantly, but at a measured pace. There is far more emphasis on walking conditions, cycling provision, and public transport. Shared streets are materialising in city centres, mostly to good effect. Transport and land-use are more regularly being considered concurrently. However the ebb and flow between the dominance of movement over place, or place over movement, continues. Transport specialists have yet to fully recognise the value of place as much as urbanists needing to recognise the value of movement; balanced solutions are hard to come by and the challenge continues.

The sections that follow provide a snapshot of our 'transport-specific urban design thinking'. Many of the ideas are borrowed because they resonate with our approach, and others, where we entered new territory, are invented.

Kobus Mentz
Director
Urbanismplus

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1.0

EXECUTIVE SUMMARY

Introduction

Transport projects have a unique opportunity to become major stimulants for good urbanism and improved sustainability.

The Need For An Holistic Approach

The street network has the most profound effect on the urban environment of all built elements. The fundamental aim should not to be to just build roads, but to enable mutual exchange whilst minimising travel. Vehicle kilometres travelled should be a key measure. The act requires, a broad holistic approach, rather than a focus on 'protecting' highways by limiting access and reducing friction.

The Likely Consequences of Conventional Approach

The likely consequences of a conventional 'protectionist' approach is increased traffic generation, reduced viability of public transport, physically divided communities, weaker local economies and less flexibility to deal with the future.

Sustainable Urbanism

There are more integrated approaches available such as the Melbourne 2030 process which predicts a $25-43 billion saving over 25 years. Most new employment is in the 'new economy' which requires a different approach to conventional transport approaches.

Context Sensitive Arterials

There is a need to better reconcile the need for local integration with the through function. Conventional approaches will result in hard edges and divider arterials. There is a growing movement towards context sensitive arterials in New Zealand, Australia, the UK and USA. Many authorities are using these and some authorities have enshrined them in codes. Practical techniques to create context sensitive arterials are available.

Connected Street Hierarchies

Connected street networks, which still have a hierarchy, offer significant safety, community, traffic and economic benefits over conventional approaches.

An Alternative Street Network Diagram

Alternative street network diagrams are illustrated. These can productively serve the needs of public transport, green and blue networks and the community. Networks also help better facilitate employment.

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THE NEED FOR AN HOLISTIC APPROACH

Transport projects can be a major stimulant for good urbanism and improved sustainability across the nation. In order to do this an holistic approach must be adopted. This will involve an understanding of urban economic, social and environmental issues, using proactive and participatory approaches, and may need organisations to set aside some of their single discipline priorities.

The street network has a profound effect on the urban environment

The design of the street network at all levels has a more profound effect on how the urban environment functions than any other physical design element. It dictates all else that follows and is difficult and expensive to change. It can, if appropriately designed, enable good cultural outcomes, healthy social settings, environmental responsiveness and economic vitality.

The fundamental aim should not just be to build roads

Roads in themselves only have value insofar that they facilitate exchange. David Engwicht states succinctly; 'Cities enable mutual exchange while minimising travel'. This exchange may involve; knowledge, information, skills, insight, culture, friendship, emotional support, material goods and so forth.

Progress should therefore not be measured in the amount of roading built but in the amount of exchange that has been facilitated. Sustainability is achieved if that exchange is accomplished with the least vehicle kilometres travelled.

A broader, more holistic, application of sustainability is required

National transport agencies have legislative requirements to manage the function of the roading network, as network manager / operator, and as a stakeholder involved in the development of local and regional settlements.

These requirements generally include operating the highway system such that it contributes to an integrated, safe, responsive, and sustainable land transport system. Key principles are sustainability and integration, and the need to focus on improving the transport system in ways that enhance economic, social, and environmental wellbeing, and that promote resilience and flexibility.

The difficulty in achieving these requirements lies in the inherently competing nature of small-scale local places and large-scale strategic networks. However, based on the provisions set out within legislation there seems to be no preference set to either end of this spectrum, and that by inference a balance must be made that best satisfies the relevant needs of each circumstance.

Planning mechanisms often do not serve the broader legislative intent

Whilst these requirements are articulated in the legislation, their broader intent is not evident in the proposed planning mechanism.

Often the interpretation of sustainability as set out in legislation is interpreted as a requirement to 'sustain' the efficiency and capacity of the state's highways. 'Sustainability' is often reduced to mean nothing more than 'maintenance of efficient flow'. From this it seems to have been assumed that social and economic wellbeing goals will be achieved through the lack of congestion-related inefficiencies and delays in the movement of goods and services. Agencies seem to have perceived their mandate to pursue integration with land use and social goals as an ability to become involved with land use planning purely to ensure nothing else can interfere with the goal of network efficiency.

This approach also fails to recognise the severing effect a highway can have on a community and the almost guaranteed impossibility (due to prohibitive cost and local land-use sterilisation) of providing any viable alternative cross-connectivity, immediately setting up any network for local traffic to fail.

This is a very narrow interpretation that prejudices other goals of resilience, flexibility, and most notably integration and will, ironically, lead to more traffic demand and congestion.

The 'protectionist' approach is outdated

The strict 'protectionist' approach which severely limits access onto arterials and promotes an inflexible hierarchy of roads cannot deliver holistic balanced outcomes.

Progressive approaches in Australia, the UK and the USA (all of whom originally adopted these measures) are moving on from this position. They are seeking outcomes that balance the through function with local integration needs and ensure that secondary networks are connected as opposed to the tree like structure. These connected networks that still have a hierarchy, can be effectively managed and typically out perform their counterparts in traffic terms.

This approach is 50 years old or more. Since then there have been major paradigm shifts in the urban environment. Employment and social patterns have changed that put greater emphasis on the quality of the local condition. Combined with environmental concerns these trends dictate that we need to reduce the need to travel.

Better approaches are available to us

This document will elaborate on a series of practical mechanisms that can be employed towards a more integrated approach appropriate to our current and future needs.

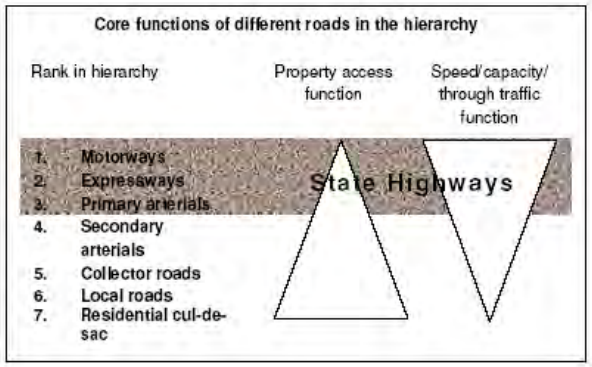
3.0

THE LIKELY CONSEQUENCES OF A CONVENTIONAL APPROACH

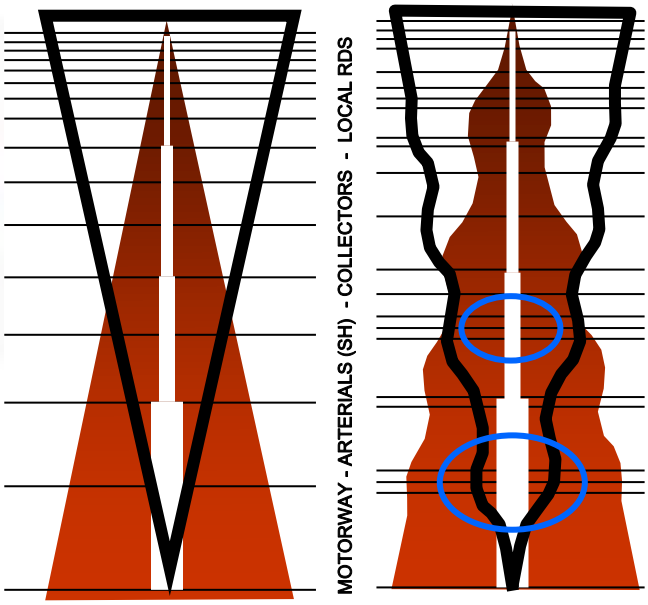
This section addresses the likely consequences of a conventional approach.

Access and through function relationship

The conventional approach illustrated by the diagram 'core functions in the hierarchy' below, indicates a strict relationship between hierarchy of road and access. This is appropriate in broad principle only: it should make more explicit allowance for contextual variations. A state highway through a town/city centre cannot have the same limitations on access. If those were applied the local economy would be severely compromised and uses displaced, this in turn will lead to more travel, and so the cycle continues. This is also counter to the needs of the 'new economy' explained in later sections. The conventional approach should be adjusted to reflect the possible variations that should result from a context sensitive approach.



SOURCE: A typical approach to core functions of different roads in the hierarchy as illustrated by a Transit NZ PPMS diagram (2006).



The conventional approach type diagram on the left.

Proposed adjustment on the right. Access and through function are adjusted to respond to the intensity of connecting routes.

Hierarchy of roads

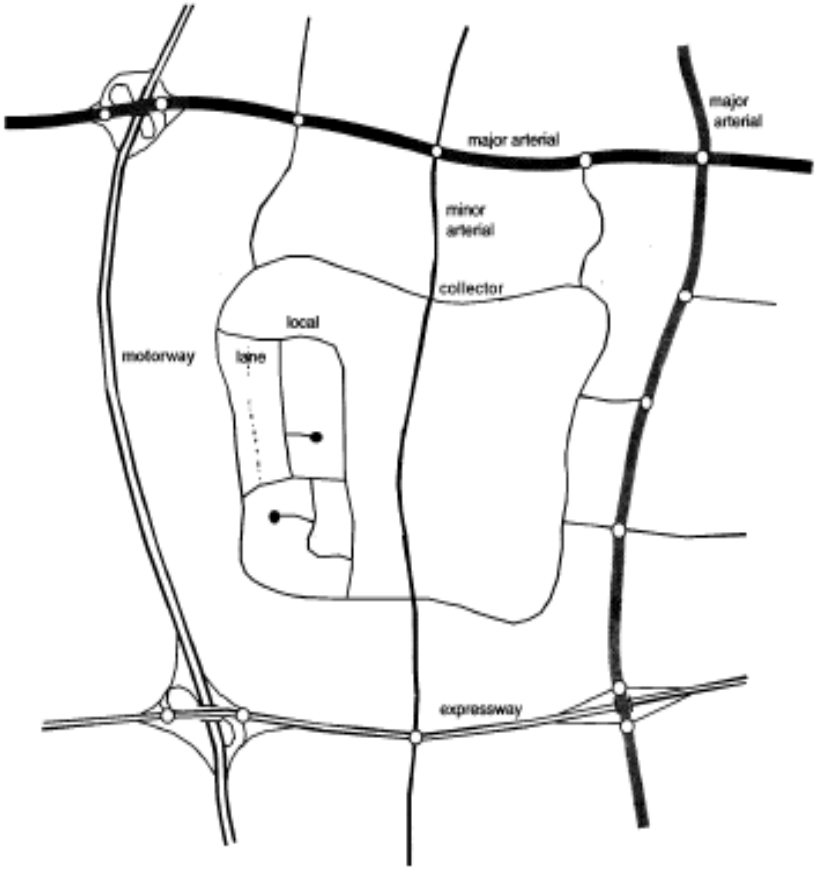
The diagram below summarises the conventional position on key design issues. It indicates motorways and key arterials with minimal connections and no property access. The local network comprises of loop roads and cul-de-sacs. The text also states; *the key principle that 'roads should connect to other roads of near the same rank in the hierarchy'.*

It is accepted that a road hierarchy is essential for traffic management and legibility (the ability to read, understand and move through the environment) reasons. It is very important however that that hierarchy is connected to form a network for vehicle kilometres travelled, personal security, social reasons. These are addressed in the following sections. This may well mean that, if safely designed, lower order roads connect to higher order roads.

