Mirvac Fini: Burswood Lakes

Illustrated CPTED Guidelines

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Working Paper 5:

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Burswood Lakes

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1.0 Introduction

This report details the principles of Crime Prevention through Environmental Design (CPTED) for the Burswood Lakes residential development in the Town of Victoria Park. An introduction to CPTED and an explanation of the principles of CPTED (included as *Appendix A*) were provided in ***Working Paper 4,*** a preliminary CPTED assessment of the building control envelopes (November 2002).

This ***Working Paper*** provides illustrated precise site-planning and design guidelines addressing the issues set out in ***Working Paper 4,*** paying particular attention to micro-scale design issues. These detailed CPTED guidelines will be complemented by guidelines for public open space, housing design, accessibility for people with a disability and older people, children's play and use of the site by young people working papers currently prepared as part of this consultancy.

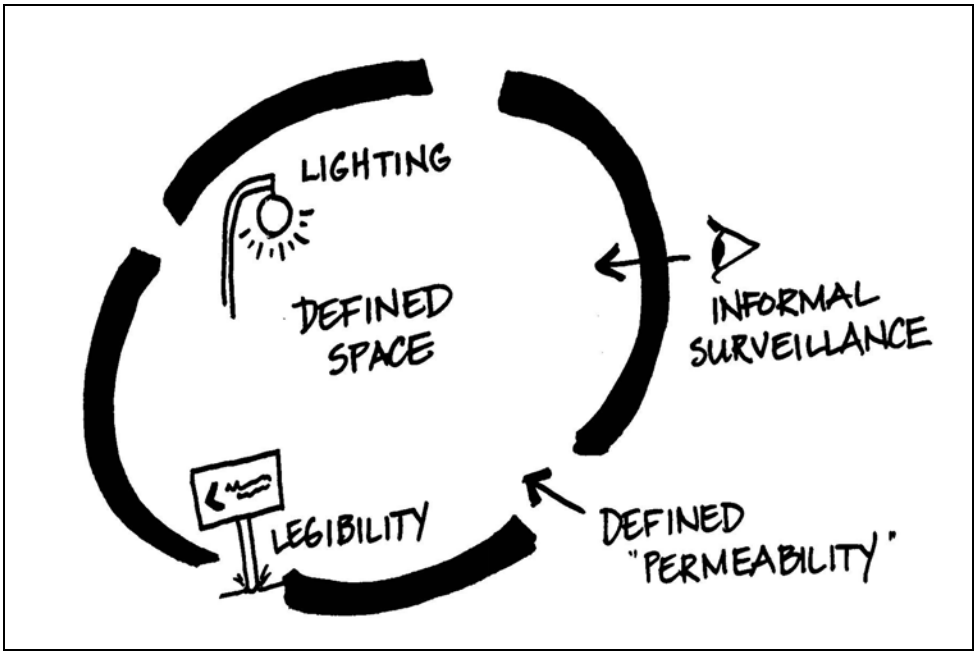

Figure 1: CPTED Elements

Crime prevention through environmental design (CPTED)

The term Crime Prevention through Environmental Design (CPTED) was first coined by criminologist C. Ray Jeffery in 1971 (see Jeffery, 1971, 1997). However, it has origins in Jane Jacobs' assessment of the importance of "eyes on the street" in her influential book about Greenwich Village, New York, *The Death and Life of Great American Cities* (1961). CPTED is a tool that modifies the built environment to reduce opportunities for crime. Traditional tactics of CPTED include creating territoriality, natural surveillance and "eyes on the street", and controlling access into, and out of, buildings and neighbourhoods. Early

versions also involved hardening potential targets so they could not be victimised, also called 'target hardening'. This discipline is based on where and when criminal behaviour occurs in the environment. It is geography of crime that addresses fear of crime in people and their fear of places that appear unfriendly.

Using Care in Applying Guidelines

There has been increased awareness in Australia in recent years about the role of urban design and planning in addressing crime problems and Australian crime prevention practice is now informed by CPTED principles. While much of the emphasis of CPTED is on situational crime prevention, that is, targeting strategies for particular local situations, increasingly a need emerges for more 'generic' guidelines to aid practitioners and decision-makers. These guidelines represent this approach, but they are tailored to suit the Burswood site specifically.

No one generic approach will work every time as every location is different. In some cases checklists actually increase risk. Minimum standards must always be treated with caution. For example, although minimum standards of lighting may be an effective deterrent to crime in commercial areas, they may lead more people to use shortcuts through well-lit (but isolated) walkways late at night. It matters little that a walkway has minimum standards of lighting if it is isolated from view, especially if it also attracts criminals or troublemakers.

These guidelines should be complemented by a full crime risk assessment of the site and its context. This will provide more precise and site specific information to aid in the application of these more general guidelines. This more holistic approach concentrates on what is needed to apply CPTED and identifies key design elements that can be assessed.

Caveats

- No approach in isolation will be effective a multifaceted approach is most effective: Planning, design, implementation and management must be addressed collectively if crime and its implications for urban form are to be addressed effectively
- Application of a diversity of planning and design guidelines will not in itself necessarily confer safety on a place or space; rather, the design stage must also address management approaches, as well as land-use mixes
- It is important to take into account the use, type of user, management of buildings and the spaces between them
- The socioeconomic environment strongly influences crime levels
- Social and management aspects of the built form should be incorporated in town planning policies to reduce crime

2.0 Commentary on building design envelopes[1]

This section summarises the conclusions to ***Working Paper 4: Crime Prevention through Environmental Design (CPTED) Assessment of Building Control Envelopes*** and provides an annotated figure commenting on building design envelopes.

The building design envelopes appear to be free of potential problems from a CPTED perspective. However, sightlines need to be maintained. Please find the annotated commentary on the building design envelopes in ***Figure 2: Annotated plan showing potential CPTED issues,*** below. The figure is supplemented by an additional commentary that follows.

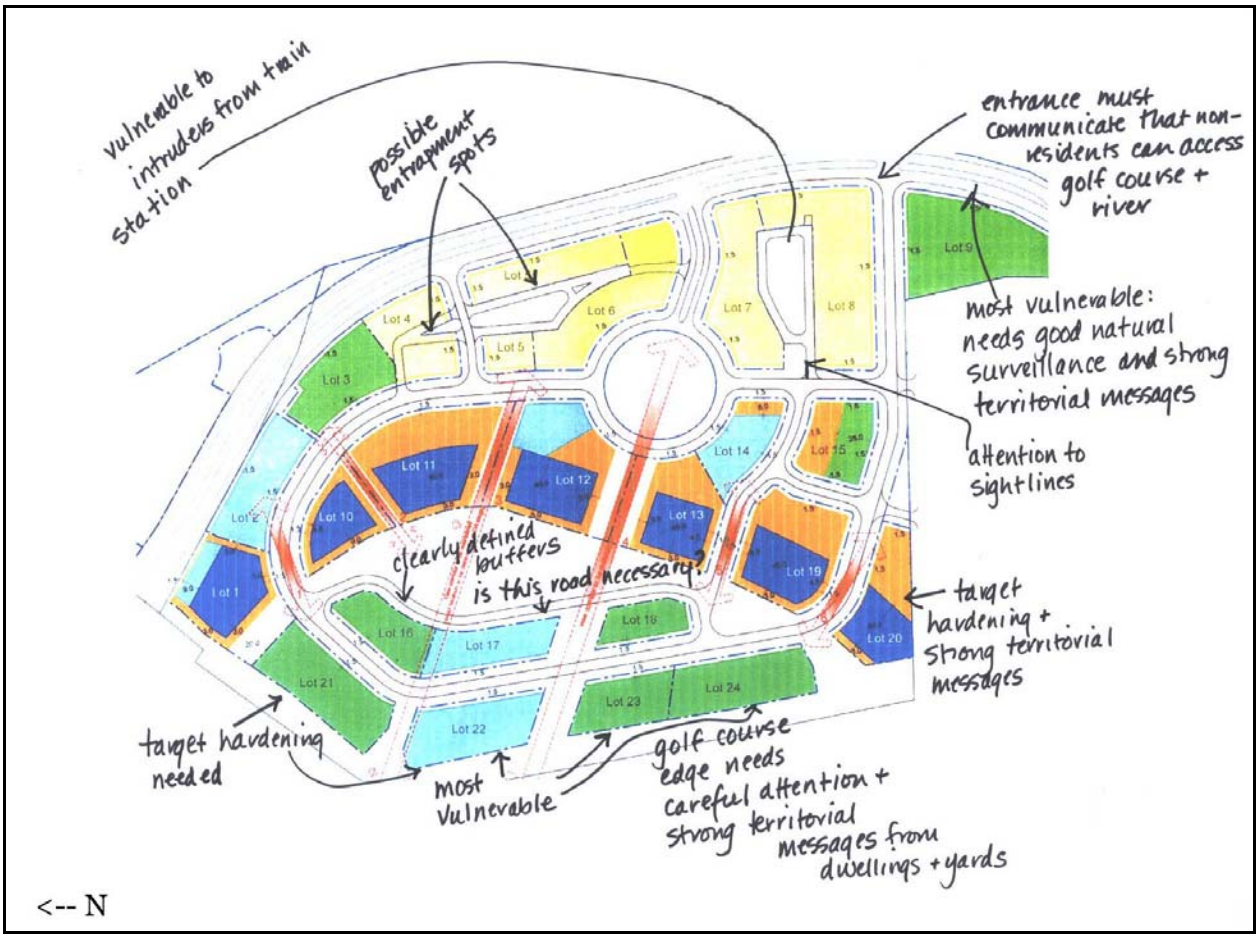

Figure 2: Annotated plan showing potential CPTED issues

The Lot in the northeast corner: the location of roads constitutes an issue, they may provide excuses for potential intruders/burglars being in area.

[1] Findings of Assessment by Individual Plan: Report dated 11 November 2002

Lot 9: strong natural surveillance will be required, to establish the 'feel' of a residential area and discourage intrusion.

Western edge of the podia onto the primary open space and Lots 16, 17 and 18: need to be carefully handled to permit full potential for natural surveillance.

Plan 2:

Lots 8 and 9: the entrance between these Lots needs to be very 'open' to achieve the welcoming sense that is required so that non-residents can access the recreation area and the river (a requirement of the Council). It must not appear 'gated', while still protecting the privacy of adjacent dwellings. This needs to be handled very sensitively at the detailed design stage.

Vehicular and pedestrian access from the main entry to and through Lot 6: this needs careful attention. This is the only place where the guiding principles of the hierarchy of open space appear to be violated.

Lots 21-24: these will probably be the most vulnerable to burglary and careful attention needs to be paid to all aspects of natural surveillance and access control along the **western** boundary.

Plan 3: this Plan shows the importance of detailed design of the podium levels of the taller blocks, as well as the potential vulnerability (to intrusion and burglary) of the western-facing units. I will provide specific detailed CPTED design guidelines for the design of the ground floor of these two types of units.

Plan 4:

Lot 6: the vulnerability of Lot 6 is clearly shown here. The concept of 'shared space' (or common open space which is the 'territory' or under the 'control' of a group of dwellings) needs to be reaffirmed in this location.

The guidelines *from Housing as if People Mattered* (1986)[2] applied here:

Lots 7, 8, 14 and 15: the treatment of the interior-facing ground-floor units in these lots needs careful attention to sightlines, fencing, access, buffers and entrapment and concealment issues.

Map 5: detailed lot diagrams

[2] Clare Cooper Marcus and Wendy Sarkissian (1986). *Housing as if People Mattered: Illustrated Site Design Guidelines for Medium-Density Family Housing.* Berkeley: University of California Press, Chapter 8, "Common Open Space and the Needs of Children," pp. 119-120.

Lot 1: in general, units in this lot will be very vulnerable to burglary or intrusion. Its north and west corners need to be carefully designed and probably target-hardened (hardware, glass selection, etc.). There are no foreseeable problems with the setbacks as suggested.

Lot 2: no foreseeable problems.

Lot 3: no foreseeable problems.

Lot 5: as per Lot 4, but we assume that the edge will be handled sensitively to avoid concealment and entrapment problems.

Lot 7: the interior spaces have the potential for entrapment unless careful attention is paid to fenestration, sightlines, and fencing - especially with reference to backyard fencing. The front is well handled.

Lot 8: the road between the buildings needs careful attention, as it could potentially invite intruders coming via the train station.[3] How the **exterior** is handled along all sides is very important. If there are any north-south cross-corridors for pedestrians, care needs to be taken to avoid inadvertently creating concealment and entrapment spots.

