ENVIRONMENT DESIGN GUIDE

TOWARDS SUSTAINABLE URBANISM

Evan J Jones

SUMMARY OF

ACTIONS TOWARDS SUSTAINABLE OUTCOMES

Environmental Issues/Principal Impacts

- Traditional pre-war Australian suburbs have far better connectivity than conventionally designed greenfield estates of the 1960s and beyond. With more intersections and smaller street blocks, the traditional street patterns offer a greater choice of direct routes including considerably better access to shops for local residents.
- Traditional suburbs have generally better public transport availability and frequency, a greater number and range of uses including retail, services and entertainment, higher resident and worker densities, and higher levels of connectivity and proximity to other places (effectively, their proximity to the centre of the overall urban area).

Basic Strategies

In many design situations, boundaries and constraints limit the application of cutting EDGe actions. In these circumstances, designers should at least consider the following:

Neighbourhood centres

- Neighbourhoods are defined by a five minute walk of around 400 metres, or about 50 to 60 hectares of urban development for the neighbourhood. At a suburban average density of about 15 dwellings per gross hectare (which equals an average lot size of about 450 square metres) a neighbourhood comprises around 700 dwellings.
- At this size, each neighbourhood can be configured around a centre with a retail or community based component, and wherever possible, with some local jobs. Neighbourhood centres should generally at least offer a corner store/deli/café, a child care centre and a public transport stop.

Town centres

- Neighbourhoods (generally six to nine) cluster around a town centre to give sufficient population catchment to support main street retail, office and community facilities.
- The town centres are located at the junctions of arterial routes. For transit oriented development, a rail station or principal public transport route anchors one end of the main street.

Movement network

- The street system is highly interconnected. The priority is to develop a street network that not only works for vehicles and provides for public transport, but specifically achieves a high level of use by pedestrians, cyclists and the disabled.

Cutting EDGe Strategies

- An emphasis on the structure of whole urban regions is needed to achieve sustainability at individual project level.
- Design based on Western Australia's *Liveable Neighbourhoods Code* will link town and neighbourhood centres with the private and public movement networks to optimise land use distribution, activities and local jobs.
- Initiatives in household energy and water use reduction such as the New South Wales BASIX assessment tool are also needed to move towards more sustainable communities.
- New governance and finance approaches may be required to achieve the coordination necessary to deliver more sustainable design approaches. In New South Wales a Growth Centres Commission is proposed to coordinate development of services and infrastructure with overall plans for the growth centres.

Synergies and References

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- Queensland Department of Tourism, Small Business and Industry, 1996, *Mixed Use Developments: New Designs for New Livelihoods* – an information paper
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'Sustainable Urbanism' encompasses Australian urban design and transportation practices that seek to create vibrant, liveable communities. This approach proposes the creation of compact, walkable communities centred around high quality public transport systems for urban infill, brownfield and greenfields sites. The aim is to make it possible to live a higher quality life without complete dependence on a car for mobility and survival. Conventional suburban development practices need to change from single to mixed uses. More housing diversity is important to increase diversity in suburbs for the demographic changes facing Australia. Provision of local jobs helps to reduce car dependency as does a public transport-friendly layout of new developments. The Western Australian Liveable Neighbourhoods Code sets out spatial structuring elements of sustainable urbanism. The approach, together with initiatives to reduce household water and energy use underpins urban extensions in Perth. This note also examines the proposed new growth centres of Western Sydney.

1.0 INTRODUCTION

Significant changes from conventional development practices of the late Twentieth Century have evolved through design approaches known variously as Traditional Neighbourhood Design, Urban Villages, New Urbanism and Transit Oriented Design.

'Sustainable Urbanism' encompasses these approaches and expresses a body of Australian urban design and transportation practices that seek to create vibrant, liveable communities'.

This paper sets out the need to change from conventional practices through comparative examples of suburb performance of traditional and suburban sprawl suburbs in Perth. It then sets out the spatial structuring elements included in the Western Australian Liveable Neighbourhoods Code, the approach underpinning urban extensions in Perth and the new growth centres of Western Sydney.

