Croydon Major Activity Centre

Active and Sustainable Transport Study Background Paper



February 2020

Final Draft

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Context - An opportunity to recommit to transit orientated development

Croydon is an established area undergoing growth and transformation. The pace of investment and development is anticipated to accelerate over the next 20 years with major urban renewal and transport projects planned. These projects are:

- Devon Street multi-deck car park
- Croydon Central Shopping Centre redevelopment
- Civic Centre precinct redevelopment
- Coolstore Road level crossing removal and Croydon station upgrade

Refreshing the Croydon Town Centre Structure Plan 2006 is an opportunity to reassess the transport and movement issues and opportunities for development and rejuvenation of the activity centre. Based on the findings of this study, a recommitment to creating transit orientated centre is essential for better performing transport networks and a successful centre.

The 2006 structure plan delivered a good foundation network for active and sustainable transportation. This legacy can be leveraged to take the next step to create a connected and integrated transport network that gives priority to pedestrians, cyclists and public transport users on key streets and intersections.

Creating an urban realm that is walkable, easier to cycle and increases access to public transport supports these highly desired structure planning outcomes:

- **Successful places** - reach the full potential of land use with the integration of mixed built forms, fine urban grain, dynamic street scapes and public realms.
- **Equitable and inclusive communities** - moving by active, public and shared transportation that is accessible and advantageous for everyone, no matter what their age or ability. It promotes social cohesion and equality of opportunity.
- **Productive and competitive local economy** - More money spent locally in support of local business and jobs creation. People and goods move quicker to customers, education and jobs.
- **Healthy people** - encourages communities to take responsibility for their own and each other's health, wellbeing and safety.
- **Affordable lifestyles** - the costs of living remain affordable to sustain a good quality of life for everyone.
- **Sustainable and resilient environments** - create streets that protects and sustains natural ecosystems to reduce effects of urban heating, contribute to the urban character and sense of place.
- **Complete networks** - it is easy and attractive for people and goods to move about and switch between transport modes, no matter the mode.

Planning for future mobility needs and expectations of those living, working, visiting and traveling through Croydon will ensure the precinct capitalises on investments in transport infrastructure and place making. The better our active, public and shared transport networks preform, the better our streets function and the more successful the centre will be.

Planning for active and sustainable transport is important

Walking, cycling and public transport are deeply linked to successful urban places, thriving local economies, vitality of urban life, inclusive communities and sustainable lifestyles. The performance of the transport network impacts the land use structure, urban form, function and activation of the centre. The interrelationship between land use and transport planning is encapsulated by the planning concept of transit oriented development.

A transit orientated development capitalises on well designed public, active and shared transport networks to shape the urban form, scale and realm. It encapsulates eight urban design characteristics, (see Figure 1). High preforming public and active transport is prioritised to achieve efficient and sustainable mobility. Efficient and sustainable mobility enables urban populations to grow and be more mobile. It recognises walking as the foundation of the transportation system as it allows for modal integration and destination access.

Figure 1: Eight characteristics of a transits orientated developments that create liveable places.



Source: Institute for Transportation and Development Policy (2017)

Walkable neighbourhoods are desirable as people choose to live, work, and play in places with good walkability and access to public transport. People want to live within convenient access to services with a variety of transport choices to reach them. Walkable urban places also have a dwelling density to supply critical mass of people and activities to support the quality public transport.

The Croydon station catchment is an opportunity for intensive mixed-use development in the heart of Croydon. To create a more walkable centre it is desirable to aim towards a density of 25 dwelling per a hectare surrounding the station. Further urban renewal potential can be leveraged from the complementary bus and active transport routes that allow for direct and efficient movement to and around the precinct. The improved transport network efficiency creates room for public space, cycling and walking networks and green infrastructure.

Transit orientated developments allow growth in economic activity and greater density without intensified traffic congestion. Places become more productive, liveable and efficient by allowing more people live, work and be served in less space. The redistribution of local trips to active or public transport can improve the performance of transport networks with the alleviation of congestion and parking pressures.

A public and active transport based transport system is one that is accessible to people of all ages and abilities. An integrated network of services that makes it possible to move quickly and reliably to destinations is fundamentally more equitable than one solely dependent on private vehicles.

Strategic imperative

Plan Melbourne 2017 -2050

Plan Melbourne 2017- 2050 is a long-term plan to accommodate Melbourne's future growth in population and employments in key activity centres across Melbourne. The urban planning aspects of 20-minute neighbourhood (see Figure 2) guides how growth and development can occur in a sustainable way. The outcome is the creation of accessible, safe and attractive local places where people can assess most of their everyday needs within an easy 20 minute walk, cycle or public transport trip. It sets a direction for the concept to be embedded in to local planning schemes and plans.

Figure 2:The integrated urban aspects of 20-minute neighbourhoods



Source: Plan Melbourne 2017 -2050

The Croydon Town Centre Structure Plan 2006

The Croydon Town Centre Structure Plan 2006 established the visions and aspirations for the future development of Croydon. An important objective was to improve the integration, access and connectivity for active and public transport.

The objective was subsequently reinforced with the development of Croydon Pedestrian Priority Plan 2009. A detailed action plan provided a pipeline of initiatives to resolve gaps in pedestrian, cyclists and public transport routes, asset quality and safety issues prevalent through the centre. Some headway has been made with pedestrian and cycling link improvements. Centre shaping projects (see Table 1) currently being planned are opportunities to complete the links.

Table 1: Major developments occurring within the Croydon Activity Centre.

Project	Description	Timeframe (years)
Croydon Community Precinct	Planning is underway for the redevelopment of the existing community precinct. It contains a significant number of community facilities, including a library, and accommodates a diverse range of associated community and sporting groups. Many of the facilities are coming to the end of their useful life in the next five to ten years. The planned redevelopment will feature a new library, family and children's hub, sport and recreation hub, enhanced war memorial and a two multi-use community spaces.	2 -3
Croydon Central Market Site	Construction is underway to transform Croydon Central into a contemporary and vibrant retail and community hub with new fresh food, services, retail, and dining open and trading in early 2020.	Commenced
Arndale Shopping Centre	Arndale is primed for renewal. No plans are in the pipeline for rejuvenation. The redevelopment of the adjacent Croydon Civic precinct might be the catalysis for subsequent redevelopment of the shopping centre.	10+

Croydon Town Centre today

Plan Melbourne designated Croydon as a major activity centre. These centres provide a suburban focal point for service, employment, housing, public transport and social interaction. Overtime, Croydon has developed as a commercial, civic and sport and recreation precinct. Performing these roles has seen a concentration of destinations where community can access a diversity products and services (see Map 1).

The highly valued open space of Croydon Park and Town Park incorporates the municipal sport and recreation facilities of Aquahub, an athletics track, the X and Y Spaces and the Memorial Pool. Additional public space has been created in the centre's heart with the new Croydon Town Square.

The centre feature three distinctive shopping areas, Croydon Central, Main Street and Arndale.

The community precinct is an important civic hub for the City of Maroondah. It contains a library, EV's Youth Centre, maternal and children health centre, community halls and council customer service.

The Croydon station and bus interchange are at the heart of the centre. The interchange is the transport hub for the centre.

The two Anzac memorials, Croydon Wetlands and the nearby Wyreena Community Arts Centre connect community to Croydon's heritage.

Croydon will be at the forefront of urban renewal with several development opportunities within the centre. The pivotal renewal projects that enhance Croydon's strengths as a centre for jobs, entertainment, sport and recreation and civic activity are listed in table 1.

One of Croydon's strengths is its proximity to the regionally important employment and commercial centres of Ringwood, Maroondah Medical Precinct, Bayswater Business Precinct, Chirnside Park and Lilydale. The rail network provides excellent rapid and direct access to Box Hill and CBD.

The centre is well placed to deliver on the transit orientated development and 20-minute planning intent to provide people the greatest choice in services, employment and social interaction. Public, active and shared transportation will play a signifigent role in the accomplishment of transit orientated centre that functions as a 20-minute neighbourhood.

Map 1: Key features of the Croydon Activity Centre and the surrounding area

Key Features of the Croydon Town Centre and the Surrounding Area

Legend

- Bus Interchange
- Train Stations
- Bus Routes
- Bicycle Paths

Key Features

id	Name
1	Croydon Central Shopping Centre
2	Croydon Town Square
3	Croydon Main Street Shopping Centre
4	Arndale Shopping Centre
5	Croydon Primary School
6	Silcock Reserve
7	Sacred Heart Primary School
8	Croydon Park
9	Memorial Pool
10	X and Y Space
11	Swinburne Unviersity of Technology - TAFE
12	Athletics Track
13	Town Park
14	Aquahub
15	Croydon Library
16	EV's Youth Centre
17	Keystone Hall
18	Croydon Community School
19	Police Station
20	Wyreena
21	Dorset Recreation Reserve
22	Eastfield Park
23	Croydon Wetlands
24	Croydon Maternal and Children Health
25	Croydon Central Kindergarten
26	Croydon Returned and Services League
27	Maroondah Occasional Care
28	Fire Station
29	St John Ambulance

0 100 200 300 400 m

Created: 9 September 2019



Active and sustainable movement

Croydon is fortunate to be serviced by satisfactory public transport connections, cycling links and walkable urban environment (see Map 2). The relative ease of accessibility and movement within and through the centre is a legacy of established movement infrastructure and transport services. The performance and capacity of the existing active and public transport infrastructure and service are summarised in this section.

Map 2: Public transport servicing the Croydon Activity Centre



Source: Maroondah Interactive Map

Train Station and Services

The Lilydale line runs through the Croydon activity centre, splitting the centre into two. The Croydon station and bus interchange are located at the heart of the activity centre. The station is classed as a premium station, that is staffed from the first to the last train.

The station is a major centre gateway with 899,752 visitations in a year[1]. PTV data shows the average weekday patronage sits at 3,153. The average daily patronage on Saturday and Sunday is significantly lower, 1,440 and 932 respectively. Station visitations across the board have increased, contributing to an annual patronage increase by 9% between 2013 and 2017.

PTV passenger activity data shows that private vehicle, bus and walking are the most common ways commuter arrive at the station. Private vehicles constitute 40% of arrivals, compared walking, 32%, walk and bus ,7%[2]. The preference to drive is a contributor to the surrounding commuter car parks being full by 7 am. Commuter parking demand continues to exert pressures on local street network surrounding the station.

[1] Public Transport Victoria (2018)
[2] Public Transport Victoria (2015)

The number of commuters walking to Croydon Station is quite high. The pedshed map shows that almost the entirety of the activity centre falls within the 10-minute walking radius of 800 metres. The pedshed covers approximately 560 dwellings. Only the southern and eastern most area falls outside the radius.

Map 3: Walking (pedshed) catchment of Croydon Station



Source: AURIN Portal

The low volume of arrivals by bus is poor for a station that is served by 10 bus routes. Hesitation to catch buses are influenced by indirect, slow routes, poor connections and waiting experiences. The failure of bus network to feed the station is considered a problem of the existing bus network.

Table 2 is a summary of train services for Croydon. Services are a mix of stopping all station and limited express services. For a Croydon passenger a journey to the CBD on a stopping all station service takes 50 minutes. Limit express services available during peak times offer a quicker 42-minute journey. On weekends, branch line shuttle services mean commuters switch trains at Ringwood Station.