The text states: *no additional unplanned' ribbon' development along state highways, or clustering around state highway intersections.* If unplanned these are likely to be undesirable. However if we are to use the movement economy efficiently there will be many instances where commercial uses fronting an arterial is highly appropriate. The viability of local businesses are often dependent on the exposure and access. There are design techniques to do this safely, such as slip roads, amongst others.

The text states: '*Reduced side friction and improved safety due to fewer, well spaced direct vehicle accesses to state highways'.* Here a distinction needs to be made between motorways and other arterials. Clearly property access should be limited onto motorways. Maintaining a high degree of cross connectivity is vital to urbanised areas, whilst safety requirements should be maximised. Where direct access is impossible over bridges should be seriously considered.

For other arterials in certain urban areas this approach could again be extremely damaging to local economies. Arterials through town/city centres require slower speeds and good integration. We know that traffic volumes are not only dependent on high speeds, at certain speeds, but that higher volumes are achieved due to closer spacing of vehicles.

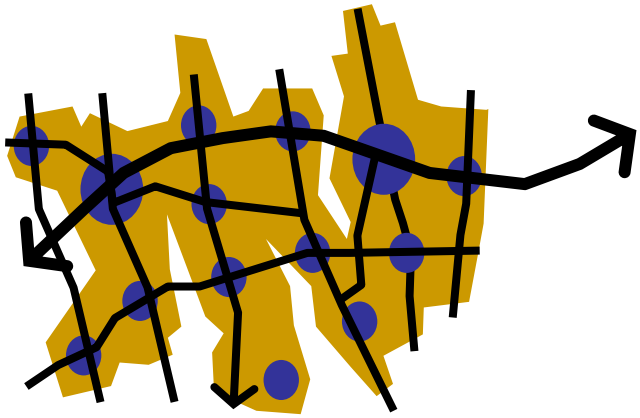


SOURCE: PPMS, Transit NZ

Likely outcomes

These diagrams illustrate the likely outcomes that could result from a rigorous application of the conventional planning mechanisms.

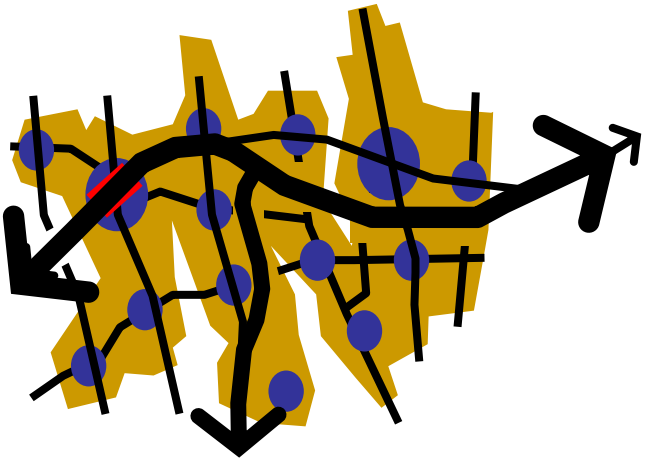
The first diagram simulates a typical urban condition. It indicates a series of activity centres of varying sizes, there is a conventional, reasonably well connected street network, creeks and natural areas exist and a major arterial links east with west.



New roading is constructed

Assuming the arterial needs upgrading, strictly in line with the conventional approach. The arterial will now have the minimum connections and property access. Some centres will be bypassed, with measures to ensure the bypass does not attract unwelcome uses.

The likely outcome will be:



→ The arterial, instead of serving an integrating function, will act as a divider.

→ Many pre-existing links are severed.

→ Harsh edges, possibly with back fencing will be created along lengths of the arterial.

Communities are disconnected

With the reduction of local connectivity larger sub areas become disconnected. This disaggregation manifests in less social, community and business interaction.

Everybody has to travel further.

This situation is further exacerbated when measures are taken to limit local traffic from using the highways!

Low density growth

Provision for growth will be an ongoing requirement in most towns and cities. However if the arterials serving the growth areas are designed to conventional standards they could be disproportionately enabling sprawl at the expense of the local condition.

Whilst this may enable the release of cheaper land there are serious costs to society, and the individual. This has been extensively documented.

As early as 1992 the established Hertz Corporation calculated the travel impact savings when living in the inner suburbs as opposed to living in sprawl development, they found:

→ $US14,000 less household cost

→ 66% less fuel

→14kg less hydrocarbons

Low densities comes at a cost

Also around 1992 the Canadian Urban Institute research determined that 'a doubling in population density will reduce annual car mileage per capita or household by 20-30% - similar for UK and USA (ROSELAND 1992).

The 'can of worms' road layout favoured by the a conventional approach with loop roads and cul de sacs are not conducive to high quality medium density living. If applied these will further ensure that growth becomes sprawl.

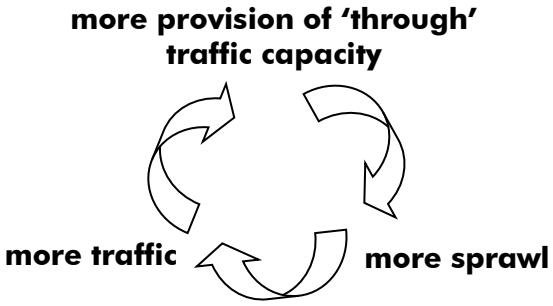
*Far too many extensive suburbs have been built using the **"can of worms"** layout. They are designed with the laudable intention of calming the motor car, but make life difficult for pedestrians and especially children"*

(Gordon Stephenson, original designer regretting sprawl outcomes 92)

SOURCE: STEPHEN THORNE ,DESIGNURBAN

Self perpetuating

Giving preference to through movement where it disproportionately favours sprawl development produces a self perpetuating cycle:



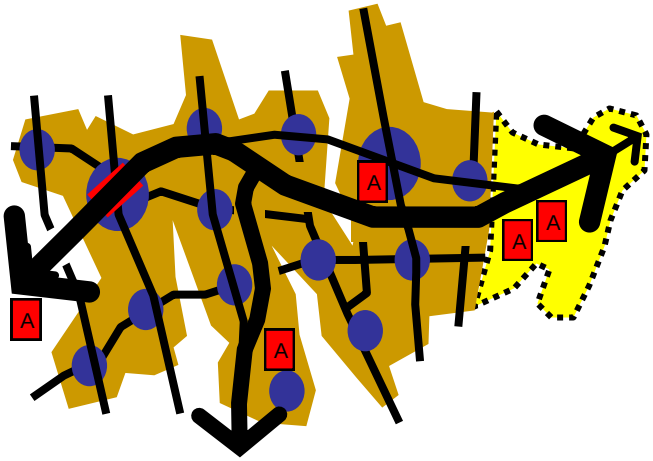
Facilitating large uses away from centres

Another natural consequence of the conventional approach is the inherent tendency for large uses (A) such as malls, big box retail and office parks to locate away from conventional centres, often on the periphery.

There are implications for employment as well. Michael Cullen's (Patrick Partners, Sydney) analysis of Auckland and Perth indicate that town centres provide up to four times as many non retail jobs than stand alone malls. Where malls are located in town centres the situation is better.

The diagrams below (top middle) shows how the conventional approach promotes car dependant uses often having poor connections or integration with other uses.

These development opportunities can usually only be undertaken by very big institutions, their scale often makes it unviable for other (often local) competing businesses able to co-locate on the other quadrants.



SOURCE : TRANSIT NZ PPMS

SOURCE : DEREK KEMP, PROPEROUS PLACES

SOURCE: STEPHEN THORNE, DESIGNURBAN

TYPICAL BIG BOX EDGE DEVELOPMENT AT FOUNTAINGATE, CASEY COMPARED TO THE MELBOURNE CITY CENTRE.

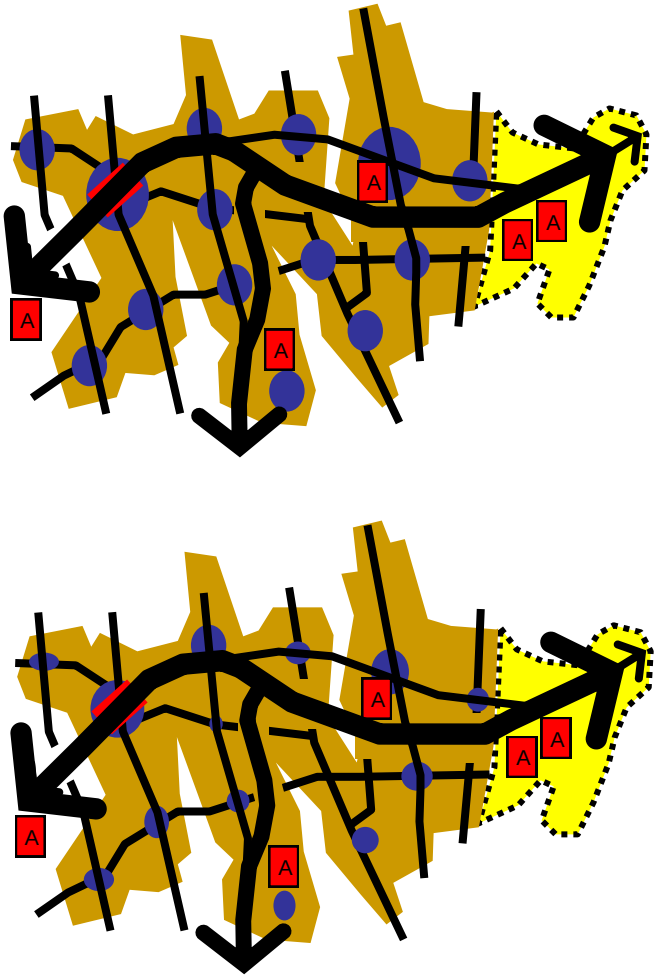
Gradual degradation of the wider urban system

All the above trends, in combination, have serious consequences for towns and cities including:

- → Increased traffic generation and vehicle kilometres travelled
- → The viability of public transport is undermined
- → Local economies get weaker
- → Disconnected communities
- → Reduced flexibility to deal with the future

The vitality and robustness of the urban environment is dependent on a multiplicity of complex connections that will vary in function over time in an unpredictable manner.

The consequences of a conventional approach, if applied in the strictest form, are serious.



A likely conventional approach outcome - car-orientated shopping centre , only about 3 new starts in US this year
SOURCE: ESD MICHAEL CULLEN 2005

A more sustainable outcome -Pedestrian-based town = centre, many more non-retail jobs.
SOURCE: ESD MICHAEL CULLEN 2005

4.0

SUSTAINABLE URBANISM

Learning from Melbourne

The author's experience gained from leading the implementation component of Victoria State Government's Melbourne 2030 Growth Strategy indicates clearly that conventional, business as usual approaches are not delivering sustainable outcomes. The lessons for New Zealand are salutary.

Looking back over the past 20 years or so at Metropolitan Melbourne's growth on the periphery reveals a highly unsatisfactory situation. This has included employment shortages, lack of community infrastructure, youth poverty and considerable travel demands on individuals. Some areas will in time have up to 170,000 vehicles per day on their city bound arterials. This is an untenable situation.

Possibly the most vital challenge is to create more local jobs as this will directly reduce commuter travel and deliver multiple social, economic and environmental benefits.

The government's response has been to undertake a highly coordinated spatially based strategy involving key government agencies and 6 local authorities. It is based on a creating strong consolidated centres, restraining sprawl and achieving high standards of ecologically sustainable development.