2.0 MEASURING PERFORMANCE OF PERTH'S SUBURBS

There is growing evidence (Robert D Putnam and others) that urban sprawl and time spent in cars by people commuting to and from work and away from home/communities is leading to a breakdown of social networks.

The performance of traditional and conventionally designed suburban developments are compared in Figures 1 and 2. They illustrate the availability of daily needs (such as milk) in the conventional and traditional suburbs of Perth. Figure 1 shows Perth's northern suburbs, which have been designed on the conventional (1960's) suburban model. Figure 2 shows the Perth traditional suburbs proximate to the Perth central business district.

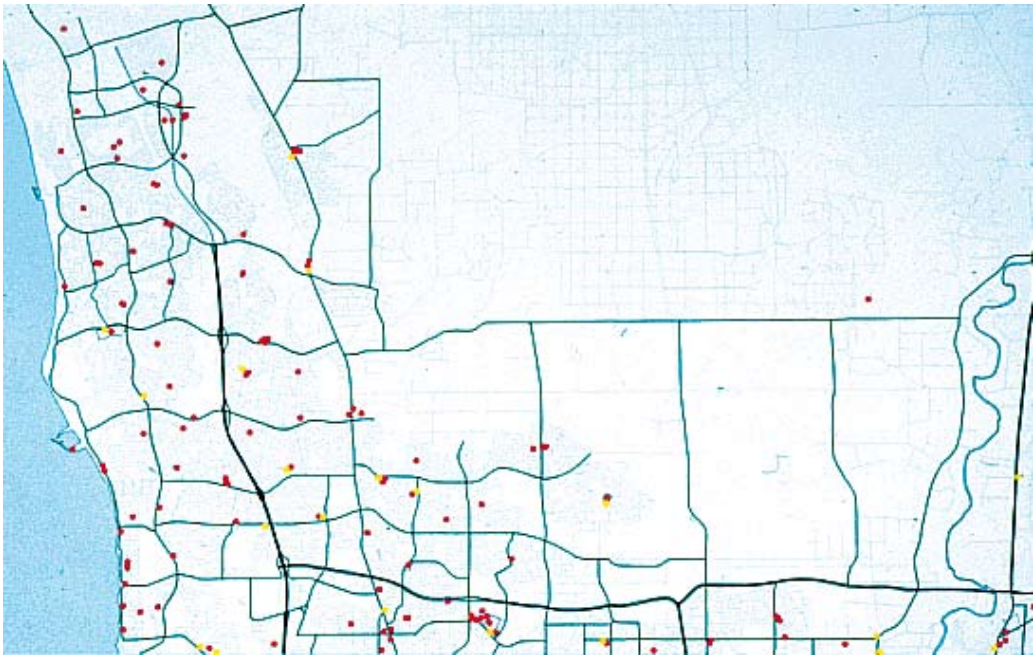

Figure 1. Local retail locations in the north west corridor of Perth – conventional suburban development

Figure 2. Local retail locations in the inner suburbs of Perth – traditional suburban development

Access to shops in the conventional suburbs of Perth is very difficult for people without a car, even if they live nearby. The young, the elderly, people with disabilities that prevent them from driving, and those without the financial means to afford a car (or a second car) are isolated from essential facilities. Generally speaking, in sprawling suburbs you need to use a litre of fuel just to buy a litre of milk. By comparison, access to shops for daily needs for people without a car in traditional suburbs is relatively easy, as the shops are frequent and in relatively accessible locations.

A comparison of Perth's traditional and sprawl-based conventional suburbs 'Which Suburbs Work?' was undertaken by the former WA Ministry for Planning to understand how the built environment affects the way the design of a suburb promotes choice and supports diversity.

The comparison was based on circles which represented a notional five-minute walk (400 metres) to the smaller neighbourhood centres, and a ten-minute walk (800 metres) to the larger district and regional centres (places where people are prepared to walk further). The issues of connectivity, accessibility and diversity of land use are discussed below.