The duration of services is excellent. Service frequency ranges from reasonable to excellent. The lines potential is held back by the 30-minute frequency in the off peak. There is opportunity for weekday off peak improvement. Commuters receive better services on the weekend than during weekday off-peak.

Metropolitan train operational performance for the last 12 months shows that the Lilydale line experiences instances of short servicing and station bypasses (see Table 2). These service disruptions are problematic as they reduce service reliability and customer satisfaction.

Train services are feeling the pressure of unprecedented patronage growth. The strain is being felt with instances of overcrowding occurring in the am peak. Croydon commuters are fortunate to be able obtain a seat on peak services to the city. All seats are usually occupied by the time the train reaches Ringwood Station. Since patronage growth is expected to continue, overcrowding incidences are likely to become more common and with greater intensity.

Table 2: Train Service Performance for Croydon Station

	Weekday		Weekend	
	Peak	**Off Peak**	**Saturday**	**Sunday**
Number of Services	23	31	53	47
Frequency range (mins)	12 - 20	30	20 - 43	20 - 60
First Train	4:41 am		3:59 am	3:59 am
Last Train	12:34 am		11:59 pm	11:32 pm
Average load on a service[3]	700			
Instances of Overcrowding[4]	2	0	0	0
Punctuality AM[5]	88.1%	-	-	-
Punctuality PM[6]	86.2%	-	-	-
Cancellations[7]	0.8%			
Short services[8]	2.7%			
Station Bypass[9]	1.0			

Buses

The centre is serviced by 12 bus routes, including 1 telebus, 1 Skybus and 1 night bus. The bus routes run on the arterial and connector roads.

The routes converge on an interchange that straddles Croydon Station with bays on both sides. The network gives excellent coverage and access. People can board buses from 33 bus stops distributed across the centre (see Map 4). It is common for the walking distance between bus stops to be as close as 200 metres.

[3] Metro Trains (2018)
[4] Metro Trains (2018)
[5] Metro Trains (2018)
[6] Metro Trains (2018).
[7] Jack T & Butt C, (2018)
[8] Jack T & Butt C, (2018)
[9] Jack T & Butt C, (2018)

Map 4: Bus stops within and surrounding the Croydon Activity Centre



Source 1: AURIN Portal

Bus routes provide important north south connectors to the important destinations of Baywater Business Precinct, Boronia, Bayswater, Wantirna Medical Precinct, Knox City Shopping Centre, Chadstone, Chirnside Park and Monash University.

Table 3 shows the service characteristics for each route. Service quality is varied depending on the day and time. Bus routes operate at their best during the peak when additional services are provided. The quality drops away during off-peak. The quality of service is at its lowest on the weekend with some routes having an hour frequency.

Associated passenger decline on such routes relates to the lower service quality. People are discontent and frustrated with indirect, infrequent and slow bus services. People are wanting better amenity for bus stops, quicker trips and buses that take them to where they want to go.

Table 3: Service aspects of bus routes that serve the Croydon Activity Centre

Routes	Key Connections	Patronage (Average Daily Boardings)	Growth/Decline in daily boardings (2014 -2017)	Frequency mins between services (Weekday)		Duration (Weekday)	
				Peak	Off Peak	Route	Last Bus (pm)
380	Eastland, Ringwood East	1,411.14	88.70	15	30	6:00	11:07
664	Chirnside Park, Bayswater, Knox City Shopping Centre.	615,79	-27.25	20	30	5:33	9:49
670	Chirnside Park, Lilydale	1,405.90	-28.87	15	30	5:40	10:08
671	Chirnside Park	142.59	-22.31	30	60	6:42	7:30
672	Chirnside Park	234.81	-17.52	30	60	6:25	8:10
689	Montrose	138.47	2.08	30	60	7:25	6:55
737	Bayswater Business Precinct, Boronia, Glen Waverly, Monash University	448.45	-22.37	20	20 - 30	6:14	9:04
688	Montrose, Mt Dandenong, Upper Ferntree Gully	398.83	4.84	20	40	5:47	9:15
690	Kilsyth, Bayswater Business Precinct, Boronia	491.66	-16.70	30	30 - 40	5:51	8:50
Telebus 4		72.23	-36.41	30	60	6:18	7:15
964 Night Bus		0.01	-	-	-	-	-

Source: Public Transport Victoria (2018)

Cycling

The public transport network is complemented by an active transport network that allows people to cycle and walk in and around the activity centre. Maps 5 and 7 show the cycling and walking networks for the centre.

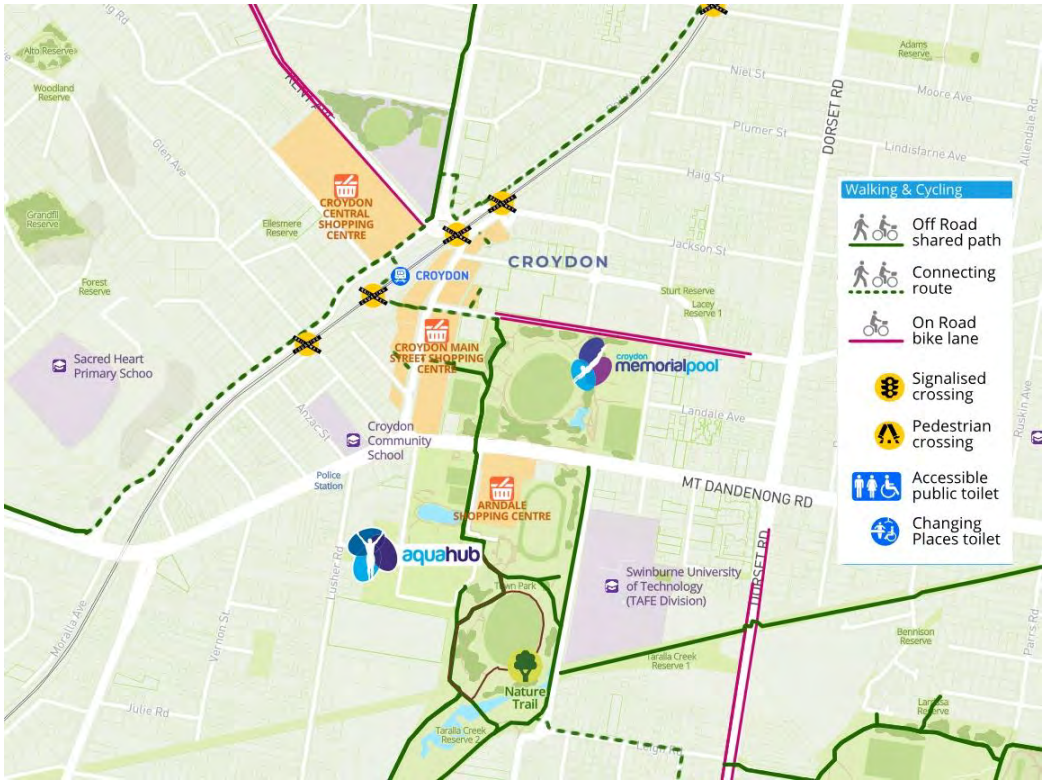
Rates of cycling for transport remains low in comparison to other modes. Census data shows that cycling only to work has remained static at 0.4% since 2006.

However, VISTA, Parkiteer occupancy rate and Super Tuesday counts suggest the participation rates in cycling for transport is higher when it is combined with another mode.

The Croydon Parkiteer has a capacity of 26 bicycles. Membership and occupation data from Bicycle Network shows that Croydon had 320 registered users in 2019[10]. The average occupancy rates for 2019 was 54%, with a variation of between 40% to 71% full. From January to October 2019 the facility has been used 2950 times. It is likely that on any given weekday the Parkiteer will store 14 bicycles.

Super Tuesday counts have shown an increase in cycling activity across the network surrounding around the centre from 2014 to 2017 [11]. Across four locations surrounding the centre, 61 cyclists where counted. Super Sunday confirmed that recreational cycling activity on the Tarralla Creek Trail has also increase by 3% between 2012 and 2016[12]. On a Sunday morning, 140 recreational cyclists where counted on the trail.

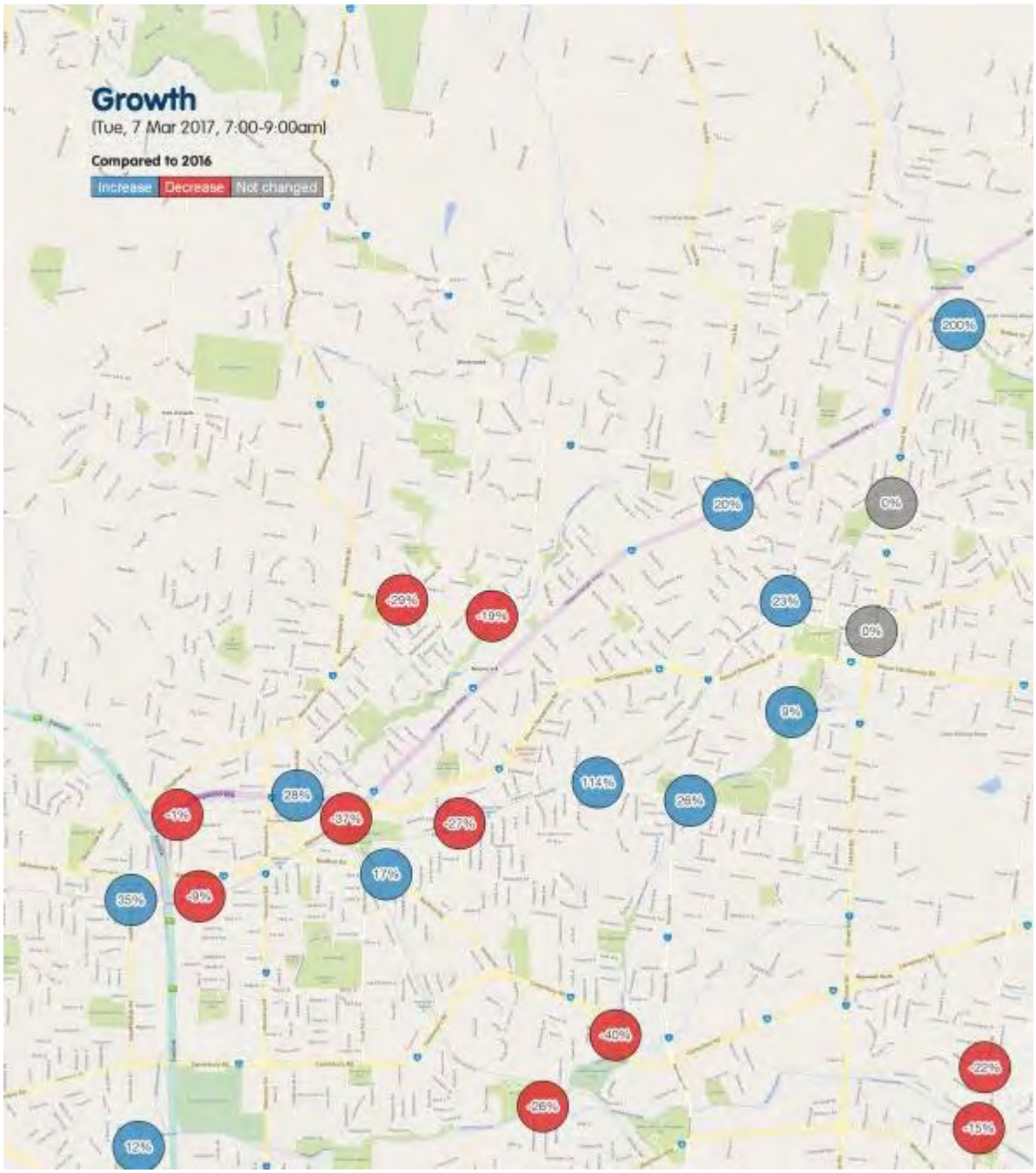
Map 5: Bicycle network for the Croydon Major Activity Centre



Source: Maroondah Interactive Map

[10] Bicycle Network (2019)
[11] Bicycle Network, (2017)
[12] Bicycle Network (2016)

Map 6: The growth in cycling participation 2016 - 2017



Source: Super Tuesday Report 2017

Since 2014, there have be 69 households in Croydon that have owned an adult bicycle[13]. Over the same period, 45 households owned one or more child bicycles[14].