Extraordinary benefits

SGS Economics and Planning were asked to quantify the effects of this approach, they concluded that it would over 25 years, lead to a 12% reduction in vehicle trips, a 14% reduction in vehicles kilometres travelled per year and, most importantly, a 23% reduction in time spent travelling, measured in vehicle hours.

Whilst the approach will require an infrastructure investment, over a 25 year period, and depending on the discount rate, the cost benefits are an extraordinary AU$25 - 43 billion!

A conventional approach will deny New Zealand these opportunities

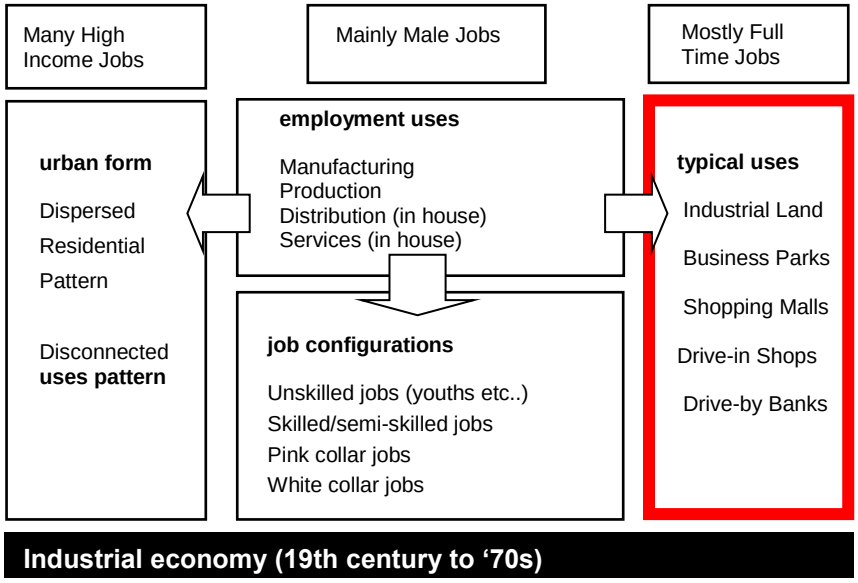
These results would not be possible with a strict application of a conventional approach. Desired objectives could not be achieved without a context sensitive arterial approach, new economy uses which need strongly connected networks to function would not establish and medium density mixed use residential precincts could not be constructed within the loop road cul-de-sac layouts (see below).

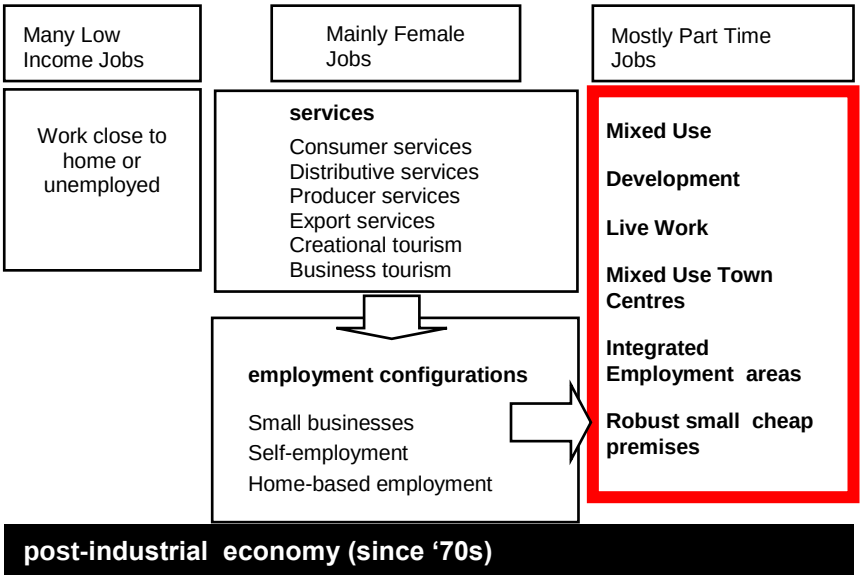
Creating local employment is vital

Even in traffic terms alone it is vitally important help create local jobs wherever possible due to the high proportion of traffic. The economic benefits are obvious. However the employment paradigm has changed substantially since the conventional approach was introduced some 50 years ago. In the past new employment was focussed in big uses; factories, business parks, shopping malls and so on.

Different approaches are required

In New Zealand the majority of new jobs (60%) are so called 'new economy' jobs. Typically these require small premises (80% employ less than 10 people and 70% of this figure employ less than 5), most are residential compatible. Their requirements are quite different (see diagram below). They require high degrees of local connectivity and amenity. The job creators at the high value end are mobile and will not locate if the conditions are not appropriate. They can choose between cities and even countries.





SOURCE: DEREK C. KEMP 'FACILITATING EMPLOYMENT GROWTH' (1997)

5.0

CONTEXT SENSITIVE ARTERIALS

The conditions along arterials to be varied according to context. Examples of how this approach is being applied in Australia, the UK, and USA, and New Zealand are given.

A conventional approach as illustrated opposite is likely to result in very harsh edges and little or no response to the context.

The need to better reconcile 'local' integration needs with the 'through' function

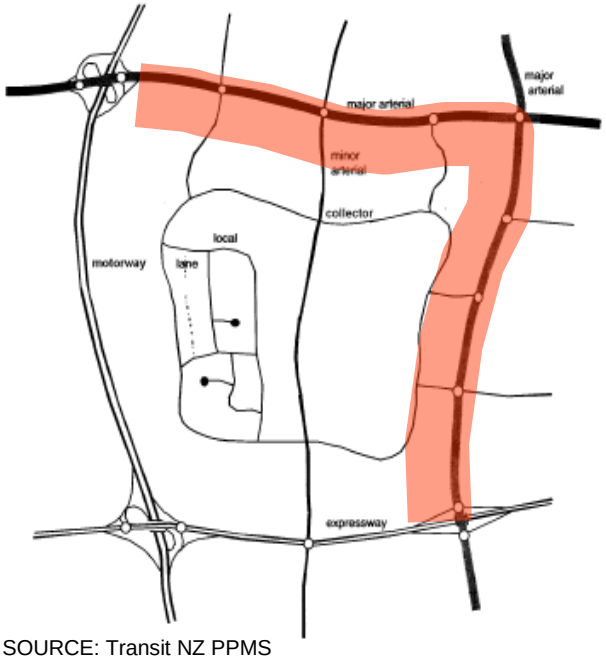
The perennial core issue, where arterials are concerned, is the tension between the need for local integration and the through function. Both are essential. If the through function is severely compromised sub regional travel needs will suffer, equally if local integration is severely compromised local communities and local economies will suffer.

For too long this has been an 'either/or' scenario.

This to some degree is to be expected as the issues are represented by different entities with responsibility to their legal requirements, public responsibilities or stakeholder interests. The results are often highly unsatisfactory with a 'winner takes all' or 'unproductive compromise' outcome. Examples are a State Highway being built with insufficient local integration, or it being stopped or compromised to the extent that the through function (and region) suffers.

This document argues strongly that the 'local' and the 'through' functions need to be reconciled early on. It will also argue that the local needs are extremely important in regional economic and social terms and traffic terms, and that they are not sufficiently served by aspects of the conventional approach.

International experience shows that these aims can be achieved. This will require an adjustments to design philosophies as well as more comprehensive, proactive urban planning processes.



SOURCE: Transit NZ PPMS

SOURCE: ESD, Melbourne

Traditional streets

The traditional boulevards and avenues in Melbourne are exquisite examples of arterials that serve a major through function whilst offering good local integration and high quality amenity.

Imagine the ‘no friction minimum connections’ approach applied here. The city would be divided, connections severed and hard edges would sterilise amenity and viability .

Rathdowne St

Royal Parade

St Kilda Rd

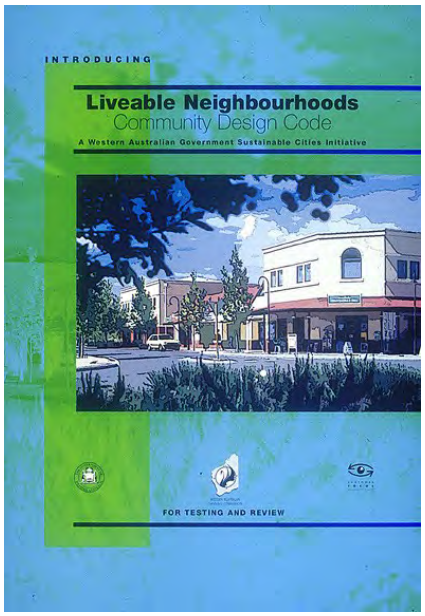
Royal Parade

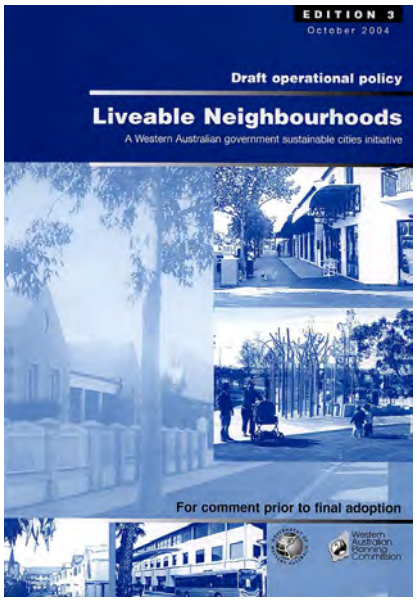
SOURCE: ESD, MELBOURNE

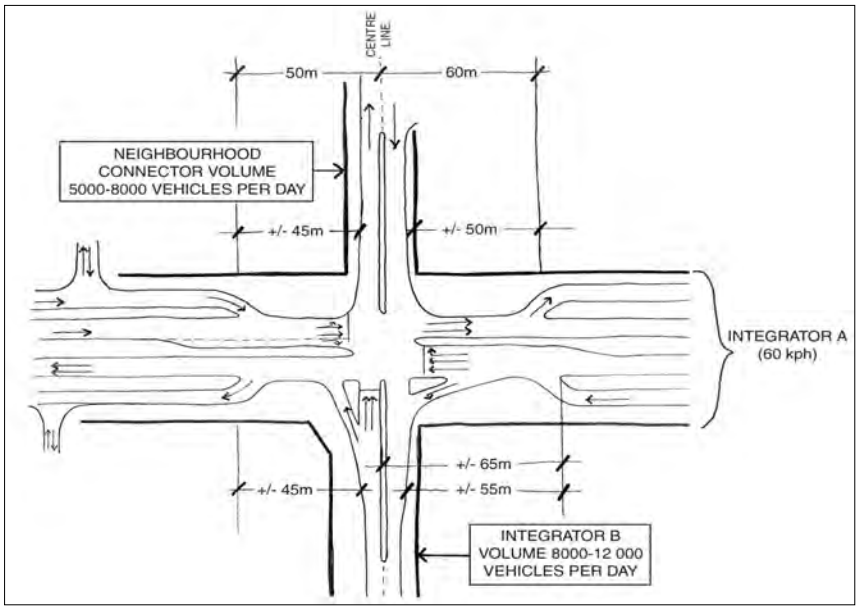
Coding integrated transport and land use

The earliest integrated design code in Australia is the *Liveable Neighbourhood Code, Western Australia*, started in 1997 and revised in 2000 and 2004. This code, at first as an alternative is now converting to mandatory status, ruling out the conventional approach. Well over 100,000 lots in WA have already been designed under, or been substantially influenced by, the code. It is also widely used outside WA.