Lot 9: this Lot is most vulnerable because of its location with respect to the train station. The street edge appears to be free of potential problems. However, the recessed interior space needs to communicate clear messages that it is **shared**, not 'public'. It needs an active frontage and messages that communicate that it is not part of the public domain. On the west side, aesthetics need to interface well with the expected future development of the Dome site. It's critical that the west side does not look like the 'back', as it may very well be a 'front' once the Dome site is developed as a vital, 24-hour housing, commercial and residential precinct. The whole of the development of lot 9 needs to take into account the potential for pedestrian access along the western side of the site if the Dome site is acquired and developed.

Lots 10-14: appear to be free of potential problems from a CPTED perspective.

Lot 15: this Lot is potentially vulnerable on the southern edge. It is not easy to determine this exactly. The location of balconies can contribute to natural surveillance but it is important that they do not contribute to 'natural ladders' to the lower units (see ***Figure 5: Natural Ladder A*** and ***Figure 6: Natural Ladder B*** for examples of 'natural ladders'). Will the ground-floor and podium units have yards?

3 Train stations are known to be a major source of access to residential sites by potential burglars. They are also activity generators. Potential perpetrators may use the train to arrive at a target and to make a getaway. Further, in some low-income communities, pawnshops are located close to train stations, which makes it easy to dispose of stolen goods a few stops away. A detailed CPTED analysis will be provided for the train station and environs.

Lot 16: the eastern side of the public open space (POS) needs to have clearly defined buffers and maximum natural surveillance from adjacent dwellings. If the dwellings front onto the western road, how will their 'backs' onto the POS be handled? The back yards could be easy targets, with burglars able to work undetected protected by 1800mm high fences.

Lots 16-18: These Lots raise the same issues with regard to their relationship to the POS. It is possible that the form of the liftwell could create concealment and entrapment spots in the side of the buildings facing the POS.

Lot 19: As with Lot 20, the units in this Lot could be vulnerable to burglary from intruders arriving by train. Sightlines could potentially be blocked by the curve of the road (this can be resolved at the detailed design stage).

Lot 20: This Lot is more vulnerable than Lot 19. The south-west corner needs target-hardening and careful design. It needs to communicate strong territorial messages. (Landscaping and lighting can be particularly effective here.)

Lots 21-24: The units in these Lots are potentially vulnerable from the western side (golf course side). The careful placement of balconies can potentially provide protection to private open space and entries but sightlines will also be very important over the boundary between the golf course and the building envelope.

For ease of reference, the following issues extracted from ***Working Paper 4: Crime Prevention Through Environmental Design (CPTED) Assessment of Building Control Envelopes*** can be successfully resolved at the detailed design stage:

- The hierarchy of open space (from private to shared [or common] to public);
- Fencing and target hardening;
- Removal or reassignment of any potentially ambiguous spaces;
- Urban design and building design that communicates 'residents only' messages for places which are to be accessed by residents only;
- Clear messages that communicate public use to reduce any sense of social exclusion (see ***Working Paper 1: Burswood Lakes as an Inclusive Community: A Summary of the Literature on Social Exclusion*** and ***Working Paper 3: Preliminary Social Planning and Social Design Study***);
- Sensitive, targeted lighting of the golf course near adjacent units to reduce hiding spaces;
- Addressing the common problems of 'front-back confusion' in the lower density units[4]; and

[4] **Front-back confusion** means that a visitor arriving to a higher density dwelling has difficulty discerning which is the formal (or front) entry of the dwelling and which is the informal (or back) entry. This is particularly a problem in some

- Consideration of the implications of the design of the future development of the Dome site and how pedestrian and vehicular access will integrate with this proposed mixed-use area.

This CPTED analysis of the building envelopes for the Burswood Lakes site has revealed that the work to this stage has been done to a high level of professionalism and the building envelopes do not, in themselves, pose safety or security risks.

3.0 Generic guidelines

It must be emphasised that no one generic approach will work every time. A more holistic approach is required. We have considered the unique Burswood Lakes context in drafting the guidelines that follow. However, a crime risk assessment will provide a more accurate picture of local factors that could impact on crime.

As the design process progresses, give careful attention to the following matters[5]:

- Activity generators[6];
- Territorial boundaries;
- Natural surveillance and sightlines;
- Movement predictors[7];
- Concealment and entrapment spaces;
- Access control;
- Target hardening;
- Fencing and buffers;
- Landscaping; and
- Lighting.

3.1 Land use mix and activity generators

To reduce crime and safety problems, it is wise to avoid strict separation of land uses that may result in the isolation of some buildings or spaces. Further, where possible, it is wise to locate activity generators or seating around active edges or fringes of a space (where there is legitimate activity and people gathering together for community activities) to

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cluster housing configurations, where visitors can be required to enter into the 'backstage' of a dwelling, often via common or shared open space (as in the Radburn style of housing).

[5] A glossary of terms is provided in at the end of this ***Working Paper*** and prior to ***Appendix A***.

[6] **Activity generators** are features that tend to create local activity: playgrounds, benches, picnic areas and kiosks. Crime opportunities can be high in such areas if CPTED is not applied. In some circumstances, activity generators can be used to reduce opportunities for crime, if the legitimate users of the space can function as "capable guardians".

[7] **Movement predictors** are predictable or unchangeable routes or paths that offer few choices to pedestrians. Pedestrian bridges, enclosed pathways and staircases are examples. Often alternate routes are unavailable to pedestrians and this becomes a problem, especially if the movement predictor contains entrapment areas where offenders can hide and wait for victims.

create possibilities for natural surveillance of a space. CPTED principles focus on encouraging pedestrian passage through or activity in areas at grade level to promote natural surveillance.

Separation of land uses

Avoid strict separation of land that may result in the isolation of some buildings or spaces.

Transitional areas

Where there are in-between or transitional areas, e.g., a linear strip bordering the development, use careful design discretion so as not to create a 'fortress-like' image.

Activity generators

Locate activity generators or seating around active edges or fringes of a space to create positive natural surveillance of a space (see ***Figure 3: Activity generators***).

Figure 3: Activity generators

Pedestrian activity

Encourage pedestrian passage through or activity in areas at grade level to promote natural surveillance but ensure that outsiders do not intrude into shared spaces or private yards, gardens or patios.

3.2 Territoriality: use and ownership

Territoriality is a concept that clearly delineates private space from semi-public and public spaces and provides cues that help to create a sense of ownership. People usually protect territory that they feel is their own and have a certain respect for the territory of others. Fences, paving, art, signs, good maintenance and landscaping are some physical ways

to express ownership. Identifying intruders is much easier in a well-defined space. An area that looks protected gives the impression that greater effort is required to commit a crime. A cared-for environment can also reduce fear of crime.

Ambiguous ownership cues provide rationalisations and excuses for criminal intent and encourage testing the defences. Thus, for example, a seemingly innocuous trespasser in pursuit of a miss-kicked ball hopes that nobody will regard him as an intruder. In this way perpetrators gauge the potential for future trespass or burglary.

Hierarchy of space

Design in a hierarchy of space using transitional cues and distinct paving, lawn strips, tactile surfaces, ramps and stairs, gardens, etc).

Ownership

Define ownership and intended use of a space through obvious design cues.

Ambiguous land uses

Avoid ambiguous land use and make sure that the whole design communicates the clarity of purpose of any space. This will avoid excuses when offenders are on private property or hiding with a view to committing robbery or assault.

Barriers

Use physical barriers (e.g. fences) and symbolic barriers (e.g. vegetation) to reduce ambiguity and excuses for inappropriate behaviour.

Clear entry/exits

Ensure that there is clarity of entry and exits into the site.

Defining space through demarcation of edges

Provide clear ownership cues at residential edges, using actual or symbolic barriers.

Pathways mirror roads

Ensure that walkways abut/align with vehicle routes (e.g. no pathways linking cul-de-sacs).

Shortcuts

Prevent shortcuts or trespassing opportunities by means of gates, buffers and other visual cues.

Signage

Use signage and cues to define intended use and ownership.

Design definition

Use environmental cues, such as changes in footpath material, change in grade or elevation, or levels of lighting to define legitimate uses.

Controlling side and rear access

Use gates/fences to control side and rear access to private yards or to dwellings.

Screening

Take care when providing privacy screening (optically permeable rather than solid screens) so that criminal activity can still be monitored from windows.

Formal supervision

Make the most of the strategic location and natural presence of employees (receptionist/concierge/building supervisors) to support natural surveillance.

Surveillance of vulnerable groups

Ensure that any spaces that may be used by vulnerable groups (such as young children and older people) and may attract inappropriate behaviour are in locations with the maximum opportunities for nature surveillance (***Figure 4: Surveillance of vulnerable groups***).

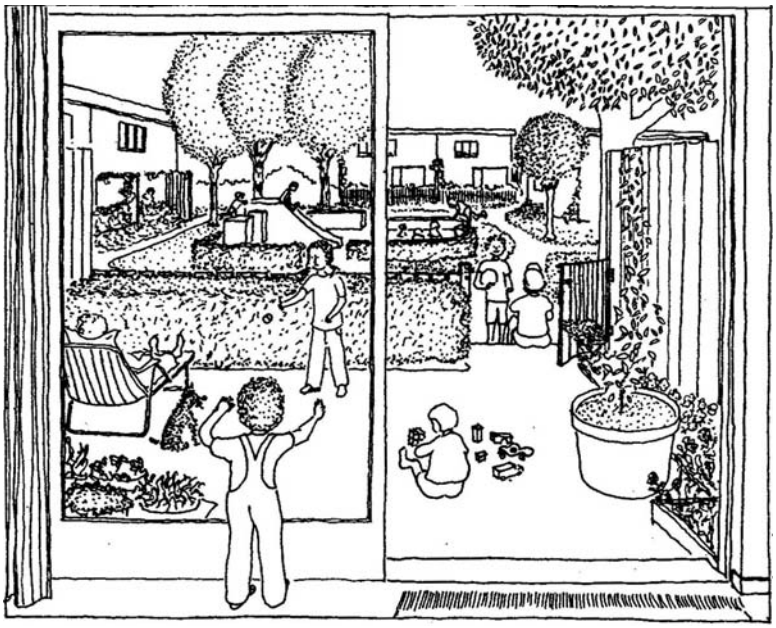

Figure 4: Surveillance of vulnerable groups (Marcus & Sarkissian, 1986)

Community guardianship

Provide opportunities to support community guardianship of public space (for example, well used and cared-for public spaces encourage guardianship).

Night pedestrian activity

Aim to achieve high levels of legitimate pedestrian activity at night to help to confer safety on public spaces. Aim to achieve centralisation of night activities to enable supervision.

Natural ladders

Design out 'natural ladders' that are building features, trees or nearby structures, including fencing, that help a criminal to climb to balconies, rooftops, ledges and windows (see ***Figure 5: Natural Ladder A*** and ***Figure 6: Natural Ladder B***.

Figure 5: Natural Ladder A

Figure 6: Natural Ladder B

3.3 Natural surveillance and sightlines

Natural surveillance is a design concept directed primarily at keeping intruders under observation. It is a way of promoting control of territory. Natural surveillance helps to create environments where there is plenty of opportunity for people engaged in their normal, legitimate behaviour to observe the space around them (see ***Figure 7: Sightlines from bike path into park***). Criminals usually do not want to be seen. Placing physical features, activities and people in ways that maximise the ability to see what is happening discourages crime.

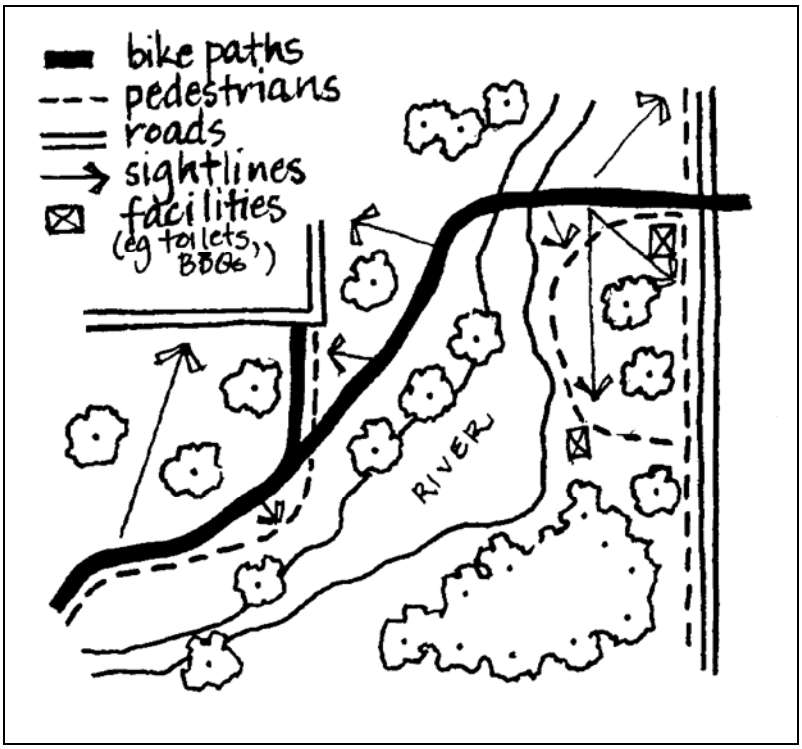

Figure 7: Sightlines from bike path into park

For example, placing, barbeques, cafes and kiosks in parks increases natural surveillance by park users, while placing communal clotheslines near play equipment increases natural surveillance of the play area.

