Cockburn Central West Grade Separation Pedestrian Facility Investigation

Prepared by

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1. Introduction

This Grade Separation Pedestrian Facility (GSPF) investigation paper has been prepared in response to addressing Modification Condition (1) 6, which requires the following to be undertaken in support of the endorsed Structure Plan:

> *The preparation of a standalone Pedestrian Movement Plan including the analysis and investigation of a possible grade separated pedestrian connection to the Cockburn Central Town Centre, to the satisfaction of the City.*

The GSPF investigation paper provides a high level assessment for the grade separated options alongside at-grade solutions. A full technical investigation involving surveying pedestrian movements and a prioritisation assessment of GSPF is not deemed to be warranted as part of the above requirements, and should only be progressed at a regional level by City of Cockburn, if deemed to be necessary.

The main focus of this paper is the movement of pedestrians between Cockburn Central West and the Town Centre as noted in the modification condition above. Therefore, the assessment of GSPF will focus on the appropriate linkages on Midgegooroo Avenue between Cockburn Central West and the Town Centre.

2. Range of Pedestrian Movement Facilities

Pedestrian movement can be controlled through various mechanisms other than GSPF, as depicted in the table below. The strategies to control pedestrian movement can be achieved through the use of one or more of the following:

Strategies	Purpose / Objective	Treatments
Time separated facilities	To minimise conflict between pedestrians and vehicles by allotting short time periods for use of a section of road by pedestrians, alternating with periods for use by vehicles	Pedestrian crossings (zebra) Children's crossings. Pedestrian actuated traffic signals (mid-block) Pedestrians at signalised intersections.
Physical pedestrian facilities	To increase the safety of pedestrian by the use of physical aids within the roadway so as to reduce conflict between vehicles and pedestrians and simplify the decisions which both pedestrians and drivers have to make.	Pedestrian refuges Traffic islands Medians Kerb extensions Loading islands Safety zones Pedestrian fencing
Grade separation	To increase the safety of pedestrians by eliminating conflict between vehicles and pedestrians.	Subways and bridges
Warning signs	To warn the presence of Pedestrians or pedestrian facilities ahead.	Static or LED Signage

Source: Manual of Uniform Traffic Control Devices 2003 Edition – Fifth Issues 2013 – Part 10 Pedestrian Control and Protection – Queensland Government (Modified)

Safety and convenience for pedestrians are important considerations as part of the planning process and should be considered during the planning of new urban roads, particularly where anticipated pedestrian and vehicular traffic volumes are expected to influence the design of the road. The pedestrian movement facility options to be implemented should be broadly considered against a set of eligibility elements, an example is provided in Attachment 1.

3. Purpose and Use of Grade Separation Pedestrian Facilities

GSPF are used and are required where it is determined that a complete separation of pedestrian and vehicular traffic results in an easier and safer environment for pedestrians to walk to major destination points such as public transport nodes, schools, shopping centres, etc. GSPF are usually implemented in areas where there are:

- Significant physical barriers to pedestrian movement and safety (i.e. rail, freeways, etc.);
- Poor site lines/ visibility to pedestrian crossings;
- High vehicular volumes and/or high speed roads;
- High percentages of heavy vehicle usage;
- Requirements for optimised traffic flow (i.e. freeway offramps).

If it is determined that a capital intensive investment is required, such as the installation of GSPF, a detailed prioritisation assessment should be undertaken. The prioritisation assessment would allocate scores against an established set of criteria, the higher the score and rank the higher the priority of the proposed solution would be in the local / district context (refer to *Technical Direction For Traffic, Safety and Transport Practitioners – Pedestrian Bridge Eligibility and Prioritisation Assessment – September 2012 by NSW Transport Roads and Maritime Services).*

4. Considerations for Grade Separation Pedestrian Facilities

In the case of existing roads within an established area, the need and feasibility for GSPF is a complex issue. The installation of GSPF come at a significant capital costs when compared with other traffic and safety management devices, and in some circumstances, introduce other safety concerns if they are not utilised or designed appropriately. The eligibility and suitability of GSPF will be dependent on a number of local conditions which will assist in determining if this particular approach is appropriate / inappropriate.