Again an integrated, connected approach is evident. See www.planning.wa.gov.au.





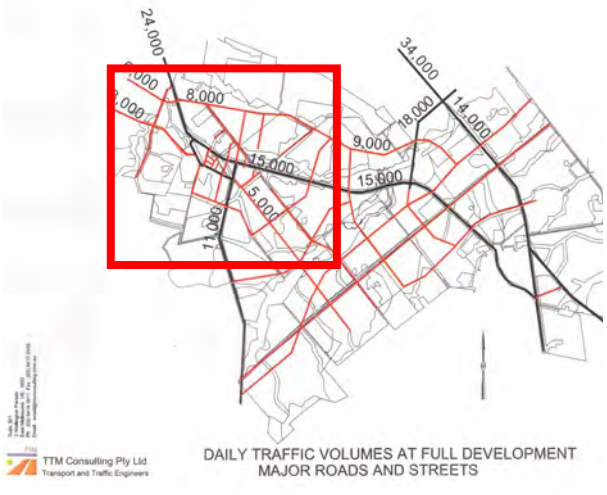


Written for the State by , Taylor Burrell, ESD, TTM et al.

Beyond traffic

In Australia the norm has increasingly become one of integrated arterials and connected networks. The traffic planning is routinely integrated with public transport employment and urban economic calculations.

Thinking networks, Not corridors
PRINCIPAL MOVEMENT NETWORKS, SUB REGIONALLY



"ULTIMATE" DAILY TRAFFIC FLOWS PRINCIPAL MOVEMENT NETWORK ELEMENTS

Local networks are important too
A STREET NETWORK ABOUT A FUTURE TOWN CENTRE

"ULTIMATE" DAILY TRAFFIC FLOWS MOVEMENT NETWORK ELEMENTS ABOUT NORTH LENEVA

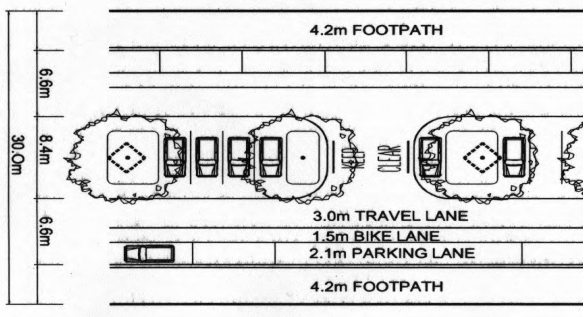
Basis of assessment

- → 24,000 dwellings
- → 64,000 people
- → jobs required = 28,000
- → local jobs = 14,000
- → external jobs = 14,000
- → local retail 46,000 sqm retail
- → all education except tertiary can be local
- → local recreational needs can be satisfied locally
- → Bandiana link in place, second river crossing, etc.

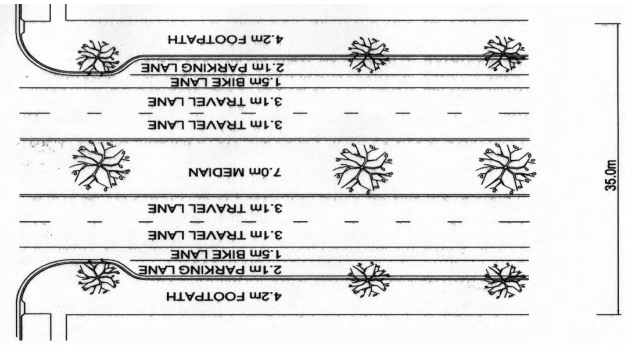
Basis of assignment

Adobe Creative Cloud.lnk

- → Baranduda Bvd 4 lanes, "business friendly"
- → Beechworth Road 2 lanes, except north of streets road
- → main street "pedestrian friendly"
- → north-south parallel routes support main street
- → southern parallel leg "truck friendly"
- → neighbourhood connector streets are important movement elements



MAIN STREET—NORTH OF BARANDUDA BVD

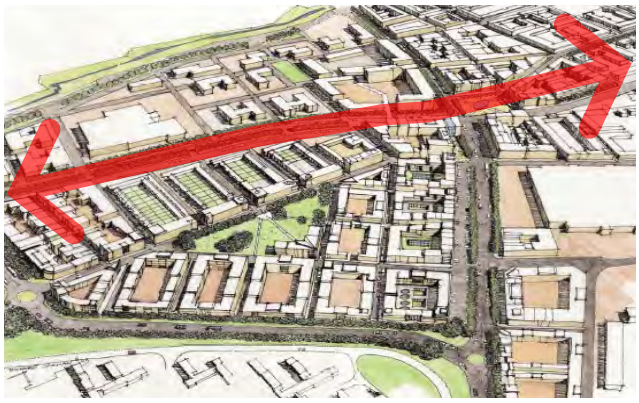


BARANDUDA BVD – BUSINESS STREET

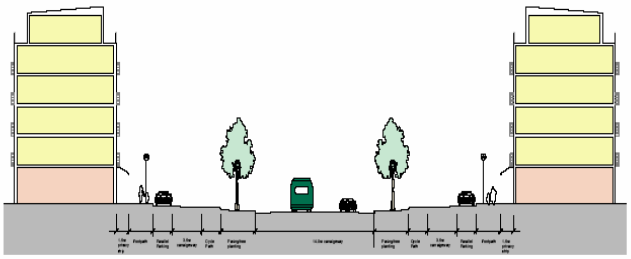
DESIGN AND SOURCE: JIM HIGGS TTM, MLB

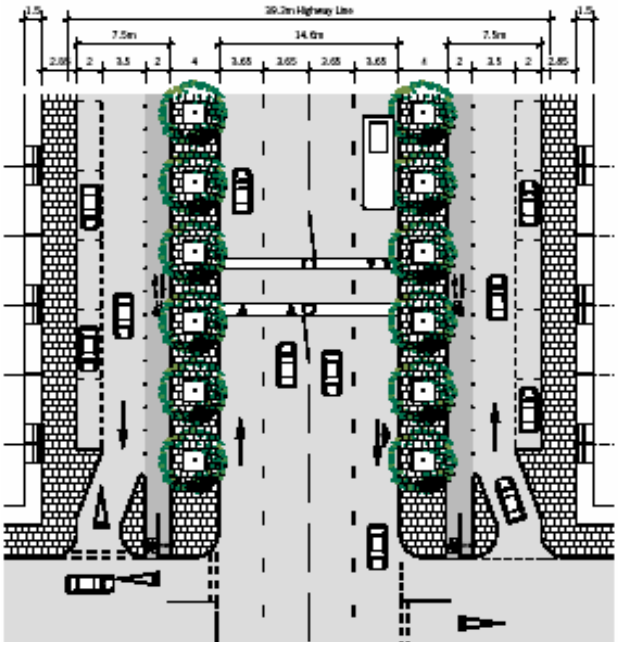
Arterials as spines

In the UK the norm has also increasingly become one of integrated arterials and connected networks. This North Dublin growth area designed by Urban Initiatives, has a major central arterial which contains a high quality bus service in a boulevard format.



The Boulevard: B-1 Northern Cross Route





SOURCE:URBAN INITIATIVES (UK)

Arterials as Boulevards

Research undertaken by Allan Jacobs and published in *'The Boulevard Book'* (2003) has significant relevance.

Boulevards have slip, or service, lanes that come together at the intersections. He compares these with that of conventional arterials in the USA and Europe; 11 in USA and 8 in Paris and Barcelona.

He found that whilst there was considerable prejudice against them from traffic engineers there was poor data on their performance.

He then undertook original research, measuring pedestrian as well as vehicle accidents. His findings indicated that boulevards were no more dangerous than their conventional counterparts.

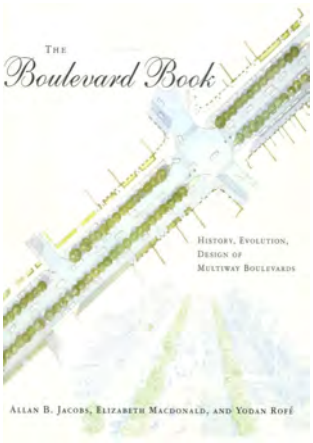
Complexity and safety

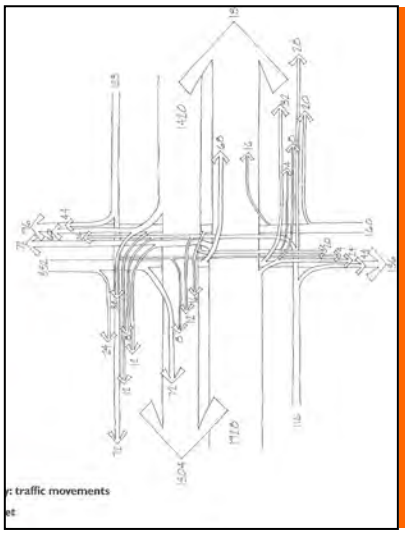
Surprisingly the safety improved with complexity. This appears to be counter intuitive to many who assume that if there are more possible points of conflict they will automatically occur. Apparently psychology works differently.

The boulevards that performed weakest were compromised in their design, and did not go all the way. The following elements are essential:

- → uninterrupted side median strips
- → tree line up to intersection
- → narrow access roadways with stop signs
- → raised or different surface treatment of access ways
- → transit stops, kiosks and benches on median strips

The adjacent diagrams illustrate the complexity of movements of the boulevards intersections. The accident rates figures (in brackets) are of their conventional counterparts.





AVERAGE DAILY TRAFFIC VOLUME 57,950

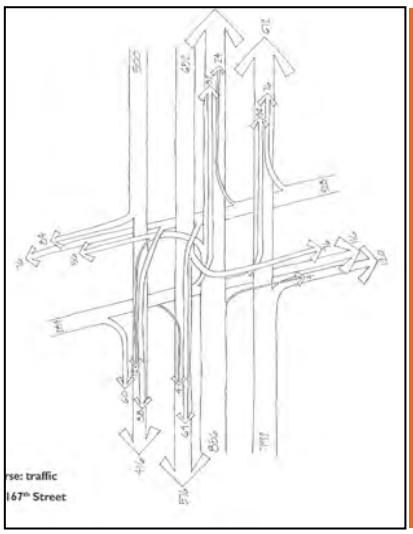
VEHICLE ACCIDENT RATE / VOLUME

0.36 (0.63 0.92)

PEDESTRIAN ACCIDENT RATE/ VOLUME

0.06 (0.09 0.07)

GRAND CONCOURSE NYC



AVERAGE DAILY TRAFFIC VOLUME 74,000

VEHICLE ACCIDENT RATE / VOLUME

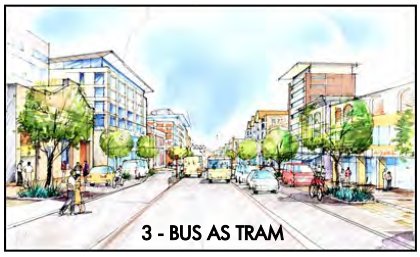
0.37 (0.65)

PEDESTRIAN ACCIDENT RATE/ VOLUME

0.02 (0.04)

OCEAN PARKWAY NYC

SOURCE: THE BOULEVARD BOOK ALLAN B JACOBS



Accommodating Future Change

In addition to offering strategies to retain employment uses in the corridor while housing intensification takes place, the town centre strategy along Adelaide Road in Wellington (NZPI commendation, 2009) makes special provision for public transport to evolve from priority bus to 'bus-as-tram' and eventually light rail (see right).

