# Alternatives in light & space

Rethinking public lighting in shared spaces

A thesis submitted in fulfilment of the requirements for the degree of Master of Design

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# Declaration

I certify that except where due acknowledgement has been made, the work is that of the author alone; the work has not been submitted previously, in whole or in part, to qualify for any other academic award; the content of the thesis is the result of work which has been carried out since the official commencement date of the approved research program; and, any editorial work, paid or unpaid, carried out by a third party is acknowledged; and, ethics procedures and guidelines have been followed

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# Abstract

This study reconsiders current public lighting design and suggests alternative practices that were determined through a case study involving a main street shopping strip. Using design as an investigative method this thesis seeks to inform and inspire practitioners and decision-makers by illustrating the possibilities of change. Australian cities are witnessing an unprecedented growth in urban density and if we do not change our thinking, the quality of our urban spaces will not match this growth. Public lighting can encourage evening pedestrian activity and help to revive the street as a social domain. People have emotional and psychological responses to light and thus it is a powerful design tool that influences urban character and amenity. Street lighting can fashion unique identities for neighbourhoods, soften cities and create places that people will want to connect with.

Keywords: public lighting, street lighting, amenity, design, urban spaces, shared use, pedestrians, neighbourhoods

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# 1 Introduction

This thesis seeks to change the way we think about public lighting by looking into the possible contributions it could make to urban design. In the process, it also champions the poorly recognised social role of streets and the need to selectively reclaim them for the benefit of pedestrians. As a human centred study it has sought to use light to create more appealing and human scale cities in hope of encouraging people to socialise and to experience them as pedestrians.

Having worked in the lighting industry I have come to believe that the current views on public lighting are inadequate and a fresh perspective is called for. Public lighting in Australia is drab, uniform and engineered. The expressive, experiential and aesthetic contributions it could make are being neglected and instead of developing attractive and unique nighttime surroundings we prescribe it via guidelines that focus on safety and visibility. Lam (1965) argued half a century ago, 'the design of public lighting plays an important part in establishing the visual image of any city' (p.2) and yet our approach to lighting has not changed since then. The technology employed and the opportunities this has afforded us have changed, but not in our worldview of what public lighting can and should be.

As with many westernised cities, the automobile has profoundly affected the shaping of Melbourne. With a road network that constitutes the bulk of our public space, road lighting has become the principal style of public lighting - even when roads are not being illuminated. The dominance of the automobile has led to lighting engineers focusing on the needs of the motorist at the expense of pedestrians. In order to address this imbalance an archetypal street was chosen for a case study to see how a more 'designerly' approach to streetlighting might improve the pedestrian experience.

Of the many objectives of this thesis one has been to position public lighting between the two polar extremes that currently apply to it, either it is seen 'solely for aesthetic purposes, or solely for providing visibility for tasks' (Millet 1996, p. 2). Consequently one argument has been that it is possible to illuminate for safety and visibility while simultaneously enriching peoples' experience of the city. Numerous other objectives will be discussed in the

forthcoming chapters but two notable others have been the intention to contribute to practice and the appeal to policy and decision makers. By illustrating an activity that is rarely shared and identifying the forces that have led to the way things are, I hope to equip designers with knowledge that will allow them to continue to expand notions of contemporary public lighting. Of equal importance is the plea to policy and decision makers and the desire to inspire and motivate them; designers may be able to offer ideas but it is only their determination that will bring about change.

## 1.1 Structure of the thesis

Having examined literature in the fields of design, lighting, engineering and urban planning, as well as current legislation, Standards and numerous guidelines, Chapter 2 discusses the attitudes and issues that have led to the current situation. Along side of this, the chapter argues for the need to review current practice and illustrates some the possibilities of light and urban design. Chapter 3 discusses the benefits of case studies, the role of sketching in visual thinking, research through design and concludes with a description of the visual tools that aided the design process.

The case study spans Chapters 4, 5 & 6 with Chapter 4 introducing the site, the data collected and the observations made during the visits. Chapters 5 & 6 discuss the design speculations and are structured around two themes that emerged from the visualisation component of this study. The first theme involves the shifting, blurring or fortifying of user zones while the second theme involves ways of reducing the perceived scale of the environment.

Chapter 7 discusses the ideas that have come out of the investigation and these findings are examined using four topics that unite the design propositions of Chapters 5 & 6: 1) the concept of equally shared spaces 2) the subjective aspects of light 3) thoughts about safety, visibility and risk, and 4) the creation of unique urban environments. Chapter 8 finishes the thesis by drawing conclusions, highlighting insights and suggesting how the ideas might be progressed further.

# 1.2 Researcher background

After twenty years of industrial design practice, which has included owning an architectural lighting business in parallel with an academic career, I reached a point in my professional journey where I sought to redefine and expand my design work. The early years of my lighting business involved a degree of play and exploration through which I discovered light's associative capacities and the emotional responses that it can elicit. These early years also revealed the transformative powers of light and its ability to offer another reading of both the luminaire that provides it, and the environment it renders. This *transformative* capacity became a central theme in all of my lighting products.

As my business grew, I came to realise the limitations of my practice; although I had some control over the object, I had none over the way it was used. As a consequence *context* became increasingly important and this meant having more influence over the environment they were to go into as well as how they were being implemented. In having an appreciation of the less tangible offerings of light I became equally interested in how my lighting could contribute to a person's experience of an environment. This led to increasing thoughts about such things as using lighting to alter people's emotions and behaviour, how the lighting might offer them a more meaningful interaction with the environment, or how it might influence their spatial understanding of the setting.

At the beginning of 2009 I commenced a lighting course offered by the Illuminating Engineers Society, the only dedicated and professional level lighting course in Melbourne. Other courses are available but they are either hobby classes or subjects within other disciplines. My participation in this course confirmed a tacit understanding I had developed over many years through my business. Although I had been drawn to the industry because of the intangible offerings of light, and the positive contributions it can make to people and built environments, the most influential school of thought (in Australia) perceived light in a highly technical and quantitative manner. The only alternative to this mindset lay in the world of theatre, but unfortunately these practitioners have little influence on anything outside of the entertainment industry.

Although many of my interests in this thesis have crossed into urban geography, planning and design, as well as place making and city amenity, the reality is that I am none of these professions. Nor am I a lighting designer per se, but rather a designer of artefacts who wishes to see unique and enriching urban environments enhanced by the (as yet) unrecognised contribution of public lighting.

# 2 Context & issues

# 2.1 Background

The first notable public lighting system was fuelled by gas and created in London at the beginning of the 19<sup>th</sup> century, with countries such as Germany and France following some 50 years later. The fuel arrived via a gas network, with a gas tap individually controlling each streetlight. The principle of a central supply was established and paved the way for electric lighting (Brandi 2006, p. 150).

The industrialisation of the late 19<sup>th</sup> century enabled the upgrading of public lighting. The creation of the electric lamp and the adoption of a centralised supply system were the first significant steps. Electric light fittings offered major benefits over gaslights by providing more lumens, less glare and greater control. Eliminating the need to manually ignite these streetlights meant that their mounting heights could be higher and thus electric streetlights could illuminate larger areas. The use of reflectors to direct the light downward, further improved upon the increased brightness of electric streetlights as well as ensuring that unwanted spill light would not irritate people in nearby homes.

Electric streetlights were first introduced in the 1880's along main streets and in squares. Their use grew as the supply networks expanded and this led to an improved quality of life for people in cities. Nightlife was borne with the widespread implementation of public lighting, which extended daytime activities into the evening and enabled people to be safe outdoors at night (Brandi 2006, p. 151).

The provision of street lighting enhanced peoples' safety by allowing them to recognise threats and hazards as they travelled within the city. It reduced the risk of pedestrian injuries, the amount of vehicle accidents and assisted with way finding for both parties. Likewise, the improved visibility reduced peoples' fear of crime by making it easier to identify thieves, the fear of recognition helped to deter criminals, and it served the interests of the police force because it offered them greater powers of surveillance and control. Public lighting shifted its focus in the 20<sup>th</sup> century as the use of motor vehicles grew. The faster the speeds of vehicles, the greater the chance of serious injury and as speeds increased from horse drawn to motorised, the attention of public lighting moved to the roads and the needs of vehicles. In the many years since, public lighting has not changed dramatically and street lamps still supply a majority of the world's lighting, for the benefit of motor vehicles.

Urban lighting falls into 3 dominant paradigms; broadly speaking their motivations are (primarily) functional, commercial or decorative. Within an Australian context, public lighting is generally functional, designed in accordance to Australian Standards and various local government codes. Decorative and commercial examples of lighting are generally onedimensional in their intentions and primarily seek to adorn urban features or attract peoples' attention.

Illuminated advertising is the by-product of the electrified city. The advertising industry is adept at controlling what people look at and lighting is an essential element. Retailers know that bright lights attract potential customers and accordingly illumination levels tend to be competitive in nature (Clark 2008, p. 23). Decorative lighting such as the illumination of building facades can also have a commercial subtext. Cities such as Hong Kong may seek beautification by illuminating their buildings and monuments but they are equally motivated by the desire to increase night commerce and tourism. Architectural lighting may wish to enhance a building but it may also seek to attract peoples' attention to a business, as a form of 'soft' advertising. Other Asian cities like Shanghai exhibit such an excess of illuminated signs that it is straining power supplies and in Seoul there are building elevations with such enormous screens that Piccadilly Circus, Times Square and Shibuya are made to look insignificant (Brandi 2006, p. 79).

Along with the excessive illumination of cities is the associated problem of light pollution and its effects on human health. Light pollution manifests as over-illumination, glare or light trespass; where over-illumination is unwarranted amounts of light, glare is intense light beyond the eye's adaption range, and light trespass is any unwanted or misdirected light. All of these can have detrimental effects on living things because light regulates circadian clocks and it is these 'body clocks' that effect physiological processes in almost all organisms. Flora, fauna and people are all affected by light cycles (including daily and seasonal cycles) and in the case of humans, light is known to have physiological effects on metabolic functions, the production of hormones (melatonin and estrogen) and cell regulation.

Similarly excess lighting can have psychological and behavioural consequences; overillumination and light trespass can lead to tenseness, stress or insomnia in people and in the case of animals it can disrupt their normal behaviour and nocturnal activities.

# 2.2 A highly technical and quantitative industry

A fortunate meeting with a lighting consultant several years ago reinforced my understanding of the Australia lighting industry. He spoke about a shopping centre he had recently worked on and the consulting engineer he had worked with. The engineer was asked to conduct a daylight study because Centre Management were interested in putting a building in the atrium. He was asked to supply a report that would outline the impact of this on light levels. All of the recommendations that came out of his report were expressed numerically. The entire description was based on a light meter and lux levels, and unsurprisingly, there was no mention of the qualities of the light.

In the highly quantified world of lighting, calculations and measurements are de rigueur and nothing can be done without a light meter, some basic trigonometric formulas and a little vector algebra. On the rare occasions where this is not the case, the focus is on the technology of lighting products, which is commonly concerned with such things as lamp types, control gear, optics, thermal design and computerization.

Lighting is an intrinsically technical field, and, as is often the case, the technical emphasis is frequently at the expense of the other aspects i.e. the symbolic, expressive, aesthetic and affective sides of light. As is common in technical worlds, the tool becomes the focus rather than the means to an (imaginative) end. Detail dominates and there are inevitably countless reasons why something can't be achieved.

Much of the published research is equally technical and quantified in nature. It is typically concerned with such topics as the measurement of lamp output or energy savings, lighting and human performance, low light level vision, glare and luminance for night drivers, visibility in work environments or day lighting in buildings. Professional education also reinforces this epistemological position - that knowledge resides in science and quantification - leading to comparable scholarly publications and course designs that are based on this value system. The Faculty of Architecture, Design and Planning at the University of Sydney offers a Masters or Graduate Diploma in Design Science (Illumination) while the equally well

regarded lighting course offered at QUT is situated within the School of Physical and Chemical Sciences. The TAFE sector also delivers lighting education with Sydney Institute offering a Lighting Principles Course and a course I attended (the only one in Melbourne) at RMIT University, run through the School of Engineering (TAFE). The primary sources of professional education in Australia all subscribe to and perpetuate this Positivist epistemology.

Very little literature - as a proportion of the whole - discusses lighting without using numbers. Everything in the lighting world revolves around measurement and as a logical extension of this, on specifications. Technical information and detail design suggestions abound, with the bulk of the applied literature being documents that assess the effectiveness of a project on the basis of do's and don'ts and unequivocal numerical data. These prescriptive guidelines ultimately predetermined a predictable and unimaginative outcome.

Naturally there are exceptions and some literature does address the qualitative sides of light. Millet (1996) devotes her entire book *Light Revealing Architecture* to the qualities of light. She focuses on its experiential nature, which she defines as the emotional, physiological and perceptual, and transcends the common obsession with fixtures, lumens and light bulbs through numerous examples, which illustrate and examine the qualitative aspects of light and architecture. In his eloquent and poetic account of the history of light, Zajonc (1993) describes light without referring to numbers. He discusses the connection between seeing and the mind, light as a metaphor for cognition and imagination, human perception, the symbolic nature of light, and many other intangibles. As a physicist he naturally elaborates on the workings of light, but much of the book is an attempt to capture its qualities. His aim is best summarized by a quote of Goethe's, which he references. In attempting to describe light Goethe states:

In reality, any attempt to express the inner nature of a thing is fruitless. What we perceive are effects, and a complete record of these effects ought to encompass this inner nature. We labour in vain to describe a person's character, but when we draw together his actions, his deeds, a picture of the character will emerge (Goethe, cited in Zajonc 1993, p. 202).

In his book *Learning to See: A Matter of Light,* Brandston (2008) confirms the quantitative nature of lighting literature. He elaborates on the sheer volume of texts that offer lighting design parameters and/or comprehensively cover all the technical aspects of light and lighting. He questions whether this is enough and employs the metaphor of a surgeon who knows how to use scalpels and clamps, but knows nothing of anatomy or physiology.

A peer and former colleague of Brandston, Cuttle (2003) readily advocates the value of measurement. Although he is less technically fixated than many in the lighting industry, Cuttle still recommends to his design students to develop a habit of carrying an illuminance meter and to employ it whenever lighting catches their attention. In this way students are encouraged to use measurement as an integral part of the observation process (p. 107).

Emphasising this obsession with measurement and data is not to suggest that there is anything wrong with developing a language - in this case a numerical one - to discuss and describe a medium as illusive as light. It is important to recognize that the quantification of light is absolutely necessary. It is when the *language* profoundly influences how people think about light, that we should take issue. Linguistic determinists would argue that language constrains thoughts, and shapes the way we understand the world by constructing unique mental environments. The idea that language and thinking are intertwined stretches back to classical societies and has been explored by anthropologists, linguists and philosophers. According to Kay (1984) the Sapir-Whorf hypothesis argues that language (and culture) frame the way we see and experience the world. Building on this thought, I would argue that it is inevitable that engineers who see everything through numbers will have a slanted view of how public lighting should be perceived. In further reflecting on this matter, it is interesting to note that the most influential body representing the Australian lighting is the Illuminating Engineering Society of Australia and New Zealand (a.k.a. IES), what is most interesting about this is that the organization perceives itself as 'illuminating engineering' rather than 'lighting design'.

There are only two (major) professional bodies representing Australian lighting, the IES, which is the largest, and Lighting Council Australia, which is significantly smaller and less influential. The IES is a voluntary organization and the only body that represents 'the profession', while Lighting Council Australia is a commercial organization that represents Australia's lighting industry i.e. manufacturers. Both organizations have a strong technical bias and are very active on committees by providing technical information and advice on lighting issues. Consequently, both have a significant influence on lighting Standards and government policies and thus the nature of public lighting in Australia.

# 2.3 The lighting design profession

Lighting design is a new profession (30-40 years old) and the design of city lighting is a contemporary phenomenon. Within Australia and the western world, there are three schools

of thought involved in the design of lighting: practitioners who originate from theatre or entertainment; engineers (and specifiers) with values that preference practical, technical or financial considerations; and a more recent stream, lighting designers, hybrid practitioners who bridge the previous two and have a slightly greater bias toward aesthetic outcomes.

John Ford, a lighting practitioner based in Melbourne captures the state of lighting practice when he writes:

In Australia, at least, it is almost impossible to train as a lighting designer. Only one course (at the University of Sydney) offers training beyond certificate level in architectural lighting. This means that lighting designers have all come from somewhere else, mostly from electrical engineering, but occasionally from theatre or interior design and very occasionally from architecture (Ford 2007, p. 112).

According to Brandston (2008) most European and American lighting designers have come from other professions, primarily theatre. He states that these designers are not bound by rules and calculations but rather, they are more concerned with communicating the emotions of their actors or the scene itself. The technical aspects they master are simply tools that are used to communicate the feelings they wish the audience to experience (p. 10).

In relation to Europe, France has been the pioneer with cities such as Lyon, Paris and Bordeaux commissioning free-lance designers to enhance public spaces, infrastructure and monuments. These designers came from the entertainment and fine arts fields and their work began to promote new types of lighting for cities in an age when lighting was only designed with functional requirements in mind (Narboni 2005, p. 104). Today, Paris is Europe's most outstanding example of what can be achieved with light and is affectionately known as La Ville-Lumière (The City of Light).

Australia is yet to embrace the changes that began many years ago in countries like France. Many other counties are catching up to France and the value of a positive nighttime image is now widely recognised throughout Europe. According to Narboni (2005) projecting a positive image implies prosperity, encourages civic pride and helps to attract tourists (pp. 104-107). Europeans appreciate the importance of high quality urban lighting and lighting master plans are now commonplace in many countries like England, Spain, Italy, Holland, Germany, and Belgium (Wachter 2003, p. 5). Although Australian cities do not have lighting master plans there are signs of change and some councils have developed Lighting Strategies, which inform future design decisions.

# 2.4 The dominance of engineering

Engineering is a 20<sup>th</sup> century profession, and as a product of the industrial revolution, it values rational outcomes and standardisation. The influence of engineering on Australian lighting is considerable and it is its 'functional' canon that dictates the nature of public lighting outcomes. In reviewing the various Australian Standards it is worthwhile pointing out the subtle use of language and how it reveals the engineers and old-school lighting professionals behind the text. With a the plethora of tables, normative procedures and a subtext that implies that anything outside of performance criteria is somehow less valid, their values are clearly communicated. AS/NZS 1158.3.1:2005 *Pedestrian area (category P) lighting – Performance and design requirements* is one of the AS/NZS 1158 series of standards devoted to *Lighting for roads and public spaces*. This particular standard regularly uses deprecating terms such as 'decorative' or 'enhancing prestige' when describing lighting that is not motivated by performance criteria alone.

Ford (2007) elaborates on the influence of engineering and its impact on Australian lighting design:

The majority of practising lighting designers have trained as electrical engineers and many lighting design practices are part of or closely connected to consulting engineering firms. This leads to a very technically-based industry that spends much of its time concerning itself with adherence to standards and little time considering the aesthetic factors involved in lighting (p. 112).

Engineering has a particular mindset that sees little value in the qualitative and subjective aspects of light; instead light is perceived through utilitarian and technical filters. A majority of lighting engineers seek uniformity and efficiency, believing that light is provided for people to perform specific 'visual tasks'; it is this focus on 'visual tasks' that needs to be questioned. Placing an emphasis on visual tasks within a work environment is reasonable decision, but to assess public lighting in terms of visual tasks alone leads to sterile and unimaginative outcomes that deprive light of the wealth of possibilities it has to offer. As Cuttle (2003) states 'to think of lighting solely as the medium by which objects and surfaces are made visible is to ignore creative opportunities for influencing users' perceptions (p19).

*Lighting: Art & Science for International Designers* is the only industry publication in Australia and is the official journal for the IES. In a guest editorial featured in the Oct/Nov edition of the magazine, Brandston (2009) speaks about the engineers that are responsible for building services and their aim to provide these 'efficiently, effectively, and uniformly throughout the space' (p.14). He goes on to discuss how these engineers accept that the relevant standards on interior lighting encapsulate the current knowledge of the lighting profession and how 'they base their decisions on its recommendations, particularly those stated in unambiguous numerical terms'. He concludes by saying that 'hectares of lighting are planned (I don't say designed) by people who have other aims... ' (Brandston 2009, p. 14)

In this same editorial, which primarily focuses on interior lighting, Brandston writes: Anyone who has been indoctrinated with the notion that the prime purpose of a lighting installation is to provide illuminance on visual task planes to compensate for the level of task difficulty, and furthermore, that the uniformity ratio is a criterion of lighting quality, has got to forget all that if they are to gain any understanding of what lighting design is all about. The simple truth is that the engineering and design approaches to lighting do not complement each other: they have virtually nothing in common (p. 14).

Engineering is a profession structured around formulas, tables and rules. Data is input into a formula or a computer program, and the output becomes the solution to the problem. Design, like engineering, also solves problems, but 'good' design is more nuanced and has different motivations. Where the emphasis in engineering is on a good technical resolution to the problem, in design it is on human-centeredness; in a good example, design strives to understand and augment the users' experience and desires, while still addressing the problem at hand. With an overriding motivation of problem solving, it is common for engineers to do things the way they have been done before. Design on the other hand celebrates originality and strives to do things differently. Very few designers would wish to produce the same design more than once; even when addressing the same problem, they would attempt to find a different solution.

## 2.5 Normative guidelines

Public lighting is governed by a variety of prescriptive documents; these are either 'technical standards' or guidelines such as Lighting Codes or Lighting Strategies. Variations of these guidelines can be found worldwide and although they may have differing titles, for example America has Lighting Ordinances, all still serve similar functions.

The most influential documents are the 'technical standards'. These exist in every western nation; Germany has DIN (Deutsches Institut für Normung) Standards, England has British Standards and there are overarching international standards such as ISO (International Organization for Standardization) that also exist. As with most of these standards, our own Australian Standards are produced and informed by engineers. Australian Standards on public lighting specify every detail; focusing on visual performance requirements such as light levels and uniformity, and incorporating countless 'technical parameters', which need to be satisfied in order to 'comply'. They are prescriptive documents, with each of the lighting standards having a normative appendix as an integral part of it. The principal standard for public lighting is the AS/NZS 1158 series, Lighting for roads and public spaces, these have a limited definition of urban lighting and as the title suggests, are predominantly concerned with the lighting of roads. The countless technical details that manifest as performance parameters appear to be the prime objective rather than elements of a greater goal. In Light for Cities: Lighting Design for Urban Spaces Brandi criticises ISO standards for this very reason, stating that the 'implementations of technical standards are the prerequisites and not the goals of any urban project' (2006, p. 164).

In contrast to the technical emphasis of Standards, Lighting Codes deal with the relationship between distribution businesses (generally power companies) and authorities (often councils) by outlining the legal responsibilities of the parties, the management procedures to be employed and how the resolution of disputes should be handled. Lighting Strategies on the other hand are vision statements and are often local government publications produced to inform future design decisions; all of them use Crime Prevention Through Environmental Design (CPTED) principles and Australian Standards as their backbone. The exemplary ones such as the City of Yarra *Draft Public Lighting Policy* and the City of Melbourne *Lighting Strategy* also reflect council aspirations. Very few of these guidelines go beyond dry and pragmatic details for the implementation or maintenance of public lighting. Excluding some of the Lighting Strategies mentioned above, all the guidelines lack 'vision'. Brandston (2009) states that:

We should not expect lighting standards (which I am taking to include lighting codes and recommended practice documents) to ensure good design, let alone excellence; their role is to ensure fitness for purpose and adequacy (p. 16)

Using Australian Standards - with all their checklists, rules and appendices - to provide public lighting equates to 'colouring by numbers' and is not an act of design. Although Australian Standards are not compulsory, they are expressed in such a language and perceived as

such; thus if used exclusively they perpetuate pragmatic and risk-averse outcomes. With no lighting master plans in place yet, and only a few Lighting Strategies to offer some vision, there are no documents in Australia that provide cultural objectives for our public lighting.