Barriers such as bushes or sheds can make it difficult to observe activity. Critical to the effectivenes of natural surveillance is the concept of 'capable guardianship'. This means that the person who is providing the "eyes on the street" must feel a sense of connection to and /or responsibility for the space and the user of the space. Otherwise, they are unlikely to intervene. The case of Kitty Genovese, who was murdered on a New York footpath while many onlookers observed her murder, is an indication of the limitations of "eyes on the street" without the concomitant community development components.[8]

8 Simply locating buildings overlooking spaces will not necessarily contribute to the safety of public spaces unless other social, behavioural and design factors are considered. For example: natural surveillance must be combined with a sense of responsibility on the part of onlookers to provide protection against crime; the mere presence of onlookers does not confer 'defensible space' to an area; and people are unlikely to stop vehicles in fast-moving traffic to come to the aid of a stranger who is apparently in danger.

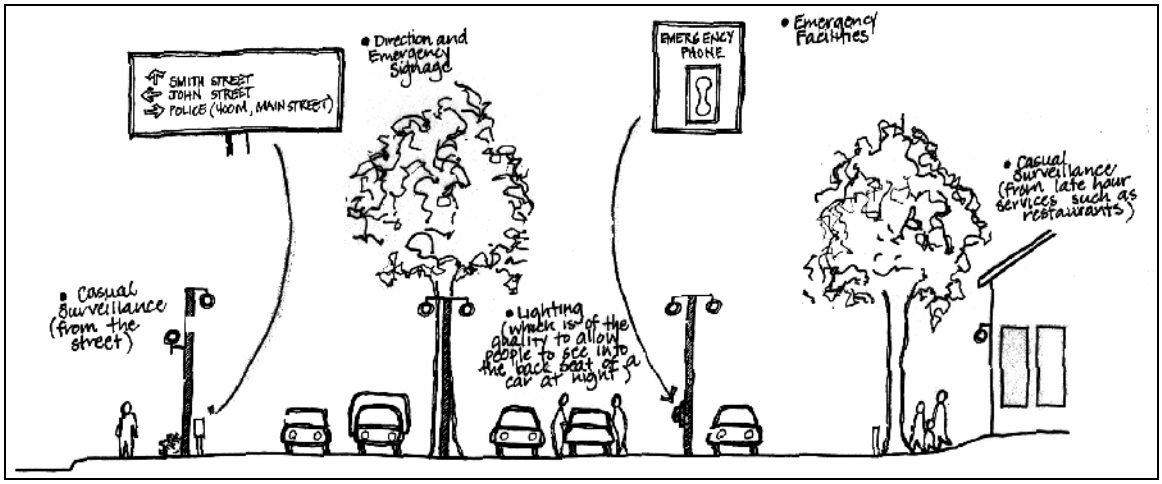

Figure 8: Strong CPTED in effect

Orientation of buildings

Orient buildings to overlook public and shared open space (see ***Figure 11: Natural sightlines created in pocket park***).

Front entries

- Design the front entries of buildings so that they do not create entrapment spots or places that attract intruders (see ***Figure 9: Entrapment area at building entry***)

Figure 9: Entrapment area at building entry

- Design buildings with well designated/defined entries and access routes, as it is easy to justify trespassing in ambiguous areas

Sightlines

Provide clear sightlines from within the building to the entry so that occupants can see outside before leaving the building. Exterior lighting needs to be very effective to facilitate good interior-to-exterior surveillance through windows, as most risks such as assault are more likely at night (see ***Figure 19: Natural surveillance from 'activity rooms'***).

Lighting

Provide high levels of even illumination at entries so that occupants can see out some distance from the entry before leaving the building. Ensure that lighting at entries does not create a blinding effect through glare and/or shadows, thus making it difficult for eyes to adjust to different light levels.

Landscaping

If landscaping is used, select low ground cover or high-canopied trees, clear-trunked to a height of 2 metres in areas where crime is likely to be a problem.

Children's play

Children need to be able to move around the estate safely on their own. There is a need for informal play areas within the site and within calling distance from the home. Equally important are differentiated play spaces suited to different age groups and areas that provide opportunities to avoid bullies. Children also like to use streets as play environments and hard-surface play is essential for motor skill development. It is unclear how those needs are provided for with safety. Failure to provide such opportunities poses a potential danger to children, as they will invariably venture out in search of suitable space, irrespective of their parents' wishes or warnings *(see also **Working Paper 6: Guidelines for Children in the Outdoor Residential Environment**)*.

Sightlines at grade

Design pathways and other spaces to minimise sudden grade changes and maximise clear lines of sight.

Pedestrian corridors

Design site layout so that pedestrian corridors are easily identifiable, sightlines are maximised and destination points visible.

Common area entry

Orient entry of a common area in a building (lobbies, foyers, lifts, etc.) to provide natural surveillance.

Communal facilities

Locate communal rooms/areas (laundries, gardens, etc.) to maximise natural surveillance).

Concealment opportunities

Reduce concealment opportunities to ensure that people cannot hide and jump out on unsuspecting pedestrians.

Facilities for young people

Provide appropriate locations and natural supervision of recreation facilities for young people so that their activities do not constitute a danger or inconvenience to others.

Park surveillance

Locate park areas with unobscured views by passing pedestrians and motorists (see ***Figure 11: Natural sightlines created in pocket park***).

Park guardianship

Locate parks within view of dwellings so that capable guardians are able to respond to calls for help (see ***Figure 10: Natural surveillance of children's recreation facilities*** and ***Figure 11: Natural sightlines created in pocket park***).

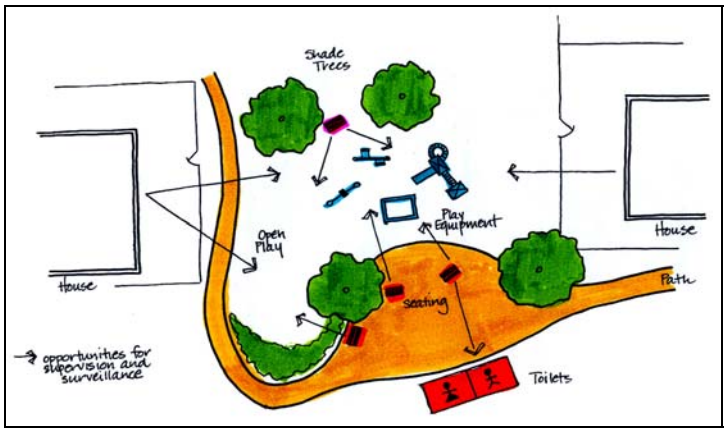

Figure 10: Natural surveillance of children's recreation facilities

Safe play areas

Locate play areas for children in areas under constant natural surveillance. *(See also **Working Paper 6: Guidelines for Children in the Outdoor Residential Environment**).*

Building orientation

Take every opportunity to reduce opportunities for illicit loitering by maximising the benefits of building orientation to provide natural surveillance.

Fence design

Treat back fencing with care to ensure that solid perimeter back fences do not provide opportunities for burglars to work undetected. This is particularly important for fencing that abuts the Golf Course.

Tunnels and overpasses

Avoid tunnels and overpasses, as they are commonly perceived as dangerous and associated with crime.

Sightlines

Provide open sightlines to maximise the ability to see and be seen in landscaped environments to reduce robbery and assault (see ***Figure 11: Natural sightlines created in pocket park***).

Figure 11: Natural sightlines created in pocket park

Landscaping design

Avoid obstructive landscaping design features (berms, walls, grade changes, etc.) that can block views or conceal intruders.

Footpaths and bicycle routes

Locate footpaths and bicycle routes in proximity to potential capable guardians so that they can intervene in dangerous situations, and away from dense vegetation/landscaping structures to reduce opportunities for concealment of offenders.

Wide pathways

Provide wide, unobstructed pathways, as pedestrians are more comfortable and are more likely to use wider pathways.

Street furniture

Locate street furniture at likely congregation points in a pathway system, in parks and other open spaces (see **Figure 12: Seating location at likely congregation point and resulting sightlines**).

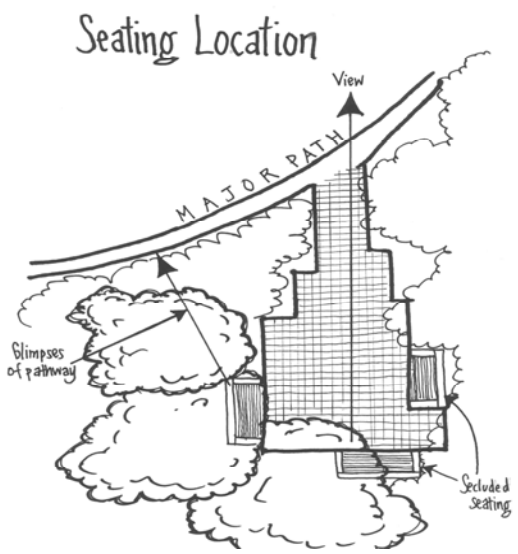

Figure 12: Seating location at likely congregation point and resulting sightlines

Landscaping

Consider the implications of planting with respect to how mature vegetation is likely to obscure areas and offer concealment opportunities.

Greenscreens

Provide opportunities for greenscreens and wall planting to reduce opportunities for graffiti and vandalism, and contribute to aesthetics. Ensure that greenscreens will not obstruct windows (see **Figure 13: Greenscreens**).

Figure 13: Greenscreens

3.4 Wayfinding and signage

Carefully designed signage and legible pathways and vehicle routes, which make it clear what is private, shared and public territory can help to reduce crime and promote community safety. Signage can specify safe routes within public open space. Signage also communicates administrative messages, that is, the rules of appropriate behaviour and who is responsible for enforcing appropriate behaviour, particularly in the public open spaces.

Orientation signage

Design the signage to identify where assistance and key areas can be located, e.g. telephones, toilets, taxi ranks and bus stops.

Visible signage

Provide signage that is visible, concise and easily maintained (in the case of directional signage, to be identifiable from 20 metres).

Design facilitates use

Provide opportunities so that the space is used for the purpose for which it was designed.

Ownership signals

Make it clear who is responsible for this space (legal owners/carers).

Spatial borders

Use spatial boundaries/borders to reinforce the intended function.

3.5 Movement predictors

Movement predictors are predictable or unchangeable routes or paths that offer few choices to pedestrians. Pedestrian bridges, enclosed pathways and staircases are examples. They are often routes that may be difficult to escape from if someone is being followed or chased. Often when alternate routes are unavailable to pedestrians, the movement predictor contains entrapment and concealment areas where offenders can hide and wait for victims. Movement predictors also influence offender's perceptions of neighbourhoods and their target selection (see ***Figure 14: Predictable route with isolated entrapment spot***, for an example of movement predictors with potential entrapment location).

Predictable routes and entrapment

Eliminate predictable routes and potential entrapment locations from the design wherever possible.

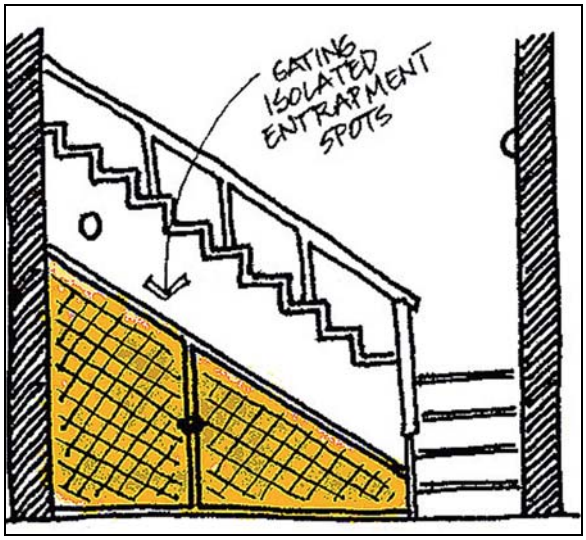

Figure 14: Predictable route with isolated entrapment spot

Sightlines

Provide adequate sightlines and lighting where there is no alternative to predictable routes.