ADELAIDE RD, WELLINGTON

Biodiversity cross-linkages

Drummond Street crosses Adelaide Road and provides a rare opportunity to provide a bio-diversity link between the two areas of native bush on the right and left of the above perspective.

Arterials made liveable

The realisation that conventional approaches to street networks have blighted much of urban America has brought about strong initiatives to institute a protocol to promote '*Context Sensitivity for Major Urban Streets'.*

This being dealt with by the following institutions:

→ Institute of Transportation Engineers

→ Federal Highway Administration

→ Environmental Protection Agency

→ Congress for New Urbanism

There are many projects underway around the USA that are addressing this issue, a few examples are illustrated here.

CHARLOTTSVILLE, VIRGINIA: Done for Thomas Jefferson Planning District Commission

DENVER, COLORADO: Done in association with Space Analytics, LLC for Colfax on the Hill, Inc.,f unded in part by the Denver Foundation

SOURCE: WWW.URBAN-ADVANTAGE.COM

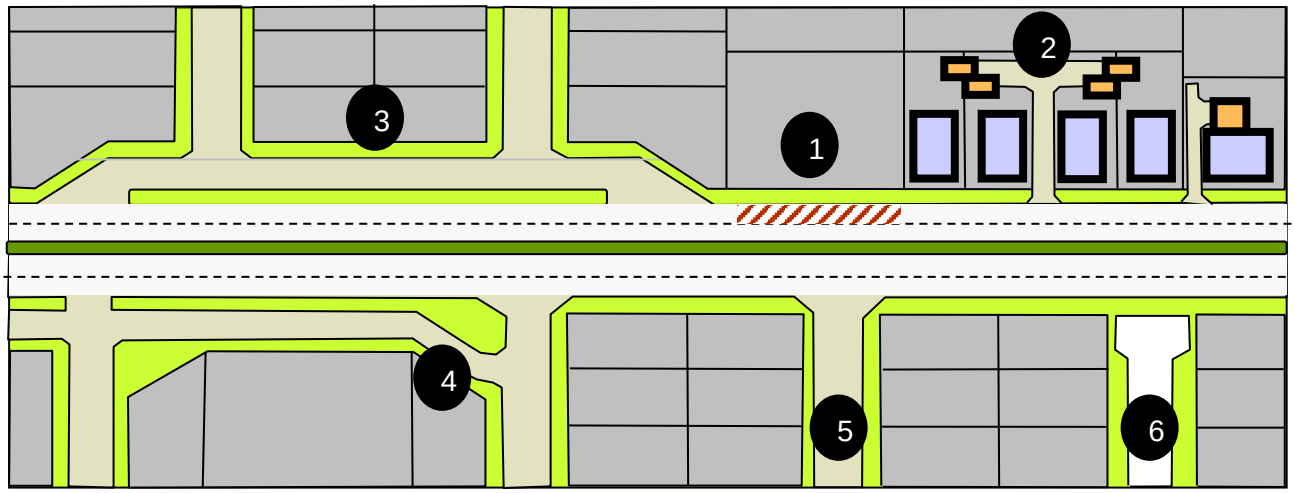
Techniques for integrating arterials with the local network

A context sensitive approach seeks to apply a range of solutions to match the urban condition.

Local integration is highly reliant on intersections across arterials. However for the lengths of road where they cannot be achieved the following techniques should be considered.

They are numbered in order of preference with 1 having the highest degree of integration.

1. Normal property access with on street parking, alternatively with on-site parking
2. Garages arranged so that cars enter the road facing forward
3. Full boulevard or parallel slip lanes with direct access off the arterial
4. Parallel slip lanes with access off side street
5. Left in left out cross road with ‘side on’ lots
6. Cul-de-sac with pedestrian/cycle access, the weakest option



SOURCE: URBANISM +

6.0

CONNECTED STREET HIERARCHIES

Why connected street hierarchies

A network of connected street hierarchies will offer significant benefits over the conventional approach. This section will address the following:

→ Connected Networks link neighbourhoods up better

→ Connected Networks improve personal and property safety

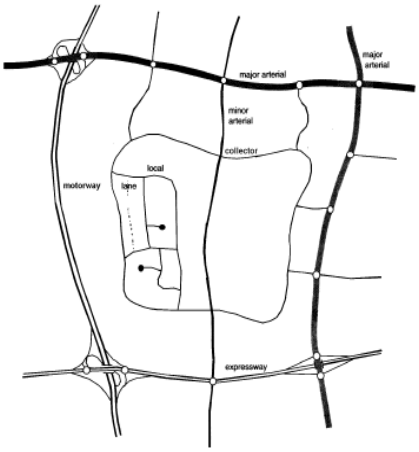
→ Connected Networks offer significant traffic benefits

→ Connected Networks offer significant travel savings

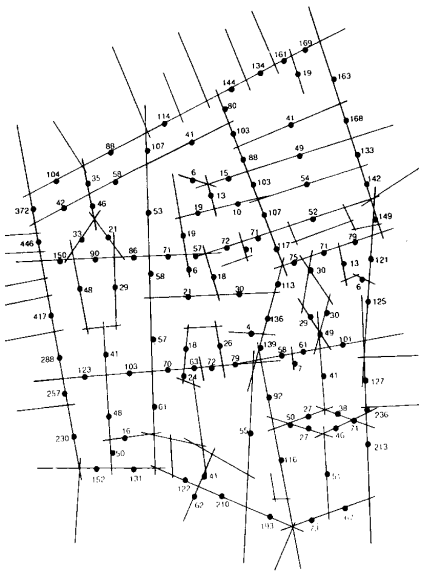
→ Connected Networks offer significant economic benefits

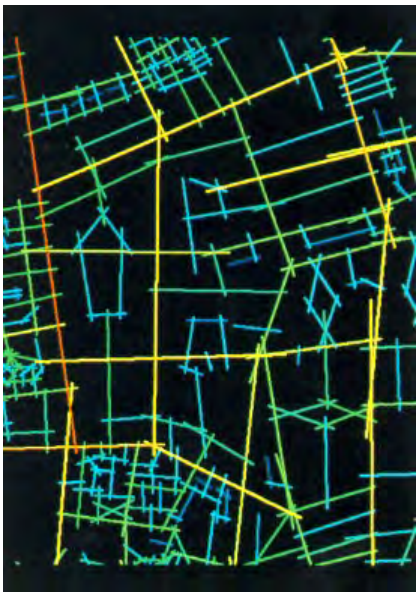
Important research has been done in this field by Bill Hillier of the Space Syntax Laboratory. In short he consistently finds, around the world, a high correspondence between the degree of connectedness and higher; pedestrian movements, personal safety, economic activity and value. Later some of his work is used to explain an important crime study undertaken in Gosnells, Perth.

These findings are not merely academic or theoretical, they have become mainstream, and adopted as policy in many places internationally. Countless projects delivering these benefits have been built.



SOURCE: PPMS, Transit NZ



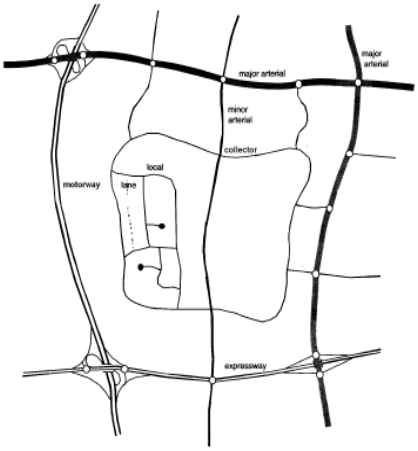


SOURCE: ARCHITECTS' JOURNAL 15 APRIL 1992: 'LOOK BACK AT LONDON' BILL HILLIER

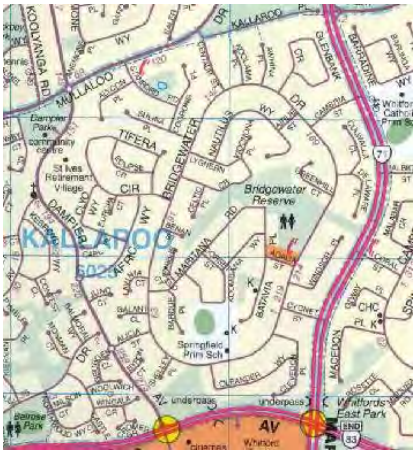
SOCIAL benefits of connected street networks

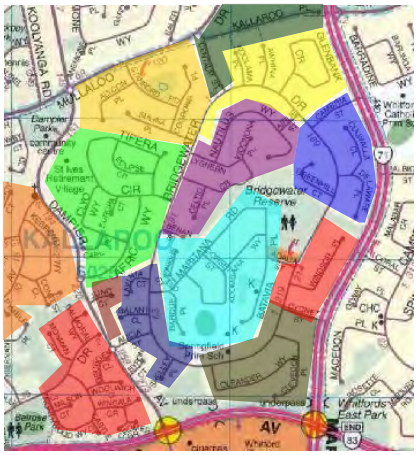
The diagrams clearly describe the difference in behaviour of the two systems. An analysis of a neighbourhood (top centre and top right) built on using a conventional approach (top left) system shows how, what appears to be a connected community is in fact one made up of disconnected sub precincts.

The connected environment (bottom) clearly indicates how the street network serves to connect with everywhere. This greatly helps the wider neighbourhood achieve infinitely more social links, later we will also see the personal and other safety benefits.



SOURCE: PPMS, Transit NZ





SOURCE : Stephen Thorne DesignUrban

SOURCE : Stephen Thorne DesignUrban

SAFETY benefits of connected street networks

A major study on personal and property safety (assaults and burglaries) was undertaken by the City of Gosnells, Perth in 2001. The urban conditions correspond strongly with its counterpart in this country.

The aim was to measure the relationship between street network design and crime. Many factors were taken into account (see next page). The degree of connectedness (a network as opposed to a conventional 'tree' structure') is expressed as integration. Constitution is the degree to which buildings front the street. The summary outcomes are illustrated in the diagram below. Note how incidents of crime (yellow dots) decrease (top right) with more integration (connectedness) and constitution.

Loop roads and cul-de-sac fair the worst (bottom left). Other findings include:

Less burglaries:

→ 37% - connected streets with high "Global Integration"

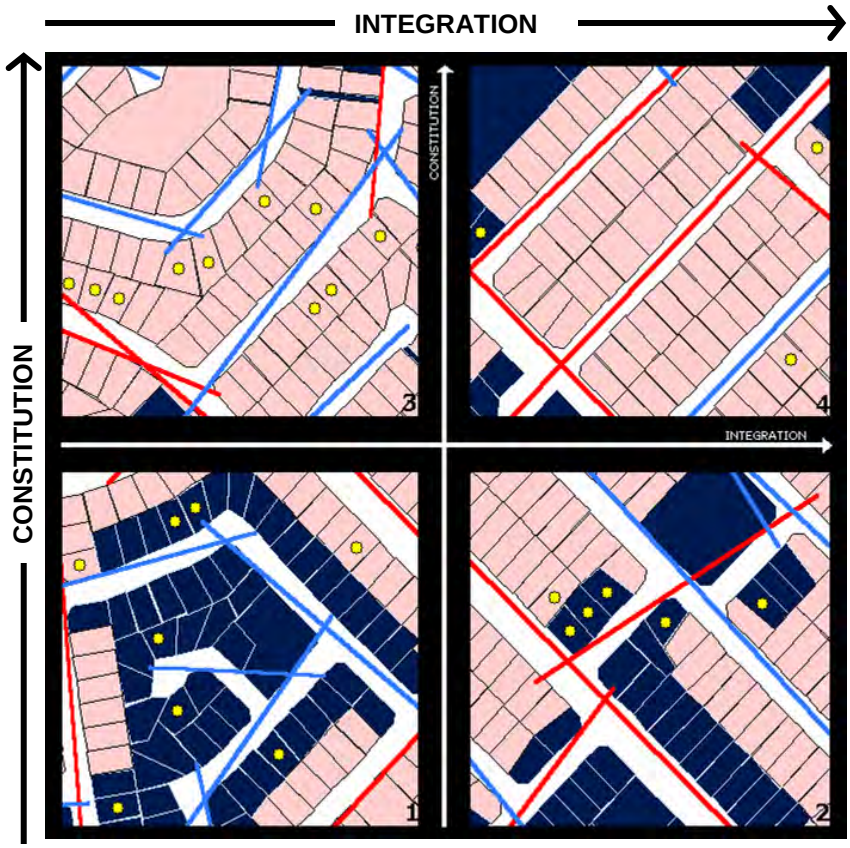
→ 29% - buildings facing the street and other fronts

More burglaries

→ 37% - exposed backs, also when backing onto parks

→ 22% - "impure" (long and windy) cul-de-sac, even if they have pedestrian links

The full study is available from the local authority.