## 2.6 Vehicles, roads, public spaces and lighting

Urban living involves the movement of people and goods, which is why cities are often established around ports, stations or stock runs. Consequently a significant aspect of urban planning involves the planning of 'movement' infrastructure such as roads, train lines, waterways, airports and interconnected public spaces. Of all of these, it is roads that have had the most significant effect on the shaping of our 20<sup>th</sup> century cities.

In contrast to conventional wisdom, the majority of public space in our cities is not civic or parkland space but rather streets. In a newsletter published by the City of Melbourne (2011) it states that '80 per cent of the city's total public space area is streets' (p. 12). This is particularly significant in light of the fact that the City of Melbourne has a very high proportion of parklands, which means that this would be even higher in other electorates.

Many authors have discussed the impact that cars have had on western cities and the effect this has had on street/public lighting. Thrift (2004) states that automobiles have led to large-scale spatial reordering within cities and that they have reconfigured civil society i.e. the way people live, travel and socialize. He also refers to urban lighting as 'automobile-related' (p. 46). Jakle (2001) speaks expressly about the relationship between automobiles and street lighting. He claims that the most common and important use of street lighting is to aid car travel and that by the 1970's 'cities were lit primarily to facilitate the movement of motor vehicles' (p255). He states that 'exaggerated' street lighting began in America in the twenties and stemmed from a concern for driving safety.

In his report on Australian public lighting Poulton (2005), a highly respected lighting engineer, estimates that there are 1.94 million public lights in Australia, with minor roads making up 70% and major roads making up 30%. What can be reasoned from these figures is that, according to Poulton, *all* of our public lighting is on roads (p.20). This may be accurate, or it may simply be revealing of a larger road-centric perception of public lighting that purveys much of the technical literature found in Australia

The definitive Standard on public lighting the AS/NZS 1158 series also privileges vehicles and roads. It identifies two categories of lighting, a category for vehicles and a category for pedestrians. Category P lighting is defined as:

Lighting which is applicable to roads on which the visual requirements of pedestrians are dominant... also lighting which is applicable to outdoor public areas, other than roads, where the visual requirements of pedestrians are dominant, e.g. outdoor shopping precincts (AS/NZS 1158.0:2005, p.14).

Once again public lighting is *first* referred to by its relationship to roads and I would advocate that this stems from a paradigm where the automobile is the *main actor* in westernized cities.

## 2.7 Safety and risk

The perception of safety and risk are highly personal judgments that are shaped by such things as age, gender and culture; as such there are no universally agreed upon definitions for these. For the purposes of this thesis and the human-centred interests expressed within, safety is understood to be 'personal safety' and thus a freedom from harm and injury. There is an enormous body of literature on safety in cities and this study does not seek to address the specifics of gender, culture or age, but rather to focus broadly on 'the public'. Equally, there has been a lot written about risk and this is discussed further in Chapter 7, but in regard to definitions, CABE (2005) states it is 'an abstract noun created to cover the multitude of ways in which individuals can perceive a situation in relation to their own personal safety' (p. 14). As for this thesis, the term 'risk' relates exclusively to people and it is defined as a person's *judgment* of the *likelihood* of harm and the *seriousness* of this occurrence.

Public lighting in Australia is entirely an accident and crime prevention measure and according to Australia Standard AS 4282-1997 it is defined as:

Lighting provided for the purposes of all-night safety and security on public roads, cycle paths, footpaths and pedestrian movement areas within public parks and gardens, but not including car parks (p.8).

In Australia there are three key stakeholders involved in the delivery of public lighting and according to Poulton (2005) they are VicRoads, local councils and electricity businesses. He states that VicRoads looks after main road, highway and freeway lighting, distribution businesses look after the supply and maintenance of infrastructure, and local councils ensure public safety on their roads, pathways and public areas. Thus the primary responsibility for

public safety falls on a stakeholder who is not well versed in lighting. With limited expertise these local councils follow the only guidelines available i.e. Australian Standards and apply them out of a fear of litigation, and to be seen to be fulfilling their duty of care. I have had many discussions with lighting professionals over the years, which have confirmed how much councils fear litigation and why they light areas well, to the point of over-lighting them in some cases, it is simply a precautionary measure.

There are two aspects to personal safety, injury and crime, and in regard to public spaces, the prevention of these is the responsibility of local councils. One measure that is employed to minimise the chance of them occurring is public lighting. Clark (2008) confirms that 'statistical evidence indicates that road lighting does reduce accidents at night' (p. 4) and that it is understood that lighting does help to prevent personal injury through trips and falls. The contentious aspect is whether lighting prevents crime? The commonly held belief is that it does although Jakle (2001) and Clark (2002) both claim that better illumination may actually increase crime and in a later report written by Clark (2008) he states that:

'CPTED and SCP material also claims that lighting assists in crime deterrence by aiding natural surveillance... but the rest of the story is seldom mentioned, viz that lighting simultaneously provides assistance for the commission of crime' (p. 35)

The populist belief that *lighting prevents crime* has begun to shift to a more accurate one where *lighting alleviates the fear of crime*. In my own opinion, light cannot prevent crime or ensure safety and if anything, it is people that assist most because it is the chance of being spotted or caught that is of greatest significance; lighting simply aids this possibility. Clark (2008) states that:

By the early 1990s, scientific reviews in the USA and UK had established that outdoor lighting was ineffectual for crime prevention. However, common belief in the efficacy of lighting against crime seems to have persisted, perhaps because of confusion with the commonly experienced beneficial effect of lighting in reducing the fear of crime. (p. 33)

In this same report Clark reviews numerous studies on the matter and states the 'there is no doubt at all that people feel safer with more and brighter lighting' (2008, p. 36) and 'it is common experience that artificial light at night tends to allay the fear of crime, and this has been confirmed by scientific studies' (2008, p. 1).

This link between lighting and the *feeling* of security i.e. perceived safety is just as important as the belief that lighting *will* prevent crime. The City of Sydney's *Safe City Strategy 2007-2012* recognises the debate and makes a carefully worded statement that reports 'good

street lighting is often cited as a measure which has the effect of enhancing feelings of safety' (p. 23). The CABE Space publication *The Value of Public Space* cites a number of English case studies concerning lighting and safety. The streets of various London suburbs were assessed before and after streetlighting improvements and their conclusion was:

In Edmonton, 62 per cent of people interviewed said they felt safer using the streets, with 83 per cent of those respondents attributing their increased sense of safety to the improved lighting levels. In Tower Hamlets, although 69 per cent of people felt safer, only 30 per cent attributed this feeling to the improved lighting, with the majority not knowing why they felt safer. Thus improved street lighting appears to make people feel safer even if they are not fully aware of it (2004, p. 21).

This section of the thesis has sought to explain 'safety' and 'risk' in relation to this study. It has also sought to highlight that a person's definition and perception of these is highly personal, and contingent on such things as their gender, age, culture and the circumstances of that judgement. With safety being such a subjective evaluation it is not surprising that people have interpreted the addition of public lighting as a crime prevention measure when in actual fact it simply makes people *feel* safer. This is not invalidate the psychological comfort that lighting provides but rather to emphasise that it does do this, and that the psychological aspects of public lighting are equally important.

## 2.8 Annotated visual review

Of the many urban, lighting and art projects amassed over this study, the following are a selection of works that may help to situate this thesis. This visual literature review is a survey of some of the possibilities of light and urban design.

The international examples featured provide alternatives to the tradition of lights positioned high on poles and illustrate how these more human-scaled treatments can create appealing spaces for pedestrians. Equally, these examples illustrate lighting alternatives that still satisfy the practical need for light but do so in a unique and visually stimulating manner.

The art practice exemplars underscore the metaphoric and transformative powers of light; they demonstrate how light can be used to reshape buildings and our perception of space, as well as light's poetic, spiritual and mysterious qualities which are rarely explored in public lighting. The lighting festivals highlight the pleasure we gain from light. They are purely celebrations that focus on our stimulation and enjoyment of this wondrous medium, while the Australian lighting survey offers exemplary installations that are beginning to emerge.

The final section of this visual review features non-traditional, pedestrian oriented urban spaces, all of which involve regeneration and at times the reclamation of streets in order to create unique environments that are primarily for the enjoyment and use of pedestrians.

International urban lighting

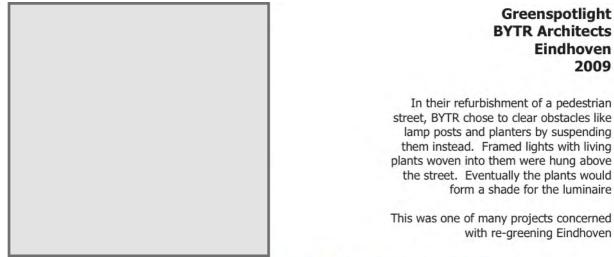


image courtesy of - www.designboom.com/weblog/cat/8/view/8421/bytr-architects-greenspotlight.html

Fig. 2.1 – Greenspotlight (Eindhoven)

O'Connell Street Dublin 2002-06	
Dublin's main thoroughfare and reputedly Europe's widest street	
The regeneration occurred over a period of years and involved (amongst other things) doubling the width of footpaths, removal of London Plane trees and the creation of a central plaza area	

image courtesy of - www.tropicalisland.de/ireland/dublin/o\_connell\_street/dublin\_o\_connell\_street.html

Fig. 2.2 – O'Connell Street (Dublin)

Eindhoven 2009

#### Hoogeveen city centre Netherlands 2010

One of the entrants in the city-people-light award staged by Philips

The revitalisation of Hoogeveen involved the central canal, integrated furniture, LED lights and projections in the city square and along the canal. A lighting masterplan was developed which outlined a unified treatment of the entire city

image courtesy of - www.lighting.philips.com/main/lightcommunity/trends/cpl/

Fig. 2.3 – Hoogeveen (Netherlands)

NumeLiTe Albi, France 2004

A European initiative with 11 partners refitted 3 streets in Albi, to demonstrate an outdoor 'white light' system involving contemporary lamp technology. The objectives involved energy costs savings, a reduction in greenhouse gases and improved lighting for pedestrians, cyclists and drivers. The outcome was an efficient and visually attractive lighting scheme

image courtesy of - www.candela.com/SiteDocuments/Presentations/Sustainable%20Urban%20Lighting%20Toronto%20Pres%2009-10.pdf

Fig. 2.4 – NumeLiTe (France)

Fins	sbury	Avenue	Square
Maurice	Brill	Lighting	Design
			London
			2004

The open space in the heart of a financial district is structured by a grid of embedded glass strips, which emerge from the ground to form the supports for the square's benches. The LED's beneath can be programmed to change colour, be dimmed and to display lighting animations

image courtesy of - www.mimoa.eu/projects/United%20Kingdom/London/Finsbury%20Avenue%20Square%20Installation

Fig. 2.5 – Finsbury Avenue Square (London)

#### The Sackler Crossing bridge Royal Botanic Gardens, Kew London 2006

In 2004 a number of architectural interventions were commissioned by RBG Kew and this bridge was designed by John Pawson Architects. The bronze fins feature lighting which illuminates the edges of the bridge of an evening

A simple and elegant solution to illuminating a path

image courtesy of - www.e-architect.co.uk/london/sackler\_crossing\_kew\_gardens.htm Fig. 2.6 – Sackler Crossing Bridge (London)

### Art practice

Desherence AntiVJ France 2010

AntiVJ is a group artists whose work is focused on the use of projected light and its influence on perception

This screen shot highlights their skills at mapping projections onto complex forms. There are many projection artists working today but their ability to transform architecture would be difficult to rival

image courtesy of - www.antivj.com/desherence/index.htm

Fig. 2.7 – Desherence (AntiVJ)

Matrix XII Erwin Redl America 2003

Erwin is an amazing artist whose spatial work with light is in the tradition of James Turrell

This is one of numerous earlier pieces that involved LED matrices



Field Richard Box United Kingdom 2004

A lighting artist who works with neon and fluorescent lights

One of a series of works involving hundreds of unconnected fluorescent tubes powered by the magnetic field of overhead power lines

image courtesy of - www.impactlab.net/2008/03/03/fluorescent-tubes-powered-by-magnetic-field-of-power-lines/15112

Fig. 2.9 - Field (Richard Box)

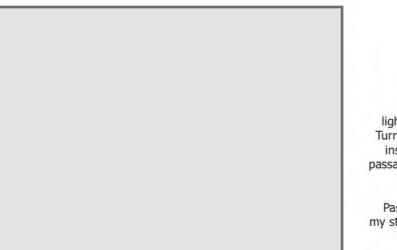
#### Fata Morgana (mirage) Tom Heneghan & Manu Kumar Berlin 2004

A collaborative project that transforms the historic Eiserne Brücke (Iron Bridge). The project explores themes of division and unification using a satellite photograph of Europe printed on 160 illuminated acrylic plates

A beautiful, subtle and poetic piece

image courtesy of - faculty.arch.usyd.edu.au/web/staff/homepages/tomheneghan.html#bridge

Fig. 2.10 – Fata Morgana (Tom Heneghan & Manu Kumar)



#### Verbindung Rotblaugelb Keith Sonnier Minich 2002

Sonnier is part of the sixties wave of lighting artists which also includes James Turrell and Dan Flavin. This is a neon light installation in a 143m long subterranean passage of the Münchener Rüeck insurance company

Passageways have come up often during my study and this is an impressive blend of light and space

image courtesy of - www.flickr.com/photos/irdrager/328068524/sizes/o/in/photostream/

Fig. 2.11 - Verbindung Rotblaugelb (Keith Sonnier)

#### Sitooterie II Thomas Heatherwick England 2003

The 2.4m cubic structure has over 5000 radially arranged hollow aluminium staves. If the staves were to continue, their origin point would be at the centre of the cube. A single light source, located at the centre, emits light which is projected through every tube end

A mesmerising and spiritual piece



image courtesy of - www.heatherwick.com/sitooterie-ii/

Fig. 2.12 - Sitooterie II (Thomas Heatherwick)

#### Canopy United Visual Artists England 2010

Most of UVA's work involves interactive or responsive light shows. This permanent installation in Toronto is inspired by the dappled light of a forest and is made of thousands of identical modules, organised in a non-repeating pattern. The 90m long sculpture works with both daylight and artificial light; at night the modules are animated like leaves in a forest canopy.

image courtesy of - www.uva.co.uk/work/canopy#/0

Fig. 2.13 – Canopy (UVA)

Echo Chunky Move Australia 2006

Chunky Move is a renown Australian dance company and this was the first time they incorporated digital technology into a physical performance

Glow involved a tracking system that generated a real time lighting response to the dancer's movement

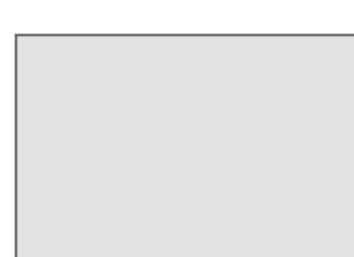


image courtesy of - www.chunkymove.com/Our-Works/Current-Productions/Glow.aspx

Fig. 2.14 – Echo (Chunky Move)

The Hive KMA United Kingdom 2008

An interactive light installation in Dublin's Grand Canal square. The Hive involved a performance of projected light and sound that was driven by the audiences movements and the changing rhythms of the sound track

The first example of responsive lighting in a public space, that I came across

image courtesy of - www.flickr.com/photos/wexler-kma/2281209425/sizes/l/in/photostream/

Fig. 2.15 – The Hive (KMA)

### Lighting festivals

#### Fete des Luminieres Lyon 2010

This is claimed to be the world's oldest festival of light, having started in 1850 as a religious festival of candles. It attracts 4 million visitors annually and 8 million small candles are sold in greater Lyon

The image is of 'Un Air du Large' which involves projections onto the fountain in Republic Square

image courtesy of - http://www.fetedeslumieres.lyon.fr/photos-gallery?page=Press

Fig. 2.16 - Fetes de Luminieres (Lyon)



This burgeoning biennial of light culture started in 2002 and attracts lighting artists from all over the world

The piece here is Leuchtbogen (bright arc) by Paul Göschel



Fig. 2.17 – Luminale (Frankfurt)

#### Vivid Sydney Australia 2011

The Sydney festival of light, music and ideas. Over 40 lighting installations were featured this year and the French design team Superbien were asked to create the projections on the sails of the Opera House. Each year artists are invited to light the Opera House and in the last two years it has been Brian Eno and Laurie Anderson

image courtesy of - www.marclehmann.net/2011/06/superbien-at-vivid-sydney/

Fig. 2.18 – Vivid (Sydney)

#### Australian lighting projects

Electrolight Melbourne 2010

**AAMI Park** 

Commonly known as the Rectangular Stadium, each of the nodes that make up the roof also house programmable lights.

Leading up to a sports event a simple light show begins, as the event draws near the animations beckon people and when a goal is scored it is communicated through the lights, to world beyond.

image courtesy of - www.aafonline.com.au/about\_aaf/aaf\_news/melbourne\_rectangular\_stadium\_aami\_park

Fig. 2.19 – AAMI Park (Melbourne)

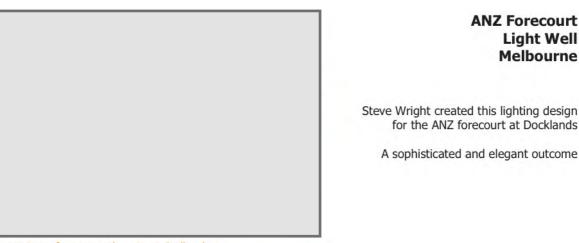


image courtesy of - www.coolon.com.au/gallery/anz

Fig. 2.20 - ANZ Forecourt (Melbourne)

Watergardens Electrolight Melbourne 2009

A catenary lighting system created at Watergardens Shopping Centre which connects the railway station and the adjacent shopping complex

The idea references railway tracks and is meant to lead people from the station exit to the centre of the complex

image courtesy of - denis smitka

Fig. 2.21 – Watergardens (Melbourne)

Chinatown Mall Urbis & Webb Australia Brisbane 2010

A major upgrade to the Chinatown Mall in Fortitude Valley. This upgrade was concerned with enhancing the liveability of this important public space

The concept was developed by Urbis who commissioned Webb Australia to do the floodlighting and Chinese lanterns

image courtesy of - Lighting Magazine April/May 2011

Fig. 2.22 - Chinatown Mall (Brisbane)

#### Urban planning

Swanston St Redevelopment Melbourne 2011

Swanston Street is in the process of being transformed into a 'pedestrian-dominated' street that will include four new public spaces, new lighting, street furniture, integrated tram stops and dedicated bicycle routes

image courtesy of - www.melbourne.vic.gov.au/ParkingTransportandRoads/Roads/SwanstonStreet/Pages/TheStory.aspx

Fig. 2.23 – Swanston St Redevelopment (Melbourne)

Holmbladsgade Copenhagen 1998 - 2003

A declining industrial neighbourhood is now one of Denmark's most successful examples of regeneration. The project included new squares, precincts, sports & cultural facilities, and new street lighting. White light replaced the existing yellow light of the area, main & side streets have been illuminated differently and each public space has a distinct lighting treatment. All of which has contributed to a unique identity for the neighbourhood

image courtesy of - www.streetviewandmaps.com/da/map/dk/50857-Holmbladsgade/ Fig. 2.24 – Holmbladsgade (Copenhagen)

> Broadway Mall New York City 2009

After a successful summer experiment one of NYC's busiest car streets is a now mall. The conversion to a pedestrian and cyclist friendly zone was made so that the city would change its thinking about streets by chipping away at the dominance of the car. The change also incorporates Times Square and this photo is of the first changes to Herald Square

image courtesy of - www.flickr.com/photos/nycstreets/4173681751/in/photostream/

Fig. 2.25 – Broadway Mall (New York)

# 3

# Method & research design

Personal and professional values mould one's worldview. In order to situate this study and the propositions put forward, I would describe myself as a designer who is located at the intersection of design and engineering. Although I endorse the pragmatic needs of vision, safe movement and security, I am ultimately more concerned with the experiential aspects of light. Both designers and engineers create artefacts and strive to 'solve problems', but as a product designer my work is human-centred and I distinguish myself from the rationalism of engineering and its overemphasis on objectivity and technical outcomes.

The two professions of design and engineering share many things and it would be simplistic to draw a line that divides them. The illustration below seeks to express this fuzzy relationship and positions my practice in relation to the two 'typical' value systems. As the white dot in the diagram, I see myself as a practical designer (as most industrial designers tend to be), with values that are more aligned to those of 'typical' designers. With engineering as the paradigm that underpins Australian public lighting, this definition of my practice has placed me in a fortunate position where I have been able to work with the current situation while simultaneously challenging the dominant thinking.

## designers

creative risk taking & unconventional high use of subjectivity speculative novelty & originality are valued human centred create objects of desire

## engineers

technical pragmatic objective & rational systematic problem focused & instrumental technical create tools

Fig. 3.1 – The 'typical' values of designers and engineers

Today's product designers are no longer the stylists they once were and are now specialists in human behaviour. In order to meet the demands of an increasingly sophisticated market, designers are now expected to come up with ideas that appeal to people on both functional and emotional levels. Norman (2010) describes how product design has changed and the new skill set required of these professionals:

Classical industrial design is a form of applied art, requiring deep knowledge of forms and materials and skills in sketching, drawing, and rendering. The new areas are more like applied social and behavioural sciences and require understanding of human cognition and emotion... (p. 2)

Distinguishing my work from that of engineering is a thread that runs through this thesis and I do so to highlight that it is people and their experience that I am putting first. As a product designer I understand human emotions and the role they play in decision-making and product satisfaction. With this professional knowledge it has been possible to imagine ideas that transcend function and to work on the emotional level of desire in order to better - and more completely - address the needs of all the users.

#### 3.1 The case study

This thesis has used a speculative method structured around a case study. It involved public lighting concepts for a site in Melbourne and it employed a visualization process unique to design. In choosing to work with a *single* case study, it was important to find a site that was representative of an urban condition. After reviewing a breadth of locations I settled upon a site that suited my pedestrian-centred objectives. Streetlighting is primarily concerned with the needs of motorists and yet there are many precincts on main streets that attract people of an evening. The lighting treatment of these areas is normally unappealing and the hypothesis of this thesis has been that the security and safe movement issues (for all parties) can be addressed while simultaneously improving the amenity of the environment for pedestrians.

The gentrification of Northcote (an inner-city suburb of Melbourne) has resulted in a portion of its main street (High Street) experiencing a rebirth. Gentrification commonly involves 'the restoration of run-down urban areas by the middle class' (WordNet, 2012) and yet there has been little physical change to the layout of this street, with the primary changes being the nature of the businesses and the shop fit-outs. Of greater importance is that this street is typical of many main road shopping strips and that – by virtue of its representativeness - it might act as a template for the rejuvenation of similar streets in Melbourne. Below is a table of comparable shopping strips and ones that might benefit from the findings of this study.