Potential concealment provisions

Provide a minimum distance of six metres between any potential concealment and entrapment locations to allow users adequate reaction time.

Alternative access routes

- Avoid predictable or unchangeable routes or paths that offer no choice for use for pedestrians, including overpasses, underpasses and narrow passageways
- Avoid provision of unnecessary underpasses and overpasses, unless there is no alternative
- Ensure that predictable routes have good natural surveillance, provide for alternative access arrangements and minimise potential entrapment locations
- Identify by effective signage alternative routes, which are preferably well lit and frequently used pathways

3.6 Spaces safe from entrapment

Entrapment spots are small, confined areas, adjacent to near a well-travelled route that are shielded on three sides by some barrier. Barriers may include: lifts, storerooms, fire stairs, dark, recessed entrances that may be locked at night, gaps in tall shrubbery, curved or grade-separated driveways, or loading docks off a pedestrian route.

Other entrapment spots can include car parks, especially if they are adjacent to pedestrian routes. Below-grade and above-grade walkways may create places that are isolated or invisible from the street.

It is important to eliminate potential hiding places where intruders might lurk undetected and commit acts of violence unobserved. Public spaces need to be designed to ensure that users, particularly women, older people and people with a disability can see a safe route through them and not be liable to attack in unsurveyed spaces. Not only will unsurveyed spaces become unsafe (and perhaps develop a reputation for danger); they are also unlikely to be used by people who regard them as unsafe. This will limit the amount of legitimate activity in the space and a further cycle of danger and non-use can occur.

Entrapment spots adjacent to pedestrian routes

- Avoid creation of entrapment spots adjacent to a main pedestrian route or movement predictor (e.g., a storage area, hidden area below or above grade) or private dead-end alleyway
- Consider adding activities (such as kiosks) to make the space safer
- Provide deadlocks for storage areas off pedestrian routes

Limiting access

- Specify appropriate heavy-duty hardware, such as dead-bolt locks for storage areas off pedestrian routes
- Limit access to loading docks and other restricted areas by measures such as lockable doors or gates. Where possible close or lock potential entrapment spots after hours
- Avoid gaps in the street such as entrances to interior courtyards, which may create an environment that is isolated after dark

Lighting and sightlines

- Use full-length polished aluminium mirrors (not convex mirrors) and other aids to sightlines to provide views around corners
- Ensure that any low-level vegetation is trimmed in surrounding areas
- Where possible, use and maintain high-branching vegetation
- Where entrapment areas cannot be removed, specify appropriate, high-intensity lighting and aids to visibility, such as mirrors
- Arrange for regular security patrols to pay particular attention to possible entrapment spots such as isolated stairwells and storage areas

Location, design and use of facilities

- Consider the location of car parking in relation to potential entrapment spaces to reduce opportunities for abduction
- Locate signs with care outside building entrances and near alcoves to ensure they do not create entrapment spots

3.7 Gender issues and community safety

Mobility is very important to women. Being able to get from one place to another, often on a tight schedule and/or with children in tow, is crucial to their daily activity. Advocates for safety for women in Australia's capital cities have specifically highlighted the dangers of bus stops and train stations and supported their contentions with systemic research about women's fears of such isolated locations. Repeatedly, women describe feeling unsafe on public transport and at transport interchanges. A commonly reported safety problem is the sprawling nature of interchange areas. Outside of peak times or in a new residential area, such as Burswood Lakes, there maybe a small number of people waiting and using the area and the area feels deserted and isolated.

Making public places safer for women means changing the urban and social environment to reduce the fear of crime and *actual* levels of crime. The specific nature of women's fear of crime in some public places is seldom identified or acknowledged until it is too late. Therefore, we suggest that the Burswood Lakes planning and design team carefully consider the significance of gender in perceptions of community safety, especially at the train station and any transport interchanges.

A transport interchange is the place where we change from one form of transport to another. For example we may walk to the bus stop to catch the bus, or drive to the railway station, park our car in the car park and walk to the train. We may catch the bus to the railway station where we catch a train or hail a cab.

When talking about an interchange, we refer to all elements of the place. These include the place itself – the bus stop, the railway platform, the taxi rank and the car park – and also the infrastructure that links these places or modes of transport – the underpass, the bus stop, the pedestrian tunnel and the telephone.

In many interchange areas, a number of factors commonly make people feel uncomfortable, confused and unsafe, including:

- The station is overcrowded during peak times, and there is insufficient seating for waiting passengers. At night the opposite is often true. There are fewer people waiting, particularly fewer women and children, and the station feels deserted and isolated. Station staff are often less visible at night, if they are working at all;
- Visibility is poor, sight lines are obstructed and/or the lighting is inadequate;
- Access routes are narrow and/or indirect. This sometimes leads to pedestrian congestion or a sense of entrapment;
- It is often a long way from one end of the interchange to the other;
- Signs are inadequate or unclear, making it difficult for people to find their way around;
- The walkways to car parks, and sometimes the car parks themselves, are perceived as dangerous; and
- Because movements to, from and around the interchange areas are predictable, people feel vulnerable. Sometimes the route to a public transit stop is a 'Movement Predictor' – from which it is difficult to escape if followed. The present path to the train station is an example of such a dangerous place.

Wayfinding

- Ensure that there is adequate and clear signage for people to find their way around
- Provide convenient access to help, i.e. station staff, help alerts and escape routes

Lighting

- Provide adequate lighting for easy identification of suspect activity or individual people without 'spotlighting' passengers waiting alone at night
- Ensure that car parks are well-lit and as close to railway platforms and bus stops as possible

Sightlines

- Design clear sightlines into and out of interchanges, as they will increase the risk for potential offenders

Movement predictors

- Design pathways, stairs and ramps wide enough for people to use with prams, strollers and for two wheelchairs to pass (See AS1428, as amended)
- Allow opportunities for exit from paths (especially 'Movement Predictors') to reduce any sense (or reality) of entrapment

3.8 Lighting

Lighting on a potentially dangerous site is a complex matter. Lighting of a site like this raises contradictory, almost paradoxical issues. For example, it is considered dangerous not to light pedestrian paths and spaces. However, it may also be dangerous to light paths and spaces which may be potentially dangerous, thereby communicating to an unsuspecting user that the place is safe, attracting use and potentially putting people using the path at risk.

Lighting is such an important CPTED issue for this site and its environ, it needs to be addressed via a formal crime risk assessment.

Light penetration

Maximise the opportunities for penetration of light into spaces, while controlling light pollution as much as possible.

Consistent lighting

Use multiple lights rather than single fittings to provide consistent lighting levels and to reduce contrast between shadows and illuminated areas, while at the same time providing a mixture of lighting to give pedestrians an impression of warmth, variety and brightness.

Lighting of inset spaces

Ensure that all inset spaces, access routes and signage are well-lit.

Lighting high-risk areas

Avoid lighting of areas that are not intended for night-time use or are considered to be of high risk (see ***Figure 15: Avoid lighting high risk areas***).

Figure 15: Avoid lighting high risk areas

Night lighting

For areas intended to be used at night, ensure that lighting supports visibility (see *AS 1158.1 Road Lighting*).

Directional lighting

Ensure that lighting illuminates pathways and potential entrapment spaces, rather than windows and roads.

Landscaping and lighting

Place lighting in a position that will not be blocked by mature vegetation.

Light 'safe routes'

Identify and light safe routes to discourage use of potentially dangerous alternatives.

Signage lighting

Provide appropriate lighting for signage and maps.

Shielded lighting

Avoid placement of 'unshielded' lighting at eye level to avoid glare, i.e. clear of a zone 1.5m to 3m above ground level.

High-mounted lighting

Install lighting fixtures that are high-mounted, vandal-resistant and deflect downwards.

Lighting to Australian standards

Ensure that all lighting is to Australian Standards.

Overlapping lighting patterns

Avoid overlapping light patterns (absence of glare/pools of light/dark) and provide transition lighting to achieve recognition of people, objects and colours. This is particularly important in areas likely to be used by older people.

Colour rendition and lighting

Use low-pressure sodium lamps with caution, as their colour-draining (monochromatic) characteristics make identification difficult. Lighting should permit the facial recognition of approaching persons at 15 metres. High-pressure sodium lighting is preferable and often cheaper than incandescent lights.

Vandal-resistant lighting

Select lighting that is vandal-resistant and looks robust without appearing institutional or providing an interesting challenge to potential vandals.

Communal area lighting

Provide appropriate communal area (or shared space) lighting to reduce crime risk by increasing opportunities for natural surveillance of and by passing pedestrians.

Lighting of movement predictors

Provide appropriate lighting along pathways and other night movement predictors to avoid opportunities for concealment and entrapment and to encourage people to use safe routes and discourage activity in unsafe places.

Targeted lighting

Ensure that lighting caters for likely pedestrian user groups, as it can help to attract people into safer areas and increase night supervision.

Security lighting

Pay attention to the placement and direction of security lighting to reduce intrusion into dwelling windows.

Lighting obstructions

Ensure that lighting design does not create obstructions that block sightlines, create glare or cast shadows that may be used by intruders to hide.

Heavy-use spaces

Light all heavily used spaces such as car parks, major pedestrian routes and entries to buildings with the power of 50 to 100 Lux (Lumens). The useful ground coverage of an elevated fixture is usually twice its height.

Lighting location

Avoid locating lighting columns and electrical equipment alongside walls or low buildings, as they can provide climbing opportunities and other equipment may be reached for further vandalism or criminal acts.

Photoelectric cells

Use photoelectric cells that are cheaper and easier to maintain and more reliable than time switches and when they fail, they tend to fail in 'on' position.

Bollard lighting

Do not depend on bollards as the only light source. While they are visually attractive, they do not illuminate to a sufficient height for an oncoming person to be seen.

3.9 Landscaping

Landscaping plays an essential part in making an environment friendly and pleasant. However, planted areas are sometimes poorly maintained and vandalised, and they can provide cover for unlawful activities. Landscaping should not detract from pedestrians' visibility, nor should it create secluded areas. Care should be taken in the selection of all plants, bearing in mind their shape and size as they mature. Landscaping can provide can provide an appropriate balance between aesthetics and safety, as an attractive area is more likely to be used.

Sturdy plants

In high-crime areas, rather than planting saplings, consider planting heavy standard (120-140mm girth), extra heavy standard (140-160mm girth) or even semi-mature trees (200-720mm) to make it physically more difficult to snap main growing stems.

'Keep-off' planting

Carefully specify location of planting. For example, use shrubs such as prickly thorns (gorse, berberis, holly or hawthorn) to prevent short-cuts across beds but ensure that no dangers to children are created. It is essential; however, that thorny plants not be noxious weeds and not be located where they can be a danger to cyclists. Carefully balance the advantages of thorny shrubs as access deterrents against the disadvantages or poor appearance of litter trapped in shrubbery. Railings set into low walls can reduce the chance of litter blowing through and getting trapped in vegetation behind.

3.10 Maintenance

Whether deliberate or not, damage which is left unrepaired is a cue to further misuse of the environment. Timely feedback on the deterioration of equipment is essential, as minor faults and repairs can develop and encourage wilful damage. Levels, degree and cost to the community of vandalism are important aspects of the overall picture

A planned maintenance cycle involving full electrical, mechanical and structural inspection is needed to assess the extent of wilful and accidental damage and natural deterioration.

Figure 16: Location requiring graffiti removal

Graffiti walls

Avoid long expanses of light coloured walls that are tempting to graffiti artists, except in areas where the intent is to increase the luminance of lighting, such as parking lots. Where this is the case, it may be advisable to attempt to encourage natural surveillance and a program of graffiti removal (***Figure 16: Location requiring graffiti removal***) rather than hamper the lighting, or possibly provide graffiti artists with their own spaces (see ***Figure 17: Location for graffiti art?).***

Construction phase

During construction, delay installing equipment until the site is ready and remove rubbish as it can provide ammunition.

3.11 Target hardening

Situational crime precaution measures aim to reduce crime by increasing the effort, increasing the risk of being caught and decreasing the reward. One key strategy is target hardening. Target hardening is the concept of opportunity reduction, where the property owner or occupier seeks to deter the criminal by making it as difficult as practicable to steal or vandalise property or buildings. The basis of target hardening is to strengthen the defences of a site to deter the attack and/or delay the success of an attack. By making the physical security of a site stronger, the perceived risk to an offender is increased.

Figure 17: Location for graffiti art?