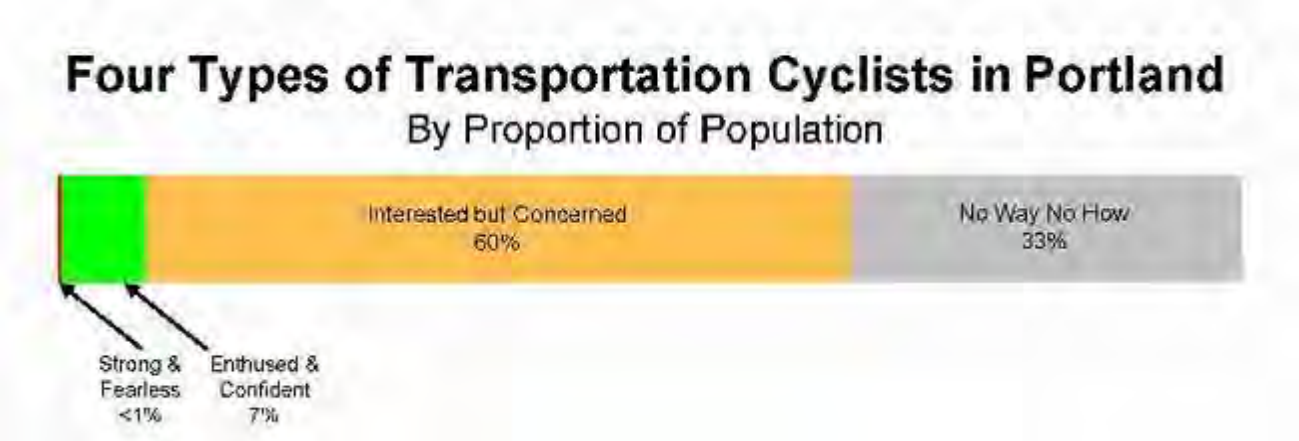
[13] Department of Transport (2019)
[14] Department of Transport (2019)

The centre has a network of developed cycling routes (see Map 5). These routes connect surrounding neighbourhoods to the centre. The cycling network is made up of trails, bicycle lanes and shared pathways. The major cycling spine is the Tarralla Creek Trail which is part of the Carrum to Warburton Trail. Kent Avenue has the only Copenhagen bicycle lanes in the City of Maroondah.

Network gaps constrain the coverage and utility of the network. Cycling routes terminate abruptly as they reach the centre's core. The rail line is a major barrier to achieving a convenient north south link because cyclists have to dismount to cross. Intersections are the other location where cycling facilities are absent.

Another matter is the inherent level of stress and comfort across the network. A cycling study in Portland found that there is a continuum of attitudes about cycling among its citizens[15]. The cycling community was split into four types based on confidence, (see Figure 3).

Figure 3: Four Types of Commuter Cyclists in Portland



Only a small fraction of cyclists were willing to ride regardless of road condition, they were classed as the strong and fearless. People that liked to cycle and are confident to do so in favourable street environments, were classed as 'enthused and confident'. The greatest proportion of population were classed as 'interested but concerned' cyclists. These people were curious about cycling but were nervous to ride. Many vulnerable people fell within this segment, i.e. females, children and seniors. Finally, there were the people who weren't interested in cycling no matter how good the facilities. They were classes as the 'no way no how'.

Consultation with the local cycling community has provided local insights about confidence levels and facility preferences[16]. Most local commuter cyclists are split between the 'strong and fearless' (45%) and the 'enthused and confident' type (38%). A small group identifies as sport and racing cyclists (12%). These three cyclist groups are comfortable to cycle in a variety of environment, from roads with no facilities to bicycle lanes and shared paths.

The 'interested but concerned' cyclists, tend to be recreational cyclists in nature. Their preference is to cycle on dedicated bicycle paths and shared paths. They will sometimes ride on streets if the traffic speeds and volumes are low. For these people, a single high stress section along the route will cause them to abandon the whole journey.

[15] Dill J & NcNiel N, (2012)
[16] Maroondah City Council (2019)

Consequently, a better linked, continuous and separated network is necessary to allow people 8 to 80 years of age to cycle confidently for a variety of trip purposes.

Secure customer and community bicycle parking is scarce. Many key destinations lack short term bicycle parking facilities. Limited shortage impedes integration and deters people from cycling. Cyclists are faced with tough decisions about the security of their bicycle. They are forced to improvise and secure bicycles to street furniture. Bicycles locked to street furniture have urban amenity and pedestrian movement implications. Provision of short-term bicycle parking should be the default for key community, commercial and entertainment buildings. Furthermore, public bicycle repair stations at key dwelling locations along the main cycling routes would also be advantageous.

Walking

Walking is the most common way people move through the centre, as almost every trip to the centre will contain a walking component. Walking is the universal mode of integration, access and inclusion.

Walking permits people to switch between transport modes. Pedestrian movement to the station, bus stops and through carparks should be convenient, pleasant, direct, coherent and conspicuous.

People complete journeys and access destinations by walking. Ease of walking is an interrelationship between block size, destination variety and quality of pedestrian connection. Appropriate block size, active building facades and complete streets provide the ideal pedestrian environments along the best desire lines.

From a transport planning perspective walking includes people moving with the assistance of personal mobility devices (PMD). Given this definition, walking has a social equity aspect with people of all ages and abilities able to participate in walking.

The centre is very walkable a with well-developed and comprehensive pedestrian network. The spine of the network is the Principal Pedestrian Network (PPN). The PPN are pedestrian arterials with the best pedestrian infrastructure to cater for greatest pedestrian movement. The majority of the streets in the centre are part of the PPN.

Map 7: The Principal Pedestrian Network and planned footpath construction



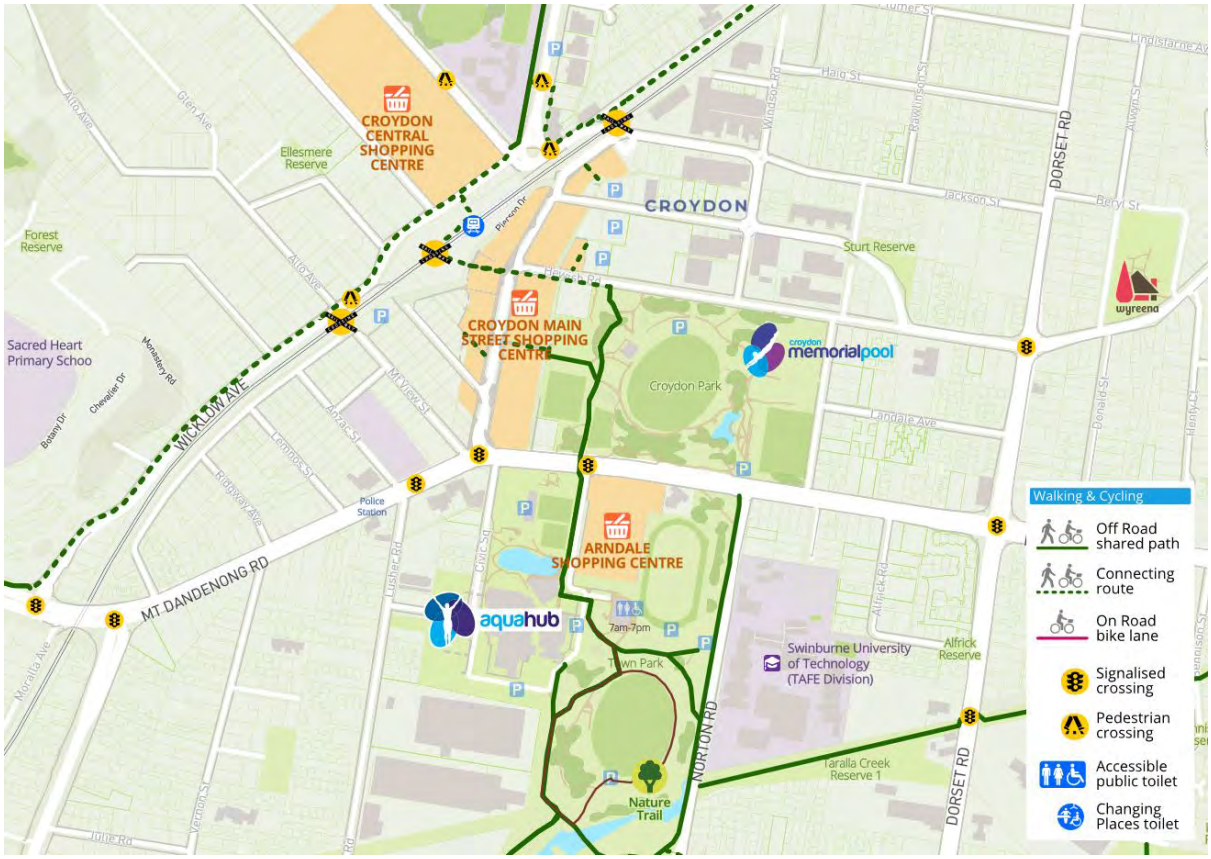
Source: Maroondah City Council - Intramaps

The PPN is complemented by connection to local streets with footpaths., many of which have established footpaths on both sides. Twelve streets within the centre are awaiting segments of footpath construction. Several laneways provide short cuts through larger blocks for greater route choice. Many of the existing gaps in the network will be constructed within 1 -5 years (see Map 7).

Pedestrian permeability across arterial roads and the railway line is attained by pedestrian crossings located at key locations on pedestrian corridors of travel. These crossings are a mix of Pedestrian Operated Crossings (POS), zebra, school and rail crossing (see Map 8). The school crossings are attended by school crossing supervisors. Opportunities to improve pedestrian connectivity between the three commercial sub-centres involve changing the placement of some crossing so they are on the natural pedestrian path of travel, refinement to signal priority and extension of crossing durations.