It is acknowledged that the two most common approaches have inherent challenges, for instance, pedestrian overpasses will increase walking distances and likely to increase the journey time when compared with at grade alternatives. Furthermore, in some circumstances, the additional effort (perceived and/or actual) associated with using a pedestrian bridge could discourage users and usage of the infrastructure. Therefore, a pedestrian bridge must not unduly subject users to a journey with increased time and distance without clear benefits.

In the case of pedestrian subway tunnels, careful consideration needs to be given to their installation, particularly in relation to ensuring individual security for uses, a perceived lack of personal safety may result in poor usage of the facility even with measures to discourage pedestrians from crossing the road i.e. pedestrian fencing.

Together with the above issues, the implementation of these pedestrian safety measures will also need to consider the following, and can be expensive to resolve:

a) Pedestrian Overpasses:
   - Vertical clearances required for road traffic.
   - Topography of the site (i.e. differential fall).
   - Relocation of overhead services (i.e. power lines) and underground services (i.e. water, sewerage, drainage).
   - Existing built form infrastructure (i.e. houses, apartments, retail, offices, and crossovers/entrances).
   - Footing requirements.
   - Construction techniques.

b) Pedestrian Subway Tunnels:
   - Relocation of underground services.
   - Flooding levels.
   - Requirements for cleaning, maintenance and lighting.
   - Constraints on construction techniques.
   - Disruption to traffic (cut and cover method).

5. Cockburn Central Pedestrian Movement Plan

In considering all pedestrian movement facilities the pathways of pedestrians must be identified along with the associated major attractors and destination points. Movement of pedestrians internally, through, and exiting the site will help to assess the possible installation of safety facilities to assist in the safe movement of pedestrians.

Attachment 2 provides the primary and secondary pedestrian and cycle routes within the immediate project area. It is also identifies the major and minor destinations along with existing pedestrian movement facilities (i.e. signalised intersections).

The plan identifies two significant pedestrian / cycle spines linking Cockburn Central West and the Town Centre, these being: Junction Boulevard and Signal Terrace. Both of these streets provide a strong east / west linkage between two major destination points, being the Cockburn Central Train Station and the City of Cockburn Integrated Regional Recreation Facility.

The movement plan identifies that there are three controlled intersections which could provide a safe movement facility for pedestrians if the signals have the appropriate pedestrian phases to allow the safe and efficient movement of pedestrians. However, Junction Boulevard is proposed to support an uncontrolled pedestrian intersection, therefore it is vital that a range of supporting pedestrian movement facilities be investigated further at this particular location.

6. Cockburn Central West Grade Separation Pedestrian Facility Options

When assessing the provision of GSPF at Cockburn Central West only three potential locations can be considered for implementing these facilities, being:

- Stockton Bend;

- Signal Terrace; and
- Junction Boulevard.

The above locations represent existing pedestrian linkages to the Cockburn Central Town Centre and would be replicated on the west side of Midgegooroo Avenue to ensure the overall development is appropriately integrated.

However, Stockton Bend is not considered to be appropriate locations for either of these facilities as it does not provide a direct path to and from major pedestrian destination points within the project area. As a result, the useability of the proposed GSPF infrastructure would be adversely affected and not considered to be a viable option from a safety and feasibility perspective.

The list below discusses the GSPF options and the associated difficulties with the possible delivery of such infrastructure:

6.1 Signal Terrace – Pedestrian Overpass

Signal Terrace has been earmarked as a controlled signalised intersection, being the only controlled intersection on Midgegooroo Avenue for vehicular and bus movements into Cockburn Central Town Centre. As such, a time separated facility can be incorporated within the phasing of the traffic lights to assist in the safe movement of pedestrians.

The introduction of a pedestrian overpass would be seen as a replication of a common pedestrian movement facility. Furthermore, it is expected that the overpass would visually impact on the intersection itself possibly creating additional safety issues.

The diagram below provides an indicative pedestrian overpass layout, based on the principles of minimising the overall length travelled by pedestrians:

Other concerns for the implementation of this facility would include:

- Sterilisation of at least 50m of existing development frontage (bases on Preston St Example – Attachment 3);
- Possible devaluation of existing development;
- Insufficient pavement width for both pedestrian overpass ramp and footpath – would require removal of on street car parking bays;
- Throw structures would need to incorporated – visual impact.