The longer an offender is required to remain on a site in order to complete the act the greater the chances of apprehension. This is true both:

- *externally,* for example, stronger locks on doors, and
- *internally,* for example, cable locks on computers.

Opportunists do not come equipped with the 'tools of the trade' nor do they always carefully plan their acts. It is therefore sensible practice to limit their perception of any component of this site as an easy target through effective use of target-hardening measures.

Examples of 'target hardening' are the following:

- Blocker plates over doorframe and lock;
- Cages over lights;
- Grilles on windows;
- Shatter film on windows;
- Enclosed shackles on padlocks;
- Window locks;
- Properly constructed fencing; and
- Security doors.

Most target hardening measures are designed as a visible signal to would-be offenders that the site is well protected, attempts to force entry will be time consuming and that there is a greater opportunity that apprehension will occur. It is vitally important that the measures not only strengthen the actual physical security of the site but also send a clear signal that it is a well-defended site.

Target hardening can help to prevent illegal entry to private property, but there are limitations in most systems. Basic hardware is sufficient to increase crime effort in low to medium-risk situations. Again, a crime risk assessment will be necessary to determine which measure most appropriate. Advice from police specialists is essential.

3.12 Second-generational CPTED

This approach is an attempt to expand the 'design thrust' of CPTED to Incorporate social crime prevention strategies, representing a more holistic approach to crime reduction. An example would be encouraging neighbourhood social events after access has been controlled and surveillance improved in that neighbourhood.

Approaches include:

- Community participation;
- Capacity building;
- Local responsibility;
- Integration with community safety initiatives; and
- Community development (see Appendix A for further information on CPTED).

4.0 Context specific guidelines

4.1 Residential areas

As Burswood Lakes is primarily a residential development, the design of housing and associated open space is a critical component of a CPTED strategy. These guidelines will be supplemented by guidelines that focus particularly on the social aspects of the planning and design of higher density housing. These issues are also fully addressed in Marcus and Sarkissian (1986). The design of residential areas has implications for the safety of adjacent public open spaces. Equally, an unsafe public realm can cause safety problems for residents. For example, if gated or other residential developments turn their backs onto the public realm or are enclosed by high fences, legitimate pedestrian activity is likely to be reduced because residents will access and move about their housing estate primarily by car. This poses a risk to legitimate users, for as fear increases, activity is likely to decrease. From the reverse angle, risk to illegitimate users decreases and unlawful activity may increase.

Motorists alone cannot provide the level of safety that a lively pedestrian realm can confer on a public space. Particularly in high-crime areas, paths through a residential development should be designed to allow pre-scanning before use, and should not include places for potential intruders to be in wait. At the same time, however, 'visibility' does not necessarily mean an undifferentiated or uninteresting site.

It is generally unwise to close off a common landscaped area in a residential area entirely. However, subtle 'filters' can be provided to create entry points, such as gates, obvious to residents but less so to passers-by. When entering via a clear access point that differentiates a residential area from the wider public realm, outsiders are unlikely to mistake the interior space for a 'neighbourhood park' or 'public playground'.

It is important to emphasise the need for designers to specify the designated purposes of any open space. Definition is important, but if the intended purpose of the space is not clear, then the risk of illegitimate use is likely to increase. Space with 'confusing cues' legitimises loitering near movement predictors (which may become rape sites), facilitates anonymity and familiarity and helps to rationalise illegitimate behaviour/s (and claims for the ownership of that space). Clear signals help to remove the 'excuse-making' that often accompanies intrusion or criminal activity.

Residential site-entry boundaries

- Employ real or symbolic barriers to help discourage intrusion by strangers into communal landscaped spaces intended for use by residents only
- Treat the boundaries of residential developments with care to allow permeability without having outsiders intruding into private or semi-private residential territories. This is important, as public access to the River via the Golf Course is envisaged
- Eliminate opportunities for casual short-cutting through the site except via designated routes by the strategic location of fences or low planting within the site and at site-entry points. Low fences and walls can define the site perimeter and serve to channel pedestrian movement
- While maintaining opportunities to maximise residential surveillance, avoid paths passing directly by dwelling windows so that pedestrians do not violate the privacy of nearby dwellings

Space hierarchy[9]

- In residential areas, clearly delineate the hierarchy of public open space, community open space (shared areas) and private open space by means of fencing, landscaped buffers, level and material changes or the use of open space as a buffer (see ***Figure 18: Hierarchy of open space***)
- Divide large residential sites into visually identifiable and assignable 'clusters', through use of appropriate fencing, planting and building placement so that open spaces become the legitimate 'territory' of specific groups of dwellings
- Where possible, provide at least a visual buffer between public and private spaces in residential areas

[9] The concept of space hierarchy lies at the heart of the notion of territorial reinforcement. The purpose is to clearly identify ownership and use of different open spaces and to buffer those spaces from each other so that intrusion into private or semi-private spaces cannot occur unintentionally.

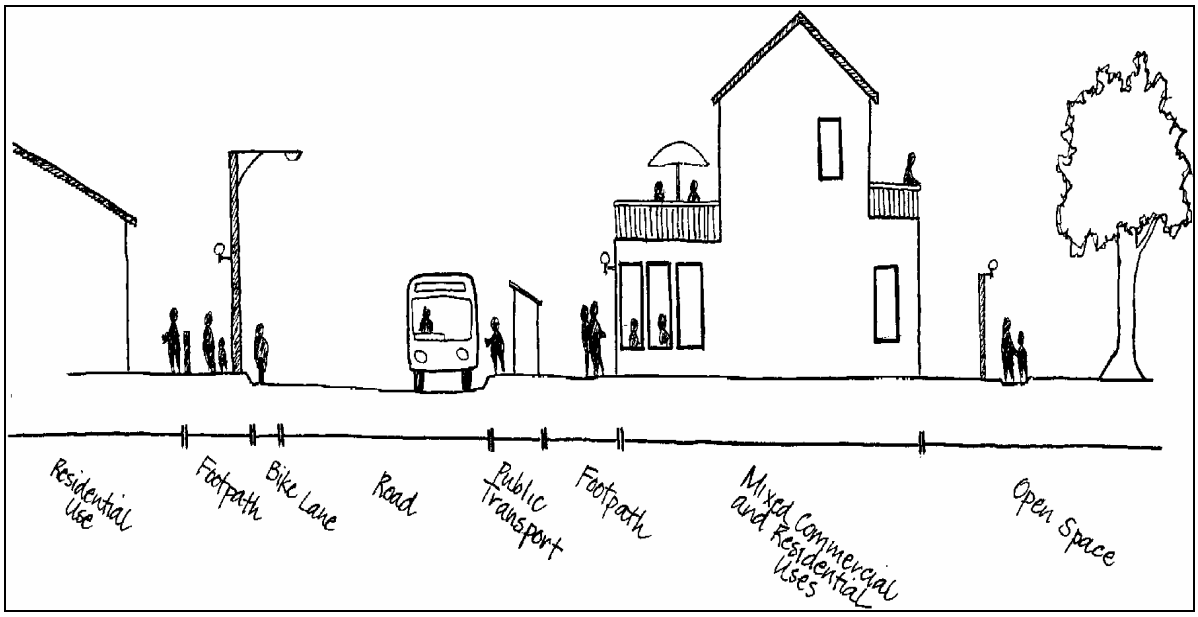

Figure 18: Hierarchy of open space

Natural surveillance

While protecting the privacy of individual dwellings, maximise opportunities for natural surveillance of pedestrian paths from windows of activity rooms[10] of adjacent dwellings (see ***Figure 19: Natural surveillance from 'activity rooms'***).

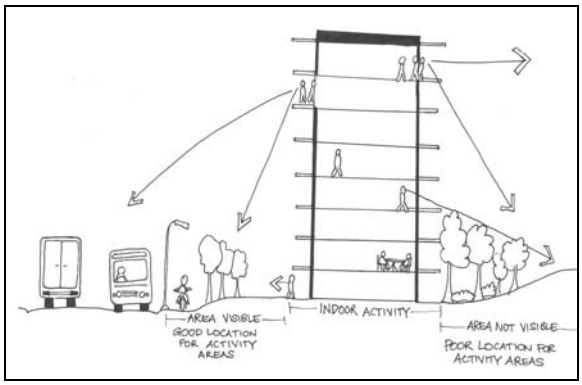

Figure 19: Natural surveillance from 'activity rooms'

4.2 Public open space and parks

The safety of common (or shared) and public open space is directly related to the design of the spaces to encourage natural surveillance, sightlines, ease of wayfinding, and protection from entrapment. Dangerous open spaces:

[10] Activity rooms are living rooms, kitchens and family rooms: rooms where there is likely to be a person who can see the public realm and private yards from a dwelling window.

- Provide places for intruders or assailants to conceal themselves;
- Are difficult to see 'at a glance';
- Have shrubbery, buildings or fences which block sightlines; and
- Are surrounded by blank walls.

Where buildings can provide an 'active edge' to a public space, the activity at the edge can convey safety to the space by means of the natural surveillance opportunities created by its legitimate activities.

In considering the relationships between the public open space and surrounding public and private uses, a systematic **crime risk assessment** process in the design of Burswood Lakes is advised.[11]

Design

- Design public open space to be interesting and inviting to attract usage by legitimate users
- Foster legibility in the design of public open space, so that entrances and exits are easily identifiable; people are then able to find their way around and find each other, and public amenities are easily located
- Avoid creating unused or unusable 'dead' spaces or isolated pockets
- Design for easy maintenance of well used areas
- Avoid open space that adjoins the rear of housing or use measures such as secure fencing that is visibly permeable so that the open space area can be observed from dwellings
- Locate children's play areas so that they are visible from adjoining properties
- Use access-control measures, such as low, visually permeable fencing, to deter illegitimate users from children's play areas

Lighting of open space

- Ensure that paths and areas intended for night use are lit to the same level as the street to indicate that they are 'safe routes'
- Provide a clear demarcation in lighting and landscaping between areas that are likely to be deserted at night and areas where legitimate activity is likely and should be encouraged. For example, it may be best not to light an isolated area at all
- Select and maintain landscaping elements so that they do not block light onto pedestrian routes
- Strategically locate trees and light standards to ensure that foliage does not block light

[11] The crime risk assessment process could include a crime analysis, safety audits, site design review, interviews with nearby users and participatory design workshops. The involvement of W.A. Police and local CPED specialists is recommended.

Sightlines

- Design pathways with unimpeded sightlines, particularly if there are curves or changes in grade
- Avoid below-grade pathways. Well planned street level crossings are safer than underpasses
- Where possible, ensure that parks or play areas are visible from the street and that housing with active frontages overlooks parks or edges of larger parks

Entrapment spots

- Ensure that if pathways have a landscape border, it is of low-lying or high branching vegetation. (Avoid trees or bushes which could create entrapment spots and reduce sightlines)
- Provide multiple entries/exits to all parks and playgrounds

Location of activity generators

Locate activity generators such as kiosks, chess board tables, etc. along the edge of parks or along pedestrian routes.

Maintenance

- Ensure that open space and associated amenities are well maintained, indicating that the area is well cared for by ground staff and residents. The greater the distance between park amenities and community control, the greater the risk of vandalism and graffiti
- Where possible, employ local people as maintenance staff and try to have the same staff working on the site, as they can act as capable guardians

Community involvement

Promote community use and 'ownership' of public open space through local events and activities.

4.3 Recreation areas for children and young people

The key issue in designing recreation environments for children and young people is to find a balance between safety and the recreation needs of young people and children in all the stages of childhood. Much of what is often taken for 'vandalism' in urban open space is often simply the result of heavy use and wear. Children of different ages have different recreation needs and not all need the same levels of protection.

It is important to provide opportunities for young people to 'hang out' in places where their activities do not cause difficulties to neighbouring residents and others using open space.

Sometimes children, women and older people find that they need to pass through areas dominated by lively young people. Where otherwise safe pedestrian paths pass through areas dominated by others who are seen as dangerous, equitable access to and use of pubic open space can be impeded.

