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Recovering suburbia: An analysis of suburban form –post fire redevelopment.

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4366 words

Running head:

MacKenzie A Post fire analysis of redevelopment

Redevelopment

Suburban

Planning

Bushfire

Abstract:

The Australian garden suburb occupies a significant cultural, symbolic, and physical place in Australian society. From the mid 20th century, suburban identity was strongly linked to the concept of living in the landscape be it a backyard, a bush setting, or simply an abundance of open space. These values were expressed in the Australian garden suburb, and this was exemplified by Canberra's urban development from the 1950s to the 1980s. More recently city planners have had to come to terms with the competing forces of urban migration, competition for development control, and rapid spread of city boundaries and these changing forces have been played out in the suburbs. As a result, today's suburban development is substantially different to that of the post war garden suburb.

This paper reports on a study of 250 homes rebuilt after the 2003 Canberra bushfires. It argues the planning regulations that govern building envelopes do not take into consideration the landscape impact of redevelopment in garden suburbs, and that planning controls should consider sanctioning landscape spaces on residential blocks subject to redevelopment. It argues a whole of landscape emphasis is needed as planning authorities manage change in suburban structure and form resulting from redevelopment.

Introduction:

Social and environmental concerns about suburban development are well documented (Troy 1996, 2004, Gleeson 2007, Banks and Brack 2003, Tranter 2006). Both new master planned estates and infill redevelopments in existing suburbs offer a wealth of material for architecture and urban planning commentaries (Farrelly 2008).¹ These topics may make good reading in the week end broadsheets, but they tend to focus on generalised environmental and cultural failings, rather than exploring possible future outcomes that allow for a diverse range of building types, or effective community engagement to determine the future character of the suburb. There is, however, a consistency in one particular theme emerging from both popular and academic literature on suburbs. Houses are getting bigger (ABS 2006). As a consequence, this style of development is having a significant impact on the configuration of the suburban landscape.

This paper investigates the landscape impact of this trend towards larger houses in the redevelopment of the suburb of Duffy on the south-western urban edge of Canberra in the Australian Capital Territory (ACT) after it was substantially affected by bushfires in January 2003. Over 250 houses and much of the surrounding landscape in Duffy were destroyed. The resulting damage prompted a redevelopment effort rarely seen in an Australian city, and the scale and scope of reconstruction was unprecedented. Six years later, the effect of the fires and subsequent redevelopment has profoundly changed the structure and distribution of the suburban landscape.

In 2007, University of Canberra students and staff measured the change in spatial pattern of the landscape in Duffy between 2003 and 2007. The project examined the changes at two scales; the block level and the suburban level. Firstly we measured the total area of sealed

surfaces including roofs, pavements and decks of new developments as a percentage cover area of the lot, secondly we compared the change in vegetative cover between 2002 and 2006 using normalised vegetation difference index (NVDI) satellite imagery to reveal the changed landscape pattern resulting from the fires and post fire redevelopment. The data was used to communicate to the ACT planning authority and local residents, the changes to the residual landscape in Duffy as a result of the fires and post-fire reconstruction.

This project defined the landscape as all spaces outside of buildings. The aim of analysing all the external spaces was to identify changes to the pattern of the suburban landscape rather than attempt to measure the loss of components that make up the landscape such as trees, shrubs, grass and other vegetation. This was seen as preferable because the aim of the project was to reveal consequences of the changes in the landscape pattern resulting from redevelopment. In this context, landscape is easier to understand as a whole because the elements in the spatial structure of the landscape are interrelated and form one complex system (Kaplan 1989, Antrop 2000). Subsequently the suburban landscape, which is a fragmented and heterogeneous mix of built and non-built structures, is more legible when it is understood as a coherent whole (Lynch 1960, Alexander 1977, Antrop 2000).

Consequently the project found that the changes to the residual landscape pattern resulting from redevelopment of destroyed homes not only lead to measureable loss of open space on private lots, but the nature of these changes also severely inhibits the opportunity for regeneration and regrowth of vegetation. During the design and reconstruction of houses, the landscape value was unrealised, and this is evidenced by the extent to which new home builders in Duffy took full advantage of the planning laws to build maximum allowable house

size on block of land up to 800 square metres, and these houses were up to thirty percent bigger than those they replaced (ACTPLA 2006).

