Deloitte.

City of Melbourne
Independent Transport Review

September 2021

Executive summary

Deloitte and PBA Transit Planning (PBA) were engaged by the City of Melbourne (the Council) to undertake an independent review of current travel patterns in the city and those from before the Covid-19 pandemic to determine how the transport network can be used to support the recovery and reactivation of the city's economy.

Covid – and the range of restrictions enforced to curb the transmission of the virus – have had a profound impact on activity in central Melbourne and travel to and within the city. As the Council noted when commissioning this study, 'The COVID-19 pandemic has had devastating health, economic and social impacts on Melbourne's businesses, communities and events.'

These impacts have coincided with recent significant changes to the central city transport network, including the introduction of segregated bicycle lanes and kerbside parking restrictions. The Council has received substantial community feedback on these changes (see Figure 1).

Against this backdrop, this report:

- Analyses how travel has changed and the capacity for growth by mode of transport
- Identifies bottlenecks in the transport network that could impede central city recovery
- Recommends short-term interventions to address these bottlenecks.

Four key bottlenecks were identified – limited road capacity, unproductive use of parking meters, the number of groups that drive straight through the city and the avoidance of public transport – along with 12 potential interventions to address them. This list of interventions was reduced to five that were expected to be effective and could be implemented in the next year.

These five interventions are to encourage flexible work hours, implement real-time transport tracking and capacity data to let users better manage their travel, trial demand-responsive parking pricing, remove more physical touchpoints and reallocate some road and parking spaces.

These points are discussed further in this executive summary and fully in the body of this report.

Figure 1: *Community feedback on transport challenges – common themes*

Vehicle congestion in the central city is reducing motor vehicle access, causing people to avoid the central city.

Bicycle lanes and parklets have reduced the supply of kerbside parking in the CBD, resulting in reduced customer access for local business, and reduced road allocation for commercial passenger vehicles, click and collect, and other freight movements.

Introduction of segregated bicycle lanes on routes such as Exhibition Street and Queens Bridge have reduced vehicle capacity and created congestion.

Sources: *City of Melbourne bike lane feedback, Councillor correspondence*

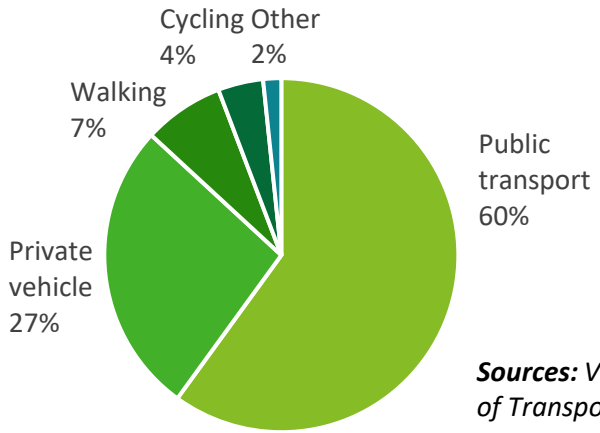
Central city activity and transport before Covid

As shown in Figure 3, Melbourne's central city is Victoria's most significant location for economic and social activity, and it supports a wide range of visitors, activities and modes of transport. These activities come together seamlessly to create a unique 'city experience' whereby people can work, shop, eat and drink, and find entertainment or other recreational outlets all within a small area. This diversity is fundamental to attracting people and investment to the central city.

The combination of a diverse range of attractions and sustained efforts to support and promote them – known as 'activation' – has underpinned the sustained economic growth in Melbourne's central city in recent decades and made the area a key pillar in the Victorian and national economies. This growth has been supported by a multimodal transport network – spanning mainly roads, tramlines, trainlines and cycle paths – that provides access to, and enables circulation within, the central city. Accordingly, the reliable and efficient operation of the network is critical to activation in the central city area and a key enabler of economic growth.