Carlisle Street	St Kilda East	Map ref – 58 D8
Burke Road	Camberwell	Map ref – 45 J12
High Street	Kew	Map ref – 45 C6
Swan Street	Richmond	Map ref – 44 E11
Bridge Road	Richmond	Map ref – 44 E9
Chapel Street	South Yarra	Map ref – 58 E4
Toorak Road	South Yarra	Map ref – 58 D3
Clarendon Street	South Melbourne	Map ref – 57 G1
Sydney Road	Brunswick	Map ref – 29 H6, G7
Mount Alexander Road	Ascot Vale	Map ref – 28 K9, K10
Barkly Street	Footscray	Map ref – 42 D4

Table 3.2 – Similar shopping strips to High Street Northcote

Case studies are extremely common in the social sciences and as a human-centred investigation it seemed like a fitting way to ground my research. The aims of case studies inevitably differ depending on peoples' objectives: some researchers will endeavour to prove or disprove theories, others may wish to test or refine hypotheses, while others may seek to illustrate something. Siggelkow (2007) summed up the benefits of case research when he stated 'I believe that there are at least three important uses for case research: motivation, inspiration, and illustration' (p.21). Although all three of these were of personal interest, the most realistic objective for a Masters thesis was to 'illustrate' possibilities - which may or may not motivate and inspire others – and to further develop theories about the lighting of these main street precincts.

Case studies can include either single or multiple cases and Flyvbjerg (2006) states that the difference between them is one of breadth or depth; large sample size studies offer breadth while single cases offer depth (p.241). According to Stake (2005) case studies are very common in qualitative research and in his chapter he categorises them into three types: intrinsic, instrumental and collective studies. Two of the three types involve single cases and these go on to form the basis of the chapter. Stake defines intrinsic studies as those where the case is known from the beginning, because it is the individual case that is of particular interest to the researcher. Collective case studies are defined as ones where there is the

least interest in a particular case and they are jointly studied in order to investigate a phenomenon or general condition, while an instrumental case sits between these two. He states that an instrumental case is interested in both the specific and the general and seeks to understand and illustrate a phenomenon (pp. 445-446). According to Stake's taxonomy, the High Street study would be classified as an instrumental study where although I was interested in the inherent issues of the site, it was not the things that were unique about site that I wanted to focus upon, but rather the things that made it typical and the insight it might provide. Stake elaborates on instrumental cases by stating:

The case is still looked at in depth, its contexts scrutinized and its ordinary activities detailed, but all because this helps us pursue the external interest... the choice of case is made to advance understanding of that other interest. (p. 445)

There are many conventional views about single case studies involving generalizability, researcher subjectivity and their ability to prove anything, all of which seek to invalidate them. Instead of unpacking issues that are not particularly pertinent to this investigation, I would rather highlight one of their primary offerings. Eysenck (1976) claims that single cases provide a valuable learning opportunity and that they are not usually published with the intention of proving something, but rather 'as examples of techniques which can be used, or of difficulties which may be encountered' (p. 4). He encapsulates their benefits by saying:

Sometimes we simply have to keep our eyes open and look carefully at individual cases—not in the hope of proving anything, but rather in the hope of learning something! (p. 9)

Flyvbjerg (2006) shares Eysenck's beliefs and asserts that case knowledge is central to human learning. He states that:

Context-dependent knowledge and experience are at the very heart of expert activity. Such knowledge and expertise also lie at the center of *the* case study as a research and teaching method or to put it more generally still, as a method of learning' (p.222)

#### Flyvbjerg later states that:

If one, thus, assumes that the goal of the researcher's work is to understand and learn about the phenomena being studied, then research is simply a form of learning. If one assumes that research, like other learning processes, can be described by the phenomenology for human learning, it then becomes clear that the most advanced form of understanding is achieved when researchers place themselves within the context being studied. Only in this way can researchers understand the viewpoints and the behavior, which characterizes social actors (p. 236).

Stake (2005) shares similar beliefs and elaborates on how single case studies offer a learning and teaching opportunity to both students and researchers. He highlights that many professional fields, including law, medicine and the social sciences, regularly study single cases and how these are used to illustrate a point, condition, or category (p. 447). He elaborates on how researchers learn from a case while simultaneously teaching with it by concurrently offering material for readers to learn from (p. 454). He goes on to reference Smith (1978) who states:

How we learn from the singular case is related to how the case is like and unlike other cases we do know, mostly by comparison. It is intuition that persuades both researcher and reader that what is known about one case may very well be true about a similar case (Smith 1978, cited in Stake, p. 454).

Eisenhardt and Graebner (2007) refer to case studies by way of a laboratory analogy and claim that like laboratory experiments, cases are chosen on the likelihood that they will offer some insight (p.27). Schön (1983) also employs the laboratory metaphor when he speaks of 'virtual worlds' and how they act as 'learning laboratories'. By using High Street Northcote as the context for my hypothetical propositions, I have been able to construct Schön's virtual world in order to experiment and learn about *a type* of urban site (p.162).

## 3.2 The generic design process vs. the design process of this study

Design has numerous definitions that are often influenced by peoples' relationship to it and their personal values. Practitioners, design advocates, historians and researchers all see the activity through different filters. Likewise organisations that promote a similar field of endeavour such as the International Council of Societies of Industrial Design (ICSID) and the Industrial Design Society of America (IDSA) have their own unique slant on design. On the ICSID website they define industrial design and state that:

Design is a creative activity whose aim is to establish the multi-faceted qualities of objects, processes, services and their systems in whole life cycles. Therefore, design is the central factor of innovative humanisation of technologies and the crucial factor of cultural and economic exchange.

The IDSA website on the other hand reveals a slightly different view of industrial design where creativity, humanisation and cultural exchange are not focused upon, but rather a more commercial and practical definition of is offered: Industrial design is the professional service of creating and developing concepts and specifications that optimize the function, value and appearance of products and systems for the mutual benefit of both user and manufacturer (n.p).

They go onto say:

Industrial designers also maintain a practical concern for technical processes and requirements for manufacture; marketing opportunities and economic constraints; and distribution sales and servicing processes (n.p).

I see 'truth' in both of these descriptions, enthusiastically believing in the goals of the ICSID definition and yet as a practitioner, also noting times where I have primarily seen design through a commercial lens. In this commercial paradigm where deadlines, chargeable hours and client demands are major forces, it is easy to focus on outcomes and to view the design process as a means to an end. With multiple deadlines looming it is equally easy to move on to the next design project without taking the time to reflect on the previous one. Unlike these moments in my commercial practice, this study has provided an opportunity to shift my focus to the design process rather than seeking a definitive and single outcome. An important product of this study has been the journey and the opportunity to reveal and evaluate possibilities that this journey has provided. The design possibilities that emerged from this activity are described in Chapters 5 & 6 and then evaluated in Chapter 7.

A fundamental aspect of design is sketching and although all architects, interior, fashion and product designers use computers on a daily basis, they actually think through sketches. It is the iterative nature of these and a reasoning that is facilitated by them, that is at the heart of concept generation. Many people have sought to understand the way these designers think and the role of sketching in this thinking process. McKim (1971) and Arnheim (1969) were two of the early pioneers in this regard. Both wrote books on visual thinking that demonstrated it to be a key aspect of our cognitive process. They described it as thinking with pictures and differentiated it from the dominant paradigm of linguistic or verbal thinking.

Design thinking and visual thinking are often used synonymously, which highlights the cognitive role of drawing and how it is central to design and concept development. McKim (1971) describes the sketching of ideas as 'talking to oneself' while Schön (1983) and Lawson (1980) both describe it as 'conversation'. It is the interaction between the external representation and the cognitive process of interpreting it, which they all seek to emphasize.

Design is an iterative process and one that cycles between analysis, synthesis and regeneration. The process involves externalizing an idea so that it can be evaluated at a distance, which normally triggers new thoughts or ideas that begin the cycle again. At times the visual trigger might be the recognition of relations or features, which suggest ways of refining that idea, while at other times it might be that these features offer ways to spring off to new ideas. Various authors describe this iterative cycle differently, Schön (1983) describes it as framing (problem definition), moving (a small design act) and reflection, McKim (1971) as seeing, imaging and drawing and Oxman (1997) as re-representation, which means that an idea is drawn and redrawn sequentially.

Sketches hold information and allow a designer to reason with their idea by making inferences or judgments from the visual information in front of them. Personal experience has shown that the conversation between designer and drawing tends to be one of debate and negotiation and I often find myself asking questions much like the 'what if?' and 'if then?' questions Schön (1983) speaks of. If repeated often enough I may strike an idea that 'fits' my objectives and the constraints of the project; this is then a solution I retain for future evaluation. This questioning cycle may also trigger totally different ideas and I may choose to follow a tangent while the thought is still fresh. One of the benefits of sketching is that it becomes a record of the reasoning process, which can be retraced if the tangent proves to be unproductive. As Schön (1983) puts it, design is a 'shaping process' where the situation 'talks back' and each move contributes to the 'global experiment'.

During the visualization component of this study, I found sketching to be such an effective way of generating and evaluating propositions that it was the only medium I needed to use. It was an invaluable tool that enabled me to clarify and bring order to my ideas, in the same way that putting thoughts into words can help to make them clearer. The speed and immediacy of the activity allowed me to investigate ideas in a fluid manner, and to test and develop more propositions than I could have otherwise.

The design process typically involved drawing a sketch, evaluating it, identifying the faults I wanted to correct or features I wanted to explore further, and then generating another sketch. In repeating this process, self-imposed constraints or constraints that resulted from choices I had made, would impact on the next iteration and what could be done with it. All the while there was another layer of cognitive activity at play. For reasons of simplicity, the three actions of seeing, imaging, and drawing have been spoken of as a linear process but in practice these are often concurrent, and not independent or sequential activities. While

drawing to capture what was in my mind's eye, I was seeing the marks on the paper and reimagining what I wanted to draw, thus my designing included a complex and real-time feedback loop; this is one of the creative strengths of designing.

Of the many advantages of sketching, not only can it act as a memory aid and a record of the reasoning process, but also that it facilitates problem solving and an understanding of the mind's idea. The act of externalizing an idea by drawing a line, which develops into a shape with size and specific details, helps to crystalize that idea, and presents the opportunity to evaluate it from a distance and to develop it further if necessary.

Sketching has other benefits as well, it offers direct sensory interaction and the ambiguity of a sketch can lead to a fortuitous misreading that can bring about new ideas. It can also be a systematic activity where an aspect of an idea is manipulated in the same way as a single variable in an experiment might be altered to see what might happen. This sequential change of single aspects can be as methodical as a science experiment where the series of changes eventually reveal a preferred or optimized outcome.

Through personal experience I have found that much of designing involves making connections and that it is the making of 'unexpected' connections, which often leads to more innovative ideas. These connections might be with something on the page, where a relationship is perceived between elements or drawings, or they might be beyond. When beyond the page they are an association with something in my memory i.e. a shape recalls another or reminds me of an event or a feeling I once experienced. A good way to illustrate this involves an occasion on High Street where while looking at the overhead wiring, I was reminded of the colourful, suspended lights found in beer gardens. When I began my concept development I remembered this and analysed it. I realised that I associated these lights with the comfort, protection and sense of place they offered, and that I could possibly redeploy this association to recreate the same qualities in my new setting.

At the heart of design is discovery and this begins well before the 'final' design outcome is found. A part of the discovery process involves establishing objectives and constraints, some of which may be known before designing begins but as was the common in this investigation, both solutions and problems emerged as a part of the reasoning process. Consequently, the objectives and constraints were dynamic criteria that I either re-evaluated or confirmed as the journey progressed. In the early stages of designing, my objectives were broad but as I generated proposals and recurring concerns emerged, I learnt more about the ill defined problem I was attempting to address. As the problem became clearer, I was able to refine and add detail to the broad objectives I had started with. On numerous occasions, objectives also emerged out of the activity, ones that did not exist at the beginning and as I developed one concept, which informed the next, I realized that what I was doing intuitively was not only attempting to improve the amenity of the site for pedestrians (by playing with the lighting) but that I was actually redesigning the streetscape and seeking to reclaim a portion of the territory in the process.

Much like my objectives, the project constraints were fluid and on many occasions selfimposed. I could have chosen to explore radical, blue-sky ideas, but with a practical disposition and a genuine desire to create what I felt would be plausible propositions, I chose to use my real world knowledge of materials, construction and technology, and my judgment of the possibility of behavioural change, as additional criteria by which I could steer and evaluate my design propositions. The propositions discussed in Chapters 5 & 6 were settled upon, on the basis of their 'fit' with my objectives at the time, these constraints, and the degree to which the proposal might improve the pedestrian experience of the area. If this 'fit' was achieved, I kept the idea and evaluated it after the visualization stage; all the ideas in those two chapters are ones that struck a balance between these criteria.

## 3.3 Design as research

Design research is a contentious area and still not readily accepted as a way of acquiring knowledge. Downton (2003) asserts that the sciences have 'colonised the term' research and 'according to some, the concept and all worthwhile ways of conducting research' (p.1). He claims that the word has become associated with the scientific paradigm and that 'sciences and science-like activities have a stranglehold on the idea of research' (p.56). He argues for the recognition of design as a research method stating 'research as understood in sciences is not the only source of reliable knowledge. Design processes both use knowledge and also produce personal knowing and collective knowledge. Such knowledge is different, not inferior' (p.55). Cross (2001) argues a similar point stating 'design practice does indeed have its own strong and appropriate intellectual culture, and that we must avoid swamping our design research with different cultures imported either from the sciences or the arts' (p. 55)

Cross (1982), Schön (1983) and Downton (2003) all argue for the uniqueness of design cognition and champion its recognition as knowledge making. The central and motivating premise behind Downton's book is that 'design is a way of inquiring, a way of producing knowing and knowledge; this means it is a way of researching' (p. 1). Schön (1983) and Downton (2003) both elaborate on the concept of 'learning through doing', Schön refers to it as 'reflection in action' while Downton refers to it as 'research through design', and both see it as a way of inquiring about the world.

With many having theorised and debated design research, to enter this argument would be perilous. What I have described in this chapter is my experience of design as a practitioner, and not as a theorist, but I hope that I have been able to highlight that design is a complex cognitive activity, which involves reasoning, discovery and learning, all of which are integral to research.

## 3.4 Research tools

This study commenced late in 2009 and after looking into a number of possible sites I trialled an inner-city parkland location. Although the trial site proved to be unsuitable it did clarify my objectives and the need to shift my focus; it also proved to be a useful practice run that informed the nature of the data and field recordings that I would need. My decision to shift to a street location stemmed from the realisation that if I truly wanted to explore the possibilities of public lighting, I needed an environment with a greater diversity of user groups. This would give the design investigation a degree of complexity and the tensions between users might provide the study with superior insights.

A number of site visits were conducted and all these involved a voice recorder and camera, to capture observations and to visually record the site. Additional site information included measurements of such things as veranda heights, footpath widths, street and car park sizes. These site visits also helped to clarify my early objectives and gave me an opportunity to reflect on the tools that I would need for the visualisation process.

Lighting designers prefer sketch concepts in the early stages of design because it allows them to work more quickly and freely; similarly, there is benefit in *suggesting* rather than *depicting* concepts. The consensus of opinion appears to be that photo-real representations can do more harm than good by misleading people. Cuttle (2008), Brandston (2008) and Mende (2000) all feel that that computer renderings can be sterile and that they are not necessarily true representations of what would be seen in real life. All three prefer to freely develop ideas using rough sketches. Mende (2000) states that it is not until the detail design stage when construction drawings, technical specifications and lighting calculations are required, that he moves to computers to verify lighting effects and technical aspects (pp. 17-20). Brandston comments on how computers '*attempt'* to portray a realistic rendering of light in space (p. 114) and Cuttle's opinions concur stating that in the real world, the eye perceives things differently to that of a screen or a print image (p. 166). He goes on to state that 'there are too many aspects of appearance that matter in real life but which may be distorted or omitted by a computer image' (p. 166).

The design industry is competitive and practitioners are not inclined to reveal much about how they work, but a survey of literature and knowledge of several Australian firms confirms a preference for sketch images. Photo-real computer renderings suggest to clients that this is *exactly* what the idea will look like and imply a finished design, with *all* the details resolved, rather than a depiction of an idea. The images on the following pages represent the breadth of communication styles used by international and domestic lighting practitioners. Fig. 3.3-3.5 show several slightly different styles of line sketches employed by Brandston, Mende and Senzi. The sketch ideas of two Melbourne lighting consultancies are shown on the page after that and these show a similar technique of drawing on black paper. Concept sketches by two European practitioners follow those and are featured in Fig. 3.10 & 3.11.



!"#\$%&'()\*+%,-&(.&/&00012\*#34,+(31'("56\*(7%'+,8.\*"1#,6 Fig. 3.3 – A concept drawing by Brandston Partnership



!"#\$%&'()\*+%,-&(.&/&0%12%&3444&/&5%,!\$1!1\$&6!+7&8!\$7+&#12&,7#2(69&:;&<=

Fig. 3.4 – A concept sketch by Mende

!"#\$%&'()\*+%,-&(.&/&0\*(.%,,!(1#2&3!\$4+!1\$&5%,!\$1&6#\$#7!1%8&9,,)%:&;<&=#1>? Fig. 3.5 – A concept sketch by Neide Senzi

image courtesy of - www.electrolight.com.au/works.php?id=62



image courtesy of - www.electrolight.com.au/works.php?id=93

Fig. 3.7 – Electrolight (Dandenong Revitalisation)

image courtesy of - www.tfb.com.au/victoria-dock.htm#
Fig. 3.8 - Flaming Beacon (Victoria Dock)



image courtesy of - www.tfb.com.au/victoria-dock.htm#
Fig. 3.9 - Flaming Beacon (Victoria Dock)

image courtesy of - Van Santen 2006 - Light zone city: light planning in the urban context, p. 100

Fig. 3.10 – Concept sketches by Christa van Santen



image courtesy of - www.tfb.com.au/monorail.htm

Fig. 3.11 – A sketch by Christian Moeller

In order to facilitate the exploration of ideas I created a number of master drawings that I could use as a base to sketch over. It was important that I was able to reproduce these drawings quickly and easily, and thus I chose to work over photocopies which had a white background. Chalks and grey pencils were then applied to these to capture the transparency and edgeless quality of light or darkness. It was also essential that I embed scale into my drawing process so that the sketches would be plausible and accurate representations of my propositions; consequently I created a scale plan view and a typical section. As my designing progressed I continued to develop master drawings and two additional styles proved extremely useful, an abstracted perspective view and line traces derived from site photos.

By tracing over satellite images I was able to produce an accurate plan view. This drawing enabled me to think about the precise location and quantity of luminaires as well as the zoning and distribution of illumination. The starting point for concepts often involved this plan view (in various scales) and design work would then move onto the typical section drawing or the perspective views when more detail was necessary.

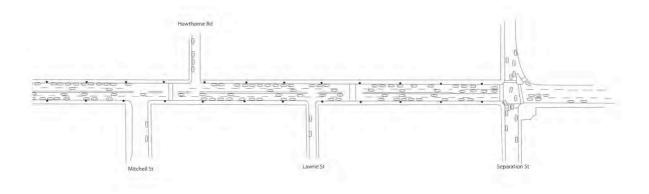


Fig. 3.12 – A portion of the plan view drawing, highlighting existing poles and traffic

The typical section drawing on the following page was used to think about elevations and how pairs of lights (on opposite sides of the street) might work together. With so many different elevations along High Street I chose not to create any drawings of shop fronts and found that the typical section view was enough to answer all the design questions. To create this drawing a number of photographs were taken across the width of the street. After stitching the photos together a vertical plane was superimposed and used to guide the manual tracing of section lines in Adobe Illustrator. All the site users were represented in this drawing and this helped to provide a sense of scale and context.

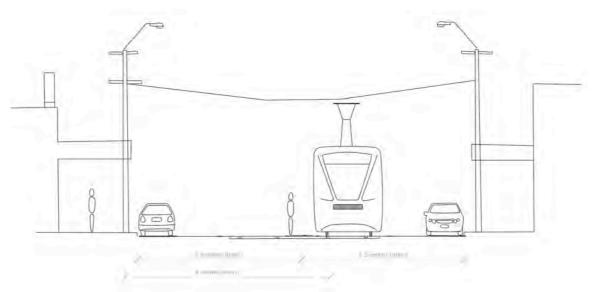


Fig. 3.13 – The typical section drawing

Both the typical section and the perspective view below proved to be invaluable thinking tools. Having a stylised perspective view, stripped of High Street's visual clutter, was particularly advantageous when exploring my more complex propositions. Using a similar technique to the typical section drawing, photos were taken from the centre of the road, imported into Illustrator and traced over by hand.

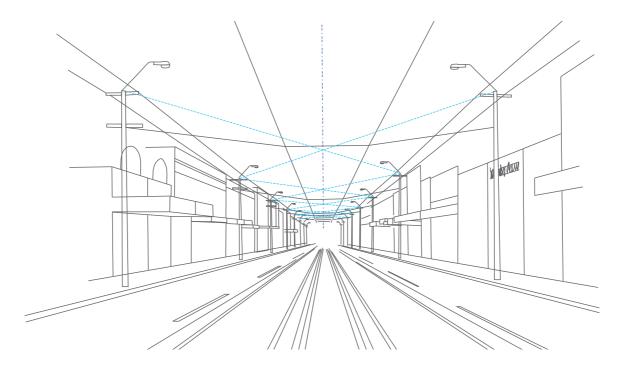


Fig. 3.14 – A simplified perspective view

The exclusive use of abstracted drawings would have led to heavy-handed design responses, which would have competed and clashed with this visually hectic environment. The visual clutter of the street needed to be incorporated into my sketching as a test for the proposition and this was initially challenging. After a number of attempts I refined a process that enabled me to create photographic-like line drawings. Site photos were imported into Adobe Illustrator and by using a tracing option they could be converted into line works. The technical drawing preset was the most effective tracing option and with the right balance of settings it would bring out different details in the photos. It was possible to calibrate the threshold and minimum pixel settings in order to capture the light, dark or mid-tones in photographs. If a single setting was used it produced either 'noisy' images or ones without enough detail, but by creating tracings at different settings, it was possible to layer them into a single line drawing that had minimal noise and ample detail. The images below are the various traces that were used to create the master drawing shown in Fig. 3.17.



Fig. 3.15 – Overlay 1 (low threshold trace)

Fig. 3.16 – Overlay 2 (mid threshold trace)

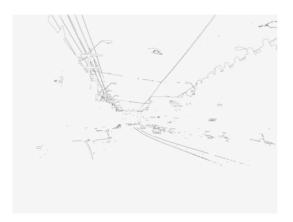


Fig. 3.17 – Overlay 3 (high threshold trace)

My original expectation was that I would be generating these sorts of contextual drawings from night photos and although it seemed odd initially, it was the daytime images that yielded the best results. The nighttime traces offered much less environmental detail and this detail was extremely useful when trying to position and scale objects within the drawing. Additionally, the nighttime traces captured the glow of the existing lighting and inappropriately emphasized it.