These findings support the well documented trend toward building larger houses on smaller lots in the last twenty years. In 1993–94, the average lot area for new houses in capital cities in Australia was 802 square metres, compared to 735 square metres in 2003–04. Conversely the average floor area of new houses built in Australian capital cities has increased from 196 square metres in 1993-94 to 235 square metres in 2003-004 (ABS 2006).

This increase in size of homes and density of suburbs has been the subject of considerable criticism; most significantly from an environmental and social planning perspective.

Contemporary concerns about changing health patterns of children has been linked to changing attitudes towards external environments in cities, and this is in part attributed to the change in the configuration of suburban lots, and size of available external spaces for recreation (Mead 2000, Tranter 2006, Hall 2008) Like wise the densification of the suburb has also been attributed to increased environmental pollution from run off which has compounded institutional impediments to effective stormwater management (Brown 2005). Empirical evidence also shows that the increase size of houses on existing lots causes a cumulative loss of urban forest (Banks and Brack 2003), and that the increase of impervious surfaces such as brick pavement and concrete in suburban lots have the potential to cause serious urban flooding (Brown 2005).

The change to the configuration of the landscape in Duffy is a result of a number of cultural and economic factors that are the subject of further research. However, the planning codes

that control the extent of built structures on the lots are directly attributable to the loss of residual landscape after the new houses and other structures replaced those built in the 1970's.

Planning regulation in the ACT.

Changes to planning regulation in the last twenty to thirty years are one of a number of factors that has resulted in a change to development trends in suburbs in Canberra. This is unsurprising as it is the main instrument by which decisions are made by developers, designers and the residents when redevelopment occurs in existing suburbs.

Even during the period of redevelopment in Duffy between 2003 and 2008, the regulations that govern development have undergone review, specifically to consolidate separate acts to form a single act to make development simpler and more efficient. The planning and development act (2007) contains the planning and development regulation (2008) under which development rules are set out, and the Territory Plan (2008) which is designed to manage the development of ACT land.ⁱⁱ

The Territory Plan also contains the codes by which development can occur on individual lots. Section 3.1 of the Territory Plan, sets out the objects of the plan and includes measures to protect landscape amenity. It states that the Territory Plan will “Ensure development respects and contributes to the neighbourhood and landscape character of residential areas” (ACTPLA 2008). So it is clear that the intention to protect the landscape character of the suburb is articulated in the legislation, yet there seems to be little scope for determining how this is achieved. Section 3.2 of the Territory Plan sets out the codes by which the development can occur, including building and site controls, setbacks, environmental impact, provision of services, site access and amenity, including solar access and provision of private open space (ACTPLA 2008). These provisions specifically relate to site coverage by buildings and other

hard surfaces but don't provide for measures to respect or protect the landscape character of the residential area.

In a democratic system, the planning regulations, in theory, reflect the public's expectation in terms of acceptable open space provision as well as other amenity provisions resulting from development. Since 2003, the review of planning regulation has been subject to considerable parliamentary and community debate; however the subsequent redesigning of the legislative instruments reflects a well established national trend toward the design and construction of larger houses and therefore a loss of residual open space on private lots in existing suburbs as well as new Greenfield developments.

Research into the reasons for this trend toward larger houses in new suburbs have been attributed to increased work hours and disposable income (Hall 2008), however very little research has explored the communities' attitude to the changes to existing suburbs resulting from redevelopment and the apparent cultural shift away from the preference for living in landscape in the suburbs. This paper reports on a project that forms part of a larger sociological study as part of a PhD thesis.

This paper contends that the changes in Duffy suggest that institutional impediments exist to restrict the protection of landscape spaces on private lots. As a result, the planning authority has less control over the forces that shape the suburb, and the mechanisms that allow the community to debate the long term integrity of the suburban landscape character are not part of the planning process.

To understand why such a shift in attitudes and how centralised planning has been progressively watered down in garden suburbs such as Duffy, it is worth briefly exploring the garden city legacy of twentieth century suburban planning.