'Running the Gauntlet'

- Ensure that no group, while undertaking its daily business on a site, will have to 'run the gauntlet' through an area dominated by others, like young people, who may represent a real or perceived threat to them (see ***Figure 20: Running the gauntlet***)
- Carefully consider the location of pedestrian routes and any elements that could be considered to be generators and attractors of inappropriate activity consider co-location issues such as the location of leisure facilities adjacent to housing for older people. This matter is highly site-specific, however, and is not amenable to these general CPTED guidelines. It can be resolved only through the use of crime risk assessment procedures. A Crime risk assessment is proposed for this site
- Minimise the likelihood of groups taking over spaces that others frequently pass through or use. This can be achieved by providing appropriate active and passive recreation areas for young people and others in locations that do not cause problems for other users of open spaces

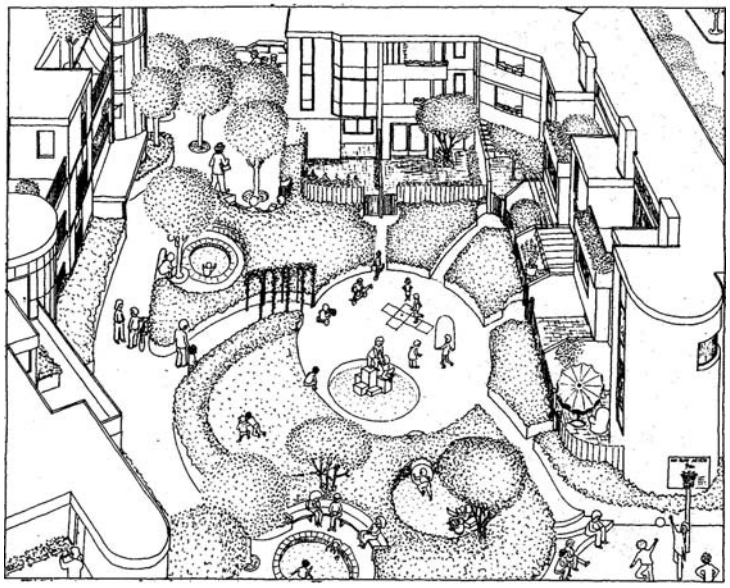

Figure 20: Running the gauntlet (Marcus & Sarkissian, 1986)

Conflicting uses

- Ensure that potentially conflicting activities are not placed next to each other.

Equal recreation opportunities

Ensure that adequate and appropriate equipment is provided for all ages and for both boys and girls so that one group does not dominate or damage recreation equipment intended for other user groups. (This matter is addressed in the guidelines in ***Working Paper 6: Guidelines for Children in the Outdoor Residential Environment***).

Supervising adults

- Provide seating areas with good sightlines to children's play areas for adults supervising children's play.

Young people's recreation

- Provide informal gathering spaces for young people, based on detailed situational planning and risk assessments
- Design places where young people can 'hang out', call their own and socialise among their own peers without adult interference. By means of a crime risk assessment procedure, locate these spaces where they will be convenient for local young people and not cause dangers to others using the space
- Involve young people and children in the process of designing and constructing recreation areas for their use to maximise ownership and care of facilities

Children's preferences

- Ensure that play equipment is selected to meet the developmental needs of children and not exclusively for the maintenance needs of the managing authority

Maintenance of recreation equipment

- Inspect and repair recreation equipment regularly
- Ensure that planting will not be damaged around areas that young people may take over by allowing plenty of standing, sitting and sprawling spaces on horizontal surfaces and low walls around benches and rubbish bins
- Regularly inspect areas where young people gather for signs of substance abuse to uncover problems early and protect others from dangers such as hypodermic syringes, etc.

Sturdy materials

- When taking children's play needs into account, select children's play equipment that is constructed from sturdy, durable, vandal-resistant materials that can be easily repaired if damaged

4.4 Pedestrian routes, lanes and alleyways

The design and use of lanes, alleyways and pedestrian routes have a significant impact on public safety, both real and perceived. Poorly lit lanes, alleyways and secluded or heavily vegetated pedestrian paths can provide potential hiding places and spaces for non-legitimate uses in residential areas.

All decisions about lighting laneways must take into account the local context. Crime risk assessment procedures could be used to address questions such as, "What movement of pedestrians do the laneways predict?"; "Who is likely to be in the laneways at what times?"; and "What nearby land uses are likely to influence safety in the laneway?" Further, who is likely to see what is being lit?

The particular needs of older pedestrians and people with a disability need to be considered in path design. Walking is a very popular activity, but mobility problems are frequent among older people. Strolling and stopping to rest, or for a chat are popular activities among older people. Walking and cycling can provide access to other activities. While being safe and barrier-free, a walking circuit should also be interesting, with changing views and allow for casual social encounters en route.[12]

As noted above, entrapment places must not be created.

There is considerable evidence that describes dangerous places and the locations of sexual assaults in the public domain. For example, the average external rape site is 10 m^2 and has two or more physical barriers (bushes/walls/berms, etc.) that help to restrict victims both psychologically and physically.

Design of pedestrian routes

- Clearly define lanes, alleyways and pedestrian routes
- Ensure that all pedestrian circulation patterns are compatible with, and where possible enhance, other security measures
- Channel pedestrian traffic so that residents using footpaths, especially in the evening, meet other people
- Avoid dense shrubbery around pedestrian paths, set shrubs well back from paths or use 'Keep-off' plant material with thorns or other repelling characteristics, providing that it can still be trimmed and ground cover cleaned and it provides no hazard to children or cyclists
- Design circulation routes with options for length and difficulty of route to encourage casual strolling. (A 'walking circuit'). See ***Working Paper 8: Public Open Space and the Needs of Older People in the Residential Environment*** for further information on the needs of walkers in residential environments

[12] Symbolic barriers (as opposed to fences) can be a useful way of defining space – and making clear its designated purpose.

- Design walkways and bicycle paths forming a collector system to encourage casual social encounters near home
- Design pathways with a system of easily distinguishable hierarchies, from major routes to more 'private' routes

Location of pathways

- Locate pedestrian pathways to enhance other security measures
- Locate paths for views of activity, as well as safety and security

Design of alleyways

- Avoid providing alleyways and access ways in areas where little pedestrian traffic will be expected. Where back lanes are provided pay special attention to micro-design details to reduce opportunities for burglary or entrapment

Lighting

- Provide even lighting along paths
- Identify priorities for lighting, such as commonly used paths
- Attempt to focus lighting on laneways and away from dwellings so that it does not shine into dwelling windows
- Align lighting along paths in residential areas to enable people to see their way and be seen by others in dwellings and those using paths. Lighting should fall directly on paths and not cast dark shadows, especially on steps
- Street scale lighting and pedestrian scale lighting should be appropriate (see ***Figure 21: Pedestrian scale lighting as different to street scale lighting***)

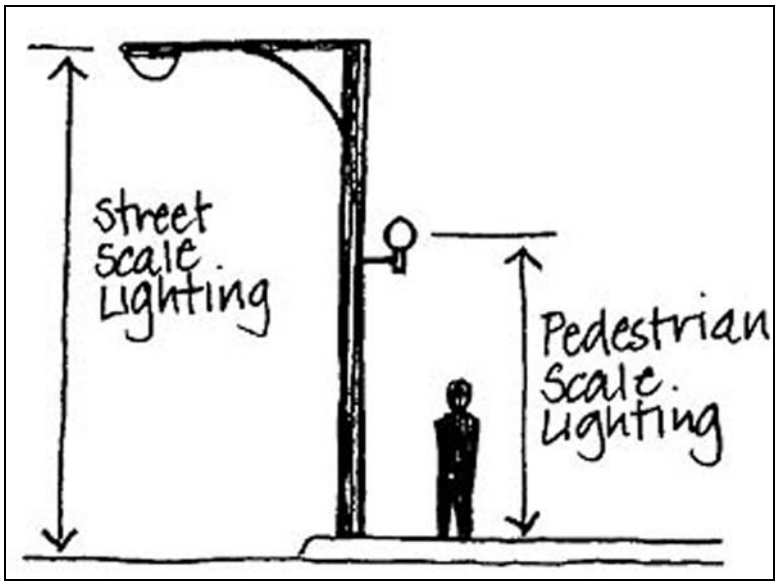

Figure 21: Pedestrian scale lighting as different to street scale lighting

Sightlines

- Align lighting and landscape footpaths so that it is possible to see a considerable distance ahead, and therefore avoid the chance of attack by a hidden intruder. A face should be recognisable from a distance of 15 meters
- Make paths relatively straight for better visibility where that does not create a monotonous appearance. Where possible, ensure that laneways have more than one entrance to avoid 'dead-ends' and entrapment spaces
- Orient paths and planting so that the whole route between the train station, bus stop or outdoor parking areas and building entries can be clearly seen

Legitimate uses

- Encourage the casual use of spaces adjacent to pathways so that they can become 'animated' and filled with legitimate uses, provided this does not intrude on the privacy of dwellings or private yards

Short-cuts

- Avoid 'short-cuts' through housing developments or interior fencing residential buildings that encourage non-legitimate users to move through areas en route to another location

Conflicting uses

- Use alignment of pedestrian paths, fencing, landscaping, built form and lighting to ensure that users of pedestrian routes do not have to 'run the gauntlet' through an area dominated by others who may be threatening to them. Minimise the necessity of groups who are likely to be conflicting (such as older persons and young people) having to take the same route

Dwelling privacy

- While maintaining opportunities for natural surveillance from dwellings, avoid pedestrian routes passing by dwelling windows so that pedestrians do not violate the privacy of residents
- Provide shades to screen dwelling windows from direct rays of street lights or locate lights away from windows

Natural surveillance

- Where possible, provide footpaths that are visible from activity rooms (not bedrooms, bathrooms or laundries) of adjacent buildings and dwellings

Direct access

- Provide direct access routes to and from buildings from streets, car parks and public transport. This is particularly important for dwellings that are closest to the Burswood train station so that pedestrians are not in danger when walking home from the station

Escape routes

- Provide a visible exit point that provides an alternative route to enable a person to avoid a situation in which he or she might feel threatened. Signposts identifying exit routes can reduce feelings of isolation

Barrier-free access

- Make paths 1360mm wide to allow wheelchairs to pass
- Provide space for wheelchairs to make a complete turning circle (1500mm X 1500mm)

Slope of paths

- Ensure that major on-site pedestrian access routes do not have a slope of greater than 5 percent (1:20). These are considered paths (or walkways); those with steeper gradients are considered ramps
- Walkway widths vary according to the amount and type of traffic using them They should be wide enough to accommodate two walking people side by side or a person in a wheelchair and a person using a walker (to give support or just for sociability). All paths of any importance should be 1500mm wide (minimum), with major paths 1830mm

Paving and walking surfaces

- Construct walking surfaces of predictable, non-slip and non-glare substances. Select surface materials for stability and firmness, that are relatively smooth in texture and have a non-slip surface
- Minimise use of expansion and contraction joints (less than 12.5mm in width)
- Avoid soft or loose surface materials
- Provide clear edge definition between paths and planting. Where edging or paving does not meet at grade, falls can occur. On the other hand, if planted areas do not have edges, plant materials can fall or be blown onto paths, making them slippery, especially when wet
- Select plant materials that will not be slippery if they fall on paths (large leaves are safer than small ones)
- Set back planter beds as far from paths as possible
- Use high edging (such as garden walls) which can be used as seating to define edges of paths and planter beds; stained broom-finished concrete is the best material
- Brick is preferable to tile. Lay it on concrete, rather than sand for greater stability; if exposed aggregate is used, it should not be overexposed; small stones are easiest to

negotiate. See ***Working Paper 7: Planning Design of Public Open Space in Burswood Lakes*** and ***Working Paper 8: Public Open Space and the Needs of Older People in the Residential Environment*** for further details on path design and accessibility

Maintenance

- Ensure that laneways and fencing on laneway boundaries are adequately maintained

4.5 Bicycle paths

Bicycle paths are major benefits for any community, which can rely on bicycles for public transport, as any reduction in automobile use reduces the negative impacts of the city on local and global environmental problems. As Burswood Lakes is to be a transit-orientated development (TOD), it is critical that convenient access for cyclists be provided.

To maximise use of cycle paths, it is essential that they provide a safe environment for cyclists of all ages, with adequate and safe facilities along the routes and at destinations.

Safe routes

- Ensure that bicycle routes are selected both for convenience and security, i.e. routes with vehicle and pedestrian traffic during the day and evening, with as few empty spaces and underground crossings as possible
- Ensure that routes are well lit and well maintained, with clear signage
- Avoid tall bushes, dense shrubbery and dense clusters of trees immediately adjacent to routes and at predictable stopping points such as road crossings
- The rule of thumb is low planting (maximum height 600mm) and high-branching trees (2 metres) to open sightlines. These are particularly recommended within a distance of 15 metres from bicycle stop signs or road junctions

Signage

Clearly sign and light entrances to routes passing through relatively isolated areas and provide clearly signed alternative night-time routes. As the identification of safe night-time routes will differ in each location because of the contextual nature of crime, it will be necessary to use crime risk assessment procedures to determine specifically which routes need particular attention.