Fig. 3.18 – One of the composited line trace drawings

4

## High Street design investigation

## 4.1 Introduction

Originally a utilitarian shopping strip catering for the daily needs of surrounding communities, High Street Northcote is anything but glamorous. It served the needs of the post war European migrants (primarily Greek and Italian) and the original Anglo community who established the area. Today the top end of High Street - before it transitions into the next suburb of Thornbury - has an energy driven by the music venues, boutiques, art galleries, cafes and restaurants which bring life to a retail strip that was once purely inhabited during the day. A celebration of this 'cultural mass' has manifested in a street festival known as High Vibes and in 2009 it drew 80,000 people.

The suburb of Northcote has bourgeoned over the last two decades and is one of the subjects of a study regarding gentrification and its impact on neighbourhood change. The study focused on migration patterns and identified Northcote as one of two areas that have experienced the most rapid gentrification in Melbourne (Australian Housing and Urban Research Institute 2011, pp. 23-24). This gentrification began in response to the less affordable housing prices and the decreased stock of neighbouring suburbs, such as Fitzroy. As people were priced out of these suburbs they naturally moved to adjacent ones and places like Northcote were ripe for revitalisation. High Street is Northcote's main shopping street and as the population has changed so too has the mix of retail outlets, which now reflect much of the new community. Young couples, often with young families, have moved into the area alongside the displaced artists, musicians and activists that once populated Fitzroy.

Although the vibrancy of the area and street is indisputable, very little of the public environment reflects or encourages this vibrancy. The street provides no pedestrian attraction and seems to be either an artery for those who pass through or a parking space for those who inhabit the internal spaces. During the day, little social activity takes place on the street with people parking as close as possible to the retailers they are visiting, conducting their shopping and departing in their nearby car. There are no features on High Street that would encourage people to meander and thus the possibility of chance meetings is reduced to those in shops. Of an evening, when everyday shopping is no longer the primary activity, the dynamic is different and visits to the area are less hurried and utilitarian. It is this evening change that provides an opportunity to explore the social and perceptual effects that an alteration in streetlighting might have on the area. It is also an opportunity to conspicuously announce and reinforce the vibrancy that so many of the new residents are contributing towards.

### 4.2 Site visits

#### 4.2.1 Background

Site visits were conducted in the middle of winter between the latter part of June and the end of July 2010. The month long visits set the tone for the subsequent design investigation and helped to identify issues that would need to be explored. During this month, aerial maps were sourced, streetscape dimensions were collected and five site visits were conducted. Visits occurred on both weekdays and weekends, with three of these during daylight hours and two of an evening

High Street Northcote is familiar to me as a shopping strip, arterial route and a place to sometimes catch up with friends. It was this familiarity that led me to choose this site for the investigation. Having this prior knowledge also allowed me to predetermine the segment of High street I wished to focus upon. The busiest part i.e. the section with the greatest concentration of cafes and venues, and the part that draws people to the area of an evening, is a 700m segment between the crest of the hill and the intersection with Arthurton Rd/Separation St.

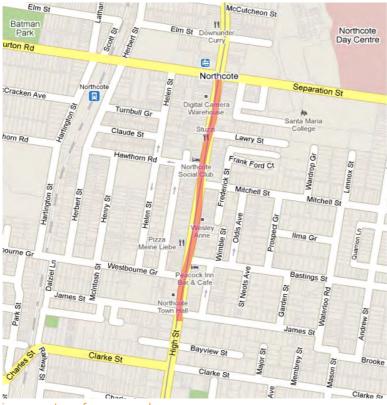


image courtesy of - maps.google.com.au

Fig. 4.1 – The section of High Street investigated



image courtesy of - www.nearmap.com

Fig. 4.2 – An aerial view of the site (a foldout version is overleaf)

Fig. 4.2 (the foldout overleaf) is an aerial view that has been stitched together from satellite images and highlights landmarks and the location of the various site photos referred to in this chapter. Fig. 4.3 & 4.4 on the following page show northward views, either side of the Northcote Town Hall. Fig. 4.3 illustrates how this early segment of High Street Northcote is quieter, with only a few shops leading up to the Town Hall. Consequently, this 150m segment between Clarke Street and the crest of the hill is not included in many of the design concepts. Fig. 4.4 illustrates the view down the hill towards the other boundary, which is the intersection with Arthurton Rd/Separation St.



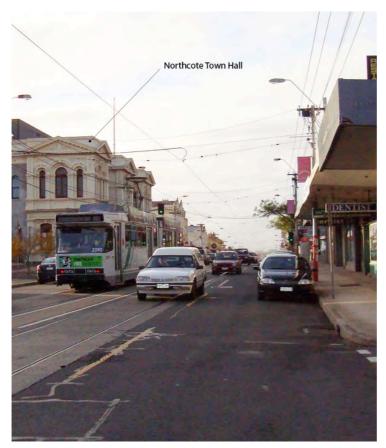


Fig. 4.3 – Leading up to the crest of the hill



Fig. 4.4 – Opposite the Town Hall looking northward

The 700m section of this study finishes at this crossing. Fig. 4.5 shows the intersection with Arthurton Road to the west and Separation Street to the east. This view is southwards and looks up the hill to where the Town Hall is located.



Fig. 4.5 – The intersection of High Street and Arthurton Rd/Separation St

#### 4.2.2 Day visits

The first site visit was between 3-5pm on a weekend day. My most striking observation was the amount of cars on the road for a Sunday. There were lines of cars parked along both sides of the road, as far as the eye could see, and a relentless stream of cars travelling along the street, to a point were crossing the road was almost impossible because of the flow of vehicles. Most of the moving cars appeared to be passing through, or on occasions looking for a rare parking spot. Pedestrians were lesser actors and there were very few of them for a day when people might be inclined to stroll. I can only imagine that all the people who owned these parked cars must have been in cafes or shops; or possibly even at home above some of the businesses on the street.



Fig. 4.6 – Typical view (northward, looking down towards Arthurton Road)

Fig. 4.6 is indicative of the stream of cars I saw during that first visit. The volume of traffic was startling and it had a profound effect on the tone of the shopping strip. Although the area is very familiar, I had never noticed how much traffic there was, possibly because familiarity dulls one's perceptions whilst observation heightens them? The cars contributed nothing to the precinct apart from the few that actually stopped to visit rather than travelling through. Two subsequent daytime visits revealed more intermittent traffic flow, with lines of cars passing in waves, but there were still lots of parked cars and the overall quantity of cars significantly outweighed pedestrians or cyclists.

Fig. 4.6 & 4.7 illustrate the two lanes that make up each side of the street and the painted island that separates them. The kerbside lane is slightly wider to accommodate parked cars but not wide enough for an additional car to drive along without the chance of hitting an opening car door. Fig. 4.8 illustrates the narrow width, which is emphasized by the waiting car (circled) near the centre of the photo. By virtue of the lane widths and the painted median strip, this wide road only permits a single lane of moving cars in each direction. The road design, trams and the continuous stream of vehicles make it impossible for cars to drive quickly through this area of a day.

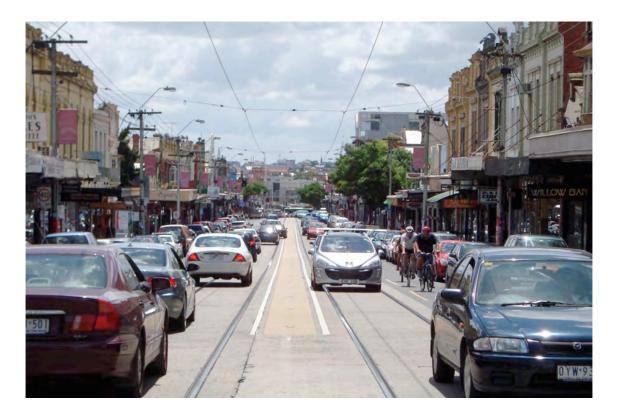


Fig. 4.7 – The centre of the road with its painted median strip (north view)



Fig. 4.8 – A single row of moving traffic (north view)



Fig. 4.9 - A driver's view

Four users were identified during the site visits and they included motorists, pedestrians, bicyclists and trams. Motorists were unquestionably the most dominant and fig. 4.9 was taken to capture their view of the street. Although the quantity of visible pedestrians increased slightly after my first visit, there were still significantly less of them when compared to the cars.

Cyclists were an even smaller proportion and fig. 4.10 on the following page shows the absence of bike lanes, which I found surprising. It was an odd realisation because Melbourne's greatest proportion of commuting cyclists stem from the northern suburbs. Super Tuesday is an annual bike count held on a morning in March where selected sites are monitored between 7-9am, a visible count is conducted and in 2009 the City of Darebin & City of Moreland had the greatest number of riders passing through their busiest intersections (bv.com.au 2010). In light of this, it is difficult explain the lack of bike lanes but perhaps it is the result of the other bike paths nearby on St Georges Rd and Merri Creek, or because the considerable width of the kerbside lane and the perception that this width affords cyclists a similar protection to a dedicated bike lane.



Fig. 4.10 – A cyclist on High Street

Apart from those already discussed, trams were the only other players in this street theatre. Their contribution was to occasionally interrupt the street dynamics by slowing the single lane of moving cars a little more.



Fig. 4.11 – Trams along High Street

The pedestrian space is considerably smaller than that of the cars and the images below show typical views of the sidewalk. By virtue of sheer numbers, their commanding scale and the space given to them, cars are asserting a disproportionate dominance over this public environment and this would prove to be an important issue that I would seek to redress in my concepts.



Fig. 4.12 – A typical southward view of the sidewalk



Fig. 4.13 – A northward view of the sidewalk

Fig. 4.14 captures the only other notable observation made during the day visits, which involves the clutter and disorder of the environment. This ordinary street with a mix of period and modern architecture is an unattractive concrete jungle, and has a proliferation of poorly designed and randomly placed commercial signs and verandas. An abundance of shabby power poles and downmarket signage dominate the skyline. Overhead tramlines, and power lines along both sides of the street, only add further to the clutter. All of which suggest a shopping strip that has grown organically, with little consideration given to its image.



Fig. 4.14 – The visual clutter of the strip

#### 4.2.3 Night visits

Evening visits to High Street involve going to cafes, restaurants and entertainment venues and thus I chose to visit on a Friday night. Although there was less traffic than during the day, there was still a regular stream of cars travelling through the strip and both sides of the street were *full* of parked cars. Once more a scarcity of pedestrians was observed and I wondered if it was simply because it was a rainy winter's night? Most of the shops were illuminated to promote their wares and yet there were very few people window-shopping. Again I wondered if it was the weather or because the ambience of the street did little to encourage people to stroll? A second night visit two weeks later showed that it was not the weather since there were still very few people on the street.

High Street is not an attractive environment at night and clearly no thought has been given to its nighttime character. Lighting can make an enormous contribution to the atmosphere of a space and hence its use in nightclubs and bars. Yet this ordinary street lighting was primarily concerned with motorists and their visibility, while the shop window lighting was disparate and competitive in nature.

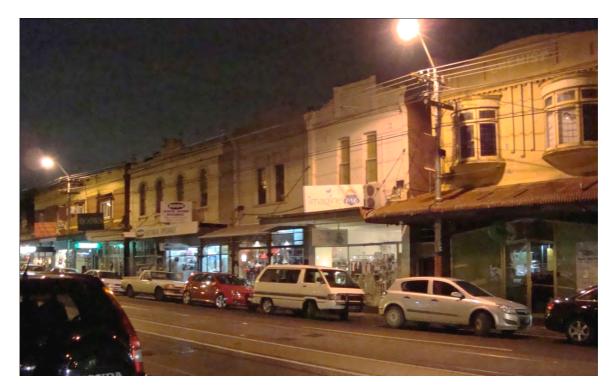


Fig. 4.15 – A typical example of the lighting in the area

Fig. 4.15 is typical of the lighting in the area, which involves regularly spaced streetlights and a mix of white light types, ranging from the yellow tinged road light to the neutral or blue tinged light in shop windows. The picture below highlights the bluish-white light typical of many of the shop windows and under awning signs. Although the commercial lighting was often garish and attention seeking, these over illuminated shop windows did inadvertently provide an abundance of light on the sidewalk.



Fig. 4.16 – A mix of colour temperatures and the haphazard illumination of architecture

Leading up to this first evening visit I believed that I would be designing lighting concepts that separately addressed pedestrian and vehicle visibility. The principal concerns of pedestrian lighting are hazard detection and facial recognition, and between the spill of streetlighting and the shop windows, both hazards and faces could easily be identified. Fig. 4.17 & 4.18 on the next page are typical of the area and show the ample sidewalk lighting available. In realising that pedestrians did not require dedicated lighting I also understood that my focus would need to be on the road and that any changes to this environment would flow on to the sidewalk.



Fig. 4.17 – The westerly sidewalk, looking north

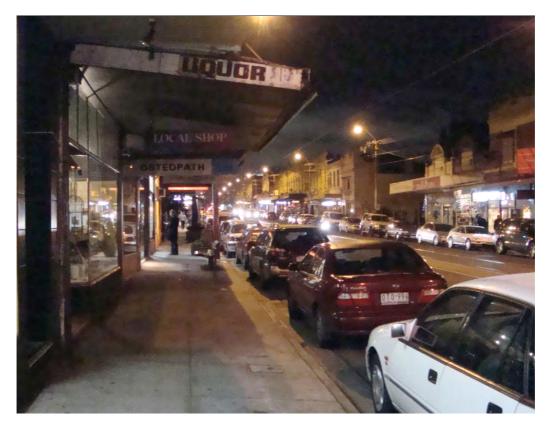


Fig. 4.18 – The easterly sidewalk, looking south

Apart from challenging my preconceived ideas about the pedestrian lighting, the visits also forced me to review my ideas about the streetlighting. The atypical lighting surprised me and the road was not uniformly or over-lit as I had expected it to be. Some parts of the street were noticeably darker than others and I wondered if this might have been because High Street was an older area that was designed in a time of more relaxed regulations?

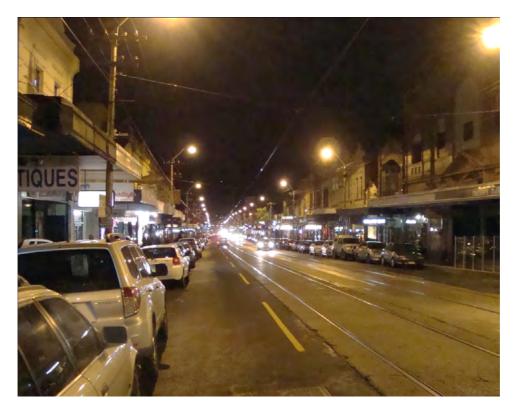


Fig. 4.19 – Typical view of the road looking south towards Arthurton Road

Fig. 4.19 & 4.20 show typical views of the road lighting and motorist visibility. As can be seen from these images the road is adequately lit in spite of the modest light levels. Equally evident is that the primary function of *this* road lighting is to aid the visibility of motorists. During the course of this investigation there have been several reductions in speed limits, which provide drivers with more time to respond to hazards they might encounter. Consequently the responsibility of ensuring safety on the road is now shared between the public lighting and driver speeds, which frees up the lighting to do more.

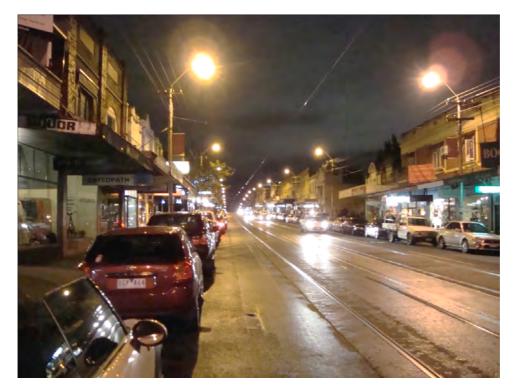


Fig. 4.20 – Typical view of the road looking north towards the town hall on the hill

During my several night visits I observed how much bearing the power poles have on the urban design of the precinct. Although it was obvious that they supply all the electricity to the area and that they are the rigging points for the overhead tram wires, it was not until my first evening visit that I realised that they also provide the fixing points for all the public lighting. Nor had I ever noticed the relationship between the parked cars and the power poles. There are 22 poles on each side of the road and 110 car spaces. The poles occur at regular intervals of 30m and between each pair of poles there were always five parked cars, and a half a car space leftover. This leftover space had me thinking and obviously the parking spaces were larger than necessary, so what remained were these random gaps that I felt I might be able to take advantage of.

After my last evening visit I felt my choice of location had been validated and it made me appreciate that a simple design response would be necessary, one that would compliment rather than compete with this busy environment. I left feeling that this burgeoning but neglected precinct would offer a real opportunity to do something unique and that the resulting findings might be transferable to similar shopping strips in Melbourne.

## 4.3 The design process of this study

The site visits challenged a lot of my preconceived ideas and revealed several issues that offered me a starting point for the design activity. During this visualisation component of the study many concepts built on each other, while some cross-informed each other and the process was anything but linear. As elaborated upon in Chapter 3, this is not uncommon experience in design, and the questions that lead to design responses, often lead to more questions and through an iterative process one finds that some design responses answer questions asked sometime ago, while some answers come more directly or are never found.

It was not until there was scope to reflect sometime later, which also involved grouping ideas and analysing similarities, that themes took shape. The recurring design themes that emerged from this reflection are unpacked in the forthcoming chapters and can be summarised as:

- 1. Lighting can define, shift and/or fortify boundaries of ownership. This is elaborated upon in Chapter 5.
- 2. Lighting can provide intimacy and a sense of enclosure, which can be used to create pedestrian friendly environments. This illustrated through the design proposals and discussed at length in Chapter 6.

# 5

## Boundaries & zones

The first theme centres on the discovery that light can define areas and create volumes. The edge of an illuminated field, particularly if there is a distinct contrast with the area beyond, forms a boundary and the difference in brightness levels defines the zones. In the same way that a theatre spotlight defines an area on stage that an actor may inhabit, urban lighting can be used to define zones that a particular 'public' actor might wish to inhabit. An even more sophisticated outcome is when zones become volumes and the light is not simply an area defined by the surface it is projected on to, but rather it is seen as a field of light that has shape. A familiar example of this is a searchlight, which is visible even though it may not be striking a subject and is akin to a spray of water from a hose, both of which have a boundary that defines a three dimensional space. These and other thoughts were explored in the proceeding concepts in order to mark boundaries or redefine zones.

## 5.1 Direction 1 - Shifting boundaries

While conducting the site visits there was ample opportunity to make judgments and to develop design ideas that I wanted to explore in the sketching phase. One of these involved establishing two distinct personalities for the area and employing lighting to this effect. The overarching idea was to award priority to certain co-owners depending on the time of day. During the day, High Street is a commonly used arterial route and a local shopping strip that people drive to. Of an evening, High Street is a place for entertainment and hospitality, activities that should preference pedestrian ownership.

Creating two characters for the area would not have a detrimental effect on its overall functionality and would simply be building on what already exists. People could continue to park on the road and traffic could still drive down the street at night. The main alteration would be to discourage unnecessary traffic by introducing environmental changes and limiting vehicle speeds. Speeds are already slow by virtue of the one lane of moving traffic in each direction, the 40 km speed limit and the regular interruption to flow caused by trams or others parking. A further reduction of speed would not be a marked change and vehicles could choose to travel down High street at a reduced speed or to use any one of a number

of alternate routes. There are several parallel streets such as Nicholson St, St Georges Rd and Station St that are modestly trafficked of an evening and could be used instead.

The following proposals are concerned with shifting and blurring boundaries. All of these involved narrowing the visual width of the street in order to reclaim part of it for the primary use of pedestrians and cyclists. In many cases these parts of the street would still be shared with vehicles and thus the blurring of boundaries sought to make ownership ambiguous so that all parties would exercise greater caution. John Adams, professor of geography at University College London, is interviewed in an article by Clarke (2006) where he states that if 'you put some uncertainty into the street in terms of who has right of way, drivers and pedestrians naturally become more attentive and engaged, prompting drivers to reduce speeds and drive more safely' (p. 291). This and similar concepts by Hans Monderman (discussed in Section 5.1.2) informed the following ideas.

#### 5.1.1 Road lines

Urban design frequently uses lighting in decorative manner but it's potential to make a strong statement is often not acknowledged. In this series of concepts, lighting was used to define boundaries much more powerfully than painted road lines ever could. This particular design direction concentrated on narrowing the perceived road width by using different styles of strip lighting. This should lead to a reduction of the psychological size of the motorists' domain and consequently their claim over the area, and could help to increase the sense of ownership that pedestrians and cyclists have by offering them this reclaimed territory.

It is commonly accepted that Australian motorists believe they are entitled to the road and in an article on cycling Foyster (2011) seeks to determine why cyclists make drivers so mad? Foyster speaks to Dr Jan Garrard who refers to the aggression of our 'dominant car culture', he speaks to Senior Constable Georgia White who states that 'motorists are getting angry with the cyclists because they are taking up a lane, which they are entitled to' (p. 63) and concludes his article on cycling in Melbourne with another statement from Garrard. She asserts that 'it's not stated publicly, but I think there's an underlying assumption that the roadway and the road system is there for cars' (p. 64) and that it's a territorial issue at play. In seeking to use light to selectively reclaim some of the road, I was able to create propositions that would strongly communicate this reclamation of an evening. The wedge shaped modules concept shown in Fig. 5.1 involved creating a continuous illuminated line by using embedded modules. These shallow triangular modules illustrated in fig. 5.2 would project yellow light inwards in order to visually reduce the road width. Yellow was chosen as the colour because traditional sodium lighting once provided all our streets with yellow light and the peak sensitivity of the human eye is in the yellow and green range of the visible spectrum. The inward facing glow was also a deliberate choice and spurred by the belief that this would emphasize to motorists that their driving zone was between the illuminated bands. The modules would incorporate a top surface that is either charcoal or white, which would allow the production of a broken line that would replace the painted one currently found on the road. During the day this length of modules would be read as a broken road line that could be crossed, but at night they would become a continuously illuminated line, advising road users not to cross, much like the yellow lines used to delineate 'tram only' segments of Melbourne's roads.

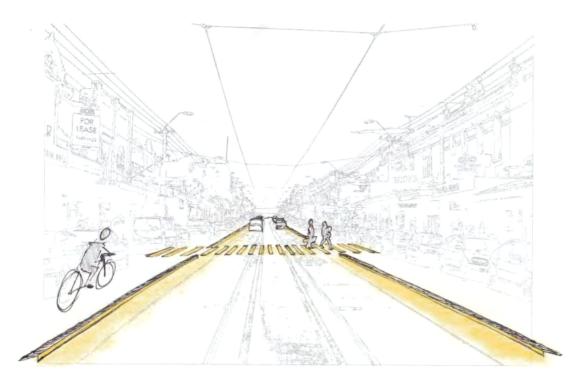


Fig. 5.1 – Wedge shaped illuminated modules embedded in the road

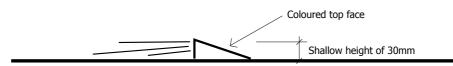


Fig. 5.2 – Typical section through the illuminated module embedded in the road

Although the LED strip would (visually) contain the traffic, it would still be possible for cars to drive over it when they wished to park by the roadside. As is also illustrated in fig. 5.1, the pedestrian crossings would feature illuminated strips, which would help to reinforcing the use of light as an indicator of 'safe-zones'. One of the failures of this concept was the trip hazard it presented to jay walking pedestrians. It also created a hazard for cyclists who already contend with getting caught in tram tracks. These hazards and the ambiguity in its communication led to another iteration of this idea.