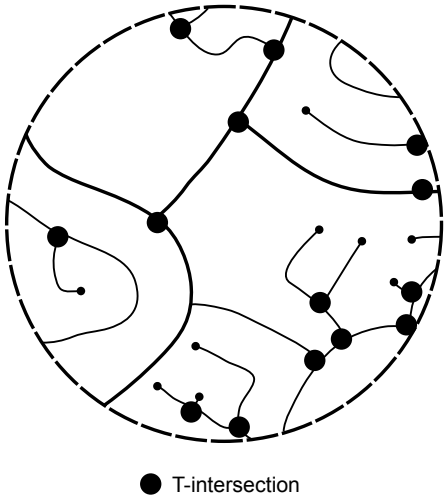

Figure 3. Ballajura – connectivity map

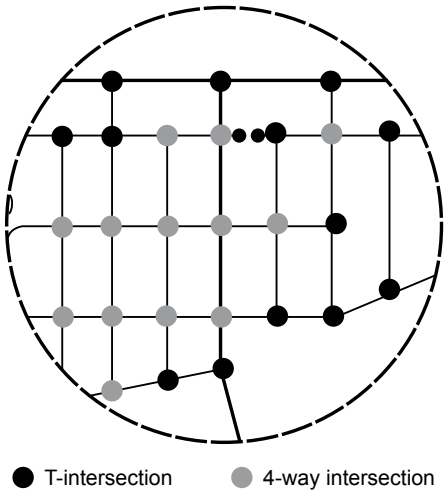

Figure 4. Nedlands – connectivity map

2.1 Connectivity

Connectivity (or permeability) provides an indication of how well each part of a place is connected to the other parts. In other words, how much choice there is for people to get from 'A' to 'B'. Connectivity is measured by the number of intersections per square kilometre.

Ballajura, a conventionally designed greenfields estate of the 1980s, measured 28 intersections per square kilometre. Nedlands, a turn of the century suburb had 78 intersections per square kilometre. The traditional street pattern of Nedlands offers a greater choice of reasonably direct routes from one part to another. This is the result of more intersections and smaller street blocks.

2.2 Accessibility

Accessibility provides an indication of how easy it is to safely walk to a place from the surrounding area. Walking is used as the benchmark because, unlike car-use, it is restricted in terms of the time and distance that people are prepared to travel. Accessibility is measured by a ped-shed – a mapping tool that compares how much developed land within a 400-metre (five-minute walk) or an 800-metre (ten-minute walk) radius circle is actually within a five or ten minute walking distance after the pedestrian routes are taken into consideration. The maps below show land lot parcels and accessibility for the areas of Willeton and Mount Lawley.

The traditional grid street pattern of Mount Lawley provides considerably better and more equitable access to the shops for local residents with a walkable catchment of 72 per cent in the 400 metre circle and 61 per cent in the 800 metre circle. Being a more 'walkable' place, car ownership is less of a necessity for living in Mount Lawley than Willeton, which is a 1970s greenfield layout. Willeton's performance was only ten per cent walkable within the 400 metre circle and 14.5 per cent in the 800 metre circle.