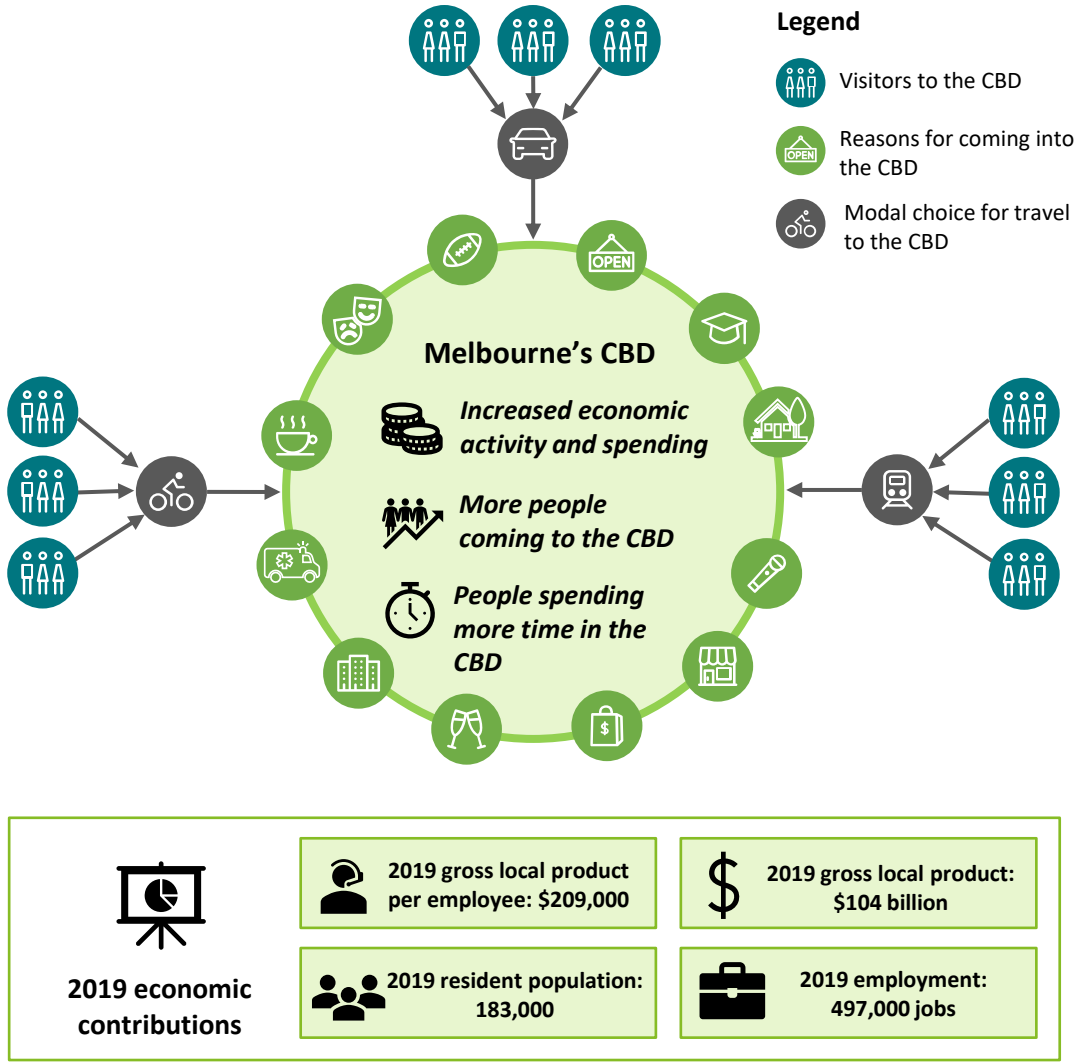
The network provides high levels of service and harmonisation across travel modes, enabling people to connect to various activities according to their travel preferences and budgets. Prior to Covid, individuals made an average of around 360,000 trips a day to the central city across all transport modes. Figure 5 shows the average share of trips by transport mode in 2018.

Figure 2: *Pre-Covid transport mode share- 2018 Average*



Sources: *Victoria Integrated Survey of Transport and Activity 2018*

Figure 3: *A model for central city recovery*



Central city activity and transport since Covid

Central city activity and transport during lockdowns

Since the onset of Covid in early 2020 to September 2021, Melbourne experienced six lockdowns to limit the spread of the disease that collectively lasted more than 200 days. The second of these was 111 days.

As shown in Figure 4, central city activity declined sharply during these periods as workers in non-essential sectors had to 'stay at home' and/or were limited to local areas, and many retail, food and beverage, and hospitality venues saw their operations restricted or stopped.

Consequently, travel to and within the central city area declined sharply. In the first lockdown (April 2020), vehicle entries to the central city declined by more than 60% of the pre-Covid daily average. Trips by train and bus each declined by approximately 90%, while trips by tram declined by approximately 96%. Walking and bicycle riding declined by about 50%.