The scale of pedestrian movement is constrained by the large block composition in parts of the centre. Large blocks discourage walking as trips take longer, are less convenient and intuitive. Encouraging lot amalgamation through planning approaches such as Greening the Greyfield or land acquition are strategies to improve block permeability. Lot consolidation and better building placement can create the space for new pedestrian right of ways. It is ideal that these new pedestrian links be created at block mid points.

Map 8: Walking trails and pedestrian crossings



Source: Maroondah Interactive Map

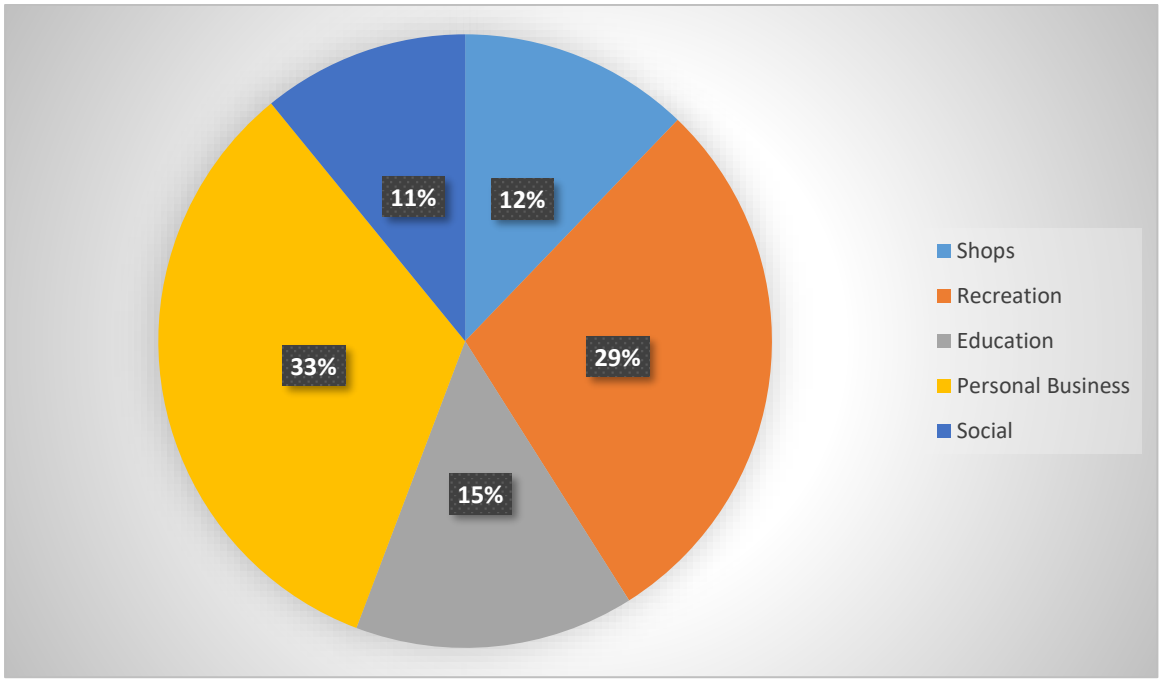
The community has excellent access to a multitude of destinations and services within short walking distances of each other. The closeness of services allows people to complete multi-purpose trips with ease on foot.

Based on census data, solo walking for transport makes up 2.6% of journeys. The participation in Croydon is double the rate for the municipality (1.3%). Other evidence sources indicate that walking for transport is more common when combined with another mode. Train boardings at Croydon station show that 32% of train users walk to the station.

Given the of prevalence of bus stops, it is common for residents to walk to the bus stop. The walking time from a parked vehicle is mostly between 1 to 5 minutes long[17]. Walking as part of a multi-mode transport trip is a common and tends to be over short distances.

People living in Croydon choose to walk for recreation, personal business, education and shopping (see Figure) 4[18]. Walking for personal errands includes all the daily errands, except shopping and education. These trips tend to be less than a kilometre and are completed in 15 minutes. Walking to the shops shares similar characteristic to personal business trips. They are less than a kilometre and take 18 minutes.

Figure 4: Walking trips by purpose



Source: Department of Transport (2016)

Walking is the most popular recreation and fitness activity conducted by residents of the City of Maroondah. In 2016, 48 Croydon residents stated that they participated in walking for recreation[19]. 1 in 4 of these participants jogged. The duration of recreational walks ranged from between 10 minutes to 1 hours. The average journey time was 25 minutes to complete an average distance of 1.5 kilometres. On a Sunday morning in 2016, the Tarralla Creek Trail had 500 walks, 15 runners and 30 dog walks over a duration of 4 hours[20].

[17] Department of Transport (2016)
[18] Department of Transport (2016)
[19] Department of Transport (2016)
[20] Bicycle Network (2016)

Walking to education is most commonly done by Croydon residents of 15 to 19 years of age. Student of late primary school and early secondary (10 -14 ages) are the next most likely walkers. Both genders are equally represented in walk to education. Students walk on average less than a kilometre, taking 15-minutes.

There is signifigent potential to increase community participation in walking in all its forms, especially for local trips less than 2 kilometres. Places where people walk more are more inclusive, safer, healthier and liveable. The more people walk the better off they are, places become more liveable and local business are more successful.

Future transport and movement trends shaping the Croydon of tomorrow

On the near horizon, there are emerging technology innovations, service models and community movement trends that are likely to shape network integration, connected places, accessible buildings and mobile communities the next 20 years.

As these technologies, service models and customer preferences become more prevalent and mainstream, their impacts will be more visible and felt in our neighbourhoods and community. Already new services are blurring the lines between public and private transportation. It is inevitable that they will play a role in the continued transformation in how people move, connect and live lifestyles.

Understanding the timeframes and implications of these future transport and movement trends enables us to consider the likely impacts on land use and urban design from the perspective of sustainable and active mobility.

Table 4: Transport and movement trends that are shaping networks and services.

Trends	**Description**	**When (years)**	**Implication**
Continue popularity of trains	People are using the trains in growing numbers to access jobs, services and entertainment across metropolitan Melbourne. PTV data shows an annual growth of 8.3% with an annual station patronage estimates of 3,961,179[21]. The Belgrave and Lilydale line services are stretched with impacts on performance and passenger comfort during peak periods. As a result, trains are often overcrowded, running short and skipping stations. The lines have the second worst peak hour punctuality for the metropolitan rail network[22].	0 -5	Without additional capacity to allow more services the rail network will cease being an enabler of future precinct development, growth and mobile community. Decline in convenience may push people back into reliance on cars and increase congestion.

[21] Public Transport Victoria (2018)
[22] Egging K (2019)

Trends	Description	When (years)	Implication
Plateauing of bus popularity	Whilst the bus network offers good coverage, the slow, infrequent and indirect routes aren't attractive, reliable or competitive when compared to driving. Unfortunately, the recommendations of the most recent bus review were not implemented and thus bus services are often failing to deliver passengers to the destinations they desire to go. This is unfortunate since buses can be an excellent means of connecting neighbourhoods to stations and activity centres. Those few services that are experiencing patronage growth demonstrate that bus routes can be successful when they're direct, frequent, accessible and reliable.	0 - 5	A redesigned network of bus routes with specific roles will better support future precinct development, growth and community mobility. A quality transport interchange, bus services seamlessly integrate public and active transport. Quicker transfers and more comfortable facilities will make public transport more appealing option.
Connected environments and communities with smart infrastructure	Technology driven automation, digital connectivity and information sharing infrastructure will transform the urban environments. The common areas of smart urban realms include: intelligent transport systems, public lighting, bins, parking, grids and water networks. Connected environments created through interoperable smart infrastructure and platforms link people to services, resources, amenities and each other. It provides a means for building connection between people, places and processes. Smart urban development provides service providers with a more nuanced and sophisticated network management opportunities enabling them to have customer focused responses in real-time.	0 - 5	Better information to allow planners to better understand and develop places and movement corridors to cater for transport needs and expectations. Improved multi-mode integration Better urban amenity creates a more desirable environment to walk, cycle or access public transport.

Trends	Description	When (years)	Implication
Personalised mobility without private ownership	Telebuses, car share, bike share, ride share and ride sourcing are already operating manifestations of on demand and/or shared transport. Research by transportation network companies operating in Melbourne indicate that services are becoming increasingly attractive. They enable people to access personalised mobility without private vehicle ownership[23]. They are proving to be effective in reducing the use of private vehicles[24]. Smart-phone traveller information applications are common and accepted. They offer a single platform for public transport service information and journey planning. These platforms lack direct payment capabilities. The introduction of Myki on a device is a step towards creating a 'tap and pay' inclusion. The next step will be for applications to provide Mobility as a Service (MaaS) information. MaaS applications integrate service information for multiple independent providers. MaaS applications allow customers to consider and choose the best transit option based on cost, time and other individual needs. An example of a MaaS application launched recently by the RACV is Arevo. On demand and shared transit is anticipated to be a growing transit industry and market.	0 - 5	On demand and shared services could be a competitor to public transport. Reduce transport disadvantage with improved access, quality and affordability outcomes for communities in public transport disadvantaged places. Restructuring of the bus network for more efficient and effective purposes.

[23] Parliament of Victoria (2018)
[24] Jain T (2017)

Trends	Description	When (years)	Implication
Transport powered with alternative fuels	Hybrid and battery electric vehicles (BEVs) are already operating on Victorian roads. The market for electric vehicles is growing slowly due to higher prices and limited lower travel range compared to petrol vehicles. Sales of electric vehicles are anticipated to increase as improvements are made to increase battery storage, prices drop and greater choice in vehicles types. The metropolitan tram and train networks are taking steps to separate their electricity system from the domestic energy grid and are progressing towards zero emissions electricity supply.	0 - 5	Increased demand for charging facilities in public and private car parks. Zero emission vehicles provide opportunities to significantly reduce greenhouse gas emissions generated from transport, and consequently better public health and a cleaner environment.
Millennials delaying or avoidance of driving	RACV research[25] indicates that youth driver licencing rates in Victoria continue to decline. Younger generations, 18 - 29 age group, are delaying or completely avoiding getting a driver's licence. At anticipated rates, only half of 18 to 24 year olds will have a driver's licence by 2025. Consultation with youth and young adults living in the City of Maroondah suggests that local car independence trend won't be as high as the rates indicated in the RACV report.	5 - 10	Migration and settlement of young adults to public transport rich areas of the municipality and inner city suburbs. Increase in cycling and pedestrian traffic and activity on active transport network.
Use of drones to support future small goods transport task	The freight industry is developing the commercial application of drones for rapid point to point delivery services. The application of cargo drones is likely to be the first witness in parcel delivery. Post and parcel courier companies such as Amazon, FedEx DHL are working with drone companies to test prototypes. The aim is to have fleets of drones to quickly send products to homes for near-instant delivery to the consumers.	10 - 15	Reductions in delivery movements made in the pedestrian zones. Incorporation of take-off and landing infrastructure on top of buildings. Reduction in light commercial vehicles movements circulating on the road network.

[25] Wunderstz et al. (2017)

The global impacts

In addition to the transport related drivers there are global force at play. They impact on the liveability of places, performance of infrastructure and community cohesion. The impacts are felt as chronic stress and acute shocks (see Table 5).

Table 5: Table of chronic stress and acute shocks.