SOURCE: SAFE CITY URBAN DESIGN STRATEGY. CITY OF GOSNELLS, 2001.
ORIGINAL RESEARCH BY SPACE SYNTAX LABORATORY LONDON

THE AXIAL MAP OF GOSNELLS SPATIAL "SYSTEM"

CARRIAGEWAY TYPE

THE PROCESSED AXIAL MAP AND PATTERN OF "GLOBAL INTEGRATION"

CRIMES WITH ROAD TYPE

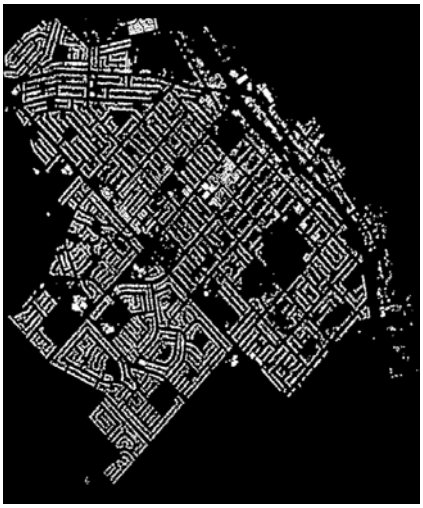


FIGURE GROUND MAP

BUILDINGS WITH OPPOSITE NEIGHBOURS THE CONSTITUTION" OF PUBLIC SPACE

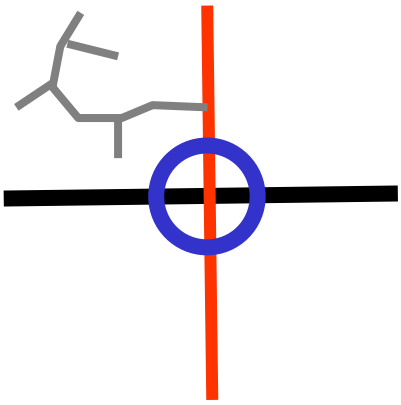
SOURCE: SAFE CITY URBAN DESIGN STRATEGY. CITY OF GOSNELLS, 2001.
ORIGINAL RESEARCH BY SPACE SYNTAX LABORATORY LONDON

TRAFFIC benefits of connected street networks

The strict 'tree like' hierarchy of roads forces traffic into a few very high concentration situations. These have often overwhelmed the local condition, with big infrastructure, big land take and big environmental impacts. Connected street networks offer the opportunity to diffuse these impacts, offer choices, and keep them in balance with other social and environmental elements.

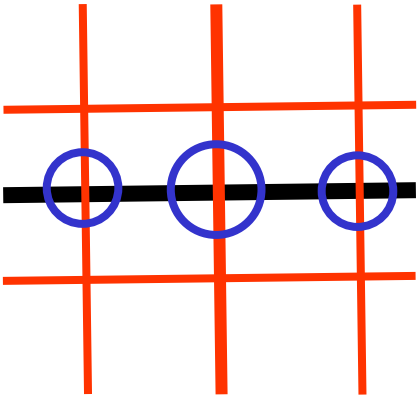
The consequences of the top diagram, based on the conventional approach, are typically that they create a concentration of turning movements in high exposure environments. This has the following disadvantages:

- → More controlled movements are required
- → Longer signal cycles result
- → Longer delays for pedestrians
- → Significantly degraded pedestrian environments
- → More vehicle kilometres travelled



Conventional approach:

150 turning movements/hour



Connected network approach:

1350 turning movements/hour

Traffic reduction

Chester Chellman, a noted traffic specialist in the USA, claims that his analysis of interconnected street networks (using Institute of Transportation Engineers' projects) indicates daily trip generations of half that of cul-de-sac based sprawl. Morning and evening peak hour traffic was reduced by 60 and 70%.

Roadway capacity and speed

Roadway capacity varies with speed, with greatest capacity being at quite low speed. Actual capacity is dependent upon a range of factors including sight distance, lane width, interruptions and so forth.

Generally an arterial road will have the greatest capacity (vehicles per hour past a given point) at a speed of between 40 and 50 kph.

A good example when the speed limit was dropped in recent times on the UK M1 which enhanced capacity but kept travel times about the same, and made a major improvement to the crash rate. The crash rate is also a serious influence on (peak period) capacity of urban arterials.

Travel savings

This example is a small illustration of how connectivity can deliver real benefits. At Kelman Park, Waitakere, three cul-de-sac streets were connected. The streets are relatively narrow with modest traffic calming. Good residential conditions have been created.

The sustainability benefits have been substantial with a projected, 25,000 vehicle kilometre travelled saved per year.

40 of these in a city would save a million kilometres a year!

Kelman Park, Waitakere SOURCE: URBANISM +

At Sturgess, in Waitakere, some 14 separate landowners were convinced to deliver a connected neighbourhood where cul-de-sac development previously prevailed.

The yellow area on the diagram shows the cul-de-sac dominated development before intervention, the red shows the connected network after intervention.

The intervention allowed for good walkability, low speed streets, a natural hierarchy for buses, and a street along the park edge.

Sturgess, Waitakere SOURCE: URBANISM +

Cross roads can be made safer than T junctions

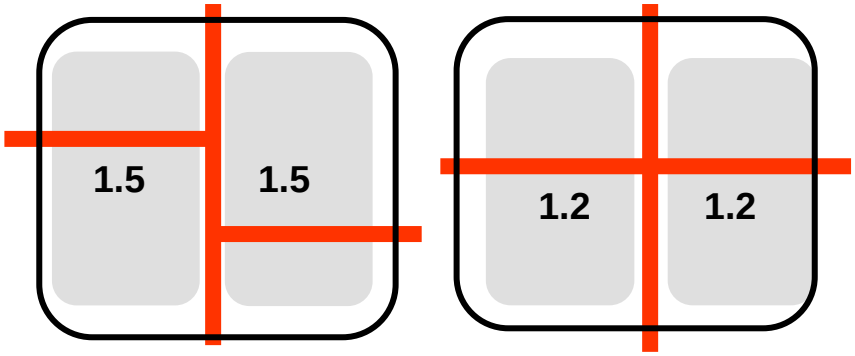
A conventional approach avoids cross roads at the local level preferring ‘T ‘junctions. However good connected networks require crossroads.

The preference for ‘T’ junctions apparently stem from an assumption that casualty crash exposures are higher than cross roads. This however does not allow for the fact that a proper comparison should compare 2 ‘T’ junctions with 1 cross road to cover the same area.

In this comparison the ‘T’ junctions generate significantly more casualty crashes.

However fatalities are still higher in the cross roads. This can be dealt with by the now widely used off set cross roads.

CASUALTY CRASHES PER 10 MILLION EXPOSURES

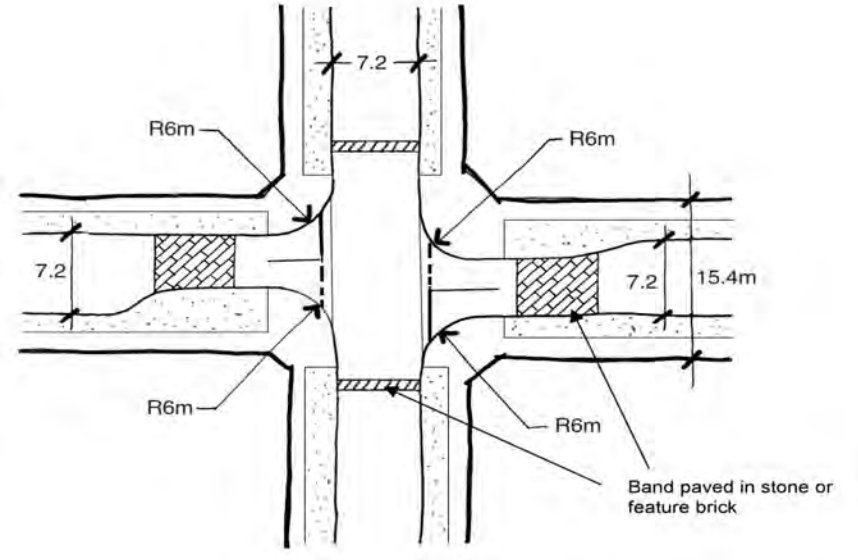


‘T’ JUNCTIONS

3.0

CROSS ROADS

2.4



OFF SET CROSS ROADS. SOURCE: JIM HIGGS TTM, MLB

Roundabouts are not a good substitute in high pedestrian areas

Roundabouts have an important role in the wider street network, especially dealing with complex geometries, or in signalling a change of condition such as rural to town. However they must be used with caution in high pedestrian areas.

Motorists are generally too preoccupied with negotiating a gap in the flow to pay attention to pedestrians. As a result pedestrians are often inconvenienced with crossings set well back.

They are also 'space hungry', and can compromise the character of tighter urban conditions.

Significant downstream effects

Because roundabouts are so efficient, they generally deliver vehicles at uniformly regular intervals creating few gaps down stream for other movements to occur.

This can effect the behaviour of a town centre or residential significantly as the figures opposite show. The worst, in this case being; gaps of 3.6 seconds where 10 seconds are required to cross the street.

Existing conditions

→ current traffic 10,000 vehicles per day

→ about 1,000 vehicles per hour in peak periods

→ average of one vehicle every 3.6 seconds

Gaps needed are typically:

→ 4-5 seconds for right turn

→ 4 seconds for left turn

→ 7 seconds to back out of driveway

→ 10 seconds to walk across street

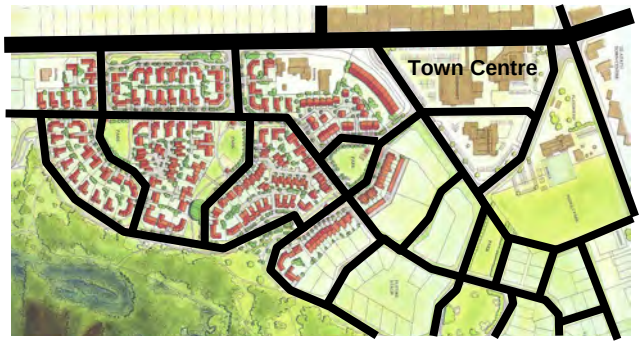
AMENITY benefits of connected street networks

In conventional residential environments cul-de-sacs are often the location of choice. When compared to the low amenity offered by conventional loop roads this is to be expected.