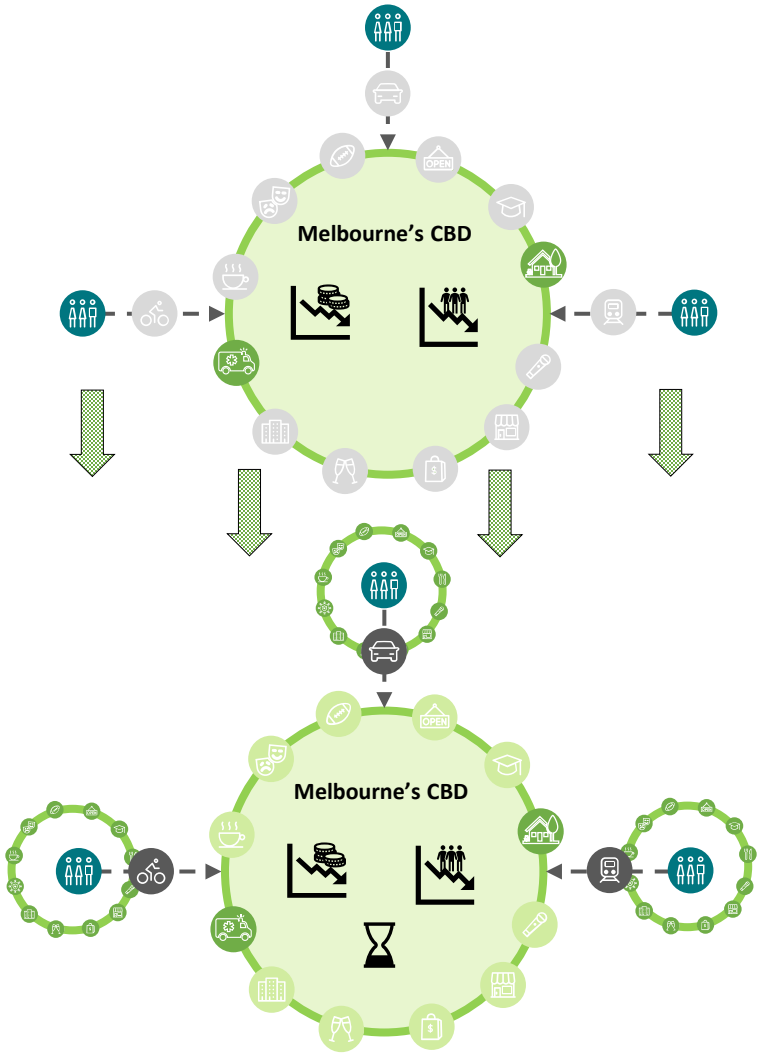
Central city activity and transport under restrictions

The relaxation of lockdown has been followed by ongoing restrictions on activity and travel. The central city economy began to recover during in these periods, as shown in Figure 4, but work and social activity levels did not recover to pre-Covid levels as workers in non-essential sectors were encouraged to continue to work from home; retail, food and beverage, and hospitality activity was subject to operational restrictions; and shifts to localised travel and activity made during lockdown 'stuck'.

Furthermore, recovery rates were not uniform across transport modes. Car trips began to recover in July 2020 and continued to rise until January 2021. However, public transport trips remained at near lockdown levels until November 2020 before starting to recover. This recovery was also slower than for cars, as people chose to drive rather than take public transport due to Covid-related perceptions of personal safety, cleanliness and ability to social distance.

Walking and bicycle riding remained relatively consistent compared to lockdown periods, then began to recover more strongly after October 2020.

Figure 4: *Activation and travel behaviour during lockdowns and restrictions*

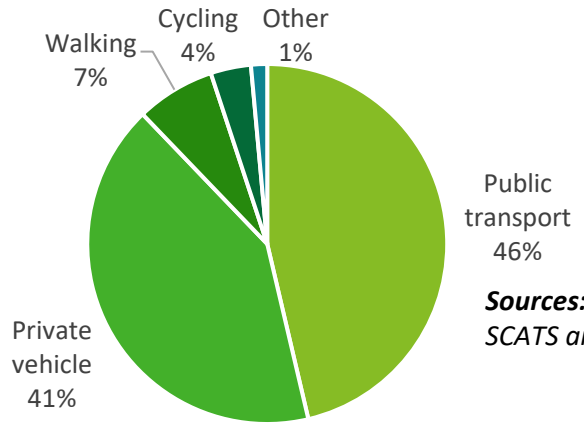


Central city activity and transport during recovery

Economic activity has tended to bounce back more strongly after each lockdown as more people have visited Melbourne's CBD and spent more time there. By May 2021, trips by car to the central city had recovered to approximately 88% of pre-Covid levels. Trips by train and tram had recovered to about 45% of pre-Covid levels, while trips by bus had recovered to about 60%. Bicycle trips remained constant at about 50% of pre-Covid levels. Figure 5 shows the share of trips by transport mode as of May 2021. Following the June 2021 lockdown, weekend trips to the city centre returned to near pre-Covid levels.