Fig. 5.3 shows a domed modules version, which features a broken illuminated line. Like it's wedge shaped predecessor it would also reduce the visual road width but would be less likely to confuse motorists about whether they could cross it or not, nor would it create the trip hazards of the earlier idea. These reflective domed strips would replace the painted line that is currently used. Made from a tough, elastomeric material, the modules would be embedded into the road and would feature an illuminated shadow gap. LED illumination would cast a glow of light towards the centre of the road achieving the same effect as its predecessor but with fewer issues.

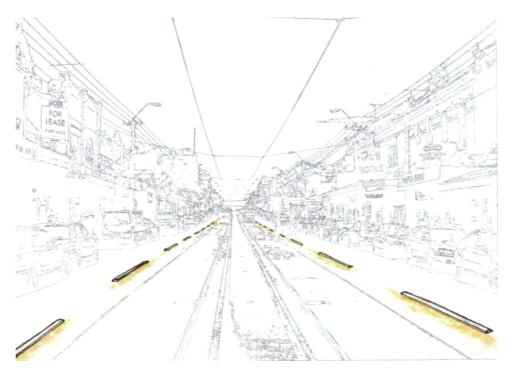


Fig. 5.3 – A broken line of domed shaped LED strips



Fig. 5.4 –Typical cross section through a module

Fig. 5.5 illustrates another version of this idea, which entails embedding large illuminated dots into the road. This broken line of dots sought to communicate a crossable boundary that motorists would understand but still respect. With closely spaced dots this array would be seen as a boundary line by those driving along the road and would make a stronger statement than the illuminated broken line shown in fig. 5.3.

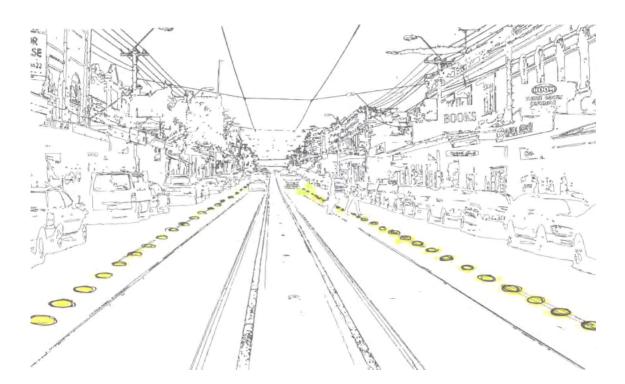


Fig. 5.5 – Illuminated dots

Fig. 5.6 & 5.7 explore similar boundary marking ideas using embedded LED lines that are flush with the road surface. The illuminated lines shown in fig. 5.6 create two lanes that act like 'psychological tracks', much like tram or slot car tracks that control the vehicles driving along them. Fig. 5.7 builds on the earlier idea of an illuminated pedestrian crossing by using the language of zebra crossings to define all the safe-zones. Both sides of the road and all the pedestrian crossings would feature these glowing stripes, which could be crossed by vehicles, but would still define a zone and reinforce the pedestrian ownership of the precinct.

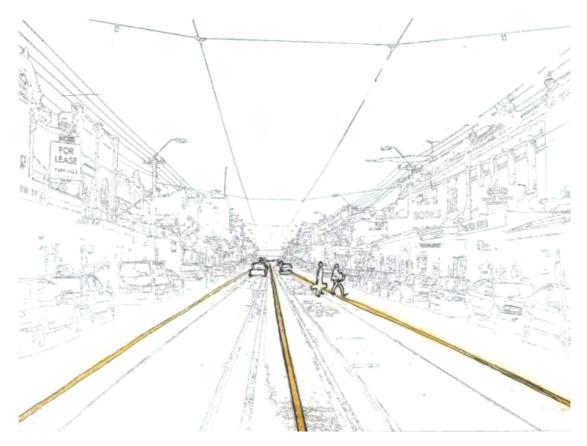


Fig. 5.6 – Illuminated lines

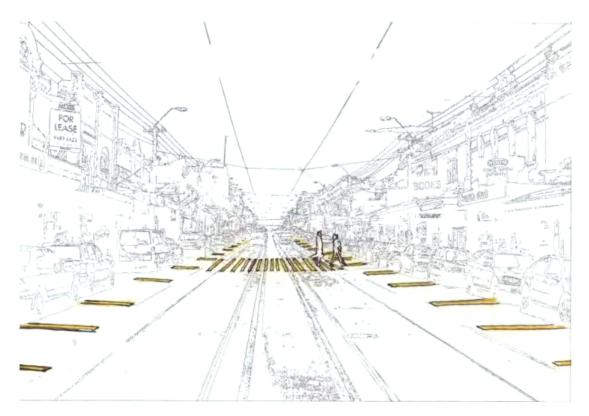


Fig. 5.7 – Illuminated stripes

## 5.1.2 Elevated paving

Fig. 5.8 highlights another design response that sought to reclaim territory. By elevating the sides of the road and illuminating the edges, it would be possible to create a shared zone with shifting priorities. During the day it can be equally shared, but of an evening the edge lighting would herald it's shift to a pedestrian zone. The use of a building material like paving, common to domestic and pedestrian environments, would blur the traditional delineation between vehicle and pedestrian areas often communicated by the use of bitumen and concrete. Paving is frequently used in European public spaces (refer to Fig. 5.9) that are shared by cars, pedestrians and bicyclists. It provides feedback in the form of vibrations, which tends to slow motorists (much like a corrugated dirt road does) and reminds them that this is not a traditional zone that entitles them to exclusive ownership. Elevating the paving to match the height of the sidewalk would also help to blur the line between the two zones, particularly, if the paving were also used on the sidewalk. Allowing cars to park on the paved part of the road further contributes to the blurring of ownership and leads to an ambiguity that necessitates more cautious behaviour; forcing people to question if the reclaimed zone is part of the road or the sidewalk, and thus who is entitled to it?

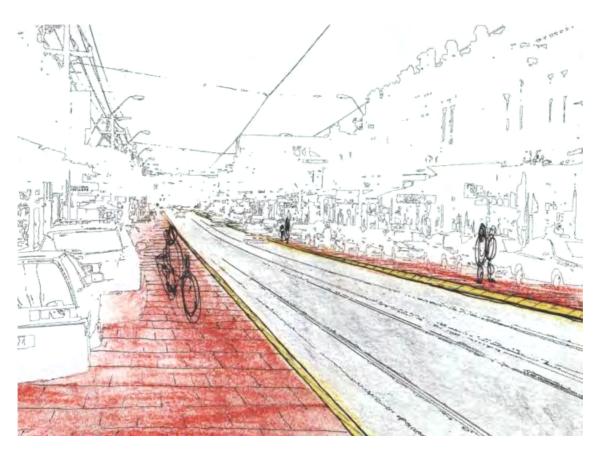


Fig. 5.8 – Elevated paving with angled edge lighting



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Fig. 5.9 – An example of shared space in a European city

This particular idea stems from a Dutch concept known as woonerf, which means 'recreation area' and from the philosophies of Hans Monderman. Woonerven (plural) are traffic-calmed areas where pedestrians and cyclists have legal priority over motorists. They have grown in popularity and now exist in most European countries: in Germany they are called *traffic calming areas*, in Sweden they are *walking speed areas*, and in the UK they are known as *home zones*. This urban planning method often features paved and level surfaces, where there is no distinction between road and sidewalk, and very few traffic signs. As 'slow zones' with no signs, they demand negotiation through eye contact and gestures, which leads to caution by all parties and consequently safer spaces.

Monderman was a Dutch traffic engineer whose philosophies were similar to those of woonerven. He was strongly against traffic segregation and regularly removed the barriers i.e. kerbs, guardrails and fences, that normally separate pedestrians and cars. In one project, Monderman was asked to reduce traffic accidents near a school and responded by removing the high fences that separated the children from the traffic. In doing so, drivers become part of the school's space and in turn become more aware of the threat they posed to the children's safety - accordingly they slowed down as they approached the school.

McNichol (2004) speaks with Monderman in his article 'Roads Gone Wild' where they discuss how environments have behavioural cues embedded in them. McNichol goes on to explain: The common thread in the new approach to traffic engineering is a recognition that the way you build a road affects far more than the movement of vehicles. It determines how drivers behave on it, whether pedestrians feel safe to walk alongside it, what kinds of businesses and housing spring up along it. "A wide road with a lot of signs is telling a story," Monderman says. "It's saying, go ahead, don't worry, go as fast as you want, there's no need to pay attention to your surroundings. And that's a very dangerous message" (p. 109).

McNichol (2004) concludes his article with another statement from Monderman 'every road tells a story, it's just that so many of our roads tell the story poorly, or tell the wrong story' (Monderman cited in McNichol, p. 112).

The change in road architecture advocated by Monderman, has been implement by him in numerous locations throughout Europe and there is significant evidence to support the effectiveness of these changes. One location, a busy intersection in Christiansfeld, Denmark, witnessed three serious injuries a year in the 90's; in an effort to improve safety all signs and markings were removed, and the junction was resurfaced. In the two-and-a-half years following the completion of the scheme, the intersection had not seen a single serious incident (Brake n.d.).

The elevated paving concept in fig. 5.8 creates a powerfully communicated shared zone through the use of lighting and contrasting materials. The act of paving and elevating this zone increases the security that it seeks to offer to pedestrians and cyclists, while still allowing parking. As in earlier concepts, the illuminated edges would gain a motorist's attention in an effort to contain the moving traffic, but in this case, the edges would also herald the evening change of this shared zone, to one of pedestrian priority. The paving would be a permanent feature that signals to all parties that this is an ambiguous area, but it would not be until the edges were illuminated that the change to pedestrian priority would be announced. Animating the lit edge was also considered as a way of providing a more forceful statement and the best of these options involved a flashing sequence, which is commonly understood as 'caution', much like flashing amber lights at a crossing.

True to Monderman's principles, the change to pedestrian priority would not be marked by road signs but rather by environmental modifications. In the 'Roads Gone Wild' article, McNichol (2004) once more quotes Monderman, this time as they are looking at an *ambiguous* intersection stripped of all road markings, signage and traffic lights. Monderman replies 'you can't expect traffic signs and street markings to encourage that sort of behaviour. You have to build it into the design of the road.' (Monderman cited in McNichol, p. 109)

Fig. 5.10 is a variation of this proposal involving the four pedestrian crossings that are part of the precinct. These crossings would be paved and lit in a similar way to the sides of the road, further reinforcing the protective symbolism offered by the edge-illuminated paving. This variation drew on an idea by Hillman (2001) where he proposed a 'continuous pedestrian network'. The norm in urban planning is to have an *uninterrupted road network* and to offer pedestrians a set of pavements that are split by roads. Hillman suggested we reverse this and stated that doing so would 'give drivers a distinct visual clue as to who has the priority' (p. 10). By visually linking the paved edges with matching pedestrian crossings, I was hoping to communicate a similar message about 'priority'.



Fig. 5.10 – Paved and illuminated pedestrian crossings

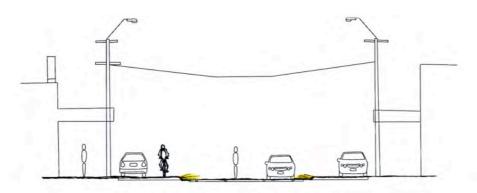


Fig. 5.11 – A typical section through the pedestrian crossings

## 5.1.3 Virtual road lines

All of the road lines proposed thus far have been material objects built into or onto the road surface, where the lighting draws attention to them and the shift in priority. In exploring the notion of *evening* boundaries, the idea of virtual road lines was a logical progression. These projected lines of light would do the same as their physical counterparts. Lasers and gobo projectors were looked into and the latter was chosen because they would pose less of a threat to pedestrian eyes. Fig 5.12 illustrates how the light would travel from the awnings 'A' and strike a surface 'B'. The mismatched broken line on either side was an attempt to create a continuous line that could be interpreted as a crossable boundary. It would also be possible to animate the gobo projectors and of the several options that were explored, the best involved slowly moving the line segments in the same direction as the traffic.

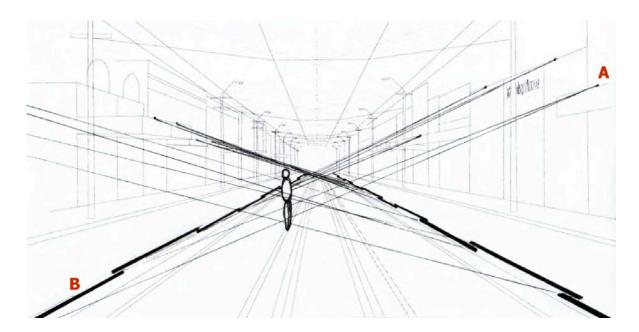


Fig. 5.12 - The projection of mismatched broken lines

The first iteration of this idea entailed projecting lines onto the opposite side of the road as shown in fig. 5.13. Research into night vision was conducted before these concepts were explored and this informed the investigation. According to Green (2009a) people don't see light, but rather they see contrast and *Good Lighting for Safety on Roads, Paths and Squares* states that 'motorists identify pedestrians best when they see them as light objects against a dark background (positive contrast)' (2000, p. 19). With this in mind I sought to use 'positive contrast' to aid the identification of pedestrians that might be crossing the road. This style of directional lighting would make pedestrians within the moving traffic zone more

visible because they would be cutting through the projected lines. Regrettably, vehicles and trams would also cut through them and in times of continuous traffic flow, very little of the projected lines would actually hit the road surface.

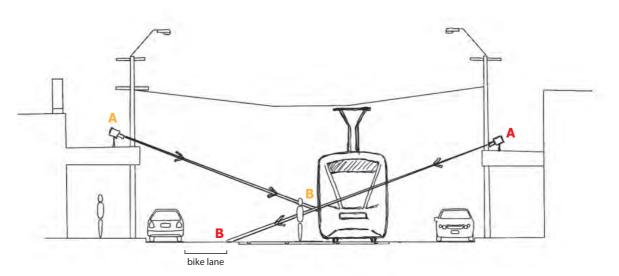


Fig. 5.13 – Typical section illustrating one of the problems with the concept

The next iteration of this idea depicted in fig. 5.14 & 5.15 overleaf, involved projecting onto the same side of the road to prevent moving vehicles from obstructing the lines of light. Although this solved one problem it created another, anything large like a bicyclist or a parking car, would now obscure the 'protective' lines. In light of these and possible glare issues, as well as the considerable effort involved in implementing and maintaining so many projectors, I decided to abandon this idea in preference to the earlier ones.

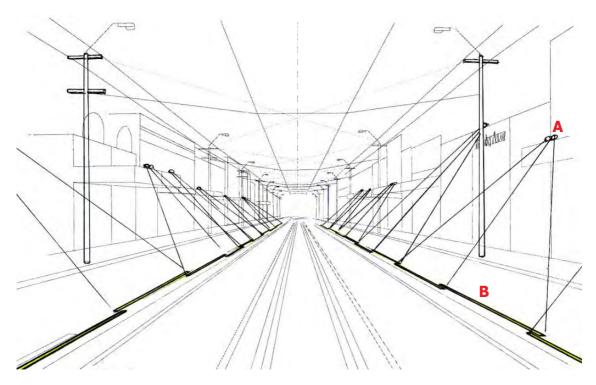


Fig. 5.14 – Lines projected from the same side of the road

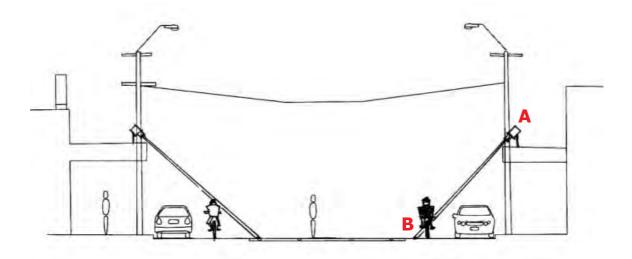


Fig. 5.15 – Typical section showing lines projected from the same side of the road

## 5.2 Direction 2 - Fortifying zones

This design direction involved accepting the status quo and working within the existing divisions. Consequently, this section focuses on sidewalk lighting ideas and needs to be considered in conjunction with the street lighting concepts discussed in the following chapter. With all of these ideas I sought to make people on the sidewalk feel safe and protected. I was equally interested in providing pedestrians with a visually stimulating environment that was different to that of the motorists. It was this 'difference' that I believed would also help fortify their zone.

Light has frequently represented such things as goodness, divinity or enlightenment and in *The Entwined History of Light and Mind* Zajonc (1993) discusses many of these symbolic associations. Much of the book focuses on the spiritual history of light and he reports: Long before it was the object of scientific study, light, and especially the sources of light, were venerated as divine – an image of godly nature (p. 8)

He later says:

The Egyptians believed light was the *sight* of the sun god Ra and Zoroastrians saw light and darkness in the form of warring spiritual powers representing good and evil (p. 42). Christianity has since adopted similar metaphors with Christ referred to as "the light" and Lucifer as the Angel of Darkness. In a spiritual context, light is often perceived as a symbolic triumph of good over evil (light overcoming darkness) and it was these allusions to light as a positive and protective force that I wanted to explore in my designs.

## 5.2.1 Responsive sidewalk lights

These concepts involved lighting strips on the sidewalk edge that projected horizontal beams of light along the path. Fig. 5.16 & 5.17 (overleaf) illustrate the proposal and how it would look in-situ. The motion-activated strips would sense the direction of travel and activate lights several metres ahead of the pedestrian. Stationary pedestrians would continue to trigger the beams thus chance social meetings between friends would be spotlighted. As pedestrians pass each other, their glowing zones would cross and continue to escort them beyond the encounter; this crossing of lights would be an implied interaction.

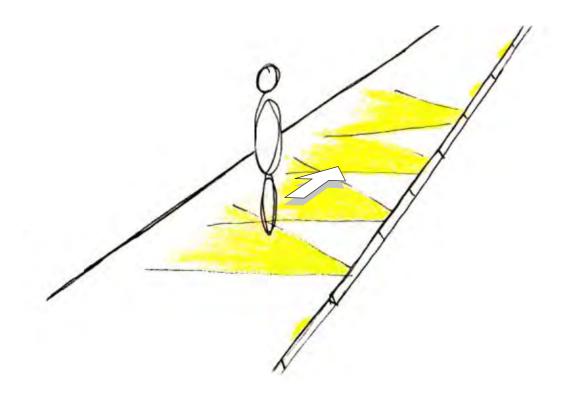


Fig. 5.16 – Beams of light are activated ahead of travel

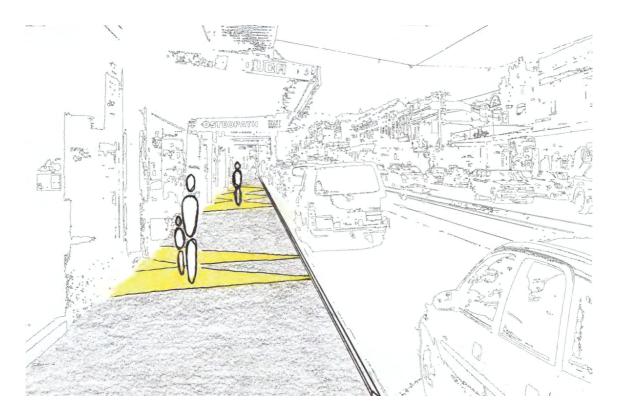


Fig. 5.17 – An in situ view of the motion activated lights

By offering light onto the footpath, the spill of streetlighting could be contained to the road area, which would help to further distinguish the two environments. With the sidewalk lighting revealing pedestrian trip hazards, the road lighting could be treated independently. Apart from their contribution to pedestrian visibility, these sidewalk lights would also offer a symbolic comfort; by projecting beams of light *ahead* of a pedestrian's travel they would suggest safe passage. This concept works with imagery that implies that the light is a protective force and alludes to familiar science fiction concepts such as 'auras' and 'force fields'.

The tracking lights shown in fig. 5.18, 5.19 & 5.20 are similar, but build on this protective metaphor by also moving with pedestrians. These mechanised marker-lights would provide a comparable experience, but on this occasion the light beams would rotate through 90 degrees in order to track a pedestrian's movement. The first two beams would follow the pedestrian while the next 2 beams would ignite in anticipation of the passing pedestrian. As the rear marker light completes its rotation, it dims and returns to its normal position while simultaneously, the marker several lights ahead, would ignite in expectation of the pedestrian. Both versions would encouraged pedestrians forward by signifying the journey is safe, but this concept would employ an additional metaphor where the pedestrian is almost like a 'relay baton', being passed from one pair of safe hands to another.

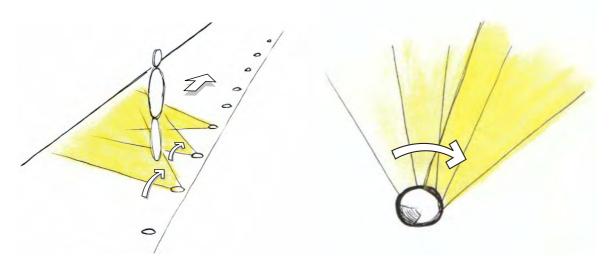


Fig. 5.18 – (Left) Horizontal beams of light follow the movement of pedestrians

Fig. 5.19 – (Right) Motion sensors activate each light, which also rotates to track people's travel

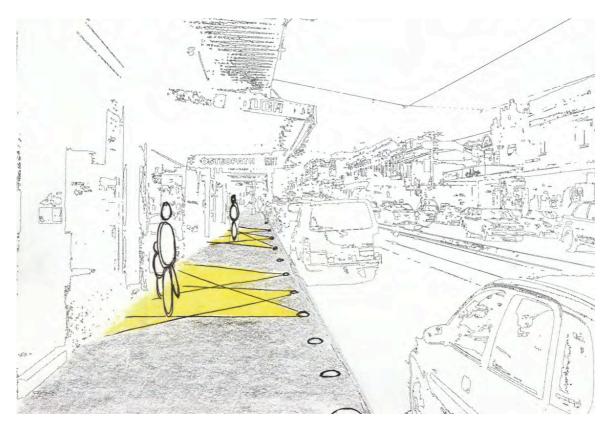


Fig. 5.20 – An in situ view of the tracking lights

## 5.2.2 Kerbside lights

The concepts shown on the following two pages suggested a protected space by offering a sense of enclosure. The two styles of bollard lights seen in fig 5.21 & 5.22 formed a semi permeable division that permitted pedestrians through but held vehicles back. In conjunction to the physical protection they 'appeared' to offer, the projected light beams would provide a sense of enclosure to further enhance a pedestrian's sense of safety. Fig. 5.21 features waist height light poles that would project uniform pools of light onto the sidewalk. In a desire to reduce the visual impact of this psychological fence, a shorter and more adjustable luminaire design was explored. Fig. 5.22 illustrates this second version, which finishes at mid thigh height and includes an eyeball feature that can be adjusted to randomly position the pools of light and thus enhance the visual interest of the illuminated sidewalk.



