TTM Consulting (Vic) Pty Ltd

CATHERINE PARK STAGES 1–3
STREET DESIGN STUDY

Prepared By

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in conjunction with

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1. INTRODUCTION AND SCOPE

Following the adoption of the Development Control Plan for Catherine Fields (part) Precinct Schedule 4 to Camden Growth Centre Development Control Plan 2012 (CGC DCP) a proposed subdivision plan for the first 3 stages of development has been prepared by DPS for the lead developer at Catherine Fields. This development proposal, Catherine Park Stages 1-3, includes 339 residential allotments, 18 integrated housing sites (superlots), a public neighbourhood park and drainage facilities.

The CGC DCP provides objectives and specific development controls for street design as well as some provisions and requirements for variations. Greater flexibility is provided for under the recent amendments to the EP&A Act as set out in Planning Circular 13-003. Planning Circular 13-003 confirms the purpose, status and content of DCPs as guidelines for development, whereby there is flexibility for a consent authority to allow for reasonable alternative solutions to achieve the objectives of those standards.

This report provides a review of the merit-based street design proposed for the subject subdivision Development Application through a best practice review of the street design proposed because some of the standard DCP controls are outdated and will lead to poor safety, amenity and sustainability outcomes.

It is the conclusion of this report that following this best practice analysis there is sound justification for the street designs proposed having particular regard to connectivity, the function of streets, safety and amenity. This report, alongside the traffic report and SEE, provides the necessary framework for merit-based street design to be assessed and supported as a reasonable alternative solution to strict application of CGC DCP standards.

2. OVERVIEW AND REPORT FRAMEWORK

The CGC DCP Schedule 4 Catherine Fields (part) Precinct provides an Indicative Layout Plan for Catherine Fields as well as additional provisions, not already contained in the CGC DCP, which are specific to the delivery of development at Catherine Fields.

The proposed subdivision layout is considered a ‘minor’ variation to the Indicative Layout Plan as it is consistent with precinct planning outcomes and vision. In particular the proposal maintains the higher order traffic and public transport routes envisaged and implements a connected local and access street network as well as having special regard to heritage considerations at Dawson Damer Drive.

This study highlights the important interrelationship of street design with the subdivision in terms of network, street hierarchy and street characteristics. This study also addresses specific street design considerations in the context of the proposed subdivision. Further considerations of the variation of the Indicative Layout Plan (ILP), such as impacts on adjoining lands, are discussed in the Statement of Environmental Effects.

The Camden Growth Centre Precincts Development Control Plan 2012 (CGC DCP), Section 3.2.3 Street Network and Design sets out the following objectives.

a. to establish a hierarchy of interconnected streets that give safe, convenient and clear access within and beyond the precinct;
b. to assist in managing the environmental impacts of urban development including soil salinity, micro-climate effects and stormwater;
c. to facilitate energy efficient lot and building orientation;
d. to contribute to the creation of an interesting and attractive streetscape; and
e. provide a safe and convenient public transport, pedestrian and cycleway network.

Various elements of those objectives cannot be achieved through application of the typical street designs provided in the DCP, primarily because of excessive carriageway widths or carriageway widths that are potentially ambiguous of function.

In relation to the variation of specific controls in the CGC DCP, Part 1 Section 3.2.3 Street Network and Design notes that the design and construction of streets is to be consistent with the relevant typical designs in the CGC DCP Section 3.2.3 Street Network and Design Figure 3-3 to Figure 3-7. This is supplemented by the Schedule 4 to the DCP which contains objectives and controls for the Rickard Road Extension Transit Boulevard as well as development options adjacent to Dawson Damer Drive.

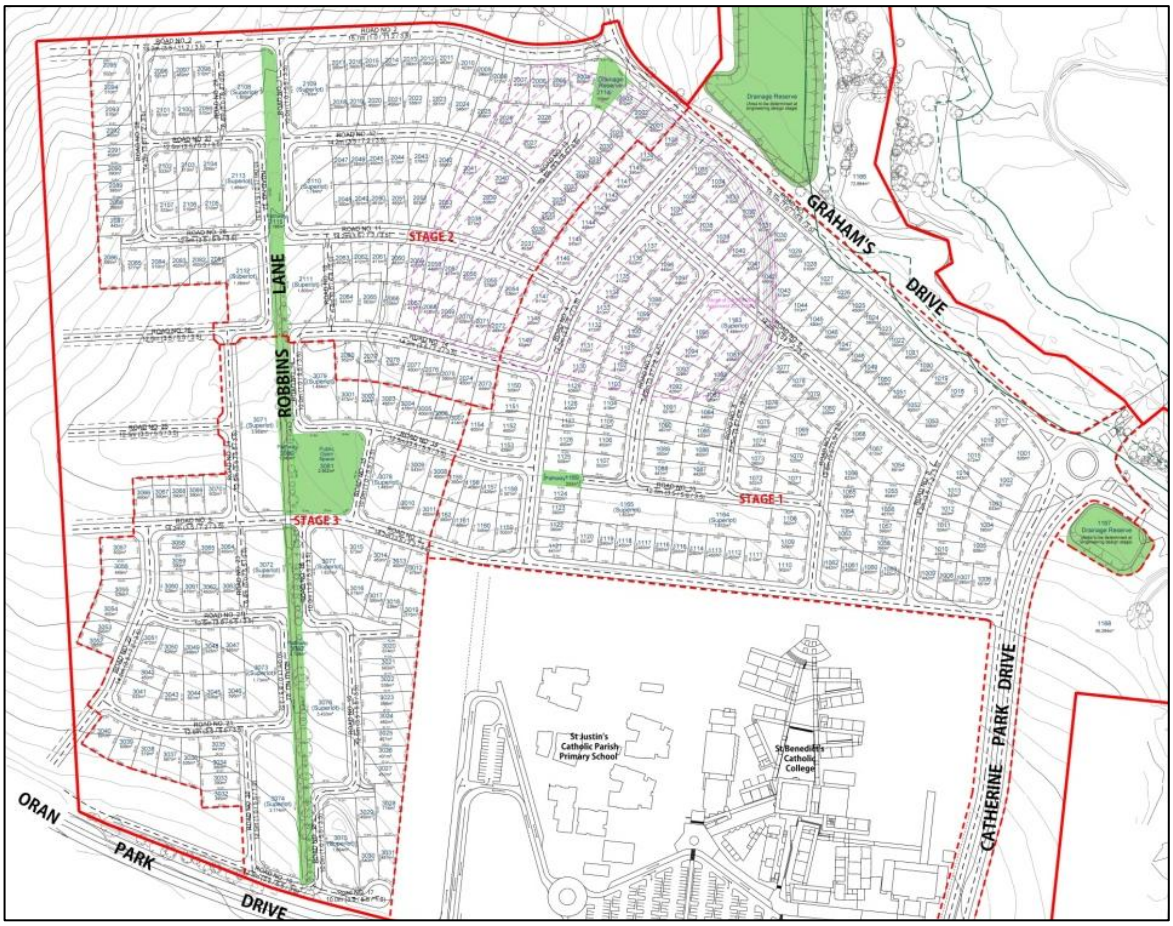
Further, the CGC DCP explicitly provides for variation for local and access streets at 3.2.3 Street Network and Design Clause. 4: "*Alternative street designs for local streets and access ways may be permitted on a case by case basis if they preserve the functional objectives and requirements of the design standards.*"

Appendix A to this report provides a comparison of best practice against various street design standards in common use.