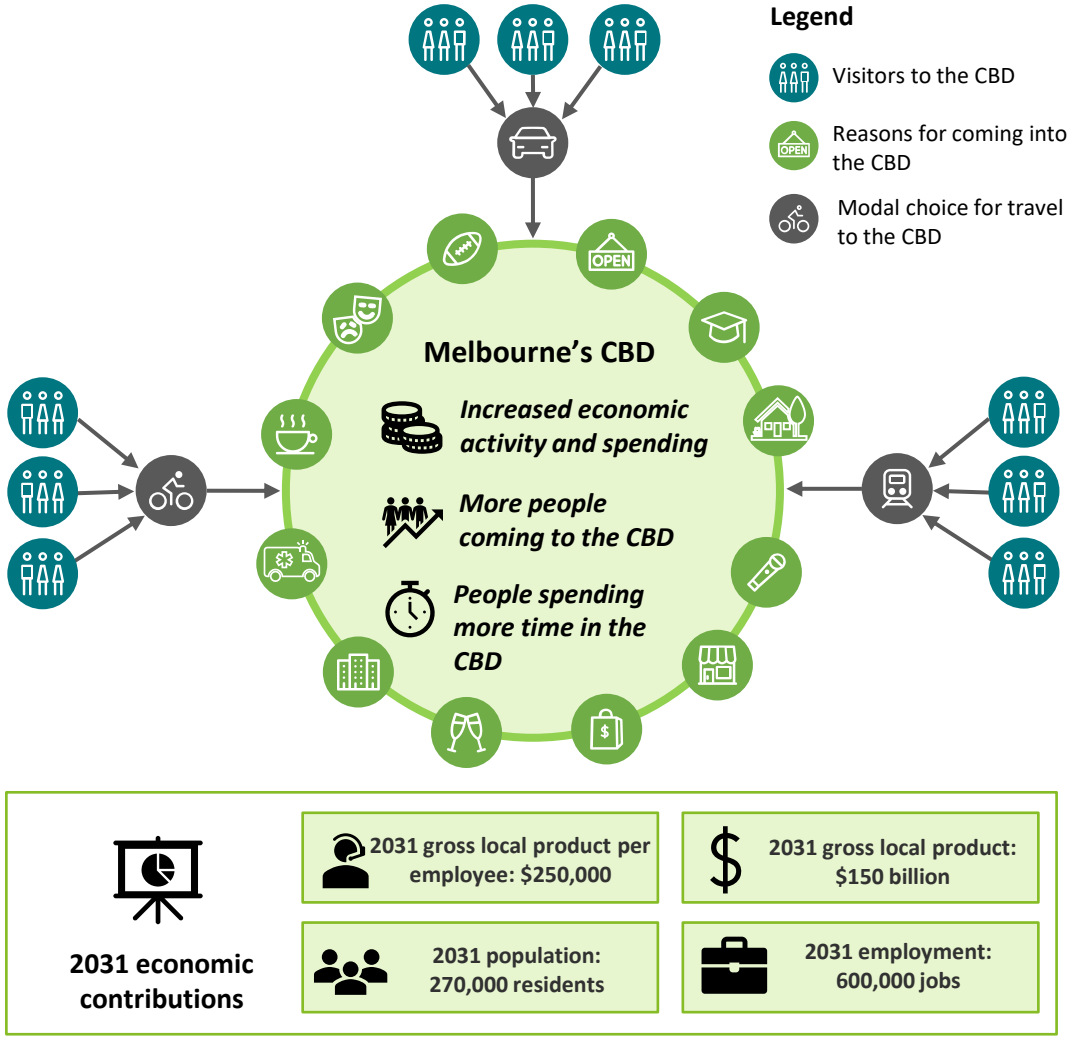
As shown in Figure 6, over time the Council anticipates that the central city's economic contribution will exceed pre-Covid levels. The ongoing attractiveness of the central city experience and the ability to reignite this experience is fundamental to economic recovery. Reactivation activities must be sufficient to displace the changed needs and travel behaviours that have arisen during lockdown and restrictions.