Fig. 5.21 – Bollard lights - Version 1



Fig. 5.22 – Bollard lights - Version 2

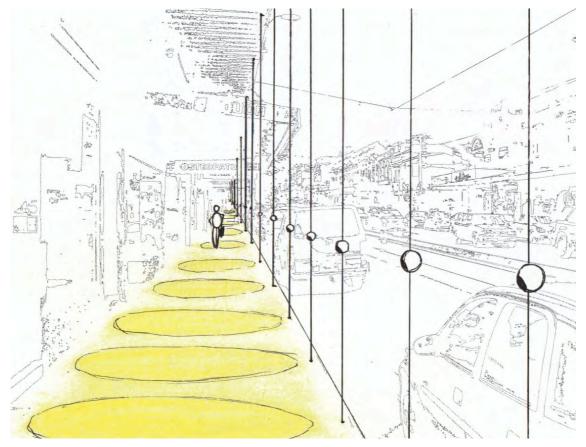


Fig. 5.23 - Low voltage spheres

The version illustrated above sought to reduce the visual impact even further and this reductive idea manifested as spheres attached to rods. These rods would span from the underside of the verandas to the pavement and the eyeball feature would be an element that could be randomly positioned (between 1100mm and 1500mm high). All three of these concepts drew on theatre lighting practices of high contrast and selected focal points. A number of problems emerged during the exploration of these ideas; problems with people exiting cars, inattentive pedestrians and vandalism amongst others, and thus I chose not to pursue this series any further.

## 5.2.3 Under-veranda lights

Of the 155 commercial premises found within the chosen portion of High Street, 136 of them have verandas, and thus it was an opportunity to be seized. There is nothing uniform or homogenous about High street and the diversity of verandas in this portion highlights this. Using the verandas as fixing points for fluorescent light seemed an appropriate way of reflecting the austerity of the streetlighting and mimicking the garish window lighting of the area.

Verandas are part of Australian vernacular architecture and are one of the defining features of a 'Queenslander'. They are effective in protecting people from the elements and thus older style shopping streets were commonly lined with them. They are an element that connects the inside with the outside and historically they acted as a transitional space between public and private domains. Being privately owned architecture that overhangs public space, I was attracted to this blurred boundary of ownership and appropriating them for the mounting of public lighting, seemed like a fitting response.



Fig. 5.24 – A ceiling of fluorescent lights

This lighting response was inspired by the disparate collection of verandas and the readymade nature of the area. The illustration above features commonly found warm-white fluorescent battens that have been haphazardly fixed to the undersides of the verandas. Their warm-white colour temperature was a deliberate choice because our homes have been lit with the same sort of warm light (tradition incandescent globes) for decades. Keeping the light low to the ground and creating a ceiling of light, further mimicked familiar domestic environments. Underpinning all this referencing of domesticity was the belief that it would lead to an inviting space, defined by a volume of light and perceived as safe.

# 6

## Intimacy & enclosure

As a human-centred investigation I wanted to explore ways of redesigning the environment for the benefit pedestrians and in some cases, to reclaim parts of this environment for their use. This caused me to reflect on the relationship between public spaces and intimacy. Intimacy can mean many things but to most of us it is a *feeling of closeness*. When used in relation to environments it would normally suggest a cosy atmosphere or a 'place' that is safe and to a majority of people this would be an attractive quality.

Smaller spaces are inherently more intimate and the two ideas of intimacy and enclosure commonly overlapped. In reflecting on the project work sometime later, I realised that *these* design objectives emerged 'out of' the process and not 'before' it. Only in hindsight am I able to express what was an intuitive pursuit at the time. The two core objectives that came out of this design activity were to reduce the perceived size of the environment (to a more human-scale) and to create an area with an appealing ambience that would be in keeping with a hospitality precinct.

## 6.1 Spotlights

The design propositions in this chapter focus on illuminating the road area and it is the mounting locations of the lights that provide this chapter with its structure. As I played with different ways of lighting the road it was the practical need for fixing points that directed my inquiry and although many types of luminaires were considered, it was spotlights, suspended lights and pole lights that lent themselves to my propositions.

With a limited number of electrical poles in the area and verandas that project far across the sidewalk, extra streetlighting poles would be difficult to install. Appropriating what was available seemed most sensible and it was the architecture and existing electrical poles that offered the only alternatives. The first concept to commandeer this infrastructure is shown in Fig. 61 on the next page. With almost 90% of the premises having verandas, they were

an obvious location and on the rare occasions where buildings had none, the façades would be used instead.

The primary objective of the spotlighting concept below was to keep the light low and strongly focused on the street, in order to reduce the perceived scale of the surroundings. Several theatre lighting principles were brought into play, the first of which involved side lighting. Strongly directional lighting provides dramatic impact and is particularly effective in rendering form and movement. It is for this reason that it is often used in dance and physical theatre where it helps to communicate the movements of the performers. The second principle involved selective illumination where the objects of prime interest (often it is the actors) are illuminated much brighter than the rest of the environment. If High Street were seen as a stage, the zones saturated with light would be the focus of the audience's attention (in this case the road) while the remainder of the theatrical setting (in this case the upper storeys of buildings and the mess of power lines) would go unnoticed and disappear into darkness.

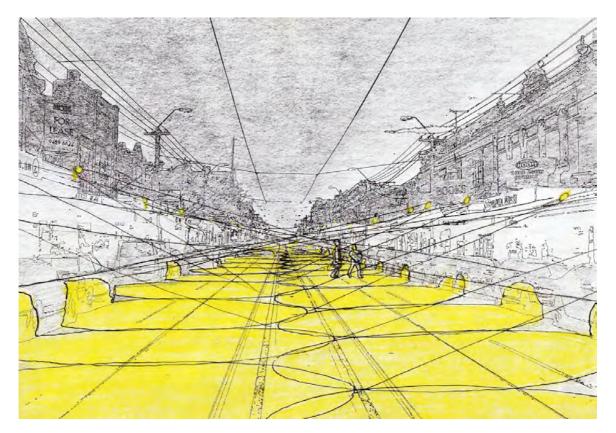


Fig. 6.1 – An in situ view of the spotlighting proposal

To ensure full coverage of the road with minimal spill light, high intensity lamps with a small beam angle would project 8m wide spots onto the opposite side of the road. Fig. 6.2 illustrates how they would work and the overlapping coverage they would offer in the centre of the road. The overlapping of beams were a deliberate decision, in order to provide ample light where it would be needed most.

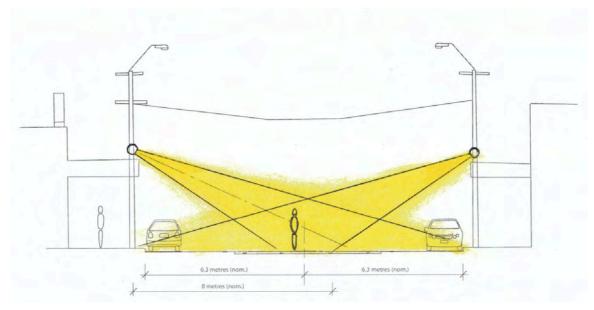


Fig. 6.2 – A typical section illustrating the spotlight beams

Fixing to the verandas would position the spotlights close to the road edge and this would ensure good illumination and accurate beam control. The mounting heights and locations of these spotlights would vary dramatically, by virtue of the variation in verandas and buildings, this would create an irregular installation of glowing luminaires and this irregularity would enhance the visual interest of the installation.

By saturating the road with light so as to strongly define it against the surrounding darkness, peoples' attention could be kept low. With the upper storeys of buildings and night sky receding into darkness, the ground level environment would appear enclosed and reduced in dimension. The use of coloured light was another strategy that aimed to keep peoples' attention low, with yellow and green tinged lighting considered as alternatives to saturation. The eye's greatest spectral sensitivity is either side of 550nm, which is the green and yellow region of the visible spectrum (refer to fig. 6.3). Yellow light produced by sodium lamps or white/green lamps that cast a 'ghostly green' colour onto the road surface would still offer excellent visual recognition but also a dramatic and high contrast environment that references the emotive style of theatre lighting.



image courtesy of - www.awesomelasers.com/laserclasschart.htm

Fig. 6.3 – Retinal sensitivity graph

An aspect of this spotlighting idea would include speed reduction. The speed limits in this precinct have been reduced several times during this study and are now 40km/h. It would only be necessary for a night reduction of speed and lowering it to 20km/h would ensure that there would be no serious accidents. Breen (2002) discusses in her report *European Priorities for Pedestrian Safety* various speed limits and the incidence of serious pedestrian injuries. She goes on to state:

Speed of motor vehicles is critical to the safety of vulnerable road users. At low speeds drivers have more time to react to the unexpected and avoid collisions. At speeds of below 30 km/h pedestrians can mix with motor vehicles in relative safety (p. 9)

Breen also quotes risk statistics based on road types in Holland (Wegman 1997) where it was shown that 30 km/h roads classified as woonerf or residential streets had a 0.20% risk of a serious accident (Breen 2002, p. 10).

This idea would provide a high contrast lighting scheme and the directional nature of this style of lighting may lead to glare (from across the street) and pronounced shadows, both of which could make hazard recognition difficult. The shadows of passing cars might camouflage road hazards, people exiting parked cars or pedestrians standing in the bike lane, and glare might dazzle jaywalking pedestrians. While these concerns are extremely valid there are also many benefits and driver recognition of jaywalking pedestrians would be improved through 'positive contrast', as was elaborated upon earlier in Section 5.1.3). The visual impact of this form of lighting would be dramatic, with parts of passing vehicles bathed in light and simultaneously casting dynamic shadows. Equally impressive would be the objects on the edges of the road and the interesting shadows they would create along

parts of the sidewalk. This idea is an unconventional road lighting proposal and would need to be investigated more thoroughly through computer simulations and/or on-site test rigs.

## 6.2 Suspended lights

During my first site visit I was impressed by the catenary system that provided power to the trams and it triggered ideas about suspending streetlights in a similar way. Having visited beer gardens I was reminded of the suspended strings of lights often found in them and how they help to encourage the habitation of these exposed spaces. By choosing suspension as a mounting option I could position the luminaires lower than what is currently there and I could create a ceiling of light that would enclose the environment.

## 6.2.1 Exterior-interior

The exterior-interior concept illustrated overleaf, references domestic interiors in a desire to create an intimate and personal outdoor environment. The concept uses over-scaled lampshades that would conceal state of the art lamps and control gear. These oversized versions of familiar lampshades are meant to represent current and past communities and to express something about the history and diversity of the area. Central to this concept is the eclectic use of iconic designs that would include anything from modernist or traditional tiffany shades to faux Murano glass and crocheted shades. The image below is one of the research pages that helped to inform the development of this proposal.

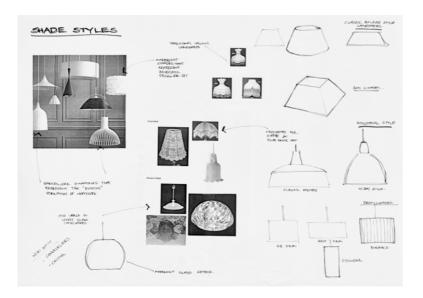


Fig. 6.4 – A concept page illustrating the variety of shades being referenced

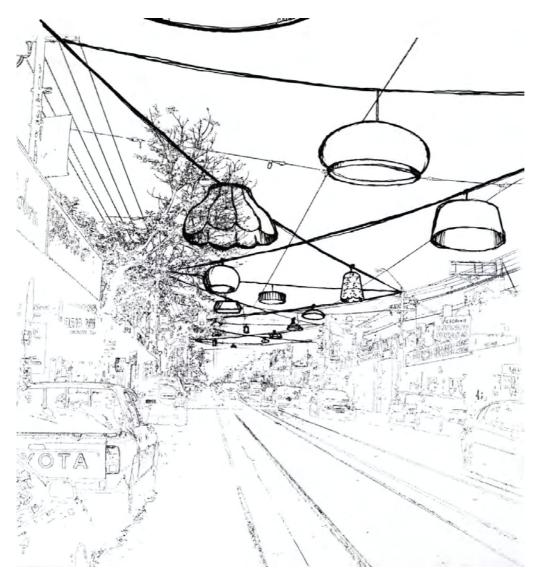


Fig. 6.5 - In situ illustration of the exterior-interior concept

This concept would involve a new layer of support wires, which would be 2m above the existing network of tram wires. Fig 6.6 illustrates how these support wires would attach to the existing electricity poles. To get adequate light coverage the tensioned wires would need to run diagonally between sets of poles so that four lights could be suspended (refer to fig. 6.7). The diagonal wires would span 34m and this crisscross configuration of wires would support 84 lampshades off the 44 electricity poles in the precinct. The use of additional wires (illustrated as red lines) would span opposing poles and would add another 22 possible lights; bringing the tally to 106 lampshades. It is also worth pointing out that the current amount of streetlighting is significantly less than this and it may be possible to eliminate this central line of shades upon detailed lighting computations.

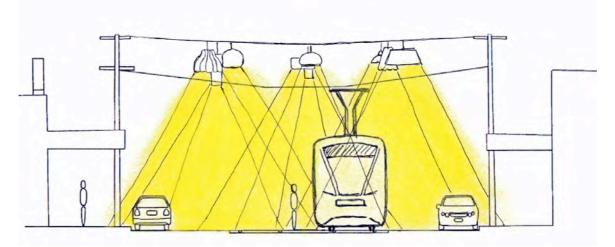


Fig. 6.6 – The additional layer of wires needed to support the suspended lights

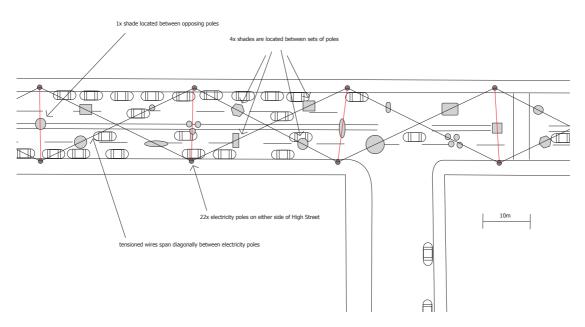


Fig. 6.7 – A plan view highlighting the suspension wires and the diversity of shade shapes

This and the following two suspended concepts all share two important objectives; they challenge the traditional uniformity inherent to all public lighting and they seek to direct all their illumination downwards. Fig. 6.7 illustrates my attempt to break with this uniformity by varying the shade shapes and their positioning along the suspension wires. In addition to this, each luminaire would have slightly different specifications i.e. lamp style, reflector and optics, and these would lead to different lighting qualities. All the shades would include some form of reflector, which would prevent any upward light and direct all of it onto the street. By keeping the visual focus below the verandas and drawing the attention to the street, the upper storeys of buildings recede into the darkness and there would be a sense of enclosure for those at the street level.

The hanging of the shades would be the final contribution towards the non-uniform outcome I sought. Fig. 6.8 is an abstraction of the proposal and attempts to illustrate how the shades would be positioned and their relationship to the tram wires (depicted in red). In many cases the shades would need to be kept above this wiring but there would be opportunities to suspend shades lower and still clear the power and the tops of trams.

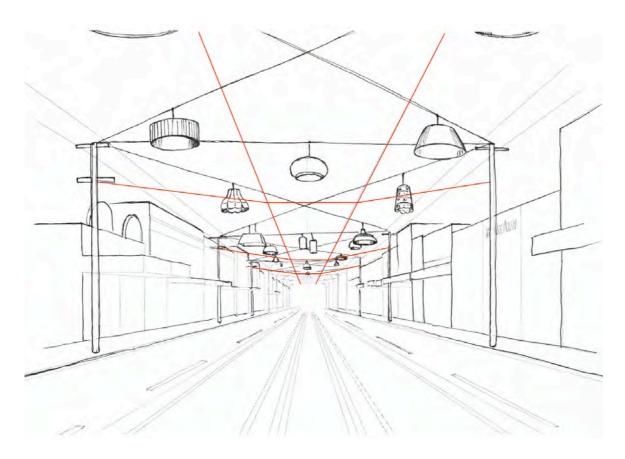


Fig. 6.8 – An abstracted representation of the concept

Although creating a ceiling of lights would clearly communicate to people that this is an unusual precinct, additional environmental clues were also considered and the plan view in overleaf illustrates the speed humps that would presage the change, while the green hatching represents the elevated road surface, which positions the road level with that of the sidewalk. The seamlessness between the sidewalk and the road would suggest a mall and would look similar to the European example shown fig 5.9. These road interventions would be passive features during the day but at night when the suspended lighting would come on, they would support the change to a pedestrian priority.

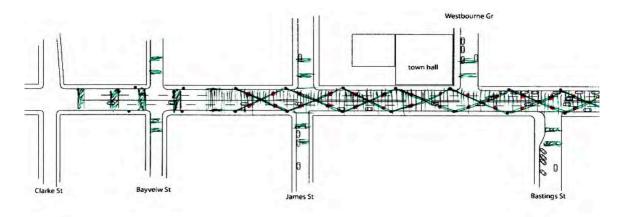


Fig. 6.9 – A plan view showing half of High Street and some of the proposed physical changes

Some of the proposed road features in this concept have already been employed in several of Melbourne's shared spaces and two examples are shown here. Acland Street features a level sidewalk while Faulkner Gardens, which is used by school children, athletes and cyclists, has raised strips that act as warnings of an impending intersection.



Fig. 6.10 - The level surface in Acland Street



Fig. 6.11 – The raised strips that warn of an impending intersection

It was while developing this particular concept that I realised the impact that a suite of changes would have. By including domestic-style lampshades, the creation of an outdoor ceiling, speed humps and an elevated road, a potent message would be communicated to all users that this is a unique zone and one that is focused on pedestrian needs.

#### 6.2.2 Adjustable luminaires

Both of the following ideas also involve downward pointing light to create an intimate and enclosed space, but with these concepts I sought to delve further into the possibilities of non-uniform arrangements by designing highly adjustable luminaires. The design of these luminaires would be such that the light could be precisely directed and thus their position would have minimal bearing on which part of the road they might illuminate. In the case of the tubular spotlights seen overleaf in fig. 6.12, the luminaires would be produced in three lengths and diameters, and these size variations would reflect the different beam angle and light intensity of each. They could be randomly positioned along the tensioned wires and would be individually adjusted to illuminate any one of the adjacent quadrants. Fig. 6.13 illustrates how the beams of light would come from random directions and yet still provide a uniform illumination of the road. This would be a visually interesting composition of luminaires and their directional nature would lead to changeable shadows being cast as people or vehicles pass.

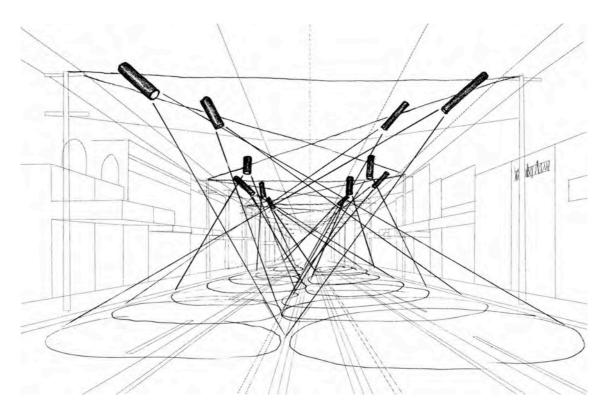
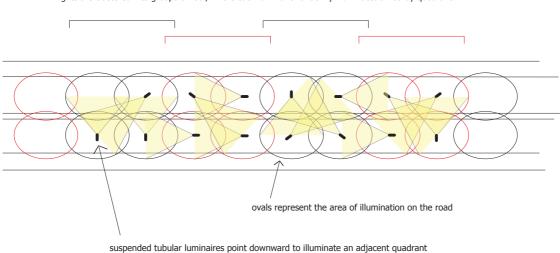


Fig. 6.12 – Three sizes of highly directional and randomly arranged tubular luminaires



Lights are clustered into groups of four, where each luminaire randomly illuminates a nearby quadrant

Fig. 6.13 - The way the lights would collectively illuminate the road in an irregular manner

The suspended reflector lights shown in fig. 6.14 offer a similar adjustability and do so by way of large mirrors. This version features additional wires that span opposing poles, which would suspend two lights near the centre and four lights would be suspended on the diagonal wires between sets of poles. Fig. 6.15 illustrates these wires and the irregular

pools of light that would be produced by these fittings. The mirrors on each of these luminaires would be used to individually direct the light beams so as to uniformly illuminate the street. The random arrangement of reflecting mirrors would offer an interesting, almost 'stellar sparkle' to the environment of an evening - as well as reflecting dynamic street scenes during the day. Apart from allowing the light to be precisely directed, the mirrors would also increase the spread of light, which would mean that a substantial amount of the street could be lit in spite of their compact nature.

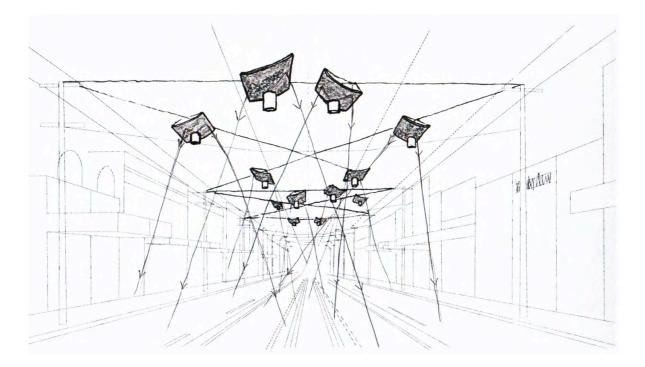


Fig. 6.14 – Suspended reflector lights with directional mirrors

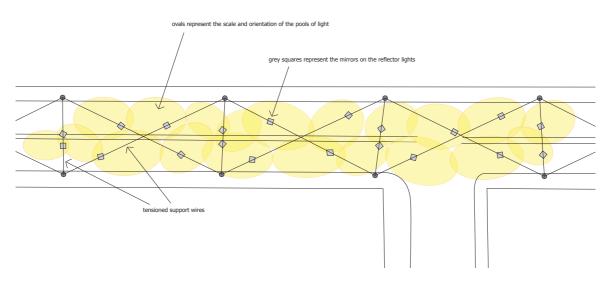


Fig. 6.15 – The random arrangement possible with these reflector lights

## 6.3 Pole lights

In seeking to create unique lighting proposals I was initially reluctant to explore concepts that involved lamps perched on a poles. Australia predominantly uses poles for public lighting and thus I felt compelled to do something unusual with this conventional style of luminaire. Of the numerous design objectives in this series, the most important involved the redistribution of territory by providing evening priority for pedestrians and reducing the perceived size of the street.

## 6.3.1 Tall poppies and the reeds

These two concepts emerged from the desire to reflect the community of Northcote. Many of Northcote's residents are left wing with green leanings and in the last three state elections the combined ALP & Greens vote has been 81%, 80% & 76% (Victorian Electoral Commission 2011). With this in mind and the lack of trees that I noticed while on my site visits, I sought to soften some of the harshness of this environment and chose to commence this series by exploring organic forms - not readily equated with street lighting.