Appendix B provides examples of international best practice.

3. THE PROPOSED SUBDIVISION PLAN

The proposed subdivision plan is copied below.



4. ESTIMATED DAILY VEHICLE MOVEMENTS ON STREETS

Daily vehicle movements due to the residential development within the Development Plan on streets within the proposed plan of subdivision are shown in the diagram below.

Christopher Hallam & Associates Pty. Ltd. has prepared a Traffic Impact Review of the proposed subdivision. Included in that review at Section 3.3, are estimates of daily traffic associated with the schools to the immediate south-east of the subdivision. There is a DA consent that potentially allows school traffic and entry point from the street along the school site northern boundary, and that would add traffic to that street and also the link north to Graham's Drive. The school related traffic estimates from Christopher Hallam & Associates Pty. Ltd. are :-

- East-west street along school boundary 148 vehicles per day
- North-south link to Graham's Drive 564 vehicles per day

Adding those volumes to the subject streets will take estimated full development volumes to :-

- East-west street along school boundary 750 vehicles per day
- North-south link to Graham's Drive 1,660 vehicles per day

It should be noted that the Christopher Hallam & Associates Pty. Ltd. estimated daily volume net of school traffic on the east-west street along the northern school site boundary is 850 vehicles per day rather than 600 vehicles per day estimated in this report. Nothing turns on that difference.

5. STREET DESIGN PRINCIPLES

5.1 What is Best Practice Residential Street Design?

Residential street design should seek to appropriately balance out the needs of all of the users of the street so that they are functional for vehicles and safe and amenable for other users. The residential environment is dominant in the design of access streets so that traffic is subservient, speed and volume are to be kept low, and safe pedestrian and cycle movements are facilitated.

Access street users will include pedestrians walking along and across the street, cyclists, drivers of vehicles going to and from the houses in the street, residents of the street in respect of amenity and aesthetics, locals and visitors parking cars, infrequent delivery vehicles, regular garbage trucks and occasional emergency services vehicles.

Best practice residential street design objectives also include sustainability related aspects such as minimizing paved surfaces, non-renewable materials and embodied energy in construction materials and processes, and providing an appropriate response to urban density objectives.

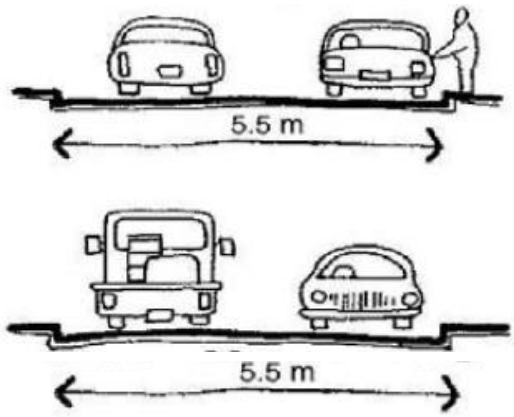
5.2 Carriageway Width Principles for Streets

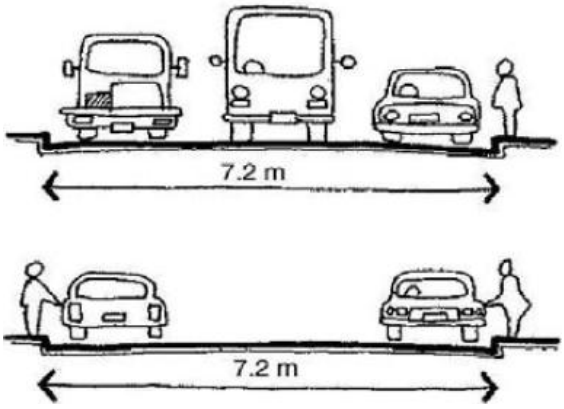
Carriageways in residential streets should be sufficient to allow for vehicle movement and on-street parking, but in so doing kept as narrow as possible to influence driver behaviour to keep vehicle speeds slow to ensure pedestrian safety and amenity. Vehicle speeds on access streets are controlled by street length and/or alignment as well as the location or parked cars which cause moving vehicles to slow as they maneuver.

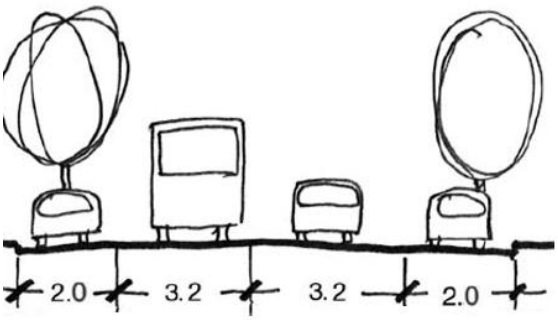
A practical way to understand residential carriageway width is to consider modules – allow 2m for parked car, 3.2m for slow moving truck, 2.5m for moving car when speed target is under about 40kph. Using these requirements as basic building blocks, street widths increase in width as traffic volumes and street length and the number of houses increases as follows.

5.3 Carriageway Width Modules

Carriageway widths determined on the basis of the above modules are thus for local streets:-

<table>
<tr><th>Residential Access Street Carriageway Widths
Principles and Practice</th><th>Comment</th></tr>
<tr><td> 

Parking One Side, Slow Moving Truck or Car Going Past</td><td>Access Street
A 5.5 metre pavement allows a car to pass a parked car or a moving car. It also allows a moving car to pass a truck, but is clearly too narrow for cars to park opposite each other without blocking the street. Staggered parking supports the function of the street.
This very low volume street carries at peak hour an average of a car every two minutes (mostly heading in the same direction). It would only take around 12 seconds for the car to traverse the street. There is ample time for traversing and maneuvering in the street.</td></tr>
<tr><td colspan="2">Max design speed/target operating speed km/hour: 50/30
Indicative volume range (Vehicles per day): 1,000
Indicative length: Up to 150 metres</td></tr>
<tr><td> 
</td><td>Local Street
A 7.2 metre pavement is wide enough for two vehicles to pass each other while passing a parked car. It is wide enough for a moving car or truck to pass between two parked cars, but is clearly not wide enough for two moving vehicles to pass at once. This perceived ‘friction’ keeps local traffic speeds slow and safe for pedestrians and cyclists.
This is the classic “yield” street and there are many thousands of kilometres of local streets of 24 feet carriageway width (7.3 metres) built all over Australia and other countries, and these have a tried and true performance such that the dimension is included in every sensible street design code or guide in the country. The parked cars act as speed management devices for the moving vehicles in the street.</td></tr>
</table>