To achieve the an adequate road clearance level over Midgegooroo Avenue a minimum ramping distance of approximately 50m would be required to allow for heavy vehicle clearance, and possibly more depending on disability requirements.

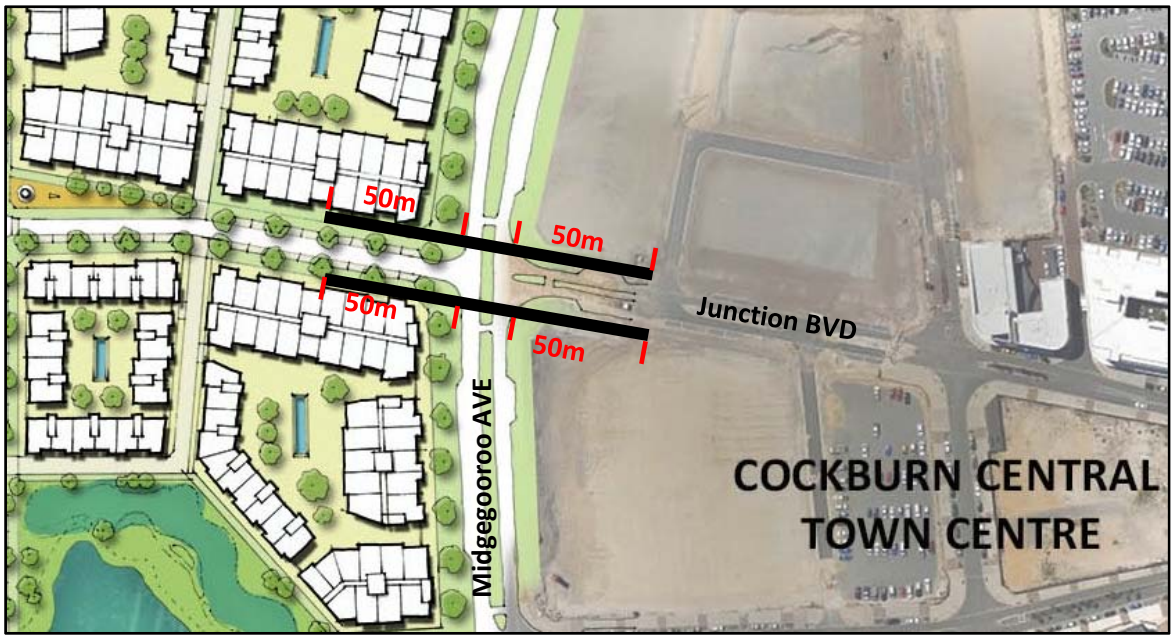
6.2 Junction Boulevard – Pedestrian Overpass

Junction Boulevard is considered to be the strongest urban spine, linking Cockburn Central West to the Town Centre, it also provides a direct route to the Train Station like Signal Terrace, but it also provides a direct route to the Integrated Regional Recreation Facility.

In accordance with Main Roads specifications, Junction Boulevard does not have the required minimum separation distance to the controlled Intersection at North Lake Road and Midgegooroo Avenue and the earmarked Signal Terrace controlled intersection. As a result, only left in / left out traffic will be permitted on both Cockburn Central West and the Town Centre sides.

The introduction of a pedestrian overpass would be extremely challenging in this location due to the proposed intensity of development. As a result, the most significant issue would be the impact on the active street frontages along Junction Boulevard and the continuation through into Cockburn Central West. Active street frontages and strong integration of built form development at this location is a key objective for the project and the introduction of a possible pedestrian overpass would severely compromise this objective.

The diagram below provides two indicative pedestrian overpass layouts, based on the principles of minimising the overall length travelled by pedestrians and providing a direct route:



Other concerns for the implementation of this facility would include:

- Possible devaluation of existing development;
- Insufficient pavement width for both pedestrian overpass ramp and footpath – would require removal of on street car parking bays;
- Throw structures would need to incorporated – visual impact.