There are now extensive examples of street networks that offer similar amenity without the disadvantages described earlier. At the lowest order a connected street can have vehicles travelling at walking speed.

A cul-de-sac offers benefits for very few in the system as all traffic is channelled back to the collector roads, those living at the entry to the cul-de-sac have twice the traffic as every one has to return the same way, there is no diffusion of the effects.

Very high values have been achieved on connected street systems as these illustrations demonstrate.



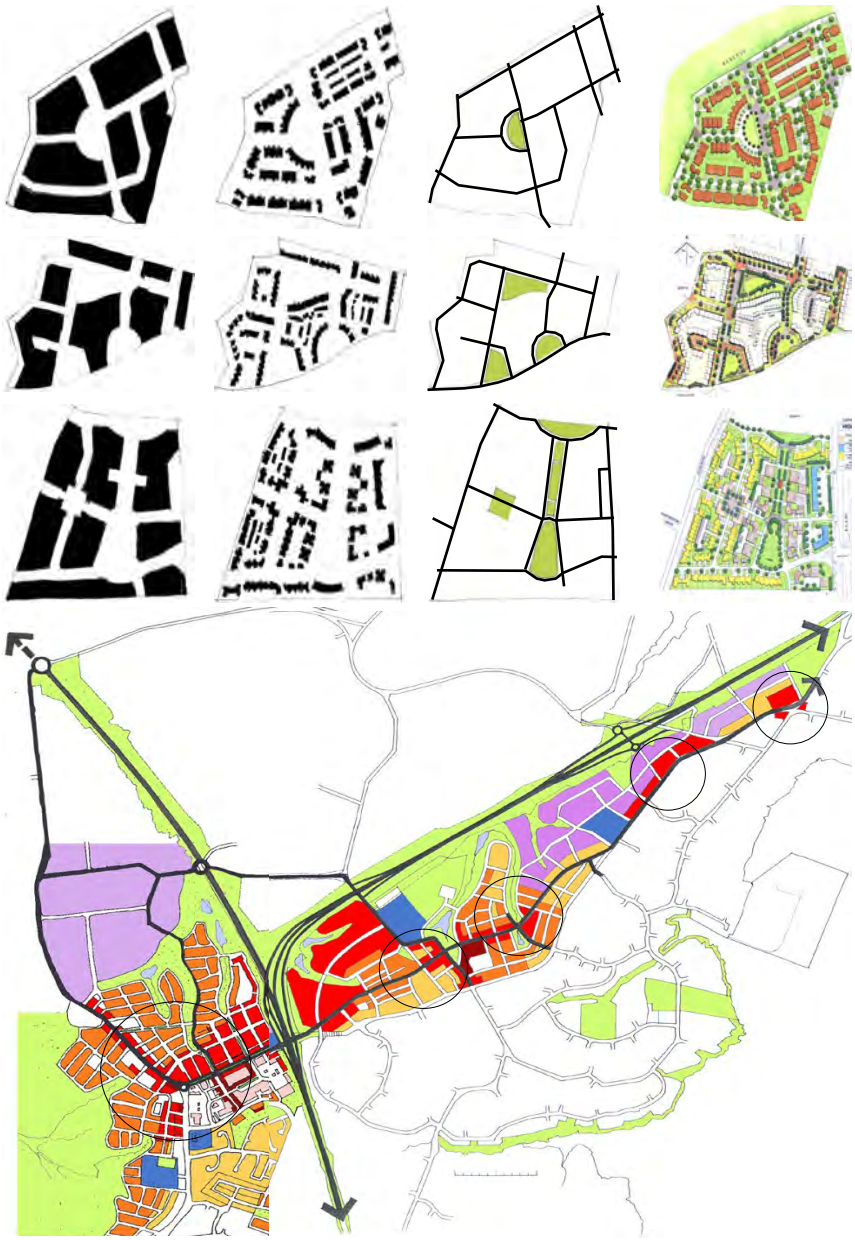
SOURCE: URBANISM +

Further examples of connected street networks

Several built and designed examples of connected networks already exist in this country. These vary from master planned new neighbourhoods, growth plans and the coordination of adjacent landowners.

The bottom illustration illustrates how several separate land owners (red) were coordinated by Waitakere City to connect up their streets.

Countless other examples exist in Australia.



SOURCE URBANISM +

ECONOMIC benefits of connected street networks

Apart from fuel savings and other cost benefits connected street networks can be powerful catalysts for other economic benefits.

The point was made earlier that a major challenge is to generate local employment, for economic reasons as well as the reduction of commuter traffic.

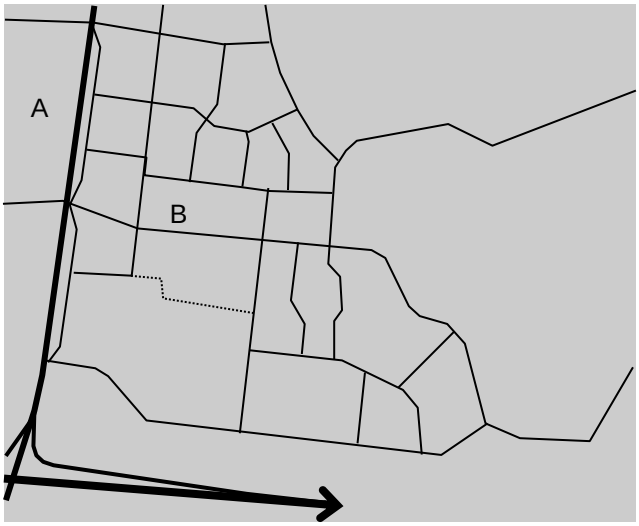
The following project is providing a strong lead on how to achieve that aim. It is a new town at University Hill, Whittlesea. It is located on the ring road north of Melbourne, on a tram line and has an adjacent university. It represents a billion dollars of investment.

The most relevant characteristic of the design relevant to this document is the highly connected street network, as well as the integration with Plenty Road a major arterial (A). At its heart is a Main Street condition (B).

Uniquely it focuses strongly on its ability to attract 'new economy' employment.

The design has enabled a projection of up to 3,400 jobs versus up to 2,618 jobs for design options under a conventional approach.

CONVENTIONAL APPROACH	
Residential dominant	**1,766 - 2,053**
Industrial dominant	**2,331 - 2,618**
CONNECTED NETWORK APPROACH	
Mixed use town centre (excludes industrial and live work)	**3,144 - 3,400**



Small office and 'Studio Commercial'

Business Services Premises

Office Services Premises

Showrooms and Studios

Affordable R&D Space

Affordable Studio Space

Flexible small designer studios retail showrooms and service trades premises

'Industrial Incubators'

Business Services Premises

Showrooms and Studios

Affordable R&D Space

Affordable Ind Space

Affordable Office Space

Affordable Studio Space

R&D Incubator

Small Business Incubator

TYPICAL NEW ECONOMY USES. SOURCE: DEREK KEMP, PROPEROUS PLACES

THE MIX OF USES MADE POSSIBLE WITH A CONNECTED STREET NETWORK

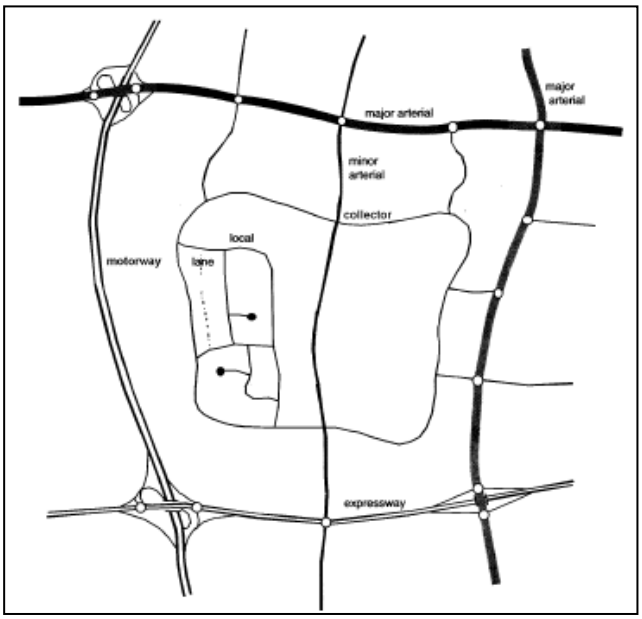
7.0

AN ALTERNATIVE STREET NETWORK DIAGRAM

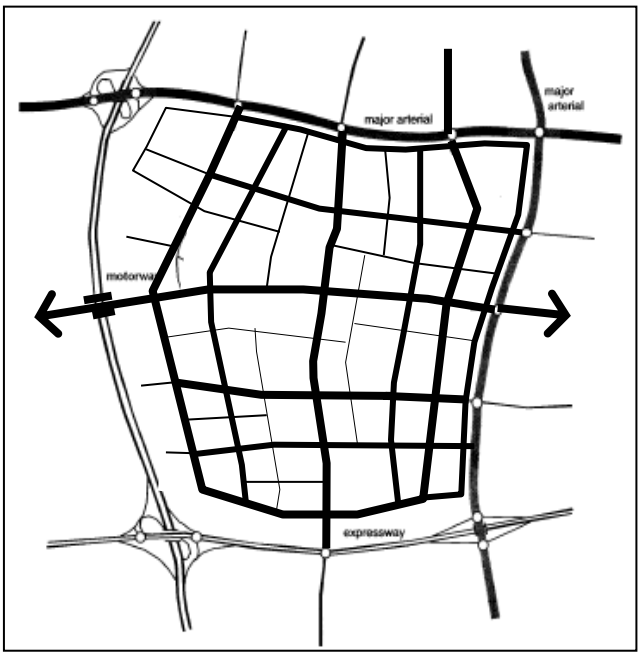
Why connected street hierarchies

The following series of diagrams illustrate an alternative to the conventional approach. They reflect key issues addressed in this document.

Many of the aspects of the conventional approach are still present.



CONVENTIONAL APPROACH



PROPOSED ALTERNATIVE APPROACH

There is still a hierarchy

A hierarchy of roads are still proposed. The difference is that they are more connected.

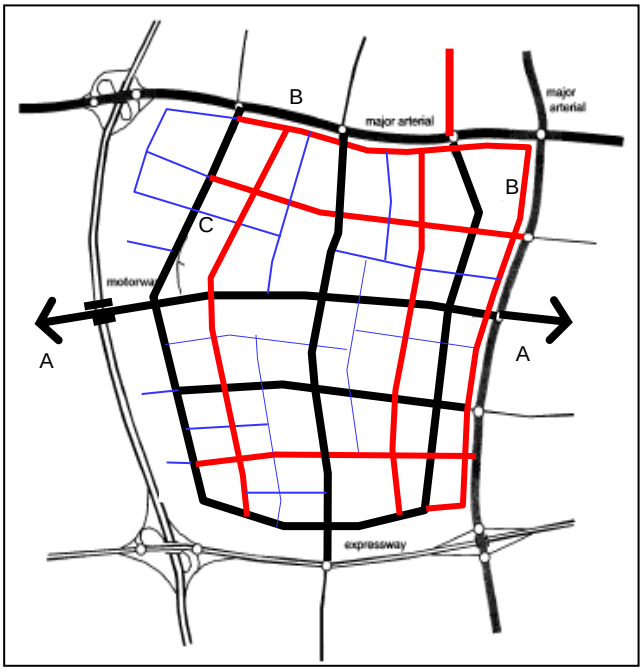
More order level links are proposed across the motorway and other arterials are proposed (A).

The arterials are more integrated (B) with boulevards or slip roads where possible.

in some instances lower order street connect to higher order ones (C).