<table>
<tr><td colspan="2">Max design speed/target operating speed km/hour: 50/40
Indicative volume range (Vehicles per day): 3,000
Indicative length: Up to 220 metres</td></tr>
<tr><td> 

10.4 m</td><td>Collector or Wider Local Street
The street type allows for parking both sides and two clear running lanes. It is only necessary when there will be expected truck traffic in a fairly high volume traffic stream, and a high level of kerb-side parking demand.</td></tr>
<tr><td colspan="2">2.0 + 3.2 +3.2 + 2.0 = 10.4m
Max design speed/target operating speed km/hour: 50/40
Indicative volume range (Vehicles per day): 3,000+
Indicative length: Up to 250 metres</td></tr>
</table>

Source: Livable Neighbourhoods, Figure 11: Diagram of physical determinants for the width of pavements in access streets, Western Australian Planning Commission, 2009.

Collector Streets typically need to be bus capable or may accommodate a designated bus route. Where a Collector Street has lower traffic volumes and requires a bus capable function the wider local street of 10.4m outlined above provides the necessary function for a bus. Where a Collector Street is part of a designated bus route the running lane is required to be 3.25-3.5m in width which increases the pavement street to a maximum of 11m.

5.4 Traffic Volume, Speed and Parking as Influences on Street Design

For Average Annual Daily Traffic (AADT) below about 3,000 vehicle movements and with general traffic speed below about 60kph cycling can mix with other traffic on the street (refer AustRoads).

For AADT below about 3,000 and parking at density under about 60% of kerb length "yield" conditions are appropriate such that there are effectively short sections of street that will allow only one vehicle through at a time, with the associated traffic management benefits.

When car parking demand is only generated from one side of the street it is reasonable to provide about half of the parking opportunity that would be afforded when houses are on both sides of the street.

6. CATHERINE PARK STAGES 1-3 STREET DESIGN

6.1 Public Transport as an Influence on Street Design

Route buses should not be made to endure the traffic management outcomes of parked cars on the street, and in a well planned development this will not be an issue because bus routes will be on a grid of around 800m so that most houses are within 400m walk to the route.

A wider view of Catherine Fields planning indicates suitable Collector and Transit Boulevard streets on an approximate 800m grid, as should be the case given the reasonably rigorous early street network planning undertaken for the precinct.

6.2 Car Parking and Driveways as Influences on Street Design

Typical lot frontages are 13-15m in Catherine Park Stages 1-3. Driveways will reduce kerb abuttals by about 5m per lot, and there are some terrace/multi-unit proposals.

A general target is to ensure that at least one kerbside parking space is available for every two dwellings. Where dwellings have garages plus space on the driveway for a visitor car to be accommodated this will provide a buffer against higher intensities of kerbside car parking.

Where street leg lengths are less than around 120m sideages will be fairly dominant and 5.5m carriageway width will generally allow sufficient parking to deliver the desired outcomes, particularly when frontages of lots are averaging 12.5m or more. Where housing is only located on one side of the street 5.5m carriageway width will allow sufficient parking provided traffic volumes are low. The typical application of that street form is along park edges or as service roads along arterials.

In longer street lengths and/or with smaller lot frontages and with housing on both sides of the street we recommend 7.2m wide carriageways on two-sided streets.

6.3 A Suite of Street Forms for Catherine Park

6.3.1 Transit Boulevard

- CGC DCP R 27.2m : V 4.5m/C 2 x 3.5m/M 4.2m/C 2 x 3.5m/V4.5m
- Merit based **R 27m :** V 4.5m/C 2 x 3.5m/M 4.0m/C 2 x 3.5m/V4.5m

Best practice confirms that Transit Boulevards have at least one bus capable carriageway which is based on NSW State Transit requirements is 3.2m-3.5m. Based on published standards, this can be achieved with a minimum of 2 x 3.2m wide carriageways. Providing 2 x 3.5m carriageways is consistent with the development controls in the CGC DCP. And NSW State Transit requirments.

This preference for additional width however has been traded where a reduction of 0.2m in the median is proposed. As noted in the CGC DCP, other Council's Growth Centre DCPs and other development codes such as the Livable Neighbourhoods in Western Austral and Clause 56.06 in Victorian Planning Schemes 4m width is sufficient to deliver a median with planting as envisaged for the transit boulevard.

6.3.2 Collector Street – Bus Route

- CGC DCP R 20m : V 4.5m/C 11m/V 4.5m
- Merit based **R 18.2m :** V 3.5m/P 2.1m/ C 7m/P 2.1m/V 3.5m

This configuration, utilizing indented parking is consistent with a range of Collector and Connector Street designs including Livable Neighbourhood and VicCode.

Again while Collector Streets to have designated bus capable carriageway, this can be achieved in a range from a minimum of 2 x 3.2m up to 3.5m (NSW State Transit, Bus Infrastructure Guide 2011). In this instance the wider of the range is provided.

Indented parking (2.1m width) is proposed in preference to full length parking lanes as this approach allows for tree planting within the line of the 2.1m parking bays and a reduction in the verge so that streetscape objectives can be more delivered in a more efficient way. Having trees closer to the travel lanes will create a more enclosed feel to the street and may encourage slower vehicle speeds.

6.3.3 Collector Street- Bus Capable

- CGC DCP R 20m: V 4.5m/C 11m/V 4.5m
- Merit based **R 17.6m:** V 3.5m/P 2.1m/ C 6.4m/P 2.1m/V 3.5m

Where a collector street is designated to be bus capable but not a designated bus route then a carriageway of 2 x 3.2m and indented parking (2.1m) is proposed. This minimum is considered appropriate as it is not a bus route, the likelihood of 2 buses passing is highly unlikely and therefore the minimum standard is considered appropriate.

Indented parking (2.1m width) is proposed in preference to full length parking lanes as this approach allows for tree planting within the line of the 2.1m parking bays and a reduction in the verge so that streetscape objectives can be more delivered in a more efficient way. Having trees closer to the travel lanes will create a more enclosed feel to the street and may encourage slower vehicle speeds.

6.3.4 Local Street

- CGC DCP R 16m: V 3.5m/C 9m/V 3.5m
- Merit based **R 14.2m:** V 3.5m/7.2m/V 3.5m

The width at 9m is excessive, unnecessary and unsafe as it provides no additional traffic or parking capability but does greatly increase speed on local streets, create pedestrian safety issues and has poor amenity as it is car dominant.