Garden city legacy

For a city like Canberra which has culturally identified itself with the landscape, in particular, the city in the “bush image”, the changing landscape character appears to uncover a shift in attitudes that contradicts the values of living in a garden suburb. To appreciate the changed configuration of suburban form between the Duffy originally built in the 1970’s and the rebuilt sections of the suburb built during the recent long boom, the garden city legacy needs to be placed in context with recent trends in planning and development practice in Australia and in the ACT.

In England, and later the United States and Australia, the emergence of the modern suburb was a direct result of unprecedented urban growth (Fishman 1987). Suburbs were once thought of as a subordinate spaces occupied by fringe dwellers in slums. During the nineteenth century, the suburb rapidly changed purpose to become havens for middle class citizens escaping the ill effects of urban congestion and moral excesses of capitalism. This ideology was expressed in the location of the suburb in picturesque settings, away from the city. The setting of the suburb and the use of gardens reflected a material culture expressing middle class wealth, and a desire to pursue a life of moral and physical wellbeing (Nicolaidis and Weise 2006).

Suburban development in Australia during the nineteenth and early twentieth century followed this well established pattern and over the following decades suburbs took many

forms which reflected the social cultural and economic influences of the time. Despite the changing social and cultural forces shaping Australia, the suburb has contained some enduring features. These include the single dwelling on a separate block of land, a well maintained but small front garden, and a larger back yard designed for utilitarian purposes. For most of the twentieth century, the size of the lot was governed by practical rather than commercial motivations (Timms 2004, Troy 1996). The landscape was seen as an essential ingredient of suburban living to be enjoyed and consumed daily, and this established the basis of the suburban ideal and way of life.

Additionally the design of houses reflected the austerity of the time particularly in the post war period. For most of the twentieth century, the cultural influence of modernism not only permeated the architecture of homes, but also presented a “modern” way of life in which practical concerns governed the appropriate size and design of the house (Greig 1995:127). The modernist ideal continued to influence the planning, design, and regulation of suburbs in Canberra under the National Capital Development Commission (NCDC) between 1957 and 1989 (Troy 1981) and later, suburban development became a national agenda under the Department of Urban Regional Development (DURD) established by Whitlam government in 1972.

The persistent theme of home ownership, citizenship, and social equality dictated house design during the NCDC and DURD period, and the suburb was characterised by modest cottages blending into a picturesque landscape setting (Freestone 2000:132). Many of Canberra’s suburbs, including Duffy, reflect this landscape character, and today you can travel across the city and see the evolution of the garden city concept and in particular, the post-war influence of the NCDC. The underlying emphasis on landscape settings for the

design of suburbs in Canberra endured until the 1980's. This was achieved through an integrated approach to civil engineering and landscape planning that demanded a holistic approach to suburb design (Taylor 2006). However this landscape legacy was significantly diluted twenty years ago with the abolishing of the NCDC and the change of governance in the ACT.

In 1988, the Australian Capital Territory gained the right to self government, and the planning function for the capital separated in to two jurisdictions with complimentary but often overlapping functions. The Federal Government retained overall responsibility for the city's strategic direction through the National Capital Plan, and the new ACT government was largely responsible for implementing day to day planning decisions through its planning agency. The new local authority, under significant political pressure from the housing industry association pursued reforms which promoted intensification and consolidation strategies consistent with development trends in other jurisdictions in Australia. These reforms largely divulged responsibility for house design and the configuration of residential blocks to the development industry.

From the mid 1970's consolidation was considered the most desirable means for increasing housing stock in Australia's towns and cities. As a result, development codes for house setbacks, verge widths and provision of open space were pared back under political pressure to achieve often dubious sustainability and efficiency goals (Troy 1996, Gleeson and Lowe 2001, Taylor 2008). This not only resulted in the construction of new suburbs with narrow streets, minimal public open space, smaller lots with reduced setbacks; it has also resulted in the construction of additional homes in existing suburbs otherwise planned under a different system and ideology.