Bicycle parking areas

- Ensure that bicycle parking areas are well lit and located where they can be informally surveyed from streets and buildings
- Provide bicycle parking and locking facilities in accordance with AS2890.3. Rails ('stands') are not secure facilities for long-stay users. Rails are only suitable for short-stay users

- All arrangements with respect to bicycle parking at the train station need to be resolved in consultation with police crime prevention specialists and the appropriate rail authority

4.6 Bus stops, train stations and taxi ranks

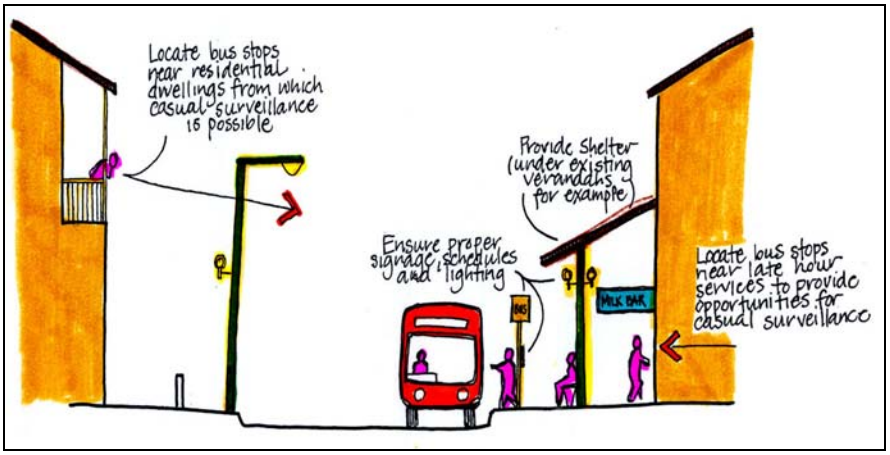

Figure 22: CPTED principles related to bus stop provision

Safety at bus stops, rail stations and taxi ranks is an important issue (see ***Figure 22: CPTED principles related to bus stop provision***). These transport access points have been criticised due to their locations away from major activity areas such as shops, and the subsequent lack of opportunities for natural surveillance. Some stations have developed a deteriorated appearance and have become sites for graffiti. Bus stops are also a common gathering point for young people who may in some cases be perceived as a threat by women and older people waiting for public transport.

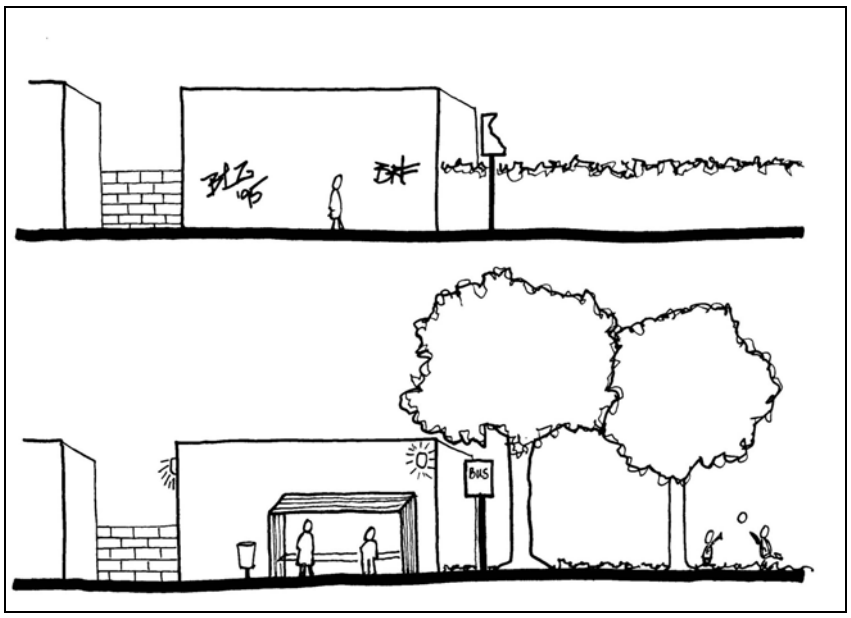

Figure 23: Bus Stop: CPTED Principles vs vandalism and negligence

While site-specific interventions require crime risk assessments to be carried out, some basic principles can guide redesign and redevelopment of existing facilities and inform new planning and design (see ***Figure 23: Bus Stop: CPTED Principles vs vandalism and negligence***). Because it is important to encourage use of the Burswood train station, careful attention to CPTED issues in its redevelopment is strongly recommended. For this work, a crime risk assessment will be required.

Lighting

- Ensure that the areas adjacent to the train station, bus stops and taxi ranks are well lit and protected from the weather. Priorities can be developed using crime risk assessment procedures
- Ensure that lighting within bus shelters is not so bright as to affect the ability to see into darker surrounding areas

Visibility

- Ensure that persons waiting at bus stops, train stations and taxi ranks are clearly visible from the street and adjacent buildings, where possible. The development of the Dome site will assist this and potentially confer safety on route between that site and the train station

Sightlines

Remove or ameliorate any walls, landscaping, fences or other structures which block sightlines to bus stops.

Location

- Avoid locating bus stops, train stations and taxi ranks adjacent to vacant land, alleys, car parks and buildings set far back from the street or near possible entrapment spots created by either landscaping or the built form
- Provide short, safe routes to the train station, bus stops and taxi ranks from night-time venues such as cinemas, etc. (This will apply particularly to the redevelopment of the Dome site; see ***Figure 24: Bus stop at Dome site***)

Figure 24: Bus stop at Dome site

Natural surveillance

Based on a local crime risk assessment, consider relocating bus stops in isolated locations to a spot where natural surveillance is possible. The redevelopment of the dome site will provide opportunities for this to be achieved.

Entrapment

Design bus shelters to reduce the possibility of entrapment and to improve sightlines.

Figure 25: Burswood Train Station

Construction and maintenance

- Construct shelters of graffiti -resistant and vandal-resistant materials, including the use of protective coatings. This work win, of course, be undertaken in conjunction with the relevant authorities. Nevertheless, it is important that CPTED considerations inform all design decisions
- Ensure that bus stops and the train station are well maintained, free of rubbish and graffiti (see ***Figure 25: Burswood Train Station***)
- Encourage local residents and workers to report suspicious behaviour at or near bus stops and the train station (appropriate signage is recommended)

Signage

- Provide adequate signage so that it is easy to find the train station, bus stops and taxi ranks
- Provide signage that indicates a number to call for maintenance
- Provide vandal-proof signage with up-to-date passenger information such as routes and timetables to avoid long waits and uncertainty

Co-location

Where possible, ensure that public telephones are located near the train station, bus stops and taxi ranks.

4.7 Public toilets

Public toilets can provide efficient locations for criminal activity: drug-use, vandalism and entrapment for example. Appropriate design can help to mitigate crime related to public toilets.

Location

Locate public toilets adjacent to high traffic areas rather than isolated, out of the way locations. However, ensure that seats and phones are not placed too near toilets as this legitimises loitering.

Secure access

To reduce the danger of entrapment, ensure that external doors can only be locked by a legitimate key holder.

Visibility

- Design approaches and entrances to be highly visible so that people cannot loiter or enter without being seen
- Ensure that entrances to public toilets in playgrounds are visible from the playground

Maintenance

Ensure that facilities are well maintained, vandalism is repaired and graffiti is promptly removed, as this will promote increased usage, a safer feeling and less likelihood of damage (see ***Figure 26: Vandalism Maintenance Icon***).

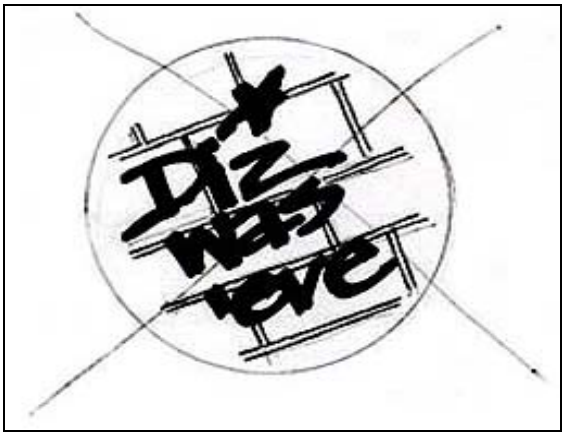

Figure 26: Vandalism Maintenance Icon

4.8 Building design

The design of buildings can contribute to community safety by reducing opportunities for entrapment and fostering natural surveillance. Providing an opportunity for residents to see inside the lobby when they enter and survey the surrounding open space before they exit a building, especially at night or after hours, increases their safety.

It is recommended that the lowest risk activities are placed in the highest risk areas. For example, activities which generate activities after hours or on weekends could be strategically positioned to provide employee supervision near entries, overlooking pathways or adjacent to loading docks, etc.

Hidden areas and blind corners provide excellent hiding places for potential criminals. Where such features cannot be removed, provide mirrors, windows, and improved lighting, ensuring as much as possible that they are vandal-resistant.

Building entrances

- Ensure that entrances to buildings are clearly defined, secure, well-lit and face the street. For example, encouraging a clear hierarchy of space from the public street to the semi-private areas of buildings can increase the territoriality of the building and make it uncomfortable for offenders to loiter in entranceways
- Design entrances so that they cannot conceal intruders and to allow for a clear view from within buildings. Design lobbies to be visible from the exterior
- Make the area around the main entranceway clearly distinguishable from public walkways leading to it so that users feel distinctly that they are entering an area controlled by the users

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Glossary of Terms

Activity generators

They are features that tend to create (generate) activity. It can result in positive as well as negative impact. For example picnics in a local park confer an added safety element to an out door space, that could in the absence of people might be less safe. Alternatively, the location of a tavern in a particular area might generate high levels of undesirable activities in what might have been a very quiet uneventful neighbourhood.

Entrapment spaces

Those are spaces usually concealed from view that can be used as hiding places or as places for trapping the unwary and for concealing criminal acts.

Movement predictors

Denotes any lane, path, or track, which follows a predictable course and where there is an absence of alternative routes.

Natural ladders

This term refers to the unintentional provision of access to yards or buildings, by the building of fences, low walls, or other pre-build structures that make it easy to gain access to places normally inaccessible except through the use of a ladder.

Natural surveillance

This refers to facilitating the opportunity for incidental observation of a street, front of house, a park, or other space that can be observed while engaged in other activities. For example, watching the street from the kitchen window while washing the dishes, or cooking a meal, or keeping an eye on prowling strangers while watering the grass.

Target hardening

A means of opportunity reduction that aims to make a potential target of attack inaccessible or unattractive and make the attack itself dangerous or unprofitable for the offender (locks, window film, grilles, computer locking mechanisms, fencing, security doors, cages of lights). These measures are designed as a visible signal to would-be offenders that the site is well-protected and attempts to force entry will be time-consuming and a greater opportunity for apprehension will occur.

Territoriality

This concept relates mostly to private or semi private space. It is also used in a group context, were groups of people, or communities, develop a sense of ownership, about a common space, such as a park, or a street for example.

Appendix A: What is Crime Prevention through Environmental Design?

By Wendy Sarkissian 2002

1.0 General concepts

Crime Prevention through Environmental Design (CPTED) is the design and effective use of the built environment in order to lead to a reduction in the fear and incidence of crime, and an improvement in the quality of life. CPTED involves the design of a physical space so that it enhances the needs of legitimate users of the space. This emphasis on design and use deviates from the traditional 'target-hardening' approach to crime prevention.

Owners, managers and community users have a responsibility to report to the police all suspicious activities and criminal occurrences; without this, the effectiveness of CPTED is minimised. Creating and maintaining partnerships with the community and local government will aid in improvement of quality of life issues and make for a safer environment and a more productive community.

For CPTED to be successful, it must be understandable and practicable for the normal users of the space. The normal users know more about what is going on in the environment and they have a vested interest (their own well-being) in ensuring that their immediate environment operates properly.

2.0 The Three-D's

The '**Three-D's**' approach to space assessment provides a simple guide for the normal users in determining the appropriateness of how their space is designed and used. The Three-D concept is based on the three functions or dimensions of human space:

1. All human space has some designated purpose;
2. All human space has social, cultural, legal or physical definitions that prescribe the desired and acceptable behaviours; and
3. All human space is designed to support and encourage the desired behaviours.

CPTED involves the design of the physical space in the context of the legitimate user of the space, the normal and expected use of that space, and the predictable behaviour of the bona fide users and offenders. CPTED emphasises the connection between the functional objective of space utilisation and behaviour management. We must differentiate

between designation of the purpose of space, its definition in terms of management and identity and its design as it relates to function and behaviour management.