The additional width of the CGC DCP provides no additional traffic or parking capability but would greatly increase vehicle speed on local streets, create pedestrian safety issues due to greater crossing distances and inducement of higher vehicle speeds. Parked cars would not act as mobile traffic management devices.

The unnecessarily wide pavement has to be provided, drained, maintained and replaced at end of life. That is poor and unnecessary use of fossil fuels and embodied energy, just for the provision of the carriageway.

The excessively wide carriageway will result in poor amenity and a waste of space that might otherwise be used for more human purposes. The 7.2m carriageway provides for the same traffic movements and parking capability in a safer, more efficient and community friendly way.

Design features include some local streets to be narrowed to 5.5m at entries, particularly along lot sideages. This is proposed where traffic volumes do not warrant a wider carriageway, and where the subject part of the street is not likely to attract significant parking demand. Narrower carriageway is recognized to slow vehicle speed and improve pedestrian safety and amenity.

Collector Streets as shown in the DCP are needed neither along the northern abuttal of the school site nor for the link from the school to Graham's Drive. The traffic volume estimates at Section 4 demonstrate that, in conjunction with standard residential lot frontages.

If buses associated with the school use those streets the movements will be in one direction only, and intersections are designed to accommodate the swept path of a 12.5m long rigid vehicle.

The photograph below shows an example of a street with 7.2m carriageway.

6.3.5 Access Street

- CGC DCP — R 13.1m: V 3.5m/C 8m/V 1.6m only where one side is or adjoins main road/open space; and

  R 11.6m: V 3.5m/C 6.5m/V 1.6m Where traffic volumes and road safety permit.

- Merit based — **R 12.5m:** V 3.5m/C 5.5m/ 3.5m is able to provide the access street function where traffic volumes and road safety permit. Where the street is used as a service lane to adjoin an arterial road or where the street has a park or other open space on one side that side verge can be reduced to 1.0m.

As demonstrated in various codes across Australia as well as greenfield development in many Council areas in the Sydney metropolitan area the role of an access street is to "be a minor street providing local residential access with shared traffic, pedestrian and recreation use, but with a pedestrian priority". The photograph below shows an example of a street with 5.5m wide carriageway.

As demonstrated in Section 5.2 and Section 5.3 the carriageway allows adequate width for a full legal width truck (truck 2.5 metres wide, envelope 3.2 metres wide) to pass a parked car, enabling deliveries and services including garbage collection and emergency services access.

6.3.6 Lanes

- CGC DCP R - not specified
- Merit based **R 6.4m:** C 6.4m

Where homes front parkland/heritage areas rear lanes are necessary to provide vehicle access. The functional role of the lane, to service homes from the rear, can be achieved through a 6.4m carriageway. No verges are required.

Design features proposed include lanes being narrowed at entries which are recognized to improve pedestrian sightlines, with a standard domestic driveway being used. The single lane/two way driveway minimizes concrete area and thus has least practical visual impact. Garbage collection is not proposed in rear lanes. That enables domestic standard driveways to be used at the ends.

With a lane pavement width of 3m near the ends where garage doors are not located, designated by bollards and landscaping, splayed corners are not necessary because a pedestrian related “sight triangle” is effectively created by the landscaped sides. Bin points near the lane ends will be nominated for efficient garbage collection. The photograph below shows a rear lane with 6m carriageway and planting strips along both sides.

The planting strips serve no useful purpose because they are not maintained and collect rubbish. This land is 7 metres wide, excessive to access requirments.

Garages with door openings at around 3m for single garage or 5.2m for double garages are conveniently accessible from a 6.4m wide access lane. By way of comparison ASNZ 2890.1 at Figure 2.2 proposed parking space width at 2.4m, length at 5.4m, and access aisle width at 5.8m.

The additional dimensions for openings and access aisle width described above allow for "corner cuts" shown at Figure 5.2 in ASNZ 2890.1 to be accommodated in the overall vehicle envelope.

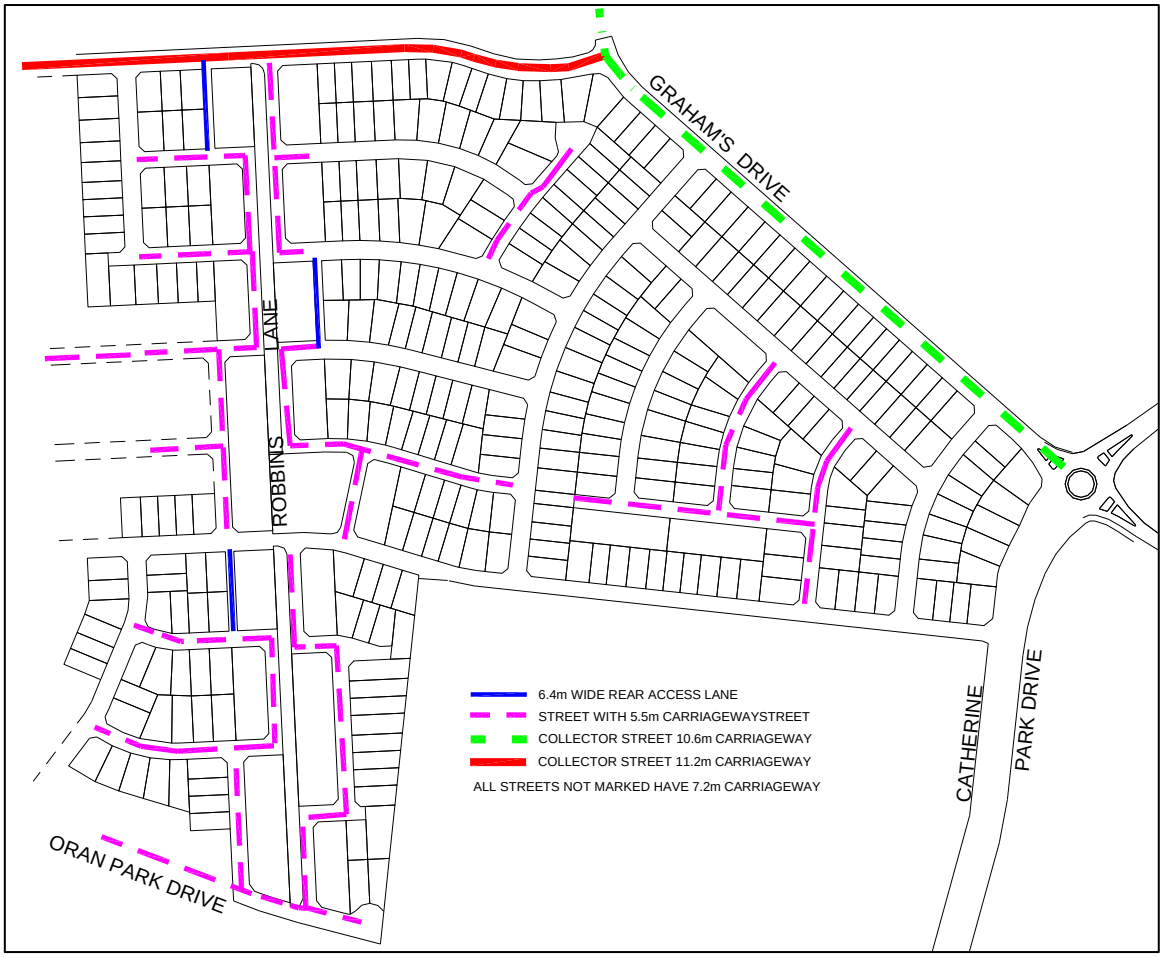
The photograph below shows a 6.4 metres wide rear lane with zero garage setbacks and street lighting carefully located. This is typical of that proposed for Catherine Park.