The change in planning focus to favour consolidation highlighted some of the conflicting social and political pressures to meet demand for new housing in the existing garden suburbs of Australia. The emerging environmental movement in the 1960's in part created the demand for a more compact housing form and this desire to improve environmental outcomes created a renewed interest in local environmental activism and accountability of local authorities to ensure environmental justice was seen to be pursued (Gleeson and Lowe 2001). As a result the environmental debate became oversimplified and served to diminish broad scale planning. The housing construction industry also advocated for a reduction in centralised planning control and supported a free market approach to improved environmental outcomes in the design of suburbs. The free market environmentalists argued the use of scarce resources was far better disciplined by the market than the planning authority (Pennington, 1999). This promotion of free market environmentalism put faith in the market to allocate environmental values to prevent both the exhaustion of resources and collapse of ecological systems. This view also sat comfortably with the emerging neo-liberal political thinking of the time, and in the absence of empirical evidence of the success of such consolidation strategies created an uneasy partnership with environmental planning and neo-liberal "anti -planning" view (Gleeson and Lowe 2001).

More recently advocates for minimal centralised planning have argued that the redevelopment of existing low density suburbs and the expediting of the development process will address the current housing affordability crisis, by increasing the supply of housing stock as a matter of priority. However the housing shortage is part of a more complex part of boom bust cycles created by fiscal policies and overconfidence in the supply of housing (especially affordable housing) and as a result of this shift in market power to the private sector, and development

codes in planning regulation reflect this. Consequently market distortion has created speculative real estate market, rather than allowing the productive capacity of the housing industry to meet the structural need of the market. Additionally, under the development assessment forum (DAF)ⁱⁱⁱ reforms, the development approval process has been progressively standardised in Australia to reflect a universal model for development which focuses on reducing red tape, and expediting development applications to reduce developer on costs. This standardising of development codes has had the effect of reducing local planning authorities to regulators of development control rather than providing a strategic planning role (Taylor 2008), and without reducing the overall cost of housing (ABS 2008). As a result, the combination of the changing political attitudes, economic prospects and cultural expectations has resulted in substantially larger new homes in both new and existing suburbs. As the housing stock has been replaced in existing suburbs, the increase in house size has also changed the configuration open space on private land.

Case study: Duffy 2003-2008

This study traces some of these changes, and looks at the development of new houses in Duffy since the 2003 bush fires, and the impact this has had on the available landscape for the restoration of the urban forest subsequently destroyed by bush fires.

In 2008, visible evidence of change resulting from the fires is significant. Fire damaged vegetation has been removed, houses have been rebuilt and a grassy plain which was once a pine plantation borders the suburb. The change to scale, form, and design of the new houses is significantly different to those they replace, and this has profoundly affected the physical configuration of the fire affected parts of the suburb. These changes are not only a necessary part of the recovery from such a catastrophic event, but they are also a legacy of a planning

system and community coping with the large scale and rapid redevelopment of the suburb. The damage to property and public infrastructure created a demand for development unusual in scale and context in two ways. Firstly, the scale of damage caused by the fire was unforeseen. Consequently the planning authority, the environmental and municipal agencies, as well as the community had no preconceived strategy to cope with the loss of so much infrastructure, or to manage the rebuilding of private dwellings. Secondly the number of applications to rebuild was unprecedented in an existing suburb in Canberra. Suburban development of this magnitude usually occurs on previously undeveloped land and relies on a master planning process to achieve desired outcomes. In the case of Duffy no master plan existed and therefore redevelopment occurred using the planning codes designed for a different scenario in a suburb planned and built under different policies in the 1960s and 1970s.

The area of Duffy affected by the fire is not zoned for intensification under the ACT Territory Plan. As a result, all new housing in this area merely replaces the existing houses without increasing the population density of the suburb, and does not meet the environmental benefits claimed by consolidation advocates. The suburb was built in the 1970's when the average block size was over 800m². Consequently, the codes for residential development were also developed during this time. However, the rules that now apply to residential development include a maximum coverage of fifty percent of total block area. This means that up to half of the block can be covered with impervious structures such as buildings, structures, carports, garages driveways and other external pavements (ACTPLA 2008:8).