A majority of the lights in these concepts are positioned on reclaimed road space and two site observations seeded this idea. As mentioned earlier, most of the buildings have verandas that project to the edge of the pavement and introducing additional poles would involve modifying many of these, combined with my observation regarding the excess space between groups of five parked cars, I saw an opportunity to reclaim road space. To reclaim enough space, one car park between each pair of poles would be added to the excess space that currently exists and this would make a series of 8m long islands possible. These islands could be safe zones within the landscape of High Street and as the design investigation progressed, I came to refer to them as 'oases'. These could be used for public furniture, much-needed green zones or café breakout spaces. With 22 poles on each side of the street this proposition would involve the loss of an equal amount of car spaces, reducing the total amount of car spaces (on each side) from 110 to 88. This small loss would offer significant benefits by visually narrowing the width of the street, providing recreational space to an environment that has none and offering previously unavailable lighting opportunities.

Both symmetrical and offset placements of the islands were explored and although the perspective illustration on the next page features islands that mirror each other, the offset style shown here in fig. 6.16 & 6.17 would offer greater visual interest, more variation in

lighting patterns and a more significant narrowing effect of the road. The shaded area in fig. 6.16 represents the islands combined with the sidewalk, while the dots represent the positions of existing electricity poles.

			•	

Fig. 6.16 – Overview of island layout

This inclusion of islands created opportunities that made it possible to introduce a second style of luminaire; one that could be located closer to the centre of the road and this would mean it could be smaller in scale and light distribution. Fig. 6.17 illustrates the four short poles that could be located on each island, while two taller poles with beam spreads of 8m could be placed between islands on the same side of the road. Using a palette of islands and luminaires would allow irregular compositions that would still meet the lighting needs of motorists, and simultaneously provide a visually stimulating environment for pedestrians to inhabit.

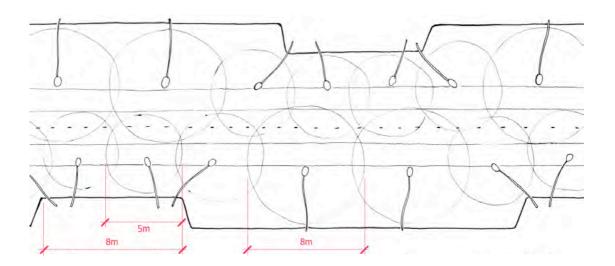


Fig. 6.17 – Detail of the placement and beam coverage of the lights

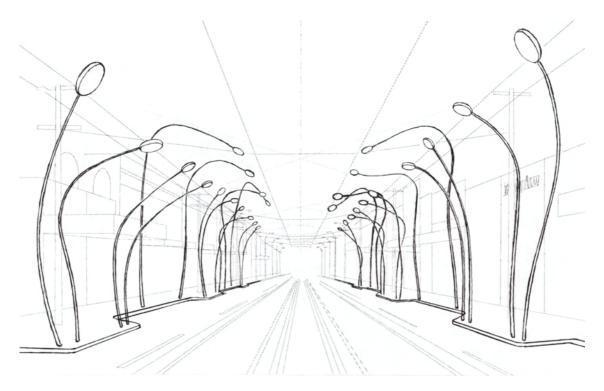


Fig. 6.18 – A simplified in situ view of the tall poppies

The tunnel effect in the above illustration is clearly visible and led to translating this idea into a depiction of reeds, as seen below. A number of real world problems began to emerge that outweighed the benefits of these designs and with the realisation that the existing electric poles would need to be kept as infrastructure for the overhead tram wires, I chose to abandon these concepts and to apply the knowledge gained to alternate ideas.

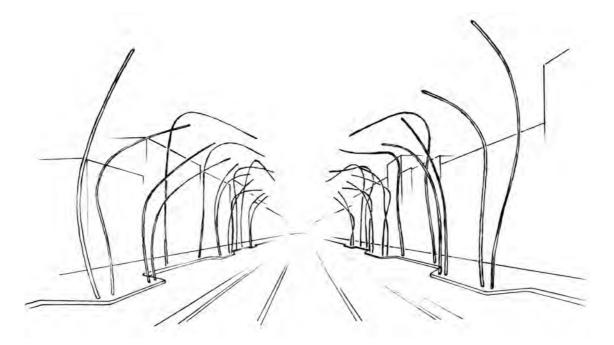


Fig. 6.19 – The reeds concept

## 6.3.2 Reflector streetlights

With this idea I chose to work within the restrictions of the environment to see if it would be possible to develop a strong proposal without making major changes to the streetscape. Inspired by a City of Melbourne luminaire that uses an upward facing lamp and a conic reflector, fig. 6.20 & 6.21 show an interpretation of this lighting technique in an original luminaire design.

By using this approach it makes it possible to use shorter pole lengths to deliver a similar spread of light. As I played with this idea, a kit of parts evolved in order to address the various site issues. One version would be attached to the electric poles and two heights of freestanding poles would be necessary; an optimum height that would position the extension arm above the verandas and a lower version where the arm would fit under a veranda. The extension arms would also be available in several different lengths and could be alternated with the two pole heights in order to achieve consistent illumination over the road surface. With a modular system evolving, I choose to include complementary pedestrian lights that would supply low lighting onto the sidewalk. These lights were not necessary and were simply included to reinforce the low lighting provided by the streetlights, and to offer a more pleasant pedestrian environment. The drawing below illustrates the low pedestrian lighting, which would be 1.5m above the ground and would be attached to each of these streetlights.

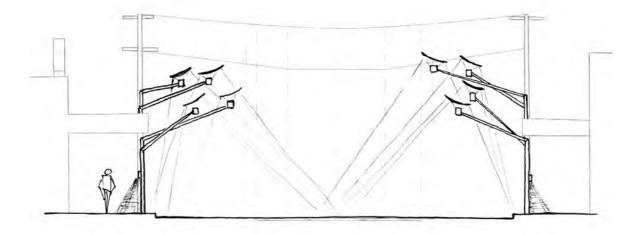


Fig. 6.20 – Typical section showing the variation of streetlight heights and arms

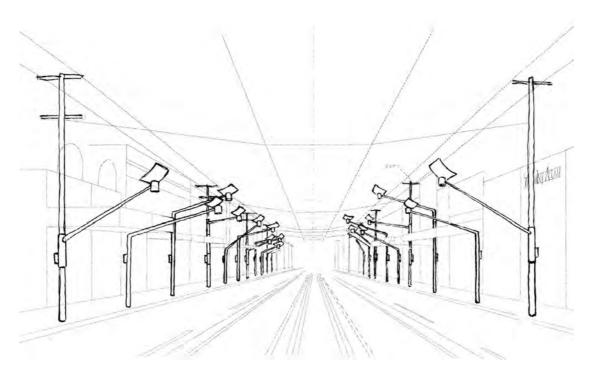


Fig. 6.21 - An abstracted view down the street

As with the earlier ideas in this chapter, the intention was to keep the light low in order to reduce the scale of the environment and to maximise the variation in luminaires and light quality. What was learnt from this proposal was that the concept was far too complex because it was working with the existing site constraints and that unless a small amount of road space was reclaimed, even as little as half a metre, it would be too difficult to use pole lights along the sides of the road.

## 6.3.3 Central poles

Employing central poles on an undivided, local road is never done; they are normally seen on avenues, freeways or highways. Their use on High Street would challenge convention and provide a unique lighting quality while their physical presence would halve the road, thus reducing the perceived width of the motorists' domain and their claim over the area. In order to minimise the chance of a motor accident, additional environmental changes were considered and thus speed limits and median strips form a part of this proposal. Rather than creating a large central island like the one in fig. 6.22 overleaf, the elevated road idea with bevelled edges was resurrected.



Fig. 6.22 – Central poles on the Eastern Freeway

High Street employs a graphic image of a median strip to keep traffic separated and thus I considered an elevated median strip as part of the refurbishment. The perspective drawing overleaf illustrates how incorporating a median strip into this proposal naturally led to elevating the sides of the road as well. Unlike the elevated paving concept discussed in Section 5.1.2, the bevelled edges in this proposal would use reflective paint. With the streetlights directly overhead they would be in an optimum location for the edges to reflect their light. Fig 6.24 also illustrates how this proposition reduces the scale of the environment (by enclosing each lane of traffic) and how these reflective edges would act as a 'containing' feature that might tend to funnel the traffic through the strip.



Fig. 6.23 – A typical view of the graphic median strip on High Street

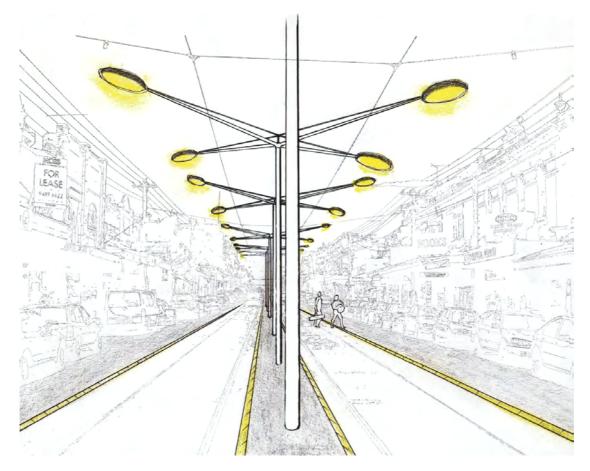


Fig. 6.24 – An in situ representation of the central poles concept

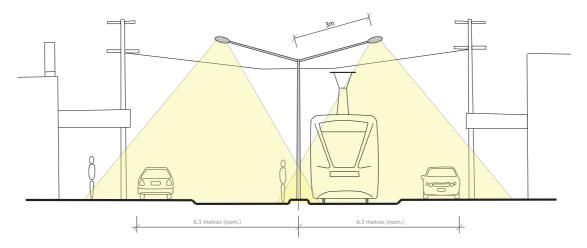


Fig. 6.25 – The spread of light provided by the extension arms

Saturating the ground zone with light would reinforce the sense of enclosure that I sought and thus the vertical poles would need to be spaced at small intervals i.e. 12-15m to achieve this. Fig. 6.25 highlights the restrictions imposed by the overhead tram wires and how the extension arms would have to be positioned above the tram infrastructure. In a desire to bring the lamps closer to the ground a compact pole version was also explored. With this type of design it would be possible to position the lamps below the tram wires, to heighten the intimate mood, but with lamps at this height and position, their beam spread would be limited and many more would be required.

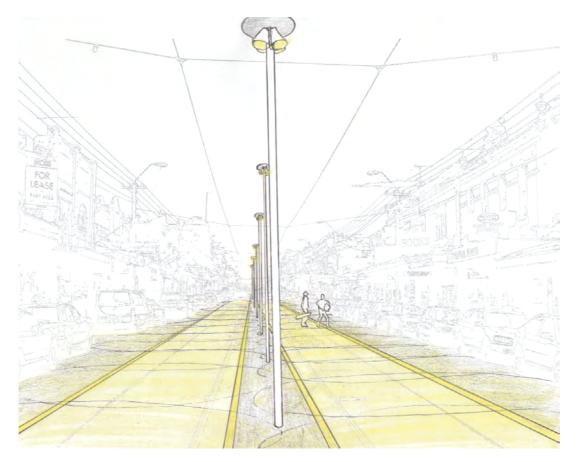


Fig. 6.26 – Lower light poles with no extension arms

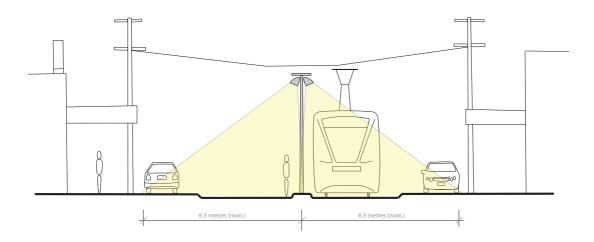


Fig. 6.27 – 4.8m high light poles and their anticipated beam spread

#### 6.3.4 Lighting tunnel

The lighting tunnel concept illustrated below, brought together several of the discoveries that emerged from earlier concepts, 1) how the physical presence of the luminaires can assist in reducing the scale of the environment and 2) the recognition that pole lighting needs to be installed on reclaimed road space.

As can be seen below, the luminaires would enclose the space within virtual walls and a ceiling, while the light that they would offer, would help to define this volume. The two aspects would work together to create a discrete space within the overall environment. To use a computer metaphor, the physical presence of the lights would be the stroke and the light that they would provide would be the fill (an illustration of this metaphor can be seen in fig. 6.29). Both aspects could exist independently, but together they would communicate a much stronger message about the scale of the environment and who the audience is meant to be.



Fig. 6.28 – The lighting tunnel

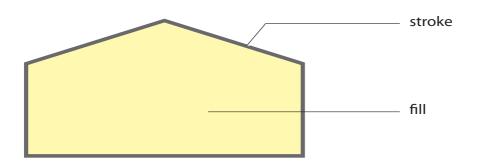


Fig. 6.29 – The computer metaphor

These light fittings would be below 5m and thus they would be limited in the area they could illuminate and would need to be closely spaced. Fig. 6.31 on the following page illustrates their spacing and how the luminaires would be offset in relation to the two sides of the street. This offset design would offer added visual interest and better light distribution. The drawing below shows how the light sticks would be slightly under the overhead tram wires and that the existing electric poles would have to be retained to support the tram wires. As with all the other concepts in this chapter, there would be no upward spill of light and this would contribute to cloaking the mess of wires that would need to be kept.

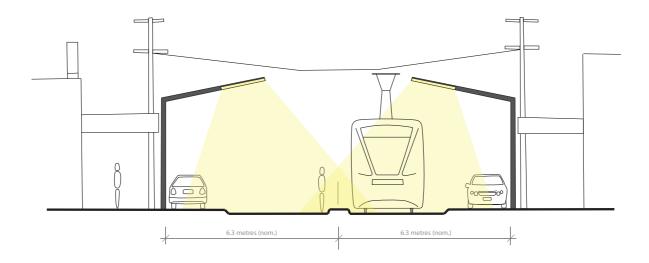


Fig. 6.30 – A typical section illustrating the height of the lighting sticks

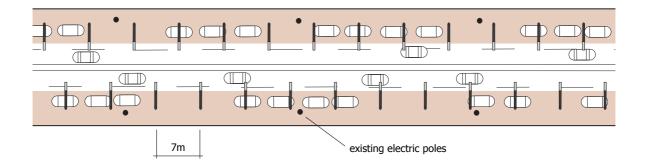


Fig. 6.31 – The offset composition of the light sticks

The plan view above shows the extent of the reclaimed road space and how the poles would be positioned on the elevated sides. Much like the preceding concept, this proposal would also feature bevelled and painted edges that would signal the boundary of the transit zone. The combination of an elevated road and unusual public lighting would be a strong message regarding the uniqueness of this precinct and its pedestrian appeal.

## 7 Discussion

## 7.1 Findings

Streets are shared public environments that require more complex and nuanced lighting solutions than currently exist. Most street lighting has been implemented in parallel with the growth of the automobile, which has shaped much of our urban landscape and dominated the design concerns of public lighting. The High Street investigation has illustrated that the lighting treatment of certain main street shopping strips can transcend the current utilitarian approach to better address the needs of pedestrians while simultaneously offering security and safe passage for all.

#### 7.1.1 A suite of measures

One of the findings that emerged from this study was the degree to which the 'other' urban elements would need to work with the lighting. The original intention to simply explore the public lighting underestimated the interplay between the various urban design elements and as the design investigation progressed, a larger intervention proved necessary, one that involved changes to the entire environment.

In relation to urban design the typical strategy involves specifying the urban and trafficplanning elements and then overlaying the lighting. Under these circumstances the power of public lighting is limited by the restrictions imposed upon it by the planning elements. If a vision for the public lighting were to be established first and the planning elements determined afterwards, the nature and character of this type of urban space would be significantly different. This approach would only be possible in new developments and in reconceptualising High Street Northcote a different but related strategy was necessary.

As the investigation developed it became obvious that simply changing the lighting would have limited scope and that a suite a wider changes would be needed in order to achieve a more significant outcome. Features such as islands, elevated road surfaces and zone markings were explored simultaneously with the public lighting because they all impacted on each other. By introducing a suite of measures rather than merely changing the light fittings, *making the area safe* at night was no longer the sole responsibility of the lighting and thus it could be freed up to do more than this. Central to all these environmental changes is the need for 'traffic calming', which seeks to make streets less dangerous by lessening the speed of cars.

As discussed in Chapter 5, all environments have embedded spatial clues that are communicated through a language of recognisable urban elements. The choice and application of these can communicate messages that can influence the behaviours of those using the area. Thus unfamiliar treatments and unexpected elements can challenge the various users and potentially lead to positive outcomes. This principle is fundamental to the Dutch concept of woonerf where the car and pedestrian zones are not differentiated and the many traffic management devices that allow people to make assumptions about behaviour are removed; these unfamiliar environments blur the rules and necessitate caution from all parties.

#### 7.1.2 The two sides of luminaires

Apart from providing light for vision and safety, luminaires have a physical presence that can be utilised as well. Often their physical contribution is simply decorative but in the concepts that suggested walls or ceilings, like a number of the pole ideas and the suspended concepts, their physical presence was as important as the light they produced. Similarly, most of the sidewalk ideas employed both the light that they offered and the physicality of the luminaires to fortify this zone.

### 7.2 Topic 1 - Equally shared spaces

Four topics have come out of the design investigation and all focus on recognising streets as public spaces, the amenity they offer, their social role and how lighting might contribute to all of these. The topics cover:

- 1. The unequally shared nature of streets
- 2. The affective & perceptual qualities of lighting
- 3. Safety, visibility and risk
- 4. The importance of unique environments.

The idea of *more* equally shared spaces arose early in the study when I observed the influence that cars had on the area and how the public lighting seemed to concentrate on their needs. Many of the design concepts I developed, explored the possibility of redressing this imbalance and what emerged was an understanding of how lighting could help to define zones and how these zones could either be shifted or fortified by it.

As the popularity of motorised transport grew in the early part of the twentieth century, the ownership of city streets began to shift away from pedestrians, cyclists and carriages. After the Second World War, urban planning begun to focus on motorists and introduced a policy of separating traffic for reasons of public safety. By the 1960's this philosophy was universally embraced by all western cultures and was seen as a 'keynote of modern road design' (Hamilton-Baillie 2008, p.165). As a consequence of this, contemporary streets now have distinct zones of ownership with physical features such as raised pavements, kerbs and asphalt defining them. This separation of traffic has also led to a disproportionate allocation of space were pedestrians are allotted sidewalks and vehicles are given roads. This unequal distribution has endorsed the dominance of the car on our urban environments and if we wish to redress this issue, boundaries need to be shifted and land needs to be reclaimed.

By playing around with various design ideas I saw the potential of using lighting to alter the perceived width of the road. All of the ideas that involved illuminated road lines worked on strongly delineating a new boundary, with the intention of containing the moving traffic and visually narrowing the road. The projected road lines (fig. 5.12 & 5.14), and the elevated paving with its brightly illuminated edge (fig. 5.8), all pursued these same objectives.

An overarching idea developed out of the design activity and in reviewing the concepts afterwards, I realised that many of them were linked, and that this link was what I came to define as 'containment'. It could mean numerous things and 'enclosure' was one, but it encompassed more than this and protection, psychological shelter and environmental reduction all came under its banner. At times containment would involve decreasing the perceived width of the street in order to reclaim some of the precinct and to share the space more equally. At other times it involved creating a distinct spatial volume within the larger environment, while on other occasions is had little to do with reclaiming territory and was purely seeking to provide a sense of protection for pedestrians.

A unique and valuable idea that developed out of the design investigation involved the shifting of *primary ownership* between night and day. During the day, High Street Northcote

is a local shopping strip and a transit road, and thus people may wish it to remain the domain of vehicles, but of an evening, it is an entertainment and hospitality strip and ought to be a precinct more concerned with the needs of pedestrians. This evening shift would require a suite of changes that would benefit by a further reduction in speed. This would have a negligible effect on those visiting by car while transit vehicles could choose to avoid this inconvenience by using one of several alternative routes. In proposing this evening change, I hoped it might rebuild the social role that *all* streets once had, and that it would encourage pedestrian activities like strolling, window-shopping and alfresco dining.

Apart from improving the pedestrian amenity of the area, the precinct's lighting would act as a signal of this evening shift in ownership, one that would also be visible from afar. Upon closer approach, the lighting would foreshadow one's entry into a different streetscape, similar to the way that gates and arches would have marked one's entry into an old world city. Not only would the streetlighting *herald*, but it would also *define* the extent of this unique district, where it would be understood that there are different rules of conduct.

Once within the locality, the *defining* powers of the streetlighting could be brought into play and used to delineate zones within the area. At their most basic, luminaires house light bulbs and reflect light, with more sophisticated designs, the extent of the illumination and the edge definition of this area can be accurately controlled. With this level of control one could firmly delineate areas within the environment and this was an idea I explored on many occasions.

Lighting is a design device that can change urban character and assist in shifting or defining zones of ownership. In reducing the perceived size of the road to reclaim a portion of it, as well as reclaiming the locality of an evening, I sought to use the public lighting to more equitably address the needs of all the users by creating a social domain and a unique streetscape for the evening enjoyment of pedestrians.

## 7.3 Topic 2 - Affective & perceptual qualities of light

If we wish to improve the quality of our urban spaces, public lighting needs to be considered holistically, particularly for shared recreational zones where peoples' requirements are diverse and complex. This would entail recognising the symbolic, affective and perceptual aspects of light, along side the physical and functional criteria that is currently used. Much like Cartesian Dualism, which perceives things as a dichotomy i.e. mind and body, the scientific orthodoxy employed in the implementation of urban lighting only recognises the material and measurable, at the expense of the qualitative. The technical rationalists have long taken the Cartesian Split as a starting point, but ultimately it is a convenient way of looking at the world. As human beings it is impossible to separate our minds from our emotions, they exist as one within us, and it is a similar indivisible nature that light possesses.

#### 7.3.1 Psychological shelter

The design study revealed several ways to alter peoples' perception of (and their response to) the environment, while still providing light for safe passage. One of these techniques was a part of the overarching idea of containment and involved psychological shelter. By creating a strongly illuminated space within the darkness of the surrounding environment it might be possible to reduce the perceived scale of the site and thus make the area 'feel safer' and more inviting to pedestrians. Scaling down the environment could suggest a protected space, in the same way that a roof or fence might represent shelter from the elements or protection from intruders. Equally, it might be likened to the way a child creates a cubby house in a garden tree or under a dinning table, and the comfort, sense of safety and security that is derived from a smaller space within a larger more intimidating environment.

Using luminaires to define a ceiling was one way of providing this sense of shelter and all the suspended lighting proposals as well as the lighting tunnel concept worked with this idea. These concepts attempted to tap into the saying that 'everything will be ok so long as there is a roof over our head'. The exterior-interior concept (fig. 6.4), took this ceiling metaphor even further by referencing domestic interiors, which most symbolise safe environments.

Other concepts offered psychological shelter by creating a space within a space and worked with the idea that by keeping the lighting low and tightly controlling its direction, it would compress the environment and thus create a cosy, more human scale space for people to inhabit. High Street's many restaurants and cafes are relaxed and intimate environments, akin to a lounge room, and it was this lounge room quality that I sought to reproduce in the public lighting. By creating an outdoor lounge room I hoped that this might suggest - and reinforce - the evening pedestrian priority.

The sidewalk proposals were another series that employed this idea of psychological shelter by using the light and the luminaires to fortify this zone. Offering light along the sidewalk was purely an emotional ploy to make people 'feel' safer through the use of allusion and the creation of a symbolic division.