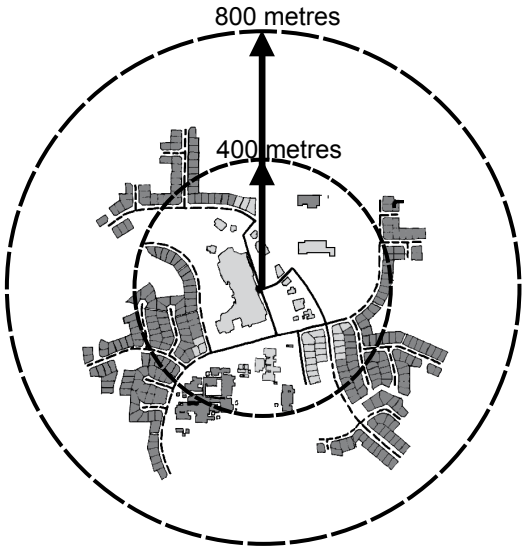

Figure 5. Willeton – Ped-shed accessibility map

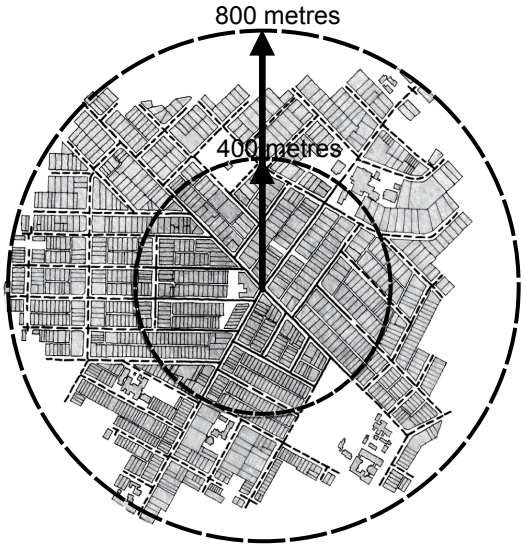

Figure 6. Mount Lawley – Ped-shed accessibility map

2.3 Diversity of land use

In this example, Hillarys, a new suburb in northern Perth was compared with Subiaco, an established inner city suburb. The greater diversity of land use in a traditional area like Subiaco provides more housing, lifestyle and employment choices for local residents while reducing the need to travel further for their needs.

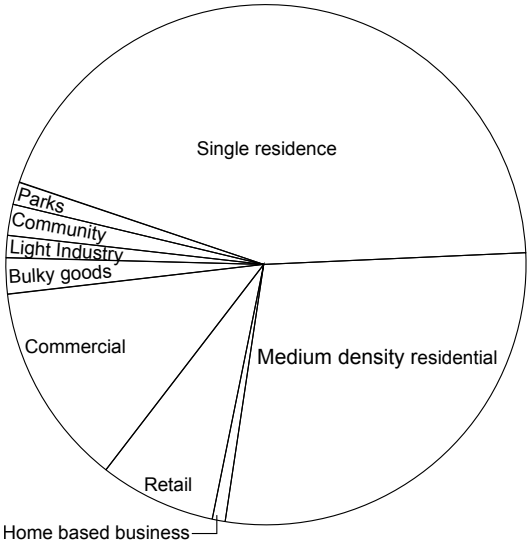

Figure 7. Land use distribution – Subiaco

The effect of urban form on the environment of the various suburb types was assessed by calculating energy use and greenhouse gas emissions for each area by a research team led by Professor Peter Newman of Murdoch University. The energy use and corresponding greenhouse gas emissions were noticeably lower in the traditional areas. The better performance of the traditional suburbs can be largely attributed to their public transport availability and frequency, greater number and range of uses including retail, services and entertainment, higher resident and worker densities, and higher levels of connectivity and proximity to other places (effectively, their proximity to the centre of the overall urban area). These factors reduce the need to travel and make alternatives such as public transportation more viable. The traditional suburbs areas significantly out-perform the conventional post war suburban areas.