Chronic Stresses	**Acute Shocks**
Population growth and migration	Housing affordability issues, rental stress, congestion, crowding.
Climate change	Bushfires, floods and heat waves. Food insecurities, disease, further migration
Oil vulnerability	Petrol price increase. Food and products affordability issues.
Aging population	Loss of working class and more retirees.

The impacts are multidimensional. On the one hand, they can create vulnerabilities, instability and disadvantage through causing disruption, limitations and damage to our places and movement corridors. On the other, they can be the impetus for change and adoption of new ways to build, live, move and do business.

At the heart of our planning response is how best to achieve balance between protection against disruption and capitalising on advantageous opportunities. Our best approach is to incorporate integrated land use and transport with emerging transport services whilst responding dynamically to changing mobility trends. It also needs to respond to current mobility demands and lay the foundations to incorporate new transport services.

Precinct planning must be agile, multi-faceted and community centred with the intension of creating a precinct serviced by dynamic movement networks that meet future mobility needs and expectations. If achieved, businesses and communities will be better placed and prepared to embrace change.

Key ambition

Eight key ambitions are priority statements to create a transit orientated precinct with a broader spectrum of sustainable transportation and movement. Reinforcement of the ambitions in the vision, aspirations and long-term plans for the centre is desirable. This will ensure greater focus and consideration on integrated public, active and shared transport by all planning authorities. The outcome will be improved consistency and accountability in how transport and place projects are planned for the centre.

The seven ambitions are:

1. **Better streets, better service, better access** - Improve urban roads and streets to be accessible and safe for people of all ages and levels of physical mobility, from 8 to 80 years old.
2. **Living streets are public spaces and ecosystems** - Strengthen streets as places, public spaces and ecosystems.
3. **Active streets are diverse places** - Attract services and create destinations that support local living and activity.
4. **Thriving streets are great for business** - Recognise that walkable places are good for business.
5. **Achieve greater density without congestion** - plan for better quality of development to accommodate enough density that is favourable for walking, cycling and using public transport.
6. **Safe and continuous movement** - Strengthen pedestrian and cycling connection with whole of route facilities on urban roads and streets.
7. **Prioritise shared transit services** - Facilitate the introduction of share mobility services.
8. **Prioritise zero emission transportation** - Provide zero emission transportation infrastructure.

These ambitions are a synthesis of the nine principles for active and sustainable movement (see Table 6). The ambitions and principles can be achieved together when the planning, designing and delivering built form, streetscape and public realm in accordance with six strategic directions for future development**.**

Active and sustainable transport principles

Nine design principles are recommended for adoption into the Croydon Town Centre Plan.

Table 6: The nine principles of active and sustainable transport

Principle	Description
Think one transport system of many modes.	Consider all transport modes in planning so they work in harmony to move people and goods effectively and efficiently. Where modes share the same space, prioritise space allocation based on desired key function of the movement corridors. Better integration of active transport with public transport coupled with provision of long-term bicycle and personal mobility device parking facilities at transport hubs.
Put the people at the centre.	Design our places, buildings, streets and transport networks with an emphasis on people movement and access. Create favourable amenity and conditions for active and public transport with the presence of footpaths, pathways, streets, gardens and other natural features. Achieve high quality street and places with an emphasis on being accessible to all users.
The concentration of local service.	The concentration of retail, commercial, educational, medical and community destinations through co-location and mixed use development supports linked trips. A diversity of services near where people live supports localised living and builds connection to place.
Continuous and permeable connections.	Important destinations are to be connected by continuous and direct routes. Gaps in the pedestrian and cycling networks are to be completed. Where active transport routes intersect with major roads or intersections, provide crossings to ensure safety, priority and minimise delay. Achieve high walkability within a street network with many permissible routes to increase block permeability.
Offer safe and low stress experiences.	Mitigation of real and perceived safety concerns crucial to attracting people to active transportation, especially vulnerable groups of women, children and seniors. Our streets, pathways and open spaces should be comfortable places for people of all ages and abilities to move and dwell. Street design should minimise potential points of conflict between modes, reduce speeds, offer lighting and protected facilities where necessary.
Active travel corridors are destinations as well.	Make corridors legible and distinctive through the application of appropriate urban design and landscape treatments.

Principle	Description
Convenient and accessible public transport.	All residents have access to reliable, safe and convenient public transport with a station or bus stop within walking distance of their home. The network provides priority to public transport at bottlenecks to ensure reliability and rapid public transport services.
Support shared transportation	Encourage share transportation by supporting the introduction of car and bicycle share programs in the public realm and private developments.
Promote zero emission transport	Promote electric vehicles by facilitation of the introduction of charging facilities in the public and private car parks.

These principles reflect the current thinking on building and urban space design to increase active travel. They bring common understanding about the core values that underline land use and transport planning for the centre. Serving as a reference tool for coordinated planning decision making between planning agencies and local government, they'll improve consistency in land development and transport project design to implement active and sustainable transport priorities.

The principles align with the Healthy by Design Guideline set by Victorian Heart Foundation and 20-minute neighbourhood of Plan Melbourne. Adherence with these design guidelines will ensure the principles are embedded in future precinct planning and development.

Strategic directions for future development

There are six strategic directions that serve to focus planning and design decisions for future development and transport pipeline projects.

- Provision of whole of route permeability through and around the precinct for walking, cycling and personal mobility devices, particularly to key destinations.
- Provision of whole of route, low stress and convenient access to public transport and active transport networks.
- Enhancement of public transport connection with neighbouring activity and employment centres.
- Active and passive surveillance of public realm to enhance perceptions of safety and amenity.
- Growth and intensification of commercial, educational, retail, leisure and community facilities to create opportunities for local employment and participation.
- Integration of shared and zero emission transportation facilities to meet the needs of people living, working and visiting the precinct.

Active transport benefits our people, businesses, networks and places

Strong support of active and sustainable transit is a necessity because moving people by active, public and shared transport has co-beneficial impacts on transit networks, urban realms, business and communities.

Different studies identify a range of benefits and costs that are directly attributed to active, public and shared transportation modes. A summary of the benefits, savings and costs across the spectrum of core place making objectives are articulated in Table 7.

Table 7: Benefits of active and sustainable transport.

Objective	Benefits	Savings (cents per km)	Costs (cents per km)
Accessible places	Convenient access and circulation to essential destinations, services, and activity for residents, workers and visitors. Enabler of compact mixed-use development and preferred future urban character.	Land use savings: 44.0[26]	
Affordable lifestyles	Lower household transport cost associated with reduction in vehicle usage or even the divesting of a car.	Vehicle operating costs: 35.0[27]	Higher property values
Sustainable neighbourhoods	Reduce transport related carbon emission. Improved localised air and water quality. Noise reduction from the volume and speed of vehicles. Landscaping and street trees create attractive and comfortable streets and pathways.	Environment: 5.9[8]	
Healthy and connected community	Incorporating incidental activity can help to reduce the prevalence of obesity, diabetes and cardiovascular disease. Passive surveillance from increased street activation can addresses actual and perceived personal safety and property security. Increases street activation and accelerates community building with opportunities for social interaction and cohesion. Builds personal connection and pride in places.	Public health: 168.0[8]	Injury costs: 30.5[7]

[26] Victoria Walks (2018)

[27] Queensland Department of Transport and Main Roads (2011)

Objective	Benefits	Savings (cents per km)	Costs (cents per km)
Complete networks	Improves capacity and efficiency of public transport by extending the catchment of transport hubs. Redistribution of more local trips to active transport assists to reduce localised congestion and alleviates parking pressures. Projects can be built in stages with completed infrastructure used immediately. Inexpensive and shorter project time in comparison to other modes. Compact scale of infrastructure is easily retrofitted into existing urban built form.	Decongestion: - 20.[78] Infrastructure: 6.8[8]	
Productive economy	Stimulate local trading by up to 40% and retail rents by 20%[28] with increased foot traffic and activated shops frontage. Increase in people entering shops and trading with local walkers and cyclists visiting more regularly and spending on average more[29]. Support business agglomeration and clustering that can increase trading by 2.5 time[9]. Increase in effective job density associated productivity[9]. Per square metre bicycle parking delivers five times higher retail spend than the same area of car parking[30]. Creates jobs connected to sales, distribution, and maintenance of active transport products. E-Bike sales significantly out-perform electric vehicle sales[31].		

[28] Victoria Walks (2018)
[29] Raje. F & Saffrey. A (2016)
[30] Lee. A (2008)
[31] Richards. C (2019)

Objective	Benefits	Savings (cents per km)	Costs (cents per km)
Equitable mobility	Address transport disadvantage by providing basic mobility for people of all ages, physical ability or income. Creation of a safer and low stress network for all users.		

Although there are costs associated with active and sustainable transport, these are significantly outweighed by the savings. The cost benefit return from active transport interventions is 13:1 cents per kilometre[32] The cost benefit for car share for the City of Port Philip was 2.4:1 cents per kilometre[33]. These savings are predominantly obtained through public health and social connection returns.

It is apparent that by supporting active, public and shared transport it is possible to achieve a diversity of movement and place outcomes with smaller investment, project scale and minimal risk.

Investment in active and sustainable infrastructure and programs has been demonstrated to be advantageous given the myriad of positive outcomes, significant savings and low capital, operational and injury costs.

How to go about it

The structure plan can leverage these favourable benefits for Croydon by ensuring active, public and shared transportation networks reach their full potential as planned. The urban structure and public realm elements considered important in a structure plan can be accomplished with the adoption of an approach that achieves the aforementioned strategic outcomes. The approach involves the strategies in Table 8.

[32] Victorian Department of Environment, Land. Water and Planning (2019)
[33] City of Port Phillip (2016)

Table 8: Strategies to support public, active and shared transport in urban structure planning.

Urban elements	Strategies
Urban structure	Provision of accessible whole-of-route walking and cycling links that criss-cross the precincts. Support inter-modal integration at transport hubs with the expansion of long term parking and storage for bicycles and personal mobility devices. Provision of a choice for ways through a grid network with clear hierarchy. Creation of pedestrian and cycle friendly streets with attractive and interesting routes.
Urban grain	Provision of destination and service density and diversity that supports local living. Creation of landmarks that assist with orientation of journeys. Minimise delays to pedestrians and cyclists at road interfaces by providing high quality and crossings. Slow down of traffic along priority pedestrian and cycling avenues. Provision of laneways to achieve high permeability through large blocks.
Public realm	Provision of focus activity areas that allow for a diverse range of activity and events. Encourage built form that enhances passive surveillance. Creation of high quality public realms and points of interest with integrated landscaping, public art, trees and vegetation.
Street and landscape	Creation of legible wayfinding signage that informs people of what is around them and how to quickly they can get there. Provision of a variety of opens space types within walking distance. Provision for abundant street furniture that encourages walking and cycling for short journeys, i.e. seats, drink fountains, short term bicycle parking. Protect the corridor of travel desire lines through shared spaces.
Facade and interface	High quality pedestrian access and interface between building frontages and street scapes. Provision of weather protected routes along primary pedestrian routes.

Wayfinding

A key feature of a transit orientated and walkable precinct is a network of streets, landmarks and interactive places that are legible. People feel safer, less stressed and more comfortable to make walking or cycling journeys when there is detailed information about local access to services and facilities.