6.4M WIDE REAR LANE

6.4 Location of Proposed Street Forms

The description of each of the street forms in the sections above demonstrates how each is to be applied in the subdivision plan. The traffic volumes and on street car parking demands are used to inform the choices that are made.

The various street forms described above are proposed to be located in accordance with the diagram below.



7. SUMMARY AND CONCLUSIONS

The consideration of the proposed streets has been investigated against best practice and is considered to logically conceived and give due consideration to the role and function of the streets required to support the proposed subdivision.

All the streets proposed fall within acceptable practice and are fit for purpose as is demonstrated by the comparison with other codes and controls both at a national level and within the Growth Centres.

It is therefore the conclusion of this report that the streets proposed present a reasonable alternative to the specific DCP controls that warrant the support of the consent authority.

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APPENDIX A

Appendix A

Catherine Park – Street Comparisons
Acceptable Practice vs Best Practice

Transit Boulevard				
Purpose and Technical Requirements:	**Best Practice Analysis and Comparison**	**Proposed at Catherine Park**	**Acceptable /Other Practice: Camden GC DCP Sch 4 and other GC DCPs**	**Comments**
Purpose: (source GC Development Code) Transit boulevards are 4 lane Arterial Roads typically with landscaped medians that are designed to maximize efficiency of flow. Supported by service roads Boulevards maintain pedestrian amenity, safety standards. Located close to centres and typically intersect with main streets; they are pedestrian friendly arterial roads. Technical Requirement: Dev Code: 30,000 – 35,000 vpd.	Best Practice: typically performance based as arterial; usually include 2 travel lanes each way, 3.25 – 3.5m; optional median, shareway 2.5m or paths and designated bikeway. Livable Neighbourhoods; Integrator arterials typically divided roads with on street bike lanes and parking; with 2 x 7.5m carriage-ways and 6m median which can be reduced if right hand turn lanes not needed (7,000-15,000 vpd); Neighbourhood connector (7000 vpd , 50km/h) 7.1m carriageways (travel lane, bike lane, parking) with 2m median.	27m Reservation Comprising: 4.5m verge 7m carriageway 4m median 7m carriageway 4.5m verge Verges: Paths on both sides of street comprising 1.5 m planting, 2.5m sharepaths and 0.5 offset Volume: 9,000 vpd on Catherine Park Drive	Transit Boulevard in Catherine Fields DCP requires reservation of 23m or with optional median 27.2m. Comprising: 4.5m verge 7m carriageway 4.2m median 7m carriageway 4.5m verge Verges comprising 0.5 offset, 2.5m sharepath and 1.5m planting - other provisions OR 1.5m footpath, 1.5m cycle, 1.5m planting. Blacktown CG DCP and other GC DCPs don't include this lower order 'Transit Boulevard'; Blacktown GC DCP contains sub-arterial with 26m width including 4m median. Other town centres include median of 3m (eg Edmondson Ave, Austral).	Transit Boulevard generally complies with DCP however 'optional' median proposed at 4m not 4.2m wide. Ample capacity with 4 x 3.5m travel lanes and low forecast volume as Forecast Volume at 2036 <10,000 vpd but capacity 30,000 vpd. Transit Boulevards with one clear lane (3.5m) in each direction and adequate junction designs have capacity up to 18,000 vpd. 4m wide sufficient for planting and efficient use of land as noted in other Growth Centre DCPs.

Collector Street				
Purpose and Technical Requirements:	**Best Practice Analysis and Comparison**	**Proposed at Catherine Park**	**Acceptable/Other Practice: Camden GC DCP Sch 4 and other GC DCPs**	**Comments**
Purpose: - service and link neighbourhoods and towns - are 'connecting streets' and neighbourhood 'arrival' streets - include garbage collection capacity - on street parking in designated areas - may include general of local bus Technical Requirements range and include: RTA – 5000 vpd AMCORD – 6,000 vpd AECOM (Catherine Fields Study)- 3,000 – 10,000 vpd 50km/hr	Best practice width: for Parking both sides and two clear running lanes: 2m+3.2m+ 3.2m+2m ie. 10.4m Carriage-way and verges 3.5-4.5m Vic Code varies; provides for 3000 vpd a 6-6.5m wide carriageway and indented parking on both sides on a bus route and 4.5m verges; for 7000 vpd 7.2-7.5m wide carriage-ways with indented parking on both sides and 6m verges. AMCORD: 3000 – 6000 vpd performance based 1000 – 3000 vpd 16.5 m width including 7m or 7.5m carriageway and 4.25 – 4.75m verges	For bus route the reservation width is generally 18.2m comprising 3.5m verge to house lots 2.1m parking lane, indented 7.0m carriageway 2.1m parking lane, indented 3.5m verge to house lots Where the street abuts park the full verge is not needed. There will be a shared path within the park and thus the park side verge can be reduced to 1.0m and the reservation width to 15.7m. Parking along the park side will only be needed minimally. On the "bus capable" segment (Graham's Drive) the clear carriageway proposed is 6.4m wide, with verge as above. Graham's Drive has park all along the northern side so the reservation is 15.1m. Maximum traffic volume for Collector Street in Catherine Park is 4,200 vpd.	Collector Streets specified in Camden Growth Centre DCP as reservation 20m comprising 4.5m Verges (0.5m offset, 2.5m footpath, 1.5m planting both sides) 11m carriageway (Able to accommodate bus travel lanes of 3.5m and parking on both sides), - Camden Cncl engineering standards for minor access streets require road width 20m with carriageway widths 11m, Oran Park and Turner Road DCPs include Collector Road as 14.4m width comprising 7.4 m carriageway (verge and parking vary), Blacktown CG DCP includes Typical Collector Road 20m width comprising 4.5m verges, 11m carriageway) North Kellyville in NW Growth Centre has collector roads of 20m comprising 3.5m verge (with 1.5m footpath) , 12m carriageway and 4.5m verge (which has 2.5 m sharepath), Other examples of narrower widths eg Shellharbour LGA 9m carriageway.	Carriageway complies/exceeds with DCP however delineates 7m carriageway and parking which is indented 2.1 (where required); this creates an effective carriageway of 11.2m where parking is proposed on both sides. Reduced verge from 4.5m to 3.5 m considered appropriate as can provide offset, planting and 1.5m pathway and indented parking provides for additional planting. Also where adjacent to park a shareway of 2.5m is incorporated in park reserve. Other controls in SW Growth Centre (Oran Pk, Turner Rd DCPs) permit 10.4m carriageway and verges of 4.6m (0.6 offset, 2.5 sharepath, 1.5m planting) and of 3.3m (1.5m planting, 1.2m footpath, 0.6m offset).