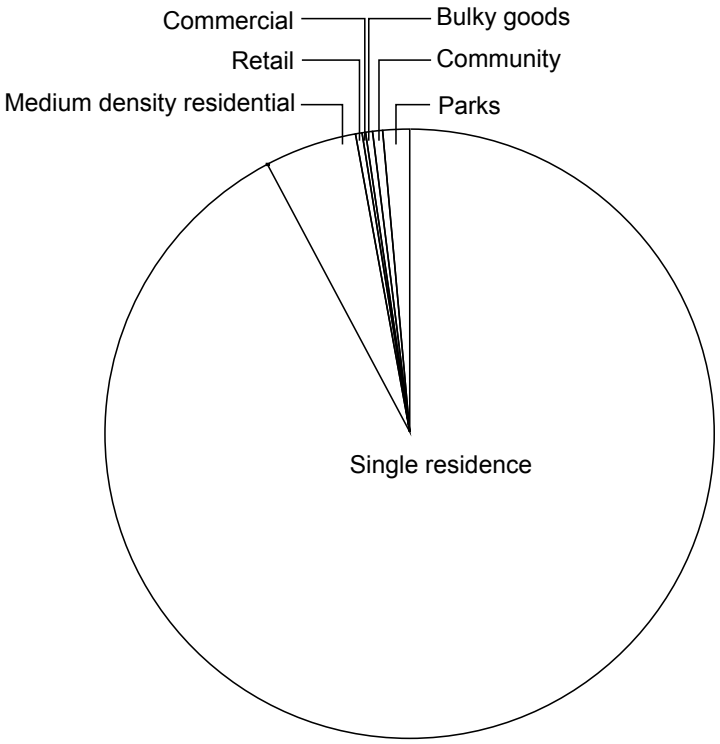

Figure 8. Land use distribution – Hillarys

Suburb	Energy use (Millijoules/capita)	Rating	Rank
Mount Lawley (traditional)	39.62	Very Low	1
Shenton Park (traditional)	43.75	Low	2
Nedlands (traditional)	45.79	Low	3
Subiaco (traditional)	46.60	Low	4
Willeton (conventional)	54.49	Med	5
Ballajura (conventional)	57.97	Med	6
Hillarys (conventional)	62.95	Med/High	7
Kallaroo (conventional)	68.12	Med/High	8

Table 1. Comparison energy use in selected suburbs
Source: Ministry for Planning Western Australia

It is clear from this analysis that sustainable urban design practice needs to rely on the operating systems of urban practices found in Australia's traditional suburbs. This needs to be coupled with necessary adaptation for contemporary social, economic and environmental circumstances as discussed below.

3.0 KEY DESIGN PRINCIPLES

A 'Sustainable Urbanism' approach has been developed over the last decade to achieve relative self-sufficiency for the likely densities of Australia's urban fringe. The Jindalee project, designed for the northern growth corridor of Perth, illustrates principles for town and neighbourhood structuring. This design also illustrates the principles, which form the basis of the Western Australian Liveable Neighbourhoods Community Design Code, currently being adopted as state policy and for the design of the Western Sydney Growth Centres.

3.1 Neighbourhood centres

The small circles such as drawn on the Jindalee Plan in Figure 9 are 'walkable neighbourhoods'. Neighbourhoods are clustered around the town centre and connected to it via the arterial routes.

A centre is generally within about 400 metres from the edge of a neighbourhood, a distance equating to about a five-minute walk for most people. This equates to about 50 to 60 hectares of urban development for the neighbourhood. At a suburban average density of about 15 dwellings per gross hectare (which equals an average lot size of about 450 square metres) a neighbourhood comprises around 700 dwellings.

At this size, each neighbourhood can be configured around a centre with a retail or community based component, and wherever possible, with some local jobs. Neighbourhood centres should generally at least offer a corner store/deli/café, a child care centre and a public transport stop.

An interconnected slow-speed street network focuses on the neighbourhood centre so that the traffic network feeds it well with customers. Nearby centres are located with their primary catchments not unduly overlapping each others.

3.2 Town centres

Neighbourhoods (generally six to nine) cluster around a town centre to give sufficient population catchment to