People learn about the urban environment, create mental maps and make informed movement decisions based on landmarks, place activation and street signage. These three elements are the core building blocks of creating a successful wayfinding network for pedestrians and cyclists.

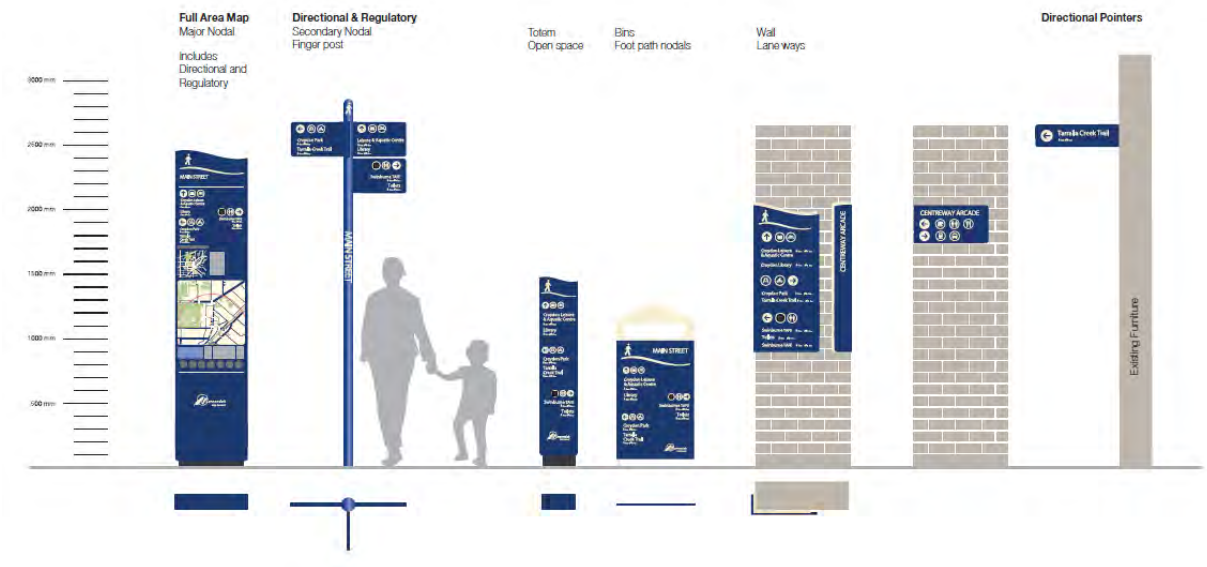
A wayfinding network serves to guide people from the precinct's gateways to the destinations that complete their journeys. It educates, informs and reinforces people about where they are, what lies ahead and how to get from point A to B.

Landmarks play a key role in the creation of a person's 'mental map' of an area. They establish a sense of arrival for the traveller by announcing that they have reached Croydon or reached a specific part of the centre. They're visual beacons and focal points seen from a distance to validate and ground the traveller. More distinctive and frequent landmarks help people to build a stronger mental map to conduct more sophisticated movement.

Landmarks create interesting and identifiable urban character, vistas and skylines. Centre planning and design must seek to preserve sightlines and vistas of existing landmarks. Centre planning must also look for opportunities to create new landmarks. New landmarks are to be appropriately scaled and located to serve as effective focal points and contribute to the centre's urban character.

Signage is a common and necessary element of street environment. Wayfinding signage make places legible by providing progressive information and directions about what's around. Effective wayfinding signage is noticeable, located at 'decision points' and communicates enough information to make decisions without overwhelming. The signage removes possible ambiguity along routes and gives the traveller confidence and freedom to choose the best route for them (see Figure 5).

Figure 5: Croydon wayfinding signage family



Source: Croydon Wayfinding & Signage Concept Design (2012)

Croydon Wayfinding & Signage Concept Design 2012 provides a high-quality map based pedestrian signage network for the centre. Informed by best practice principles and design standards it set a framework to implement a wayfinding signage network. Importantly, the document articulates the wayfinding signage suite, style guide, signage network locations and individualised signage content and features. The spine of the network features large full area map totems, stemming from Croydon Station to Croydon Library.

Opportunities to improve the wayfinding are:

1. Update the mapping of the existing wayfinding signage to reflect recent changes in the centre.
2. Roll out the rest of the wayfinding network in accordance with network proposed by the Croydon Wayfinding Signage Strategy.
3. Declutter the urban realm and streets with the removal of redundant signage.

Festivals, events and street performances create an environment where people feel welcomed, safe and want to visit. Activations encourage people to visit and associate with the centre with hallmark events. People learn, associate and remember places by what goes on there. Good activation assists specific locations to standout. They contribute to the centre's distinctive profile. Croydon's profile includes Maroondah Festival and Croydon Multicultural Festival.

Centre planning can allow for a greater scale of day and night activations by including flexible open spaces and streetscapes in their plans for the area. The provision of event space will need to be balanced with recreational and circulation spaces.

Croydon's alleyways have the potential to be transformed into intimate areas by opening up shop frontage to encourage human interaction and interface.

An activation plan for the centre is desirable to ensure a rich schedule of activation that obtains the most benefit from event spaces. The plan should be prepared by a coalition of stakeholders to deliver a pipeline of diverse activations across the key public spaces throughout the year.

Supporting car share

Sustainable modes of transport such as public transport, cycling and walking are readily available in and surrounding the centre. However, for trips when a car is necessary, car sharing is a cost effective alternative to vehicle ownership for residents and businesses.

A general rule of thumb is that for each car share vehicle provided, ten cars are avoided[34]. When car ownership is replaced by immediate, convenient and cheap car share, a cascade of co-benefits are triggered. These co-benefits include the released space in the urban realm and streets, reduced local congestion, decline in parking demand and lower household living cost. From a planning perspective, a successful car share network plays a role in accommodating sustainable intensification with more people, more dwellings and highly mobile communities without rampant private car ownership.

The centre already has some of the prerequisites required to support a car share network. It has access to high frequency public transport and a high diversity of destinations and services within a walkable centre. In such places, people tend to be less reliant on the private vehicles for their mobility.

Croydon has good walkability. Good walkability enhances the catchment of car share services. Research recommends a 150m walkable radius around vehicles to service a catchment covering approximately 7 hectares[35]. The close distance reflects cultural expectations that vehicles must be conveniently accessible from the front door. The proximity allows car share to be competitive with other transport options, especially private cars. Guided by the 150m radius, network coverage of the centre can be achieved with 20 on-street car share bays.

The density of people and jobs is a signifigent factor in the viability of car share. Steady density growth is predicted for the centre (see Table 9). The actual density may be higher since the calculations used assume use of the total area of the centre which includes significant open, education and parking spaces. Even so, the centre's density is currently significantly below the favourable density of 30 dwellings per a hectare to reliably support a car share service[36]. A planning intent would need to be set for the centre to accommodate the extra 4,200 dwellings required to achieve this scale of density.

Research into Melbourne car shares services shows that on average 10% of a population are members. As the population of the centre grows so does the potential customer base for car share. Each car share vehicle needs 20 active members to be viable. Based on the evidence, Table 9 shows the estimated number of car share vehicles that the centre can support as it the population grows.

[34] City of Port Phillip (2016)
[35] City of Port Phillip (2018)
[36] City of Port Phillip (2018)

Table 9: Car share network coverage and support based on the density and population of the Croydon Activity Centre.

Year	2021	2031	2040
Population	2,725	3,537	4,581
Households	1,222	1,822	2,118
Dwellings	1,280	1,908	2,218
Dwelling density (per Hectare)	9.1	13.6	15.8
Number of privately cars owned vehicles based on 45 vehicles per 100 people	1,280	1,662	2,153
Number of car share vehicles based on network coverage[1]	20		
Number of car share vehicles supported by population[2]	13	17	22

[1] Based on a walking distance of 150 - 250m radius to vehicle covering a 7-hectare catchment.
[2] Based on 10% of population being car share members and having 20 active members for a vehicle to remain viable. 2

For Croydon, the percentage of households with a private vehicle has repeatedly increased from 80.3 in 1991 to 90.1 in 2016. This trend is a concern for implementing car share since car share is best suited to drivers who do not own a private vehicle. Long term, driverless cars open up the market for non-drivers to use share cars.

The network map from the Draft Car Share Position Statement shows proposed foundation parking bays for the centre (see Figure 6). The size of the fleet is three vehicles below the 2021 estimation for services that can be support by populations. The foundation fleet size has been set at this size as the risk of fleet under-provision is low, while the risk of fleet under-utilisation is high. A systematic expansion of car share of the scale mentioned in the Table 9 can occur in response to proven market response.

Currently there are about 47 privately owned cars per 100 people in the centre. Factoring anticipated population growth, it is expected that a fleet size of 13 vehicles in 2021 is required to maintain or reduce the number of privately owned cars in the centre.

Figure 6: Proposed Parking Bay Locations for a Car Share Network



Supporting Zero Emission Transport

Full electrification of vehicles coupled with sourcing electricity from clean energy sources is the leading scenario for achieving zero emission transportation. Forecasts project electric vehicles (EV) will account for 30% of new car sales by 2030[37]. The number of EV models available on the Australian market is predicted to be more than 135 by 2040[38]. Forcasting suggests that about 500 EVs will be owned by residents living in the centre in 2031. EV visitations and movements through the centre will be boosted by EV ownerships in neighbouring suburbs.

EVs have different refuelling patterns to petrol vehicles. EVs are more likely to charge at home or work over a longer period of time. Public charges are provided for the 30% of EV owners who don't have a charger at home or work[39]. Charging infrastructure will be necessary in activity centres for these visitors within a decade.

Charging infrastructure is emerging, lead by Tesla's 'supercharger' network on popular interstate routes, shopping centres and hotels. This is true for the City of Maroondah with the first Tesla chargers installed at Eastland. Structure planning can play a lead role in the allocation of land for EV parking and charging by determining an EV network for activity centres.

Guidelines have been released to help local government to deliver an EV network that is accessible, well utilised and provides a return on investment. These guidelines give best practice advice to plan, design and build a charging network. Activity centre planning must consider the following aspects to determine appropriate land allocation and public realm design for EV parking and infrastructure.

Site selection is important and there are several suggested factors that influence placement. A network plan must consider existing infrastructure, space requirements for hardware, electrical supply, lighting, access, physical safety, charging operations and site management. Chargers intended to be used by more long distance travellers are best placed near access to restrooms, shops, playgrounds and cafes.

Another important consideration is the levels of chargers and plug types. It is recommended high quality, networked chargers capable of being monetised and monitored. For domestic use, chargers should be at least 7-22kW for AC level 2 and at least 50kW DC level 3 for urban locations. As such, type 2 plugs would be recommended around Croydon as most new EVs will come with this type of charger. For regional travellers, some level 3 DC fast chargers will be necessary. Wireless charging should also be considered into the future as more vehicles with this capability come onto the Australian market.

Based on the guidelines, it is necessary to create an EV network plan for the centre. The Plan is to determine ideal coverage, charger type ratios, hardware specifications, station design and preferred locations.