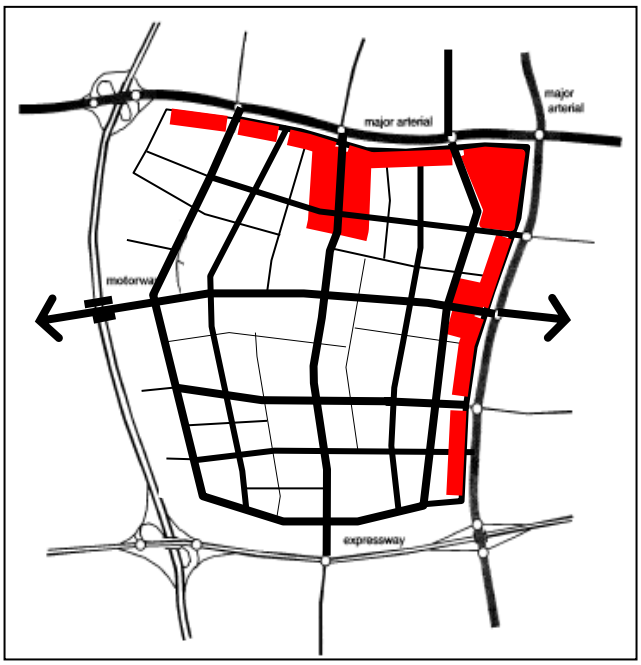
Cross roads and ‘T’ junctions are used.

High quality boulevards, avenues and local roads are proposed as illustrated below.



Exploiting the movement economy

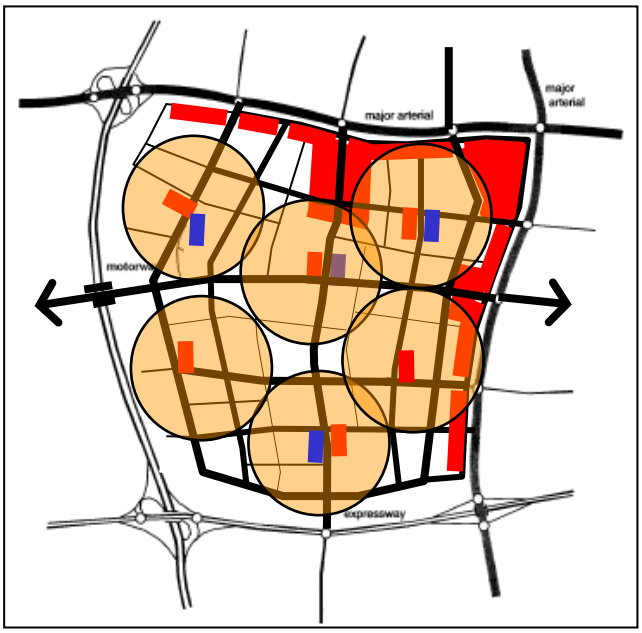
Major commercial uses are located where they can be seen and easily accessed. This does not constitute ‘unplanned ribbon development’.



Walkable catchments

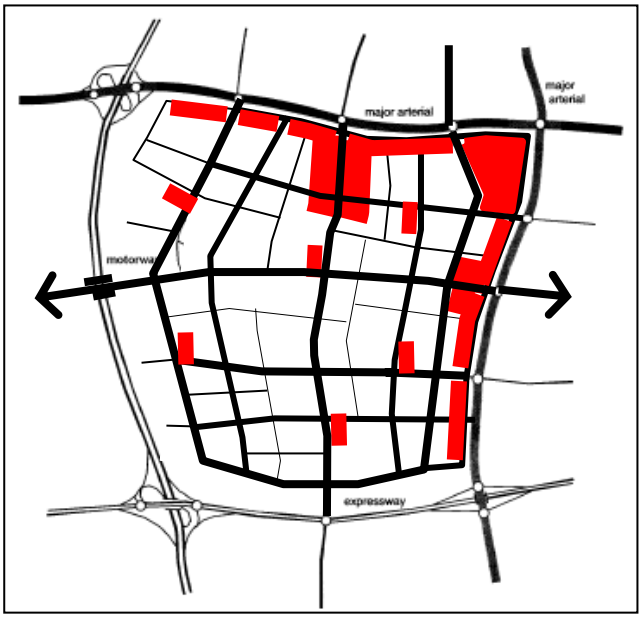
The area will be designed into walkable catchments to facilitate good access to public transport and other amenity including community facilities.

These will be the focus of high quality urban consolidation.



Neighbourhood centres

The retail components of the neighbourhood centres are located on the busier roads in order to assist their viability.



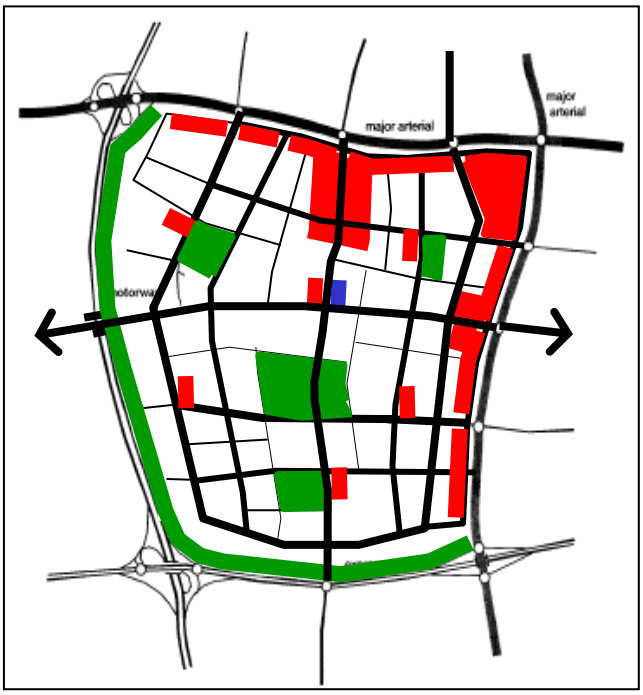
Community facilities

The walkable catchments will be analysed to see which community facilities and other amenities should be included.

A green and blue network

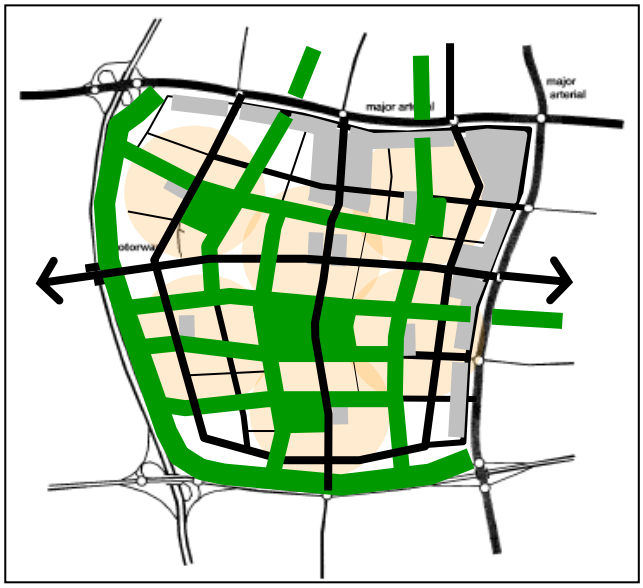
The design would integrate areas of high ecological value landscape character. This would often coincide with the natural waterways.

Additional, distributed, open spaces will be provide for recreation and water quality management.



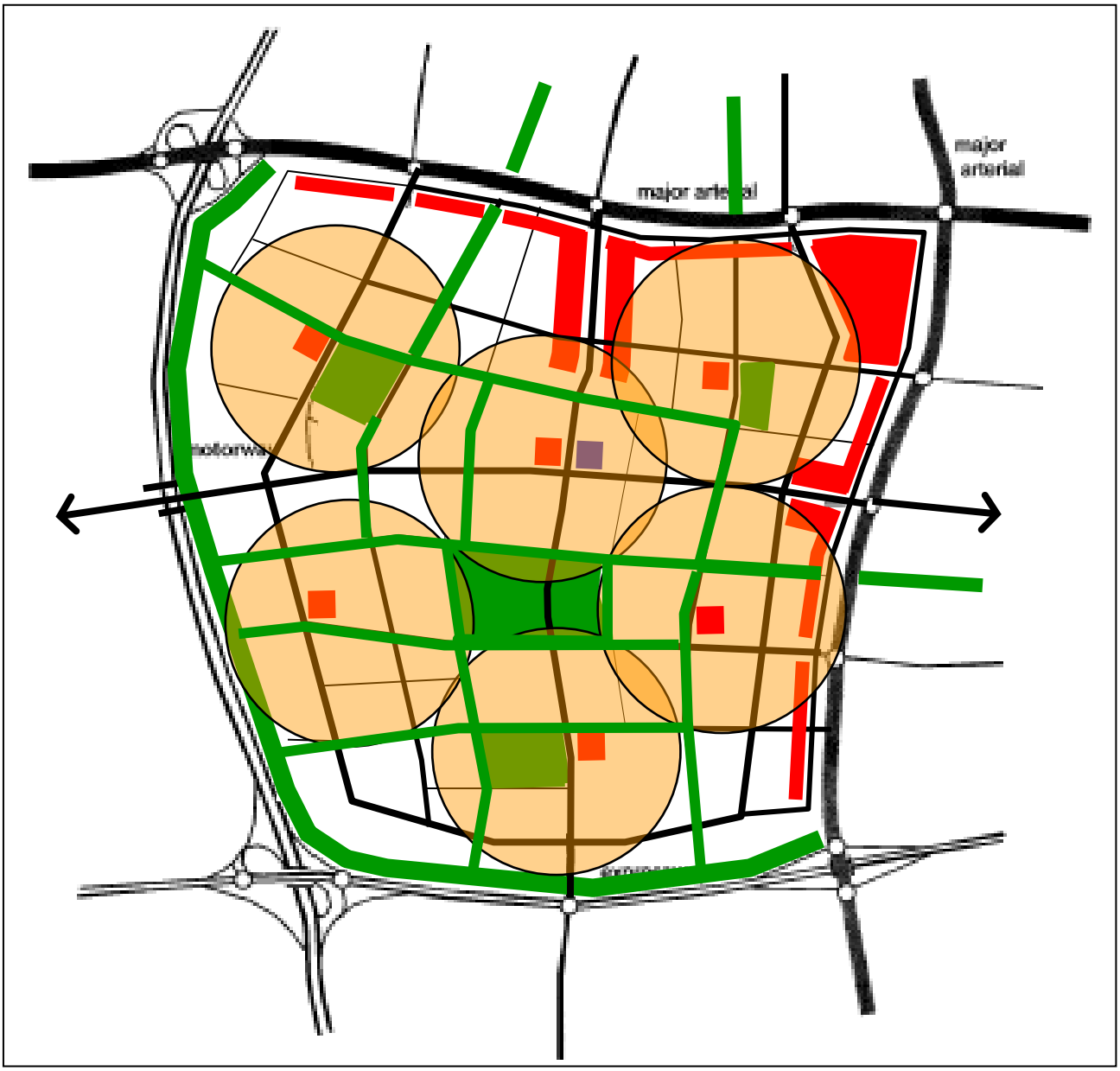
A recreational walking network

Where practical open spaces will be linked together. Some linkages will be provided through well treed streets. Recreational walking can be provided by ensuring this network is different from the busier streets.



A combination of networks

This approach allows a rich combination of networks (traffic, public transport, green, blue and community). With its economic logic this makes for truly sustainable planning.



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