6.3 Evaluation of a Pedestrian Overpass at Cockburn Central West

Pedestrian overpasses are implemented where there are significant physical and/or safety barriers for pedestrian movement; access over Freeway's, Highways and Rail corridors are the most common locations for implementation. In the Cockburn Central West circumstance this situation does not seem to be evident.

The three controlled signalised intersections provides a suitable solution for the safe movement of pedestrians, so long as the signals have the appropriate pedestrian phase. However, the treatment of Junction Boulevard could be improved through elements noted in Section 8 of this paper.

The difficulties highlighted above demonstrate some significant barriers which would need to be overcome if a pedestrian overpass was to be progressed. Attachment 3 provides an example of the likely impact of the ramp, the associated sterilisation of development frontage and the overall impact on the streetscape.

Notwithstanding the difficulties associated with implementing a pedestrian overpass, it seems clear that there are other solutions which would provide a better all-round outcome for the area. Attachment 1 provides a broad assessment against some high level eligibility criteria for evaluating the need for GSPF. If it was determined that a GSPF solution was required then a prioritisation assessment should be undertaken.

6.4 Signal Terrace – Pedestrian Subway Tunnel

Similar to the pedestrian overpass, the introduction of a pedestrian subway tunnel would be seen as a replication of a common pedestrian movement facility. However, unlike the overpass it would not have a visual impact on the intersection.

Some additional concerns for the implementation of this facility include:

- Sterilisation of existing development frontage for the ramping down structure;
- Possible significant maintenance costs and safety management requirements;
- Possible devaluation of existing development;
- Excessive costs to relocate underground services;
- Insufficient pavement width for both pedestrian underpass ramp and footpath – would require removal of on street car parking bays;
- Possible flooding issues during major storm events.

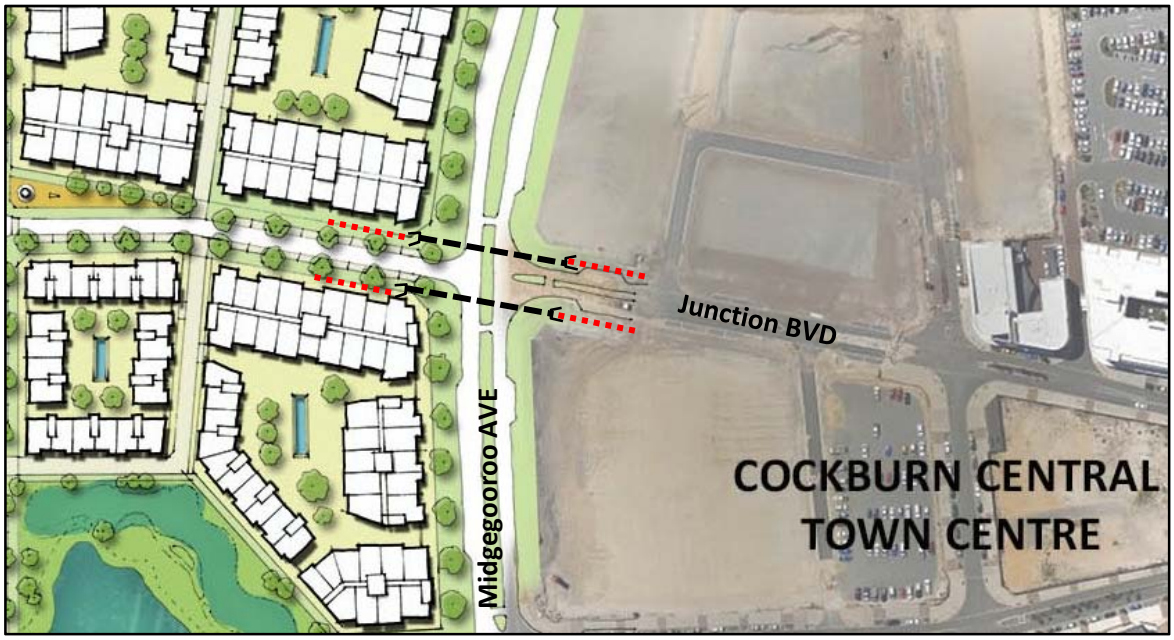
The diagram below provides an indicative pedestrian subway layout, based on the principles of minimising the overall length travelled by pedestrians and providing a direct route:

6.5 Junction Boulevard – Pedestrian Subway Tunnel

The introduction of a pedestrian subway tunnel would be extremely challenging in this location due to the existing and proposed road and development levels. Significant ramping would be required on both sides of Midgegooroo Avenue to achieve the required clearance level and to comply with Disability Standards.