Local Streets				
Purpose and Technical Requirements:	**Best Practice Analysis and Comparison**	**Proposed at Catherine Park**	**Acceptable/Other Practice: Camden GC DCP Sch 4 and other GC DCPs**	**Comments**
Purpose: - provide vehicular access to residential properties - provides access to detached dwellings and medium density - include garbage collection capacity - provides low speed pedestrian friendly environment - on street staggered parking Technical Requirements: 1000 – 3000 vpd 40km/hr	Best Practice: parking both sides, truck or car going between; parking one side and two cars going past: carriageway 7m - 7.2m; 3.5 m verges; 14m – 14.2m reservation Vic Code for 1000 – 2000 vpd; 5.5m wide carriageway with 1 hard standing verge parking space per 2 lots, 4m verges AMCORD 1000 -2000 vpd 13.5 m width comprising 4m or 3.25m Verges and 5.5 or 7 m carriageway Livable Neighbourhoods 1000 vpd 14.2m reservation with 5.5-6m carriageways; 3000 vpd 15.4-16m reservation with 7-7.5m carriageway	Width 14.4 m V 3.5m/7.2m carriageway/ V 3.5m Path on one side of street comprising 1.5 m planting, 1.5m path and 0.5 offset Maximum Catherine Park traffic volume will be 1,660 vpd, including maximum potential school traffic on one street. All others <600 vpd. Key local street runs between school and Collector (Graham's Drive) while no further capacity is required for traffic additional paths are proposed to emphasize pedestrian link and approach to school. (Note. Local street adjoining northern boundary of school may also include additional provisions for traffic management on school land and are not subject of this proposal)	- Local Streets specified in Camden Growth Centre DCP as Width 16m comprising Verges 3.5m (0.5m offset, 1.5m footpath, 1.5m planting both sides) / 9m carriageway. Camden Council engineering standards for minor access streets require road width 15-16m with carriageway widths 7m for connecting road up to 200m otherwise 8m (as minor collector road) for connecting road. Footpath (1.2m) required on one side if 7m carriageway otherwise on both sides if 8m carriageway. Oran Park and Turner Road DCPs include Local Road as 14.4m width comprising 3.5m verges and 7.4 m carriageway. Blacktown CG DCP includes Typical Local Street 16m width comprising 3.5m verges, 9m carriageway.	7.2m carriageway proposed falls within acceptable practice. 9m as proposed by DCP reduces pedestrian safety and does not increase parking. Increased widths encourage higher speed for vehicles. Additional width inefficient use of land in local street and width not required for any functional or amenity purpose. Other controls in SW Growth Centre (Oran Pk, Turner Rd DCPs) permit 7.4m carriageway. Verge consistent with DCP and provides landscaping, path and offset. Detached dwellings will accommodate off-street parking for minimum 3 cars.

Access Street				
Purpose and Technical Requirements:	**Best Practice Analysis and Comparison**	**Proposed at Catherine Park**	**Acceptable /Other Practice: Camden GC DCP Sch 4 and other GC DCPs**	**Comments**
Purpose: - provide vehicular access to residential properties - provides access to detached dwellings and medium density - include garbage collection capacity - provides low speed pedestrian friendly environment - on street staggered parking Technical Requirements: <1000 vpd	Allows 2 cars to pass or parked car and passing truck: 2.5m+2.5m; 2m+ 3.2m; carriage 5-5.2m; Verges 3.5m 12.5m total width Vic Code 5.5m carriageway with parking on carriageway on one side AMCORD <300 vpd 12 m width comprising 3.5m Verges and 5 m carriageway 300 – 1000 vpd 13m width including 5m or 5.5m carriageway and 4m or 3.75m verges Liveable Neighbourhoods <1000 vpd 5.6m carriageway	Width 12.5 m V 3.5m/5.5m carriageway/ V 3.5m Path on one side of street comprising 1.5 m planting, 1.5m path and 0.5 offset allows for <1000 vpd; but all <300 vpd in Catherine park.	- Access Streets specified in Camden Growth Centre DCP as only permitted where adjacent to road /open space Width 13.1 m comprising Verge 3.5m (0.5m offset, 1.5m footpath, 1.5m planting) / 8m carriageway / planting verge 1.6m. Carriageway may be reduced to 6.5m in certain circumstances to make width 11.6m comprising verges 3.5m, 6.5m carriageway, 1.6m verge or 13.5 m width comprising 3.5m verge, 6.5m carriageway and 3.5m verge. Camden Cncl engineering standards for minor access streets require road width 14m for connecting street up to 100m with 9.5m total footway (including 1.2 m path on one side) and carriageway 4.5 m - Camden non Growth Centre DCP includes Access Street 13 m width comprising 4.5m carriageway and 4.25 m verge on either side. Blacktown CG DCP includes Typical Access Street as 13.1m width comprising 3.5m verge, 5.6m carriageway and 4m verge (includes 1m verge, 2.5m path, 0.5m offset). Other examples of 6m widths include Shellharbour 12 m with 3m verges and 6 m carriageway.	Access Street dimensions are over specified in Catherine Fields DCP for role and function. 5.5m carriageway as proposed falls within acceptable practice. 6.5m as proposed by DCP does not improve amenity or pedestrian safety or increase parking. Also other controls in NW Growth Centre (Blacktown CG DCP) permit 5.6m carriageway. 8m width would just increase traffic speeds in the street. Pedestrian environment is the key consideration as traffic volume is very low. Verge is consistent with DCP and provides landscaping, path and offset. Detached dwellings will accommodate off-street parking for at least 3 cars.