By using the 'Three D's' as a guide, space may be evaluated by asking the following types of questions:

2.1 Designation

- What is the designated purpose of this space?
- For what purpose was it originally intended?
- How well does the space support its current use or its intended use?
- Is there conflict?

2.2 Definition

- How is space defined?
- Is it clear who owns it?
- Where are its borders?
- Are there social or cultural definitions that affect how space is used?
- Are the legal or administrative rules clearly set out and reinforced in policy?
- Are there signs?
- Is there conflict or confusion between purpose and definition?

2.3 Design

- How well does the physical design support the intended function?
- How well does the physical design support the desired or accepted behaviours?
- Does the physical design conflict with or impede the productive use of the space or the proper functioning of the intended human activity?
- Is there confusion or conflict in the manner in which physical design is intended to control behaviour?

Once these questions have been asked, the information received may be used as a means of guiding decisions about the use of human space. The proper functions have to be matched with space that can support them.

The design has to assure that the intended activity can function well and it has to directly support the control of behaviour.

3.0 Five key CPTED principles

CPTED is supported by the following five overlapping principles that are applied to specific sites and situations.

3.1 Territoriality

Territoriality is a concept that clearly delineates private space from semi-public and public spaces, and creates a sense of ownership. People usually protect territory that they feel is their own and have a certain respect for the territory of others. Fences, paving, art, signs, good maintenance and landscaping are some physical ways to express ownership. Identifying intruders is much easier in a well-defined space. An area that looks protected gives the impression that greater effort is required to commit a crime. A cared for environment can also reduce fear of crime.

Areas that are run-down and the subject of graffiti and vandalism are generally more intimidating than areas that do not display such characteristics.

Ownership creates an environment where appearance of such strangers and intruders stand out and are more easily identified through:

- The enhanced feeling of legitimate ownership by reinforcing existing natural surveillance and natural access control strategies with additional symbolic or social ones;
- The design of space to allow for its continued use and intended purpose; and
- The use of pavement treatments, landscaping, art, signage, screening and fences define and outline ownership of space.

3.2 Natural surveillance

Natural surveillance is a design concept directed primarily at keeping intruders under observation. Provision of natural surveillance helps to create environments where there is plenty of opportunity for people engaged in their normal behaviour to observe the space around them.

Criminals usually do not want to be seen. Placing physical features, activities and people in ways that maximise the ability to see what is happening discourages crime. For example, placing cafes and kiosks in parks increases natural surveillance by park users, while placing clotheslines near play equipment in a multiple unit development increases natural surveillance of the play area. Barriers such as bushes or sheds can make it difficult to observe activity. Areas can be designed so they are more easily observed through:

- Design and placement of physical features to maximise visibility. This will include building orientation, windows, entrances and exits, carparks, rubbish bins, walkways,

landscape trees and shrubs, use of wrought iron fences or walls, signage and other physical obstructions;
- Placement of persons or activities to maximise surveillance possibilities; and
- Minimum maintained lighting standards that provide for night-time illumination of carparks, walkways, entrances, exits and related areas to promote a safe environment.

3.3 Access control

Access control is a design concept directed primarily at decreasing criminal accessibility. Provision of natural access control limits access and increases natural surveillance to restrict criminal intrusion, especially into areas where they will not be easily observed. Access can be restricted by physical barriers such as bollards, fences, doorways etc or by security hardware such as locks, chains and alarms. Human measures can also be used, such as security guards. All these methods aim to increase the effort required to commit a crime and therefore, reduce the potential for it to happen.

When present, intruders are more readily recognised through:

- Use footpaths, pavement, gates, lighting and landscaping to clearly guide the public to and from entrances and exists; and
- Use gates, fences, walls, landscaping and lighting to prevent or discourage public access to or from dark or unmonitored areas.

3.4 Activity support

Activity support is the presence of activity planned for the space. Activity support involves placing activity where the individuals engaged in an activity will become part of the natural surveillance system. Examples include:

- Place safe activities in areas that will discourage would be offenders, to increase the natural surveillance of these activities and the perception of safety for normal users, and the perception of risk for offenders;
- Place high-risk activities in safer locations to overcome the vulnerability of these activities by using natural surveillance and access control of the safe area;
- Locate gathering areas in locations that provide for natural surveillance and access control or in locations away from the view of would-be offenders; and
- Improve the scheduling of space to allow for effective use and appropriate intensity of accepted behaviours.

3.5 Maintenance

Proper maintenance of landscaping, lighting treatment and other features can facilitate the principles of CPTED, territorial reinforcement, natural surveillance and natural access control. Functions include:

- Proper maintenance of lighting fixtures to prescribed standards;
- Landscaping which is maintained at prescribed standards;
- Minimising the conflicts between surveillance and landscaping as the ground cover, shrubs and trees mature.

4.0 Crime Risk Assessment: Key design elements

During a crime risk assessment process, specific types of problems can be identified. These include features such as activity generators, edge effects, movement predictors, conflicting user groups, crime "hotspots" and displacement effects. Once identified, CPTED principles can be brought to bear to reduce the impact of these problems. These are summarised below.

4.1 Activity generators

Activity generators are features that tend to create local activity: playgrounds, benches, picnic areas and kiosks. Crime opportunities can be high in such areas if CPTED is not applied. In some circumstances, activity generators can be used to reduce opportunities for crime.

4.2 Edge effects

Edge effects are generated around the actual, or perceived, physical borders of different land uses, such as the edge of a park, the border of a commercial strip or around a shopping mall. Research has shown that high crime rates have been found in such areas. Contemporary CPTED aims to identify, soften or eliminate as many as possible.

4.3 Movement predictors

Movement predictors are predictable or unchangeable routes or paths that offer few choices to pedestrians. Pedestrian bridges, enclosed pathways and staircases are examples. Often alternate routes are unavailable to pedestrians and this becomes a problem, especially if the movement predictor contains entrapment areas where offenders can hide and wait for victims. Movement predictors also determine the awareness spaces that offenders have of neighbourhoods and where targets may be located.

4.4 Conflicting user groups

Urban features designated for one legitimate group can conflict with other groups nearby, such as older people. In addition, different groups using design features for different reasons can often cause conflicts, such as walking trails used by both bicyclists and hikers. Attention must be given to avoid generating opportunities for problems by creating or exacerbating conflicts between user groups.

4.5 Hotspots

Hotspots are existing high-crime locations that can affect a nearby development. These can include areas of high car theft such as certain underground parking lots, pick-pocketing in bus terminals, or specific pubs experiencing fights at closing time. Consideration must be given to the proximity of such locations and how to provide for public safety at the proposed development.

4.6 Displacement

The 'displacement phenomenon' occurs when crime is moved away, or drawn into, new developments. Many aspects of a problem or crime can be displaced, including its place, timing, and nature of offence, target and the method. Research has shown that displacement is not always negative. It can be controlled, and even used positively, if proper CPTED planning principles are incorporated.

5.0 Thinking like a criminal when designing to reduce crime: rational choice theory

Criminologists have long known that criminals make rational choices about their targets and generally:

- The greater the risk of being seen, challenged or caught, the less likely they are to commit a crime;
- The greater the effort required, the less likely they are to commit a crime;
- The fewer the reasonable or believable excuses that can be offered, the less likely they are to commit a crime; and
- The lesser the actual or perceived reward, the less likely they are to commit a crime.

CPTED principles in planning, design and management of the environment are therefore used to ensure that:

- There is more chance of being seen, challenged or caught;
- Greater effort is required;

- Territorial boundaries make it clear when people are not on public land or in public space;
- The actual or perceived rewards are less; and
- Opportunities for criminal activity are minimised.

6.0 My approach to CPTED analysis

6.1 A holistic approach by thinking 'social'

Creating safe communities is a complex matter, which relies on a delicate balance between physical and social interventions. Earlier approaches, relying on target hardening, hardware and 'defensible space' have been supplanted by approaches that are more comprehensive. One recent development is **'Second-generation' CPTED**, developed by G. Saville and G. Cleveland in 1997. It attempts to expand the 'design thrust' of CPTED to incorporate social crime prevention strategies for a more holistic approach to reducing crime. An example would be encouraging neighbourhood social events, after access has been controlled and surveillance improved in that neighbourhood. (After all, there is no point in having eyes on the street if those eyes are not willing to do anything about crime.)

6.2 Working at all three scales: *micro, meso and macro*

Research has already demonstrated convincingly that CPTED is an effective tool in reducing opportunities for crime, fear of crime and nuisance problems. However, CPTED principles must be incorporated into planning and development on a consistent basis to ensure safe development in future years. This should include careful assessment of CPTED principles at ***micro***, ***meso*** and ***macro*** levels.

Physical design interventions can certainly minimise risk; that can be guaranteed. However, they cannot provide assurances that crime can be prevented. Rather than a prescriptive approach to CPTED, it is necessary to experiment and explore, embracing a range of theoretical approaches which lead to an understanding of how opportunities are created and criminal choices are made. As crime and fear of crime are situational in nature, any guidelines will have to be tailor-made at the local level to meet the needs and priorities of the community.

6.3 The crime risk assessment (CRA) process

A crime risk assessment (CRA) process represents the most systematic way to determine which CPTED strategies apply, based on the context of a specific site. The risk assessment incorporates four elements.

Stage 1: Site visit, including interviews or surveys with local residents and other relevant persons, including preliminary discussions with local police. Photo surveys of the site and

the surrounding area by day and night are sometimes conducted. Safety audits can also be used.

Stage 2: Preliminary reviews, including more in-depth discussions and meetings with CPTED-trained police officers, residents, planners, or CPTED consultants. This process can take the form of planning meetings, focus groups, meetings with the public, and so forth.

Stage 3: *A crime risk assessment*, including crime analysis of available statistics, local demographics, mobility patterns and any available forecasts. On complicated or large projects, specialists use 'hotspot' analysis, and other technical techniques.

Stage 4: Design reviews, including architectural design workshops and a CPTED review of existing plans are conducted. Detailed landscaping plans and models, where appropriate, can be used to examine sightlines, movement predictors, entrapment areas and natural surveillance locations. This stage would also pay attention to technical issues such as lighting, target hardening, finishes and detailed landscaping plans.

Appendix B: Conflicts between Crime Prevention and Ecological Sustainability[14]

Recent concern about crime in Australian cities has encouraged some authorities to propose the introduction of comprehensive lighting programs to protect pedestrians at night. Equally, selection and pruning of vegetation in high-crime areas require consideration of CPTED principles. While it is possible to balance ecological and crime-prevention concerns in plant selection, the problem of lighting for security is more difficult. Increasing city lighting undoubtedly increases energy use and contributes to pollution. The possible conflicts between CPTED principles and ecological sustainable design or development (ESD) need to be explored in implementing any CPTED strategy.

Take some examples. Dense developments, if well designed, can reduce crime because of the increased natural surveillance connected to having more people in a place. Dense developments are likely to be more ecologically benign than suburban sprawl. However, poor design can contribute to crime or inappropriate behaviour. Territoriality, natural surveillance and image are important factors in design for crime reduction in dense developments.

On the other hand, planting to achieve CPTED objectives often leaves very little space for animal habitat areas. An ecological animal habitat matrix includes patches of low, medium, and high shrubs, along with trees, in order to create a vertical and horizontal stratification that maximizes 'edge' ecotone conditions. Connections between these patches are also very important for local fauna.

Some possible conflicts between CPTED and ESD are the following:

Lighting

- light pollution
- use of non-renewable energy sources through lighting
- pollution and creation of Greenhouse gases from energy uses, especially for lighting

Landscaping

- creation of unnecessary heat islands in urban areas by trimming or elimination of vegetation
- excessive paving causing runoff and drainage problems and impeding percolation into soil
- effect on drainage and soil stability of excessive pruning

[14] Extract from ACT Crime Prevention Guidelines (1998)

- losing the benefit of energy-efficiency features of using deciduous trees if they must be pruned to preserve sightlines

Target Hardening

- energy and life-cycle costs of target hardening measures
- the increased use of locks, bars, heavy doors, and other security devices greatly increases energy and material consumption, as well as waste and pollution
- high-energy consumption manufacture or resource extraction/refinement processes required to produce metal fences and gates

Durability and Maintenance:

- using materials that weather well is important for reducing consumption, waste and pollution
- low maintenance landscapes, which need no pesticides, fertilizers and as little water as possible have the least ecological impact
- a small consumption of materials and energy to repair immediately will help to reduce larger repair jobs in the future

This subject requires further research if we are to ensure that, in meeting CPTED requirements, we do not inadvertently contribute to either local or global ecological problems.