Similar to the pedestrian overpass situation, the ramping would create a significant impact on the active street frontages along Junction Boulevard, particularly for any retail, commercial and office floor space.

The diagram below provides two indicative pedestrian subway layouts, based on the principles of minimising the overall length travelled by pedestrians and providing a direct route:



Other concerns for the implementation of this facility would include:

- Possible significant maintenance costs and safety management requirements;
- Possible devaluation of existing development;
- Excessive costs to relocate underground services;
- Insufficient pavement width for pedestrian underpass ramp and footpath – would require removal of on street car parking bays;

6.6 Evaluation of a Pedestrian Subway Tunnel at Cockburn Central West

Similar to pedestrian overpasses, pedestrian subways are only implemented where there are significant physical and/or safety barriers for pedestrian movement. Again, the Cockburn Central West situation does not warrant the provision of a pedestrian subway. The only possible improvement, as noted above, would be the treatment (at grade) in and around the uncontrolled pedestrian intersection at Junction Boulevard.

With the exception of the cost of implementing the pedestrian subway, the existing levels of the site produces one of the greatest constraints for implementing this possible solution. Ongoing management and maintenance would also be significant factor for the life of the facility if it was to be implemented.

7. Long Term Planning for Cockburn Central

At full build out, Cockburn Central West and the Town Centre are proposed to connect seamlessly across Midgegooroo Avenue, which will transform into an import town centre boulevard. Regional traffic will travel along the parallel routes of Beeliar Drive and North Lake Road in an east / west direction, and Poletti Road is proposed to be upgraded to provide a duel carriage north / south connection which would have a higher speed environment than Midgegooroo Avenue.

To reduce the pressure on Midgegooroo Avenue it is vital that the construction of the North Lake Road flyover occurs in the short to medium term to help establish appropriate travel behaviours and to recognised Midgegooroo Avenue as a lower speed city centre environment which is more conducive to pedestrian activity. MRWA have reported that the commencement of this project is expected to be within their four year capital funding horizon.

Given the significant regional upgrades proposed for the area and the objective is to create an integrated city centre via Midgegooroo Avenue, the introduction of GSPF would not be in keeping with the overall objective for an integrated city centre. Standard pedestrian movement facilities within a city centre environment should be explored and implemented to achieve this vision.

8. Alternatives to Grade Separation Pedestrian Facilities

The Perth Central Business District is a good example of using a number of standard pedestrian movement facilities in a high traffic / pedestrian volume environment. In fact, the use of these standard pedestrian movement facilities has been favoured over the use of GSPF; a number of pedestrian overpasses have been removed in the CBD in the last couple of years. Attachment 4 provides a few examples of pedestrian movement facility treatments in the Perth CBD.

In the context of Cockburn Central West, Junction Boulevard was identified as a location which could be improved through the use of various pedestrian movement facilities. The list below identifies a number of appropriate solutions which can be investigated further to maximise the safe movement of pedestrians at this location:

a) Physical pedestrian facilities:
    - Zebra Crossing.
    - Raised flush pavement to provide differentiation.
    - Vehicle bollards within refuge areas.
    - Traffic Island.
    - Mid-block refuge area.
b) Warning Signs:
    - Vehicular speed limits of 50 kms / h.
    - Pedestrian crossing signs.
    - Line marking.

9. Conclusion

This investigation paper has provided a high level assessment of the grade separated options alongside at-grade solutions. It is clear from this broad level assessment that the implementation of grade separated facilities is not warranted, particularly when the overall vision, objectives and long term planning of the area forms part of the consideration.

Junction Boulevard has been identified as a key pedestrian linkage between two major destination points and further design investigations can be undertaken to ensure a safe movement environment is provided in the future.