Rear Lane				
Purpose and Technical Requirements:	**Best Practice Analysis and Comparison**	**Proposed at Catherine Park**	**Acceptable /Other Practice: Camden GC DCP Sch 4 and other GC DCPs**	**Comments**
Purpose: - provide vehicular access to rear of residential properties - provides access to detached dwellings and medium density - may or may not include garbage collection Technical Requirements: <100 vpd, low speed	Allows 2 cars to pass or a slow car and passing truck: 2.5m+2.5m; 2m+ 3.2m; width 5-5.2m Vic Code: 5.5m wide with no parking spaces to be provided and no verge required; carriageway designed as shared zone; <300 vpd, 10km/hr Liveable Neighbourhoods carriageway 6-6.4m carriageway only; wide enough to allow vehicle access into garages located on the property boundary; target speed 15km/h Width control is generally the space required to turn into and out of garages on boundary. 6.4m allows economical internal garage and doorway width.	Carriage-way only 6.4m (fully paved), no set-backs to garages. No garbage collection in lanes. Domestic scale driveways at street interfaces to reduce impacts on streetscape and pedestrian environment.	- rear lanes not specified in Camden Growth Centre DCP - rear lanes shown as development option at Dawson Damer Drive to service lots with frontage to heritage 'driveway' of Oran Park House - rear lanes in Oran Park DCP and Turner Road DCP has lane reservation width 7.8m comprising 6m carriageway with 0.9m verge either side. - rear lanes in North Kellyville DCP 7.5m comprising 5.5m carriageway and 1m verge either side. Other Growth centre DCPs provide for rear lanes but do not specify design. - Camden Cncl engineering standards for 'lanes' (not specifically 'rear lanes'): 9 m reservation width comprising 6m carriageway and 1.5 footway either side; however other specific rear lanes in Camden Non Growth Centres DCP include Elderslie 8m carriageway only, no footway.	6.4 m (carriageway only) proposed falls within acceptable practice. Rear lanes are to provide a service function, and have been designed only to be used for access to rear of properties so traffic volume is very low. Verges or Footways typically end up in poor condition, are used as dumping areas and are a waste of space. Adjoining lots should allow side of houses on zero lot line as that provides for efficient land use and ordered streetscape.

APPENDIX B

Appendix B

New Practice Guides for Integrated Street Design

1. Manual for Streets – UK Department of Transport, 2007

Manual for Streets guides the design, construction, adoption and maintenance of new residential streets. It places a high priority on meeting the needs of pedestrians, cyclists and public transport users, so that growth in these modes of travel is encouraged. The manual recognises the importance of the community function of streets as spaces for social interaction and applies a user hierarchy to the design process with pedestrians at the top. As follows:

Consider first ↓ **Consider last**	Pedestrians
	Cyclists
	Public transport users
	Specialist vehicles (e.g. emergency services, waste etc.)
	Other motor traffic

"For too long the focus has been on the movement function of residential streets. The result has often been places that are dominated by motor vehicles to the extent that they fail to make a positive contribution to life". (Page 7 Preface)

Manual for Streets 2 – The Chartered Institution of Highways and Transportation 2010

Manual for Streets 2 sets key principles for busier streets and roads, and enshrines the philosophy in the earlier guide that residential street have priority of place over movement:

2. Liveable Neighbourhoods - Western Australian Planning Commission 2009

Liveable Neighbourhoods is an operational policy for the design and assessment of structure plans and subdivision throughout Western Australia. A key objective is to provide for access by an interconnected network of streets which facilitate safe, efficient and pleasant walking and cycling and driving.

Local streets are considered to extend the domestic environment and should be safe for pedestrians (particularly children), cyclists, neighbourly meeting and even social events. Most residential streets should be designed to encourage lower speeds than the 50kph legal limit, generally in the 30-40 kph range. Table 4 of Liveable Neighbourhoods sets out the function and characteristics of four types of local streets – Neighbourhood connectors; Access streets; Laneways and Small town centre streets:

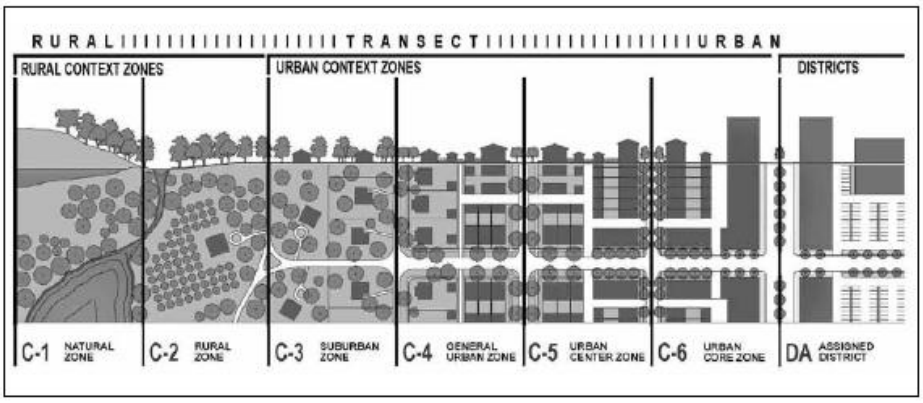
Table 4: Function and characteristics of local streets

Street type and function	Street characteristics	Street name	Max design speed/ target operating speed (km/hr)	Indicative volume range* (vehicles per day)	Indicative street reserve width (metres)+	Indicative road pavement width (metres)
Neighbourhood connectors Streets with mostly residential frontage that typically provide the lower order sub-arterial network. These streets service and link neighbourhoods and towns.	A two-lane divided street used for higher neighbourhood connector volumes, or for character, stormwater infiltration swales or safety. These are often special streets and their design needs to have particular regard to context, function and adjacent land uses.	**Neighbourhood connector A** (Median)	50/50	7000	24.4 **	2 x 7.1 including parking, on-street bike lane, median plus shared path on one verge.
	A two-lane undivided street for lower volume neighbourhood connectors. Typically can accommodate buses, will have at least one shared path and above 3000 vehicles per day separate on-street bike lane.	**Neighbourhood connector B** (Minor)	50/50	3000	19.4	11.2 including parking, plus shared path on one verge.
Access streets Access streets are to accommodate shared pedestrian, bike and vehicular movements. The requirements of adjacent land uses should be supported through street design.	Varied formats to suit a range of typical conditions in predominantly residential areas at different densities, and with different traffic volumes. An avenue access street (Access street A) with median is particularly suited to incorporation of a drainage swale.	**Access street A** – avenue	50/40	3000	20-24	2 x 3.5 (or 2 x 3.6 under some conditions) plus indented parking.
	Access street B is a wider undivided street for situations with increased parking and/or traffic demand.	**Access street B** – wider street	50/40	3000	16.5-18	9.7
	The most typical and most common residential street will be Access street C – Yield street.	**Access street C** – yield or give way street	50/40	3000	15.4-16	7.2 (7-7.5)
	Access street D is for short, low volume and low parking demand streets. In addition, a comprehensively designed variant with 3.5 m travel lane with indented parking, is also specified for very low volume short streets.	**Access street D** – narrow yield or give way street	50/30	1000	14.2	5.5-6
			50/20	150	14.2	3.5 (plus parking indents)
Laneways Provide access to the side or rear of lots principally for access to garages.	Laneways may incorporate some services and can provide rubbish collection access. Laneways usually contain some studio units over garages for surveillance. Lane may be widened in parts to create mews courts.	**Laneway/rear lane**	15	300	6** - 6.4	6** typical 3-6.4 (range)

3. Design Walkable Urban Thoroughfares: A Context Sensitive Approach – Institute of Transport Engineers USA, 2010

This report was developed in response to widespread interest for improving both mobility choices and community character through a commitment to creating and enhancing walkable communities.