[37] Bloomberg New Energy Finance (2018)
[38] Electric Vehicle Council (2018)
[39] Energeia (2018)

Shaping the centre for tomorrow

Croydon reputation as a green, leafy, accessible and highly liveable place will be protected and enhanced by new and revitalised community services, more open space, improved public transportation, shared transport and prioritised active transport links over the next 20 years.

The future transport network for the centre will be influenced by the critical centre servicing projects described in Table 10. The projects have the significant potential to change the urban structure, land use and built form to create new direct, convenient, coherent and safe public and active transport connections in and around the centre. They are also opportunities to introduce shared transport services and zero emission infrastructure within the centre.

Table 10: Key centre servicing projects.

	Timeframe (years)	Status
Coolstore Road Level Crossing Removal and Croydon Station Upgrade	10+	Concept Design
Croydon Civic Centre redevelopment	5+	Precinct Planning and Design
Ringwood to Croydon Bicycle Trail connection	5+	Concept Design
Croydon Multideck Car park development	5	Committed and funded
Reimagining Tarralla Creek Project	10	Stage 1 - committed and funded

At the regional level, a review of the bus network is required to overcome the problems with the bus service discussed earlier in this study. A review will determine bus service improvements to better connect activity centres, employment areas and communities. The network must offer bus routes that excel in either the role of first and last mile shuttle or rapid regional connectors.

These significant centre serving projects will be completed by small scale interventions to develop a high-quality walking and cycling network. These local improvements will make it safer and easier for people to move about by walking, cycling and public transport.

Current and future residents, workers and visitors will be supported by good transport connections to and within the centre. The success of a place is influenced by the quality of transport infrastructure and services. It affects visitations and how people choose to move in and through the centre. To be successful, the centre will require a greater shift towards walking, cycling and public transport to alleviate congestion, boost local businesses, jobs access and inclusion.

Movement and Place

There are opportunities to enhance the performance and efficiency of the road network by balancing the dual functions of movement and place. The road and streets not only support movement of people and goods, they can also be destinations. Some streets are places that support a diversity of activations and meeting of people. Applying a movement and place approach to network planning will guide deliberation of appropriate road prioritisation necessary to create a successful centre.

The Department of Transport's Movement and Place Framework is a tool to plan for a more multi-modal network that improves the liveability of places. The framework integrates land use and transport planning where the consumer is at the centre and the focus is on movement, place, road safety, community and environmental benefits.

In their document, the Department of Transport have created classifications to describe different transport movements and places. The definition and hierarchy for each of the general movement classifications are explained in Table 11. General movement classifications are given across multimodal types to give the aspirational movement function and prioritisation.

Place classifications represent the future vision for a place. It is the first classification applied to a link and considers the place characteristic that have an impact on movement and dwelling. Table 11 also explains each of the place classifications and their hierarchy.

Table 11: Movement and Place Definitions

General Movement Definitions		**Place Definitions**	
M1	Mass movement of people and/or goods on route with a State or National level of movement function or primary access to a State level place.	P1	Place of State or National significance.
M2	Significant movement of people and/or goods on routes connecting across multiple municipalities or primary access to Regional level places.	P2	Place of Regional significance.
M3	Moderate movement of people and/or goods on routes connecting across multiple municipalities or primary access to Municipal level places.	P3	Place of Municipal significance
M4	Movement of people/or goods within a municipality.	P4	Place of Neighbourhood importance.
M5	Local movement.	P5	Place of Local importance.

Source: Department of Transport (2018)

The Department of Transport provided the subsequent Movement and Place modal and place maps for Croydon Activity Centre (see Maps 9 - 14).

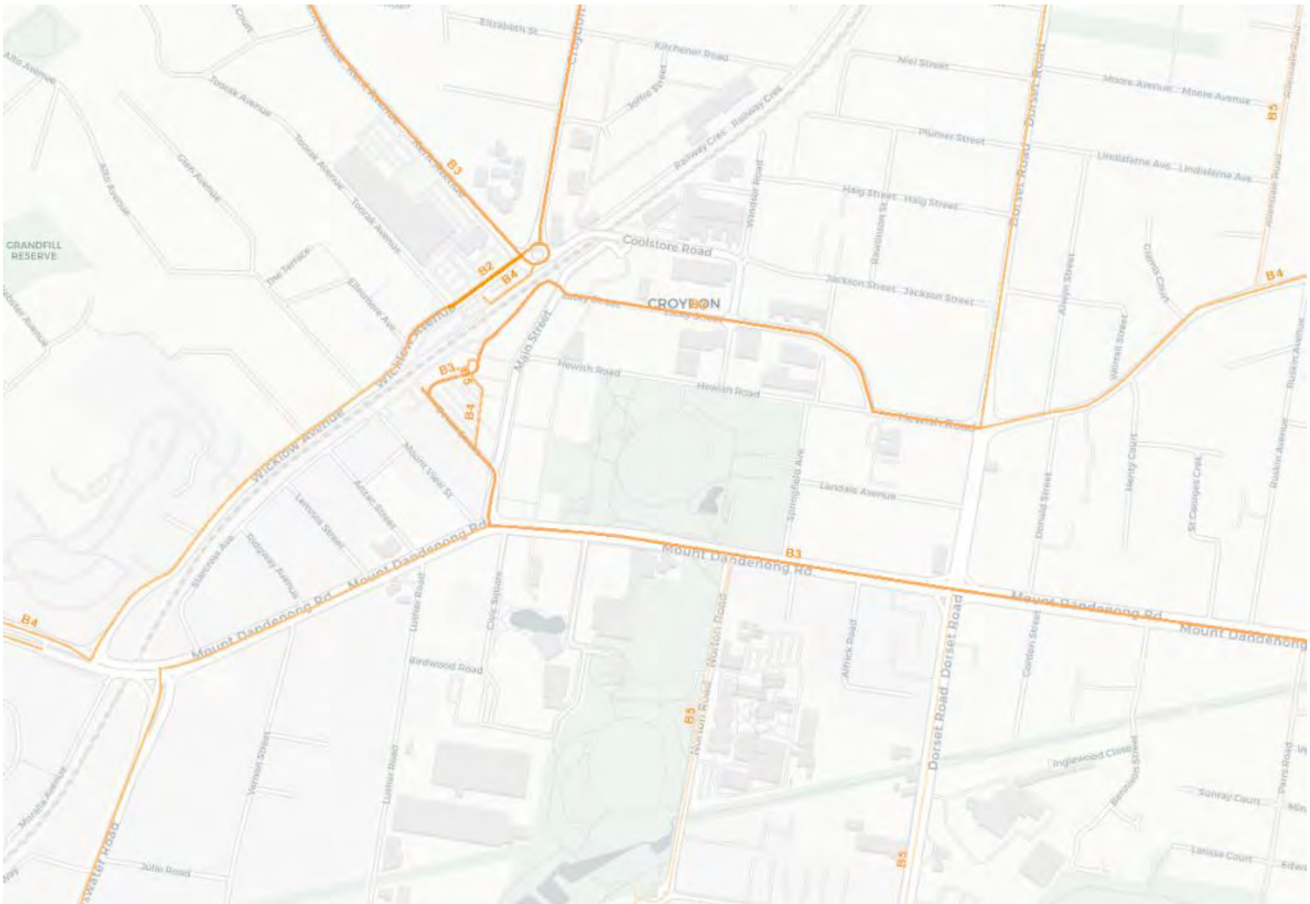
Map 9: General Traffic (GT) (excluding GT5 - rest of network)



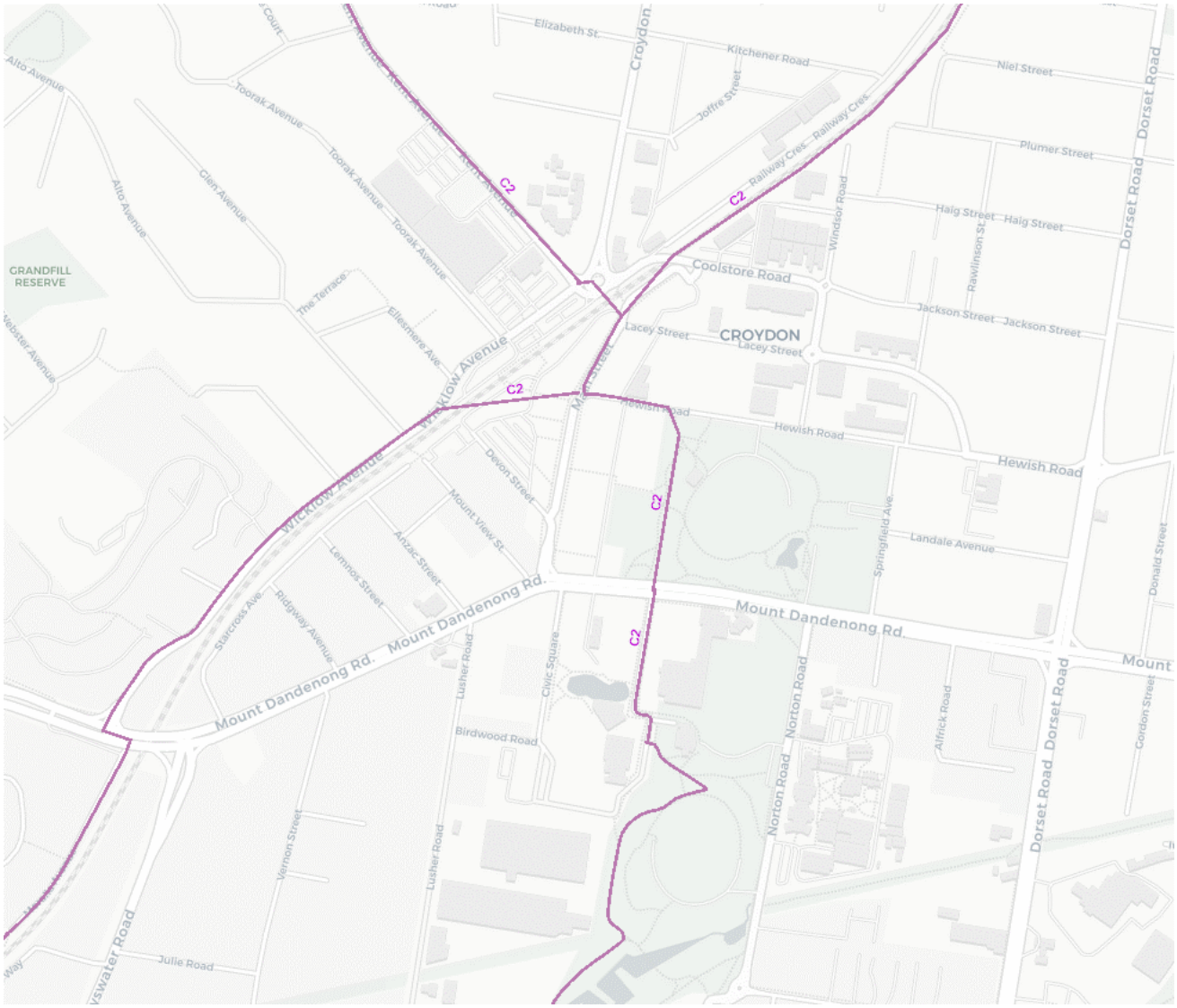
Map 10: Freight (F)