Method

This purpose of this project was to focus on the loss of residual landscape on redeveloped lots in Duffy since the 2003 fires. It used two methods to identify the extent of loss resulting from the redevelopment of houses including the analysis of development applications (DA's) submitted after the fires. The ACT planning authority provided DA's for houses rebuilt after the fires, but could not provide DA's for the same properties prior to 2003. Therefore the project design focussed on the extent to which developments took advantage of the fifty percent site coverage rule, and what the landscape impact resulted from that change. Further research is needed to provide more accurate data revealing the extent of the increase in built form; however this paper serves to promote discussion about the landscape impact of such practices, in doing so, it used two methods to highlight the changes to the configuration of the suburban landscape resulting from redevelopment.

The first method measured the extent of coverage of the lots with sealed surfaces such as houses; other approved external structures, driveways, and other pavements. The site coverage was measured as a percentage of total block area. The second method used high resolution satellite imagery (HRSI) to compare the spatial patterns of vegetation and built structures in 2002 and in 2006 at a whole of suburb scale.

Development application analysis:

Seventy randomly selected development applications (DAs) that were approved for construction were analysed to determine the extent of site coverage by built form and other paved surfaces. The houses selected were fully destroyed during the 2003 Canberra bush fires. The DA site plans were scanned and inserted into a vector based CAD program. Each

sample was scaled to match the block in question. The area of the house footprint, sealed surfaces and easement were separately calculated (Fig 1), and the data entered into a simple spread sheet program to analyse to percentage of space covered.

Insert fig 1 here

Figure 1: Typical spatial measurement of surface coverage of DA plans.

We determined the amount of ground space available for potential future regeneration of vegetation on each block sampled as a percentage of the total block area, less the area of building footprint and other sealed surfaces. The percentage of covered area was then calculated including the easement area to determine the remaining available space for planting trees and other large vegetation.

The built form as a measure of site coverage included the following categories:

- The area of the house footprint; the roof area was used as a measure of house site coverage. The house footprint was chosen instead of the gross floor area (GFA)^{iv} as recorded by ACTPLA, as it more accurately represents site coverage by buildings.
- Other sealed surfaces - including paving, pools, driveways, retaining walls, pergolas and other structures which covered the ground which prevent the planting of vegetation.

The easement^v was also identified in the analysis of the DA samples. This was included to determine the amount of residual land available for planting trees. In the ACT, telecommunication lines are located at the rear of private blocks on easements which can not

be planted with trees or shrubs larger than three metres. Consequently the size of the house roof rather than its total floor area, and its location on the block, were the main determining factors that affected the overall percentage of residual uncovered space available for landscape treatment.

HRSI Analysis

Without pre-fire data available to quantify total loss of space, we focussed on the change in landscape pattern at a suburban scale in order to illustrate the landscape impact of both the fires and the subsequent rebuilding of houses.

HRSI was used to identify different surface types by calculating the Normalised Difference Vegetation Index (NDVI), a measure of the vigour of plant growth to distinguish between areas with a low reflective index. These areas are typically covered by perennial vegetation such as trees and shrubs, and areas covered by roof, pavement and other surfaces with a high reflective index. In each case the reflective spectrum in question was isolated and all other pixels were removed from the image (see Fig 2). A graphic designer produced two posters that showed vegetation change and built structures change at a suburb level.^{vi} The results of these findings are discussed below.

Insert fig 2 here

Figure 2: The left side image shows Duffy in 2002 and the right 2006.

Results:

The results showed that the developers of new houses in Duffy took full advantage of the fifty percent block coverage rule to maximise the amount of space permitted by the planning regulations to be built on. It also showed that the change in total amount of vegetation as well as the configuration of the landscape at a suburban scale has been profoundly changed. This is consistent with data collected by ACTPLA in 2006 that reveals from a sample of one hundred and twenty DA's submitted after the fires, only two DA's submitted showed no increase in GFA, and eighty six showed an increase in GFA of fifteen percent or more in GFA (ACTPLA 2006). The following results give an indication of the extent of these changes.