Principles for walkable communities include accommodating pedestrians, bicycles, transit, freight and motor vehicles within a fine-grained urban circulation network where the allocation of right of way on individual thoroughfares is based on urban context. The guide is aimed at thoroughfares and although residential street design is not specifically covered, it is included in a planning hierarchy as in which streets are designed in accordance with their position along a transect of urban activities as follows:



Context Zone	Distinguishing Characteristics	General Character	Building Placement	Frontage Types	Typical Building Height	Type of Public Open Space	Transit (Where Provided)
C-1 Natural	Natural landscape	Natural features	Not applicable	Not applicable	Not applicable	Natural open space	None
C-2 Rural	Agricultural with scattered development	Agricultural activity and natural features	Large setbacks	Not applicable	Not applicable	Agricultural and natural	Rural
C-3 Suburban	Primarily single family residential with walkable development pattern and pedestrian facilities, dominant landscape character. Includes scattered commercial uses that support the residential uses, and connected in walkable fashion.	Detached buildings with landscaped yards, normally adjacent to C-4 zone. Commercial uses may consist of neighborhood or community shopping centers, service or office uses with side or rear parking.	Varying front and side yard setbacks	Residential uses include lawns, porches, fences and naturalistic tree planting. Commercial uses front onto thoroughfare.	1 to 2 story with some 3 story	Parks, greenbelts	Local, express bus
C-4 General Urban	Mix of housing types including attached units, with a range of commercial and civic activity at the neighborhood and community scale	Predominantly detached buildings, balance between landscape and buildings, presence of pedestrians	Shallow to medium front and side yard setback	Porches, fences	2 to 3 story with some variation and few taller workplace buildings	Parks, greenbelts	Local, limited stop bus rapid transit, express bus; fixed guideway
C-5 Urban Center	Attached housing types such as townhouses and apartments mixed with retail, workplace and civic activities at the community or subregional scale.	Predominantly attached buildings, landscaping within the public right of way, substantial pedestrian activity	Small or no setbacks, buildings oriented to street with placement and character defining a street wall	Stoops, dooryards, storefronts and arcaded walkways	3 to 5 story with some variation	Parks, plazas and squares, boulevard median landscaping	Local bus; limited stop rapid transit or bus rapid transit; fixed-guideway transit
C-6 Urban Core	Highest-intensity areas in subregion or region, with high-density residential and workplace uses, entertainment, civic and cultural uses	Attached buildings forming sense of enclosure and continuous street wall landscaping within the public right of way, highest pedestrian and transit activity	Small or no setbacks, building oriented to street, placed at front property line	Stoops, dooryards, forecourts, storefronts and arcaded walkways	4+ story with a few shorter buildings	Parks, plazas and squares, boulevard median landscaping	Local bus; limited stop rapid transit or bus rapid transit; fixed-guideway transit

4. Complete Streets

Some US communities have adopted "complete streets" laws and policies to ensure that their roads and streets are routinely designed and operated to provide the safest achievable access for all users, including motorists, bicyclists, pedestrians and transit riders. In communities with complete streets policies, the objective is for pedestrians, bicyclists, motorists and transit riders of all ages and abilities to be able to safely move along and across an urban street.

A complete streets policy creates a routine process for providing for all travel modes whenever a street is built, altered, or maintained. Such policies have been adopted at the state level in the United States (Oregon, California, Illinois, South Carolina and Virginia), by MPOs (Central Ohio, California Bay Area) and by local governments (Charlotte, NC; Sacramento, CA; Boulder, CO; and Chicago, IL).

While context sensitive solutions involve stakeholders in considering a transportation facility in its entire social, environmental and aesthetic context, complete street policies are a reminder that providing for safe travel by users of all modes is the primary function of the corridor. Under complete streets, basic accommodations for bicyclists, pedestrians, transit users and disabled travellers are necessities rather than optional items. All modes and users are important on all thoroughfares.

www.completestreets.org.

5. Link and Place: A Guide to Street Planning and Design 2008 UK Peter Jones

The Guide develops a new approach to urban street planning and design, based around the dual function of streets as Links and as Places. It advocates shifting from a roads-based to a streets-based approach to planning and design, which has major implications for the ways in which streets are classified, how street needs and design requirements are defined, how satisfactory street performance is judged, how parts of the network are prioritised for attention, and for the types of street design solutions that are developed and appraised.

The Guide stresses the role of streets as 'places', as well as, channels for movement, and shows how a more balanced approach to street planning and design can be applied in the case of lightly-trafficked residential roads.

6. Urban Design and Traffic, 2006, The Netherlands CROW

The book focusses on a manner of designing and building streets in which people are the key and the goal is a sustainable and liveable environment in which the roads are safe.

It describes the introduction of 'Sustainable Safety' – the road safety policy in the Netherlands that has focussed on creating a balance between the function, shape and use of roads to bring about a continuing decrease in the number of accidents. Accidents are less serious at slower driving speeds and when they involve smaller, lighter vehicles.

In the Netherlands, roads in residential areas have a 'versatile' mix function in which cars and cyclists are in the same traffic space. The maximum speed in built up areas is 30 kph. Profiles of roads in residential areas focus on residential functions over movement are pavements are kept as narrow as possible to ensure pedestrian safety, not exceeding 404.5m for two way traffic.

Narrow profiles are intended to encourage drivers to adjust their driving behaviour to accommodate other road users. To achieve this, two way streets are to be designed just wide enough for two cars to pass, without leaving room for cyclists. This forces drivers to wait and overtake cars or cyclists only when there is enough space.

Broader or ambiguous profiles could result in unclear situations and cut-offs when motorists take risks and endanger cyclists. In addition, broad profiles encourage speeding, which requires expensive and often unattractive speed-reducing measures.

Parking spaces can help reduce speed by the street profile, and this can be formalised by introducing islands or trees between a fixed number of parking spaces that extend into the traffic path and visually and physically narrow the profile.