Overall, the existing signalised infrastructure, the future changes to the regional road network and the improvements at the pedestrian crossing at Junction Boulevard will result in an improved and safer pedestrian environment within the context of an integrated city centre and GSPF are not warranted in this location.

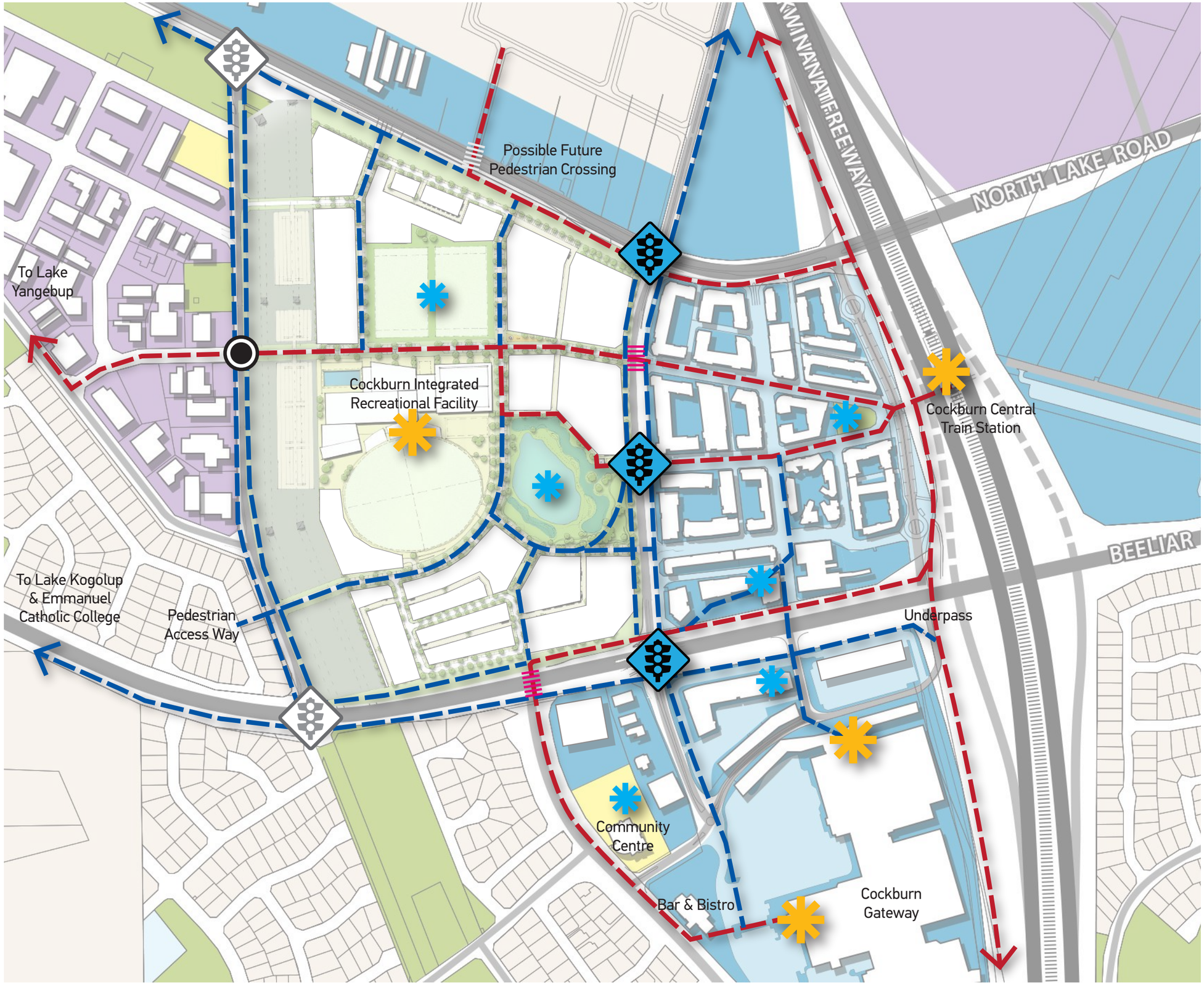
ATTACHMENT 1

ELIGIBILITY ASSESSMENT CRITERIA FOR THE PROVISION OF GRADE SEPARATED PEDESTRIAN FACILITIES

ELEGBILITY CRITERIA AND QUESTIONS FOR GSPF	YES	NO
Are there significant physical barriers to pedestrian movement and safety?		×
Are there poor site lines/ visibility to pedestrian crossings?		×
Are there proposed high vehicular volumes in the long term, greater than 20,000 vpd?	?	×
Are there high speed roads proposed for the area;		×
Are there existing or forecasted high percentages of heavy vehicle usage;		×
Are there special requirements for optimised traffic flow (i.e. freeway offramps)?		×
Is GSPD the only improvement which can be made for pedestrian safety?		×
Will the road hierarchy be elevated a result of regional works;		×
Are there other locations which may warrant GSPF over this location?	✓	
Is there an anticipated concentration of pedestrian movements and frequency of use?	✓	
Is there an existing number of pedestrian injuries, crashes and fatalities within this location or close proximity to this location?		×
Are there any existing or proposed land uses which are likely to attract pedestrian movement within this location? i.e. Hospitals, Public Transport, Recreation Facilities, Age Care, Commercial and Retail.	✓	

ATTACHMENT 2

COCKBURN CENTRAL WEST
PEDESTRIAN MOVEMENT PLAN



LEGEND:

- PRIMARY PEDESTRIAN & CYCLE ROUTE
- SECONDARY PEDESTRIAN & CYCLE ROUTE
- MINOR DESTINATION
- MAJOR DESTINATION
- PEDESTRIAN INTERSECTION
- PRIMARY CONTROLLED INTERSECTION