The average block size of the sample was 844.6 square metres, the average house (roof) size was 238.5 square metres, and the average paved area was 109.5 square metres. The average site coverage by sealed surfaces was 41.9 percent. When the blocks over 800 square meters are removed, the average site coverage increases to 44.1 percent. Therefore the residual open space that remains uncovered by sealed surfaces is as little as 55 percent on blocks up to 800 square metres. The HRSI shows a visible change in landscape pattern but does not offer any findings that were able to be quantified to the level of accuracy of the DA analysis. The major contributing factor to the change pattern is the loss of tree canopy directly resulting from the fires, in addition, the 2006 image was taken in summer during a drought and so some of the open spaces show an absence of vegetation where. However, when the reflective index is highlighted the increased roof areas in the fire affected parts of the suburb are clear. Fig 2 shows the difference in landscape pattern by highlighting the spectrum with a low reflective index which indicates vegetation. Fig 3 shows the difference in built form by highlighting the spectrum with a high reflective index which indicates rooves, paved areas and other surfaces not suitable or available for landscape treatments such as planting of vegetation.

Insert fig 3 here

Figure 3: The left side image shows Duffy in 2002 and the right 2006.

Discussion:

Planning regulations in the ACT endeavour to control the extent of built form on a block of land through site coverage and setback controls (ACT Territory Plan). While these controls achieve a limit on the total amount of open space uncovered by building and other sealed surfaces, they have little effect preserving viable spaces for future suburban landscapes to grow. As a result the planning codes don't take into consideration the cumulative loss of landscape in existing garden suburbs resulting from increased coverage by larger houses and pavements. Subsequently, the landscape becomes 'left over linear space' on private land with restricted opportunity to accommodate future use of the landscape such as the planting of shrubs and trees. While this loss of productive landscape space is most evident and often criticised in new suburbs, this study shows that even in existing suburbs with larger blocks and established vegetation, we risk losing the landscape spaces that are desirable for social and environmental reasons. This is consistent with contemporary concerns about the loss of open space on private blocks in Australian suburbs (Hall 2008, Banks and Brack 2003, Tranter 2006).

The results indicate that landscape change is evident at the block scale and the suburb scale, and the changes to the suburban landscape are significant. The decisions by individuals to build larger houses has a cumulative effect on the configuration of the landscape pattern in the suburb, and the residents of the suburb and the local planning authority have little or no control over how the landscape character of their suburb changes over time.

This paper argues a holistic and strategic approach is needed to manage development in existing suburbs by sanctioning productive landscape spaces on existing residential blocks. That is, spaces able to accommodate large shrubs and trees, and significant recreation space. The planning authority should ensure the measures used to protect landscape space are most effective in providing opportunity for suburban landscape renewal.

The average sized block in Duffy is over 800 square metres and so these blocks also constitute more than half of the total open space available in private ownership that can accommodate suburban landscape space and vegetation. The percentage of site coverage of new houses on these blocks was also lower than that of blocks under 800 square metres, and so by applying a different residential code for setbacks and site coverage on larger blocks, the objective of maintaining and enhancing urban vegetation can be achieved with relatively little impact on the opportunity for development to occur on these blocks. This paper argues that to amend the residential code in the Territory Plan to allow more landscape spaces on blocks over 800 square metres would not constitute a significant restriction on development opportunities for land owners.

Conclusion

It is easy to see the change in the configuration of the landscape in Duffy. While individual residents may have waited years to return to their home, the scale and scope of the reconstruction was rapid by normal market driven standards. A visitor to Canberra who has no specific knowledge of the fire event could drive down Eucumbene Drive on the western edge of Duffy and see new houses built on the most desirable blocks of land. In effect, the fire

became a catalyst for gentrification. The agents for change in this landscape were the planners, architects and landscape architects working in an opportunistic market buoyed by a glut of land flooding the market. The other change agents were residents who had lived in the suburb for most of their lives, and merely wanted to return to a suburb, albeit a permanently reconfigured one. The combined effects of a coordinated government response to expedite the recovery and the flow of capital from a buoyed market resulted in rapid change to the landscape that seemed to lack any sort of holistic vision, and as a result, only after the event could the effect on the landscape be measured.