Map 11: Bus (B)


GRANDFILL RESERVE
Coolstore Road
CROYDON
Main Street
Hewish Road
Wicklow Avenue
Mount Dandenong Rd
Dorset Road
B2
B3
B4
B5

Map 12: Cycling (C)



Map 13: Walking (W)



Map 14: Place (P) (excluding P5 - rest of network)



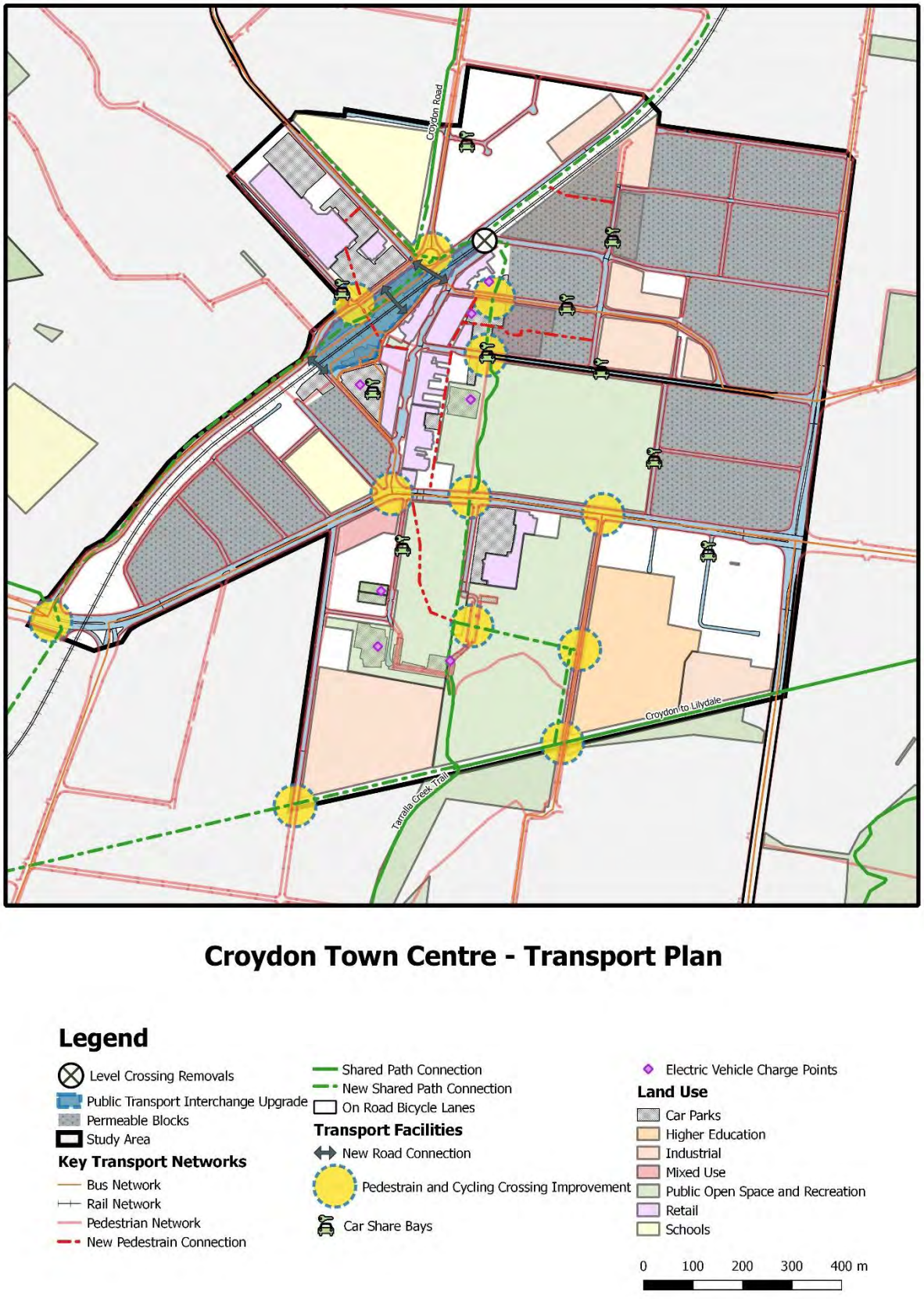
Transport Plan concept

There are opportunities to improve public, shared, zero emission and active transportation within the centre. We can build on the good work undertaken by Croydon Pedestrian Priority Plan 2009, with a revised transport plan for the centre. The plan can capitalise on the existing public and active transport networks.

Figure 7 is an indicative and conceptual transport plan base on the analysis of this study. It is a response to the identified transport, movement and place issues faced by the centre over the next 20 years. The Plan brings together solutions to capitalise on anticipated transport and land use opportunities for the centre's urban form and transit networks.

It shows existing and proposed connections that will support the aspirational development of places and networks to make sustainable transport a real travel choice for more people for more trip types. It is about delivering mobility and access choices for people that live, work and visit the centre now and into the future.

Figure 7: Transport Plan concept



Complete Streets visions

Thriving places, sustainable communities and the vitality of urban life depends on a street design that is sensitive to the multi-faceted role streets play. Making transit work in and through the centre means raising the level of street design across the entire precinct.

For streets to function in accordance with the aspirational Movement and Place classification, the application of urban street design must translate Movement and Place principles into technical options.

Complete Streets Victoria is a design guide for urban roads and streets in development by the Department of Transport. It is intended to be a tool to guide the reconfiguration of streets to transition to the Movement and Place aspirational role. The premise of the Complete Streets Design Guide is that streets can be changed to balance the movement, places and ecosystem aspects. It is a toolbox of tactics to better incorporate and knit together street elements that in turn change street composition to achieve the street's aspirational role.

The Movement and Place classifications provided by the Department of Transport classifies the centre's streets into the following type: connectors, active streets and boulevards or local streets.

The following are Complete Streets design concepts for selected streets in the centre based on street type allocation. They demonstrate how public transport, active and shared transportation elements can be integrated into a variety of urban streetscapes. They also show how street design elements work together to create vibrant streetscapes.

Mt Dandenong Road

Movement and Place Classification: Active Streets and Boulevards



Source: National Association of City Transportation Officials (2019)

James Kerr Way

Movement and Place Classification: Active Streets and Boulevards



Source: National Association of City Transportation Officials (2019)

Wicklow Avenue

Movement and Place Classification: Connector



Source: National Association of City Transportation Officials (2019)

Lemnos Street/ Haig Street

Movement and Place Classification: Local Street

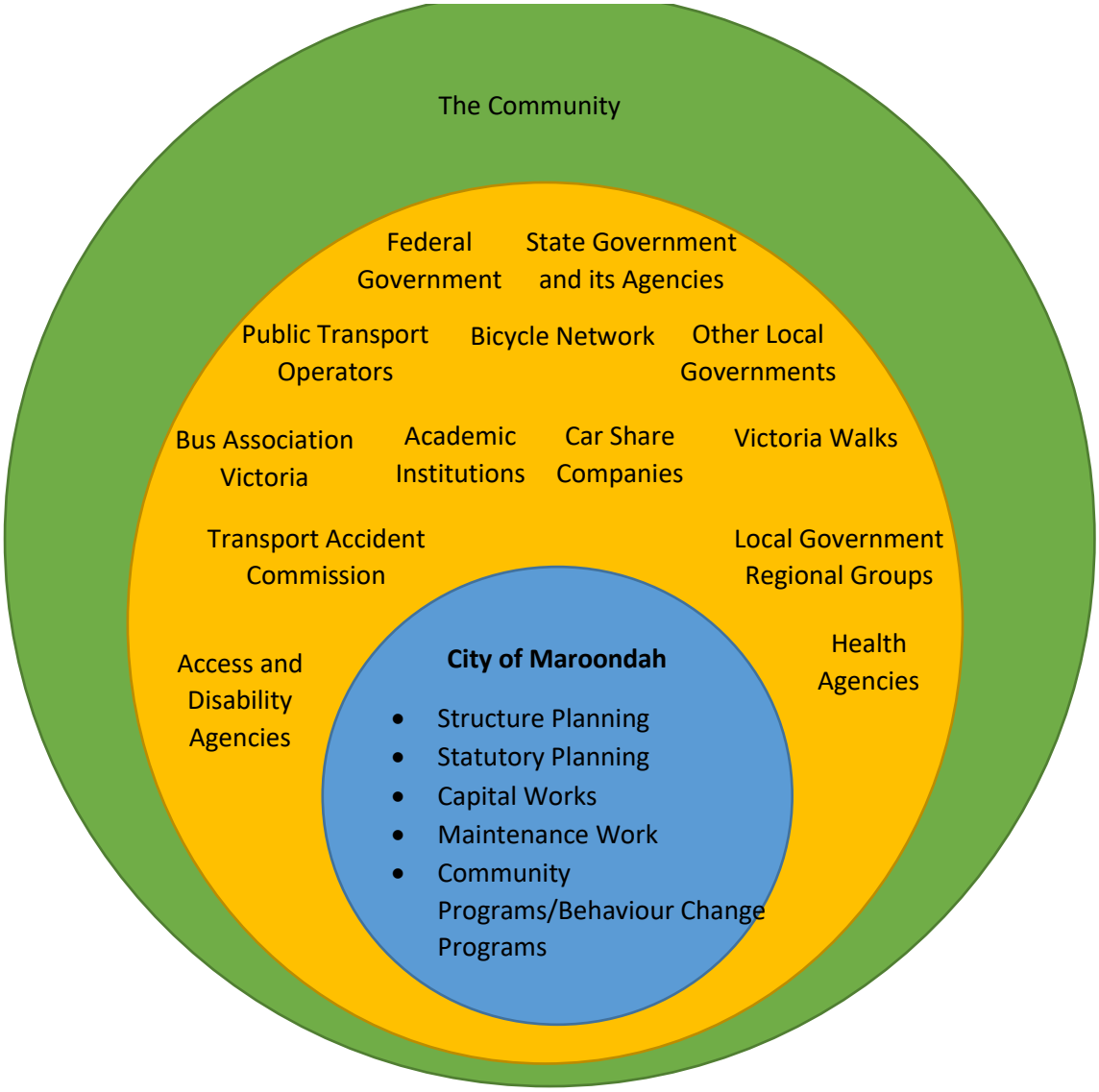


Source: National Association of City Transportation Officials (2019)

Key partners for coordinated planning and implementation

Enhancement of sustainable and active transport choices and participation will require a commitment between transport and planning agencies and local government. The key partners in the provision of public, active and shared transport are detailed in Figure 8.

Figure 8: Key Partner in Sustainable Transport Sector



Council will manage strategic planning, local pedestrian, cycling and road capital works projects, education programs and policy setting and work with strategic partners to deliver these.

Improvements to public transportation facilities and services in the municipality will require funding and input from State Government and its agencies. This means Council will continue to engage with the relevant public transport operators, active transport advocacy groups and Council regional groups to advocate for improvements to the quality of public and active transport infrastructure and services. The engagement is important to progress our planning. It ensures that consumer, community and stakeholder insights inform the detailed planning for the centre and the subsequent project pipeline.

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