- POSSIBLE FUTURE CONTROLLED INTERSECTION
- ROUNDABOUT

PEDESTRIAN MOVEMENT MAP

PD 0870 - COCKBURN WEST BUILDING TYPOLOGIES TESTING

DATE 21.11.2013 | DWG NO 001 | REV C | SCALE NTS

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ATTACHMENT 3

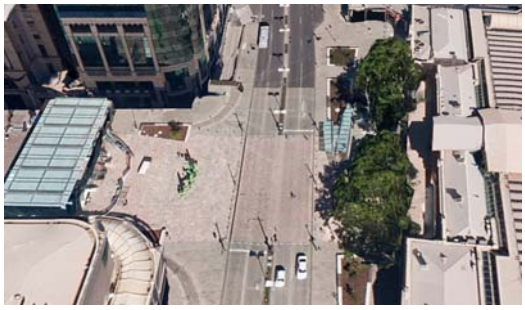
PEDESTRIAN OVERPASS EXAMPLE
PRESTON STREET COMO, WA

Preston Street / Melville Parade Como, Western Australia

ATTACHMENT 4

PEDESTRIAN MOVEMENT FACILITY EXAMPLES

PERTH CBD

	**Location:** Hay St, Perth CBD, between William Street and Milligan Street **Traffic Details:** One way Traffic, two lanes. **Treatment:** Raised bricked pavement to differentiate with ashphalt; installation of traffic bollards and lighting
	**Location:** King St, Perth CBD, Cnr of Hay Street **Traffic Details:** One way Traffic, crossing two lanes of one way traffic. **Treatment:** Raised bricked pavement to differentiate intersection; integration of pedestrian pavement with surounding roads.
	**Location:** William / Hay Str Intersection, Perth CBD **Traffic Details:** Four-way intersection, two way traffic on William Street (two lanes north direction; two lanes south direction). **Treatment:** Bricked paved intersection to demarcate pedestrian movement zone; line markings to guide pedestrian traffic.
	**Location:** Wellington Street, Perth CBD, between Willam Street and Barrack Street. Direct access to Perth Main Train Station. **Traffic Details:**Two-way traffic, four lanes, intersecting with a major pedestrian crossing from Perth Main Train Station. Approx 26,000 vpd in 2009. **Treatment:** Raised Bricked flush pavement, line markings, traffic bollards, signalised crosswalk.
	**Location:** Murray Street, Perth CBD, between Milligan Street and King Street **Traffic Details:** One way Traffic, two lanes. **Treatment:** Zebra Crossing, signage and line markings, across two lanes of oneway traffic.