The challenge for government is to empower planning authorities to develop planning regulation that can take into consideration the consequences of long term spatial change caused by development. This requires an acceptance that the forces shaping our suburbs are currently beyond the realm of local planners (Troy 2004). By doing this, the debate about the future of the suburb should be framed around how we want to live, what sort of landscape character is desired, and what the long term interests of the community might be. This paper does not advocate a general constraint on development opportunity, but rather a broadening of possibilities that includes a landscape approach to managing the spatial configuration of the suburb. Shifting focus from the individual block to the suburban scale also encourages the community and the local planners to explore the issues beyond the short term benefits of a particular development.

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Endnotes:

ⁱ Elizabeth Farrelly has been a regular critic of suburbs in the Sydney Morning Herald, however one of the most elegant opinion pieces was titled "Crowded Land of Giants" written by playwright David Williamson in the Good Weekend magazine in August 2003.

ⁱⁱ Planning and Development Act (2007) ACT

ⁱⁱⁱ The Development Assessment Forum (DAF) was formed in 1998 to recommend ways to streamline development assessment and cut red tape - without sacrificing the quality of the decision making. The Forum's membership includes the three spheres of government - the Commonwealth, State/Territory and Local Government; the development industry; and related professional associations. www.daf.gov.au

^{iv} Gross floor area (GFA) means the sum of the area of all floors of the building measured from the external faces of the exterior walls, or from the centre lines of walls separating the building from any other building, excluding any area used solely for rooftop fixed mechanical plant and/or basement car parking (ACTPLA 2007).

^v The water supply, sewerage, stormwater and gas pipe reticulation, electricity lines and telecommunication cables are normally located in road easements or easements within leases (ACTPLA 2007).

^{vi} The final posters were displayed at The Inaugural ACT Community Safety Field Day held on 20 May 2007 at Stromlo High School. The students were available to explain to community members the nature of the project and provide information about future research into the community's attitude to the changing suburban landscape. The viewers of the images at the community field day could observe and reflect on the changed pattern between the unaffected and affected parts of the suburb three years after the fires. Further qualitative research into the resident's responses to the changed configuration of the suburban pattern is proposed as part of this project.



fig 1



Fig 2

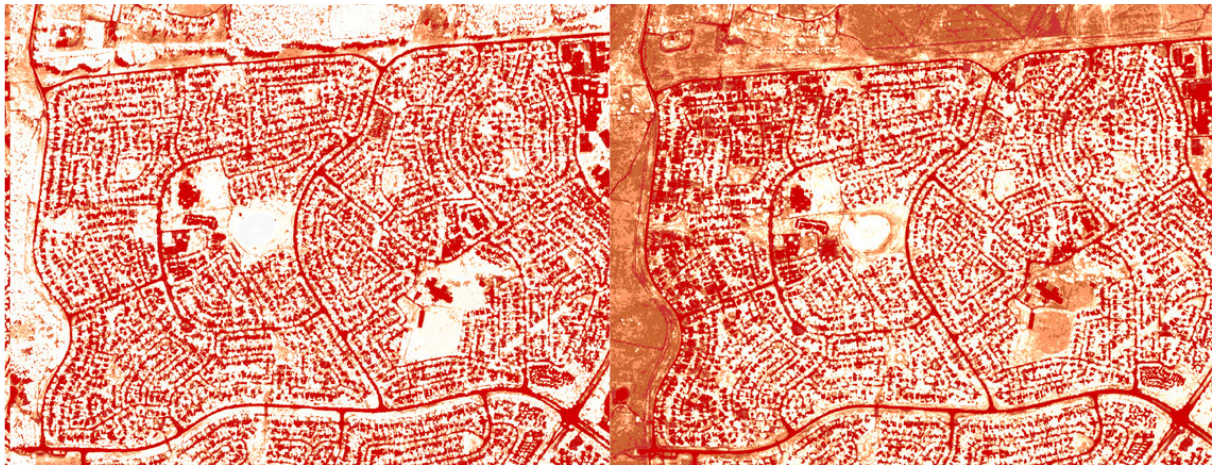


Fig 3