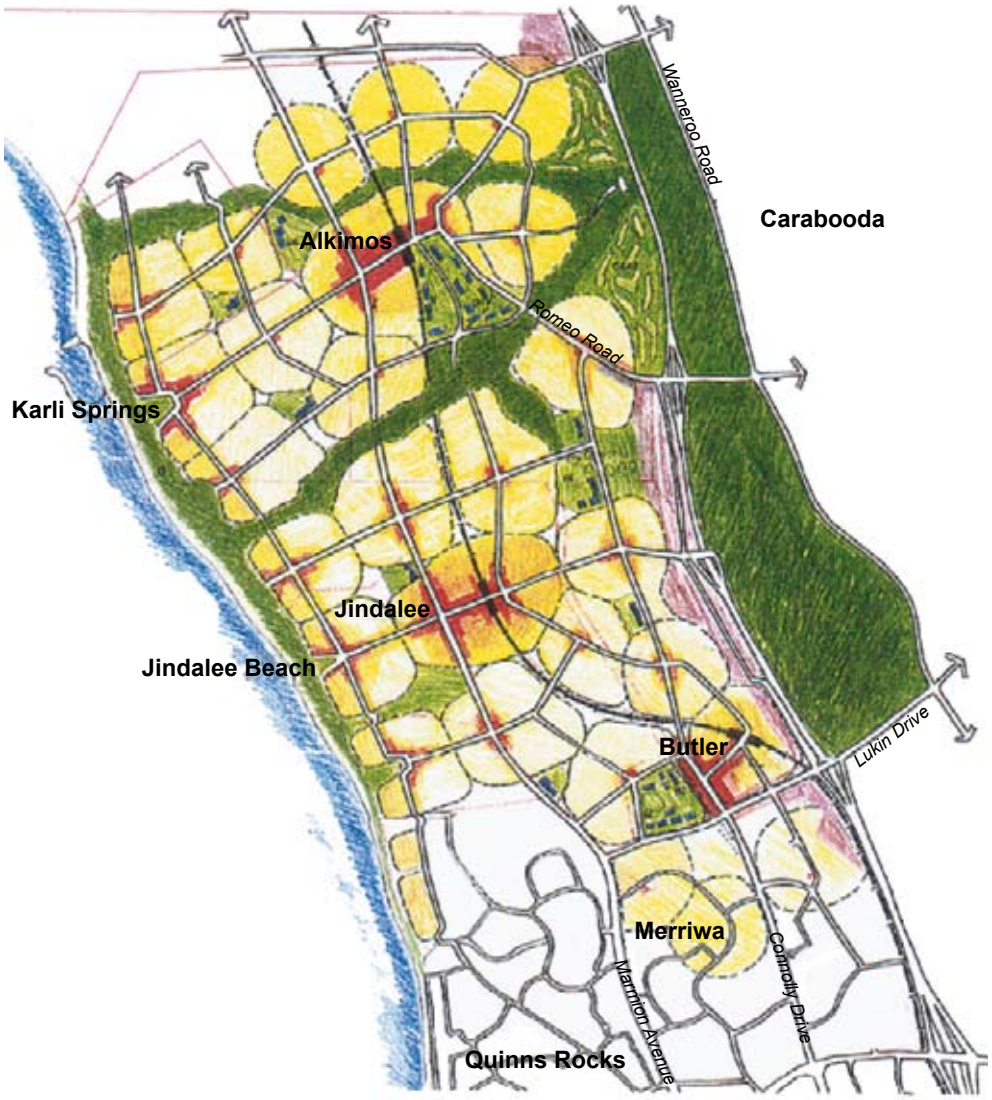

Figure 9. Jindalee regional plan with neighbourhoods clustering to form towns

support main street retail, office and community facilities. The town centres are located at the junctions of arterial routes. For transit oriented development, a rail station or principal public transport route anchors one end of the main street.

The retail and commercial sizes of the town centres are determined by their available catchments. Depending on densities and the number of clustering neighbourhoods, the initial build-out populations generally range from a minimum of 10,000 supporting one supermarket and related shops and businesses, to about 30,000 supporting two competing supermarkets, a discount department store, and an array of other business and community facilities.

As a rule of thumb, most town centres with about 20-25,000 square metres of retail may support a 400 metre-long main street segment of street-level retail premises, in which case the walkable catchment for the town centre may be oblong in shape, perhaps 800 metres-wide by 1200 metres-long (a 400 metre or 5-minute walk out from core retail segment of the main street).

Main streets for town centres (with shops both sides of the street) generally work well with at least 15,000 vehicle trips per day (carried in two traffic lanes). Four-lane main streets generally need central medians and signalised intersections to encourage pedestrians to cross them to shop on both sides of the main street. Transit boulevards may work as main streets, but wider and higher-speed arterials do not work well as main streets, as they tend to divide, rather than integrate, the urban fabric and interaction across the street.

3.3 Movement network

The 'Liveable Neighbourhoods' approach emphasises connectivity, amenity and integration to achieve safe, efficient and attractive street networks. The priority is to develop a street network that not only works for vehicles and provides for public transport, but specifically achieves a high level of use by pedestrians, cyclists and the disabled. The street system is highly interconnected. Arterial routes generally form the spine of neighbourhoods and towns, rather than the edges. Arterial streets are designed to integrate rather than

Figure 10. Mixed use street, (Western Sydney Growth Centres)

divide with the use of service roads or lot layout techniques to enable development to front the arterial routes. Traffic is distributed more evenly through a flatter hierarchy of streets.