#### 7.3.2 Brightness and perception

Another way to change peoples' perception of the environment is through the purposeful use of light, which involves altering what people notice and thus shaping their perception in a deliberate way. Brightness levels can be varied to control what people see and the order in which they see these things. In the same way that theatre lighting influences one's reading of the stage, urban environments can be seen as a stage where the audiences' viewpoint can be manipulated. The narrative support and emotion that theatre lighting offers a performance can be employed on a larger scale in an urban context. Several of the concept directions worked with this by focusing people's attentions on specific aspects of the surroundings in order to construct a perception of the space. The concepts that involved low and intense light fixed people's attention on a concentrated version of the environment, while the concepts incorporating illuminated road lines sought to seize the attention of motorists (it would be the thing they would notice first), to ensure they understood that their domain had shrunk. Similarly the pavement lighting concepts sought to gain the full attention of pedestrians by placing them 'in a world of their own', so that any anxieties about 'the world beyond' would not occur to them.

A majority of the propositions developed sought to exploit some psychological aspect of lighting and to see what impact this might have on the various users. Some ideas involved looking into the expressive and symbolic potentials of lighting to make people feel more comfortable and safe, while others explored its ability to affect those surrounded by it and to shape their perceptions of that environment, by creating contained spaces that offered a sense of shelter or a feeling of intimacy.

## 7.4 Topic 3 – Visibility, safety and risk

This aspect of the investigation involved unpacking a controversial and divisive side of the industry. The notion of what is perceived as 'adequate' in regard to lighting is highly contentious, but the influence and control that this judgement has over the implementation of public lighting cannot be over emphasised.

The primary argument of this thesis has been that safety and amenity are not mutually exclusive objectives and that satisfying pragmatic concerns need not be at the expense of the qualitative sides of lighting. In an article by Schwarcz (2008) he states that in the 90's most communities expected safety and security from road lighting. He goes on to ask how outdoor lighting might be progressed in the 2000's where the requirements of local authorities are now more complex. In continuing to recognise safety and security as the main functions of lighting, he troubles the other objectives that are becoming more important, some of these include energy efficiency, spill light and making outdoor environments 'friendlier'. To build on his thinking, my lighting propositions have sought to go beyond the basic need for visibility by exploring how much could be added through a more contemporary concept of public lighting.

#### 7.4.1 Visibility

In contrast to the uniform illumination normally found on city streets, all of High Street has a modest level of streetlighting, with parts of it better lit than others. Using the performance of the existing lighting as a starting point, my design proposals sought to reproduce equivalent or improved lighting conditions. Having established this as the operational benchmark for the streetlighting and recognising that the spill this streetlighting provides satisfies pedestrian visibility, one of my objectives shifted accordingly and I focused purely on creating a 'sense of safety'.

#### 7.4.2 Safety

The conventional approach to night safety involves ample and consistent illumination so that people can see potential danger; for pedestrians this involves identifying approaching cars, trip hazards and facial recognition. Although these are reasonable guidelines, in an area like High Street Northcote where there is abundant spill light from the shopfronts and the street, it is 'perceived safety' rather than recognition of threat, which becomes important. Bearing in mind one of the Chapter 2 topics regarding the correlation between lighting, the feeling of safety and the fear of crime, I would argue that the perception of safety is just as important as actual safety. It is similarly important to note that perceived safety does not necessarily correlate to actual safety, and many Australian suburbs 'feel safe' in spite of their high burglary rates while others feel unsafe, even though the statistics suggest differently. The City of Sydney (2008) states in their *Safe City Strategy* that 'people's fear of becoming a victim of violent crime in Sydney tends to be much greater than their chances of actually becoming a victim' (p. 8). They go on to say 'people's perceptions of crime can often be disproportionate to recorded crime data' (p. 11).

Although plentiful public lighting will alleviate people's fear of crime, and thus help to encourage pedestrian activity, this approach lacks subtlety and imagination. The High Street proposals highlighted alternate ways to do the same, most of which involved enhancing the perception of safety by exploring ideas of protection. The use of metaphors was one way to suggest a protected space and the responsive sidewalk ideas explored this by implying 'a protective energy field' while the kerb-mounted luminaires created a symbolic 'fence'. The illuminated pedestrian crossing lines were yet another attempt to introduce symbolic meaning by offering people a corridor of light that would protect them from cars.

In seeking to make this precinct more attractive to foot traffic I was also hoping to improve peoples' safety by populating the street. One of the key crime prevention principles of CPTED involves natural surveillance and this exploits the relationship between the risk of getting caught and the possibility of criminal activity. As the potential for being spotted increases, the likelihood of unlawful behaviour tends to decrease and thus one of the consequences of creating a populated street is that it becomes safer.

#### 7.4.3 Risk

Although this study was unable to determine the risk implications of the numerous proposals, two things have emerged from this thesis; the first is a more comprehensive and nuanced understanding of risk, while the second is an argument in favour of taking 'managed' risks.

To begin with it is important to establish that risk in not a given, but rather a matter of judgement. According to Adams (1998) 'everyone takes risks; everyone is a risk manager' (p. 16) but it is a person's propensity to take risks that varies. It is equally important to recognise that what represents risk differs between individuals i.e. flying might be too risky for some, while others might see it as exciting. Adams (1998) also makes a distinction between risk and uncertainty. Science has been very effective in reducing uncertainty by making visible, dangers that were previously invisible (p. 14), and thus we have come to expect certainty on occasions when it is not possible. Public spaces are inherently uncertain and a fear of risk can hugely exaggerate trivial dangers. *Living with Risk: Promoting Better Public Space Design* (2007) builds on his ideas and elaborates on how hazards (features that may cause harm) are often seen as risks (situations where there is a significant chance and magnitude of harm) and that public spaces subsequently respond to the exception rather than the norm (CABE Space 2007, p. 2)

Those responsible for the provision of public lighting are primarily concerned about their 'duty of care' and fear the prospect of possible litigation. Consequently they see risk in very conservative terms with many of them seeking to eliminate it altogether. Yet it is impossible to eliminate all potential threats or hazards and thus risk is a part of everyday life and it becomes a case of managing it instead. *Living with Risk: Promoting Better Public Space Design* (2007) discusses this matter at great length claiming that managed risk should involve debate and negotiation, and that 'a proportionate and sensible approach to risk management is required' (p. 3). It asserts that all public spaces involve uncertainty and that all risk assessment requires some *supposition* about how people might behave (p. 4). It advocates using risk creatively to produce unique environments and argues:

It is easier for those engaged in making decisions about schemes, especially clients, to justify a decision that avoids risk than a decision that uses risk creatively. So the balance needs to be swung the other way: we need to challenge the justifications for the easy solution as opposed to being warned off a more demanding one (CABE-space 2007, p.1).

In todays risk sensitive climate the benefits of risk-taking are all but forgotten. Adams (1998) refers to the balancing of risks and rewards (p. 1) while CABE Space (2005) seeks to remind us of the positive opportunities that risk offers. In their document *What are we scared of? The value of risk in designing public space,* they highlight how risk has come to be seen in a negative light, stating that 'there seem to be no more good risks; all risks appear bad' (2005, p.5)

### 7.5 Topic 4 - Unique urban spaces

#### 7.5.1 Population growth and amenity

As the population of our cities gets larger and more pressure is placed on increasing urban density to reduce metropolitan sprawl, the importance of urban amenity will also grow. According to the first volume of *Melbourne Beyond 5 Million*, published by the Committee for Melbourne, our city prides itself on its liveability. The report goes onto say that Melbourne has doubled its population from 2 to 4 million between 1960 and 2010 and is expected to have the largest urban population in Australia (2010a, p.2), with projections of greater than 5 million in the near future and 7 million by 2050. In order to preserve the liveability they speak of, the quality of public spaces will need to rise to the challenge.

Planning for this extraordinary growth has begun and the Committee for Melbourne, a non profit organisation focused on Melbourne's liveability and economic prosperity, is promoting 'getting better as we get bigger' which is part of their strategic championing of high quality environments and well planned urban growth. An integral part of improving the quality of our urban environments will involve public lighting and the High Street case study has illustrated how lighting could contribute towards creating unique and identifiable neighbourhoods that make a large city an enjoyable and manageable environment to live in.

The Committee for Melbourne (CfM) and the Department of Planning and Community Development (DPCD) recognise that large cities need to be made up of smaller centres to preserve liveability. Melbourne was ranked the world's most liveable city in 1990 (Committee for Melbourne 2010a, p2) and it is this liveability they wish to maintain. The Victorian Government has defined six Central Activity Districts (CADs) and is investing in the development of these to cater for Melbourne's anticipated growth. The development of CADs is working towards creating a more manageable multi-centred rather than monocentric city. Both CfM and DPCD argue that the CADs are vital to future planning and that good urban planning will allow Melbourne to remain one of the most liveable cities.

#### 7.5.2 Neighbourhoods and unique urban character

The ability of neighbourhoods to turn a large city into a more personal space will increase in importance as our scale and population grows. The Committee for Melbourne makes numerous references to the value of urban character and neighbourhoods in their publications and on their website. They recognise the need to preserve neighbourhood character, they talk about CADs having unique and individual identities, and in the second volume of *Melbourne Beyond 5 Million* they comment on how neighbourhoods can offer a 'quality of life' (2010b, p24). One surprising aspect to emerge from the review of these – and other - strategic plans is the omission of public lighting and its role in the design and amenity of cities. The High Street design investigation illustrated the contribution that lighting could make towards the fortifying and delineating neighbourhoods and yet, curiously, none of this is acknowledged in our planning documents.

The prevailing approach to public lighting in Australia is a utilitarian one, as appears to be the case in most western cities. The Eurocentric book *Light for Cities: Lighting Design for Urban Spaces* states:

"It is now widely recognized that the almost universal policy of using public lighting for the sole purpose of making streets safe has prevented timely reflection on the role of lighting in determining the nocturnal image of the city." (Brandi 2006, p161)

This 'universal' and solely utilitarian viewpoint, common to technical rationalism and the risk aversion of governing organisations, does not acknowledge the cultural and expressive contributions lighting can make. The High Street case study has demonstrated how lighting could – and should - offer much more. With the primary needs of visibility satisfied, higher order needs such as nighttime character and the defining of neighbourhoods must to also be considered as our cities grow. To do so, the homogeneous approach we currently employ ought to be reviewed and the non-standardised implementation of lighting needs to be considered.

Public Lighting throughout Australia is treated in an all too familiar manner involving evenly spaced poles arranged along the edges of roads. This standardised approach stems from a paradigm that values technical and commercial efficiencies i.e. streamlined implementation and minimised installation and maintenance costs, and proffers that only through the uniform and prescriptive application of identical luminaires can it be certain that urban environments will be acceptably lit for peoples' visibility. The High Street case study illustrated that adequate and even illumination can still be addressed without resorting to uniform and predictable outcomes.

Unusual proposals such as the various suspended concepts and some of the pole lights would offer uniform and substantial illumination without resorting to typical arrangements, identical luminaires or predictable compositions. In doing so, the environment would become visually richer because it is this variation in luminaire design and positioning that contributes to interest. While the irregular sized pools of light and the way that these would overlap, would add further to visual interest of the lighting installation.

In order to provide even illumination on the horizontal surfaces, these aforementioned concepts demanded luminaires that offered significant adjustability and a degree of customisation. The use of various lamp specifications, adjustability of the head location/direction, as well as beam control through specifically designed optics would allow installers to tune the light output of each luminaire. The ability to adjust each fitting to suit its unique position within the environment would naturally lead to a more labour intensive rollout, when compared to a standardised installation, but it would also result in a more *natural* and stimulating environment without sacrificing visibility needs.

Additional visual interest would be realized through the staggered ignition and shut down times of the lights in the area. Within the half hour transitions found at dusk and dawn, lights would be randomly illuminated or shutdown depending on the time of day. All public lighting is fitted with photoelectric cells and these could be set to differing sensitivities so that lights would randomly ignite at dusk. Some would come on early while the last of the lamps would come on at the very end of sunset. Not only would this 'sparkle effect' lead to an interesting transition at dawn or dusk, but it would also be a distant signal that this segment of High Street is a unique environment worthy of further investigation.

Public lighting can offer enormously to the distinctiveness of neighbourhoods and yet this is not being explored in any significant way. Looking at the City of Melbourne as an exemplar, it has designed its own heritage lights, employed unique pole lights in many of its gardens and is at Stage 1 of redesigning Harbour Esplanade (involving a major lighting component) but distinctive streetlighting treatments - in more prosaic urban environments - are not being explored by them or any other councils. Public lighting can reinforce the vibrancy of a local community and create a unique identity for a non-descript shopping strip such as High Street; doing so would also contribute to place making by emphasising the individuality of the area and celebrating the people who inhabit its surrounds.

Like so many of our shopping strips, High Street has no distinct identity. The various communities that have populated the area have shaped the type of businesses and the architecture of the strip, but there has been no unified vision and the environment is the sum of individual decisions and commercial interests. Little attention has been given to the

ad hoc development of High Street and some thought about building on the unique character of the community would be of merit. Many other areas in Melbourne (table 3.2) would benefit from a similar make over and the lighting possibilities generated in this study could act as a template for their rejuvenation.

#### 7.5.3 Nighttime character

The process of conceiving the physical aspects of urban environments involves analysis, discussion, consultation and planning. It is through the act of writing and drawing that the planning takes shape. Areas are designated, roads are drawn within them and a skeleton is formed. On the skeleton are overlaid details such as recreational, commercial and residential pockets, and urban infrastructure such as power, water and public transport. Envisaging the location and quantity of these various elements takes place diagrammatically and inevitably these diagrams are thought about from a daytime perspective. The built environments that subsequently fit between the bones of this urban landscape are also conceived and refined from a daytime perspective. Seldom are urban and built environments visualised from an evening perspective (by virtue of the process of designing) and in rare cases, a lighting plan might be overlaid onto these once their conception is finalised. The net outcome is that our cities are never conjured up from a nighttime perspective and half of our experience of them has not been consciously designed. Clearly, there is merit in the idea of visualising urban streets - the greatest proportion of our public space - from an evening perspective and that the High Street case study has been a step towards this aim.

In recognising the importance of visualising environments from a nighttime viewpoint, the idea of a *unique & alternate* evening identity is equally compelling. It would be simplistic to suppose that urban localities have a single, coherent identity. Massey (1991) asserts that places have multiple identities and do not have 'a single sense of place, which everyone shares' (p.320). Moreover, in the same way that it is accepted that people have multiple identities, so too can places; people's routes through a place, their favourite haunts within it and the connections they make, all vary enormously (Massey 1991, p.320). If we accept that places have multiple identities that vary between people, it follows that a place could also have multiple identities to the same people; this is an aspect that is rarely explored or seized upon and it was one of the stronger ideas that came out of the design investigation. The idea of a place having markedly different identities between day and night and that

there would be a suite of elements - in the same way as there are a number of traits that define a person's character - that could be used to remodel the character of the location. Central to the implementation and heralding of this change would be the public lighting. Unlike the other changes that were proposed in the design component e.g. elevated roads, paving treatments, islands and barriers, the public lighting would be the only change between day and night. Apart from providing a commanding *character trait* that would be defining of the area, it would also be the most conspicuous environmental element marking the zone's change to pedestrian priority of an evening.

#### 7.5.4 Place making

Unique nighttime identities for neighbourhoods are yet to be fully explored but as our cities grow, and so too the demands placed upon them, the need for more complex and nuanced urban experiences will grow accordingly. A part of creating the 'layers' that add tone and gradation to urban spaces, needs to include the dynamic and elusive process of place making. Place making can mean many things but what is fundamental to it is 'uniqueness' and 'people'. Part of place making involves making great spaces, an example of this might be Melbourne's laneways or the temporary spaces known as pop ups, but the success of place making hinges on people and their choice to inhabit these spaces. Places are owned spaces, as captured by phrases such as: 'a sense of place', 'a meeting place' or 'your place'. People are at the heart of it all and need to be prioritised, it is for this reason that the evening shift to pedestrian priority was promoted and that this change was signalled by conspicuous lighting alternatives. All of the lighting concepts endeavoured to make High Street Northcote attractive to people rather than to the cars that currently dominate the area. This involved providing a welcoming experience, be it an unexpected, pedestrian interaction with the sidewalk lighting or a more intimate and human scale environment. These human centred concepts sought to make the area more attractive to walking and to generate a unique identity, one that reflects the values of the communities that inhabit High Street.

Place making is a growing movement and a seven-month online conversation culminated in October 2010 with a three-day conference devoted to it. The *Melbourne Place Making Series* hosted by VicUrban, in partnership with DPCD, City of Melbourne and several consultancies, encouraged collaboration between parties in order to develop new models of urban development. Topics involved: creating our future cities, social and economic sustainability, accommodating unprecedented population growth, uniqueness and community building (Melbourne Place Making Series 2010). Several of the forum posts found on their website, elaborated on the importance of uniqueness and identity, stating that 'a key tenet of place making is that one place is different from another' (VicUrban 2010) and 'places hold the identity of the community, reflect community values and evolve to meet changing aspirations. Places reflect local distinctiveness...' (Legge 2010).

Central to place making is a concern for urban character, and making cities enjoyable and desirable to people. Kylie Legge of Place Partners testifies that places (as distinct from spaces) are attractive and meaningful to people because people can connect with them 'in a personal and emotional way' (Place Partners 2010). What has been a significant and surprising revelation in sifting through the place making articles and discussions has been the omission of public lighting. Lighting provides character, it holds great meaning, people have an emotional response to it and it can be custom designed to provide unique outcomes - and yet, nobody seems to be discussing the contributions that lighting can make to urban environments.

Public lighting has the power to define neighbourhoods and contribute to the creation of a unique identity by adding visual interest and providing customised solutions that build on the character of the area. In line with the growing awareness regarding place making, urban lighting in recreational zones needs to shift its focus to pedestrian needs and to move away from the standardised implementation that we are all familiar with. Urban planners and place making practitioners need to start thinking about the role and contribution that public lighting can make to a streetscape such as High Street. Similarly, practitioners and decision makers need to incorporate public lighting in a push to create unique and alternate nighttime identities for parts of Melbourne.

Cities are inherently complex and planning for their growth will need to embrace this through the addition of 'layers' and more nuanced urban environments. Developing multiple centres, unique neighbourhoods, building on existing urban character and recognising the role of people in place making will contribute to the layering that is part and parcel of a city's maturation. In conjunction with city growth will be the need to raise urban amenity, which will make our large cities more enjoyable and tolerable, as well as ensuring that places like Melbourne remain amongst the world's most liveable cities.

# 8 Conclusion

This study was motivated by a dissatisfaction with current lighting practice and a belief that it was leading to lost opportunities. Consequently this thesis has sought to rethink street lighting and to explore the additional contributions it could make to urban design. The design component of this investigation has illustrated a breadth of ideas, which offer more interesting, visually attractive, and emotional appealing options than currently exist and these have demonstrated that it is possible to address utilitarian lighting concerns while simultaneously enriching peoples' experience of the city.

The High Street Northcote case study has successfully highlighted the complexities involved in changing street lighting and how such changes need to go beyond simple lighting alterations to include the entire environment. The design research has provided new insights and illustrated plausible alternatives to current practice, but it has not been able to prove anything. Proof comes through implementation and testing, which were impossible aspirations for this study and thus the speculative activity of this thesis has sought to persuade instead.

All research has limitations and involves making choices about how much can be studied or completed. As a Masters thesis there has only been the opportunity to conduct a single case study and this has limited the conclusiveness of the findings. The visualisation of ideas has also been a limiting factor and although the sketch visualisations have been an invaluable thinking tool, I suspect that these representations may only persuade some, rather than all. In retrospect it would have been preferable to have sketched these ideas on a dark background instead of the white I choose to work on and this would have led to more dramatic and persuasive representations. Similarly, had it been possible to create computer generated visuals they might have made the concepts more alluring and thus improved their persuasive powers, but to create accurate representations would have required a vast amount of work involving technical details and months of computer modelling.

Lighting is a powerful design element that can have a profound effect on people and urban character, but it needs to be seen in the context of a suite of measures for it to work effectively. If the streetlighting is the only aspect of the environment that ensures peoples safety it will be restricted in what it can contribute, but if this is a shared responsibility supported by additional changes, it will be freed up to do more than addressing this basic need.

People must to be able to identify potential dangers and this is the traditional role of public lighting, but if these potential dangers no longer existed or were minimised, it would allow the lighting to transcend this limited goal. The primary dangers encountered in main street shopping strips are personal injury and crime, where cars would be the greatest threat of injury and pedestrians would be the source of crime (or injury through assault). If we were to lessen the threat of cars by significantly reducing speeds, or by changing the width and treatment of the road, it would calm the traffic and minimise the chance of someone being seriously injured. Equally, if the street were to be more populated because it is a more enjoyable environment to be in, the likelihood of criminal behaviour would decrease and peoples' safety would benefit.

People engage with lighting on an emotional and psychological level, thus it is a potent design tool and something that can humanise and bring meaning to a city. Lighting has the ability to soften urban spaces and to make streets more appealing, all of which help to draw out people, while the social encounters and chance meetings that are a consequence of this, are the things that give city lives meaning. People need to be able to connect with places and to feel that they own a part of them. This might be through reclaiming street precincts or simply by using lighting to create unique and identifiable neighbourhoods. As our cities mature and continue to grow in density and population, the quality of our urban spaces will need to rise and it will be these neighbourhoods and reclaimed streets that will make our large cities more manageable and rewarding to live in.

This study has revealed a number of insights about lighting and its relationship to urban design, two significant insights involve the *way* we design our environments. Urban spaces are never conceived from a nighttime perspective, nor are they thought of free of their daytime identity. This is because lighting is perceived as a downstream activity and thus it is expected to follow on from the decisions that have already been made. This happens regularly in architectural and outdoor lighting, where light is applied to the built environment once everything has been designed. To illustrate this point through an example - if we were

to establish the lighting qualities before we thought about the urban design details, and then determined these elements on the basis of this vision, the nature and character of this type of urban space would be significantly different to the spaces we currently have.

This investigation is finishing with objectives and techniques that will require further testing. Having commenced with several core objectives and discovering numerous ones along the way, it has since been possible to distil these into three overarching aims, which should form the starting point for a new investigation. These refined, human-centred, objectives involve reclaiming territory, asserting pedestrian ownership, and reducing the perceived scale of the environment. Ways of satisfying these objectives were explored in the case study and a variety of techniques were developed. Illuminated road lines and elevated road surfaces sought to rebalance ownership and to reclaim road space. Dedicated pedestrian lighting sought to enhance the safety and appearance of the sidewalk, while lowered and downward focused illumination was used to reduce the scale of the environment.

The new investigation will need to build on this knowledge and these techniques will need to be applied to a cross-section of the sites found in Table 3.2; this testing should either invalidate or advance the theories that underpin them. In the longer term, lamp specifications and luminaire optics will need to be attributed to specific proposals and this will allow lighting calculations to be conducted. These calculations will provide quantitative confirmation of the coverage and effectiveness of the lighting, while computer-generated visuals could verify *some* of the qualitative aspects. None of these activities will prove that these concepts are going be successful, or if the associated psychological and emotional claims are accurate, but they will help to persuade people about the *likelihood* of their success, if they should choose to implement them.

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