Wherever possible, rail is used to anchor town centres and link them to the wider urban transport network. Light rail could also work, but so far fringe densities have not justified its implementation. Bus routes are provided in a parallel network focussed on the town centre, with as many neighbourhood centres as possible connected *en route* to other destinations.

3.4 Distribution of densities

Densities increase in and near the urban centres, and in areas fronting attractive open spaces, especially urban parks. Concentrating more population near the urban centres increases the number of people that can walk to the centres and thereby reduces parking demand. It is also good for the elderly and young who do not drive. Density at the centres increases the localised custom for restaurants and other businesses that contribute to urban amenity in centres, as well as putting more people close to urban and community services such as child care located in the centres. Density at the centres also puts more people close to the public transport stops, which are located in the centres, thereby reducing car dependence.

3.5 Compatible distribution of uses

The detailed Jindalee Plan (available in the web version of this note at www.architecture.com.au/edg) shows an ideal distribution of uses. Retail is concentrated and continuous in the main street heart of the town centre, and as small nodes at the neighbourhood centres. Offices and related businesses are proposed to locate above the retail in the centres, at street level adjoining the retail core on the main street and cross streets, as well as along major arterials as business corridors, and at neighbourhood centres to the extent they can support them.

Medium density residential is positioned at strategic locations close to the town and neighbourhood centres with lower density residential more on the periphery of the town centre and neighbourhoods. Educational, community and civic uses are located in the town and neighbourhood centres, with schools being positioned at the interstice of three neighbourhoods for them to share.

Light industrial uses should locate in small pockets near town centres to serve them, close enough for convenient access by car, but not within urban centres. Light industrial uses may also co-locate in corridors along noisy freeways with good access for trucks, or along rail lines (but not at passenger stations), especially if shunting yards provide cross-docking business opportunities. An example is the long corridor of light industrial uses along the freeway in the Jindalee Plans above.

4.0 WESTERN SYDNEY LAND RELEASE

In December 2004, the NSW Government announced a new plan for land releases in the north-west and south-west of Sydney. These included the development of approximately $7.8 billion of infrastructure, including roads, rail and bus networks, educational and health services, linked to a staged release of land.

The plans reflect the 'Liveable Neighbourhoods' suburban structuring principles as shown in figure 11 to support a range of urban centres and industrial precincts to attract and support economic development and local jobs, with residential areas providing for a range of housing. The plans attempt to structure urban development within existing servicing

contexts whilst protecting the natural environment (although the latter is under extreme pressure to be overturned by disaffected landowners with remnant native vegetation on their properties).

The neighbourhood and town based planning structure will provide a strong foundation for the development of more diverse communities than have been developed in Western Sydney over the past decades following conventional post-war design approaches. A wider range of housing choice, proposed to average 15 dwellings per hectare and comprising units and townhouses, attached housing, rear lane studios and small and large lot homes, will cater for Sydney's changing demographic. A wider mix of activities, including local shops and community facilities, will be able to be achieved through improved pedestrian access and public transport.

The new approach to the physical structuring of the urban fringe is proposed to be matched with new planning, financing and governance arrangements for land release. A New South Wales Environmental Planning Policy is proposed to zone precincts released for urban use; other zones include future urban, industrial, landscape and rural lifestyle. A new development code is proposed to be introduced after plans for the growth centres are finalised.

A new Growth Centres Commission is being established to coordinate the orderly roll out of land release and infrastructure by matching infrastructure funding and plans to land use plans. The Commission will work with local government on precinct planning based on the Liveable Neighbourhoods 'towns'. The Precinct Plan will amend or replace the Local Environmental Plan for the release area and new zoning and development controls will then apply. The Growth Centres release will be coordinated over a 25-30 year period so that the delivery of lots is optimised with the provision of critical infrastructure.

Compared with past suburban growth, the proposed structure design for western Sydney will result in less energy and resource consumption with a relative reduction in the demand for travel because of the ability of people to walk, catch public transport or drive to local services and facilities. BASIX, the New South Wales sustainability index, will reduce energy and water consumption in individual households by 40 per cent and the new Growth Centres Commission will introduce water recycling initiatives.

4.1 Sustainability assessment

Peter Newman, NSW Sustainability Commissioner suggests that the following criteria be used in assessing the Western Sydney Growth Centres:

- natural resources – to live within natural resource limits and minimise ecological footprint
- environmental protection – to protect and enhance biodiversity, air, water and agricultural land
- quality places – to provide quality places for people to live and play
- housing diversity – to provide a range of housing choices to ensure a broad population can be housed and which can be adapted over time

Figure 11. North-west Growth Centre structure plan (Western Sydney Growth Centres)

- jobs-economy – to provide employment opportunities through increasing Sydney's role in the global economy and in regionally-based jobs
- access – to provide sustainable accessibility between homes, jobs, services and recreation
- quality and equity in services – to ensure quality health, education, security, community development and other government services are provided equitably across Sydney
- governance – to establish effective, fair and efficient planning and decision-making.

Professor Newman ascertains that as a car dependent city, Sydney will have to work very hard to stay within its bioregion capacity. In particular, air and water quality limits are close to being reached in western Sydney and so any development has to be very clean. The land release proposals for western Sydney incorporate the introduction of BASIX so that these combined initiatives should conserve water, energy and land significantly more than in average suburban fringe developments.

Newman concludes that there is very high quality in all aspects of spatial design in these growth centres exceeding world 'best' practice. The design quality in these centres should ensure the streets and buildings are amenable, providing quality urban spaces with minimal traffic conflicts. Land and funding for state purposes has been determined. Local community facilities will be coordinated with state facilities through the new Growth Centres Commission planning and budgeting processes.

Considerable effort is taken to facilitate a wider range of housing, though inevitably less than exists in older areas of the city. Jobs are always harder to find in outer suburbs but these growth centres are moving towards good practice in comparison to the rest of the city and are considerably better than most new areas. Centres will be built with an urban design framework to encourage employment; land for light and major industry areas is planned from the start and all significant employment related infrastructure will be provided at an early stage.

Rail links and rapid transit bus ways are proposed with centres located at the junction of routes. Roads to the area are to be expanded to cope with extra traffic and freight. Bike tracks and footpaths will lace the areas based on Western Australia's Liveable Neighbourhoods code. Nevertheless, access is assessed as 'ok to good' as rail links to these areas will be low until population develops.

In terms of governance and services, the new Growth Centres Commission will ensure that development is coordinated with overall plans for the growth centres. Services, including health centres, schools and local facilities such as libraries and child minding, will be available in a timely manner to all of the new areas. The Growth Centres Commission will partner with local government, industry and communities to make key decisions.

Finally, a new approach is proposed to save biodiversity values by creating 'landscape areas' with funding for management initiatives. This approach was based on the inherent value of the remaining Cumberland Plain Woodland and the need to create biological links between remaining stands of vegetation for their long term health. However, this proposal for landscape areas' is unlikely to survive because of strident protests by local residents who believe that their development rights have been disqualified.

5.0 CONCLUSION

The considerable challenge over the last decade has been to reverse the post war urban structure of conventional suburban development by reintroducing traditional neighbourhood structures in contemporary circumstances. In urban design, sustainability is about structuring the form of a town to empower as many citizens as possible to successfully reduce their dependency on cars, helping them better determine the outcome of their daily lives in so far as the layout of the town and the location of uses can assist.

New suburban structuring principles have been developed through the Western Australian Liveable Neighbourhoods Code under influences of design approaches known as Traditional Neighbourhood Design, Urban Villages, New Urbanism and Transit Oriented Design. Applying the principles to urban extensions in Perth and Sydney is enabling an evolution of suburban development towards a more sustainable model.

The 'Sustainable Urbanism' model promotes choice, supports economic activity and growth and has the potential to be much more environmentally benign than conventional suburban models. It needs to be supported by new planning, governance and financing strategies to ensure that a regional approach to land use and infrastructure coordination supports structure planning and is implemented over the long-term time frame that suburban fringes will take to properly form.

Urban design and urban form improvements need to be linked with initiatives to conserve water, energy and land so that new suburban developments are much cleaner and greener than their post war conventional suburban fringe counterparts.

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BIOGRAPHY

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