Figure 5: *Post-Covid transport mode share – May 2021*



Sources: *DoT PT Patronage; DoT SCATS and bicycle sensors*

Figure 6: *A model for central city recovery and the CBD's growth potential*



Source: *Economic Development strategy 2031*

Transport-based obstacles to central city activation

As discussed above, Melbourne's convenient and multimodal transport network has been a key historic driver of the central city area's economic growth. In turn, it is important to identify whether the network could obstruct the recovery of economic and social activity in the city after Covid. Using the best available data at the time of preparing this report, Deloitte and PBA identified four primary ways the city's transport could act as an obstacle to the city's recovery. These are summarised in Figure 7.

Figure 7: *Key transport-based obstacles to central city recovery*

Obstacle 1

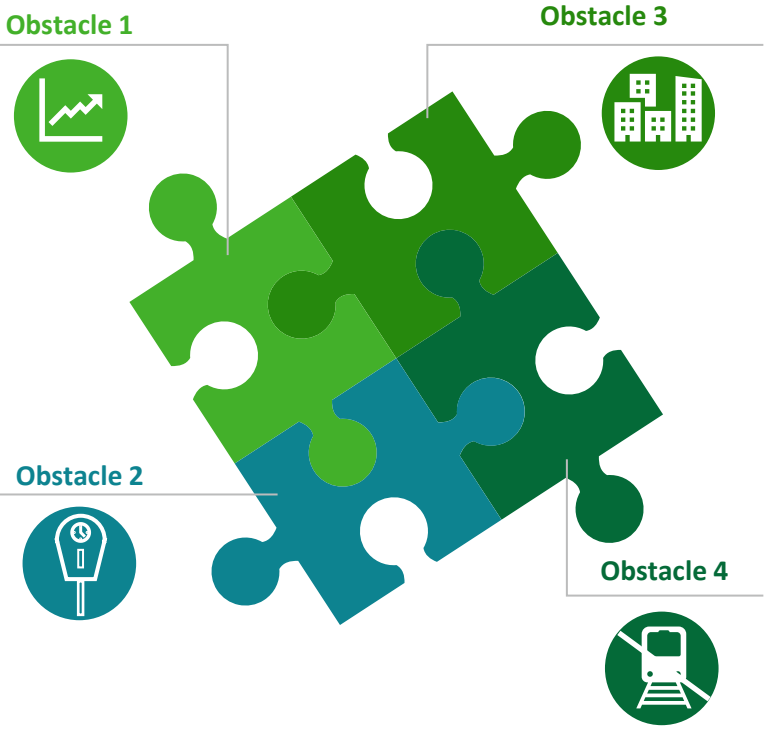
Road volume capacity has been reached in the morning peak

Road volume capacity and related congestion is a barrier to central city activity because they constrain access. This is particularly relevant during Covid, since more trips are being made by car as people avoid public transport. The problem is most acute during the morning peak of 8:00 AM to 9:00 AM.

Obstacle 3

~43% of car trips within the central city are through trips

Through trips (those by people who don't stop in the central city) use road space but make no contribution to central city economic or social activity. This becomes a problem during the morning peak period, when congestion can discourage other people from visiting the central city.



Obstacle 2

Unmetered kerbside parking is not productive

At various points during the pandemic, kerbside parking bays have been unmetered in terms of time or cost, or both. This has led to people parking vehicles for extended periods, which reduced space for more economically productive uses by short-term visitors, click-and-collect customers, commercial passenger vehicles and loading zone users.

Obstacle 4

Avoidance of public transport

Public transport is the most efficient way to move large numbers of people to and within the city centre. An ongoing reluctance to use public transport, for Covid-related reasons, would be a key obstacle to recovery.

Potential interventions to address transport bottlenecks

The following interventions were considered as potential ways to address the four primary transport bottlenecks listed above. The 12 potential transport interventions listed below have been proven in cities around the world.

Table 1: *Proposed interventions to assist with Melbourne's recovery from the impacts of Covid*

	Potential intervention
Travel behaviour interventions	Provide real-time transport tracking and capacity data
	Set density limits on public transport and key network interchanges
	Encourage flexible work hours to reduce peak demand
Financial incentives	Introduce permanent off-peak public transport fare reductions
	Subsidise individuals' investment in and use of active transport
	Trial demand-responsive parking pricing
	Implement road pricing for vehicles making through trips across the CBD
Infrastructure solutions	Install mobile smartphone ticketing infrastructure for the public transport network
	Remove key physical touchpoints across the CBD
	Construct and upgrade separated bicycle corridors
	Remove bike lanes to increase road and parking capacity
	Reallocate road and parking space for local activation

The 12 interventions were shortlisted based on their ability to be implemented within a 12-month timeframe. Twelve months was identified a reasonable period for implementation and given the National Roadmap to Recovery and the existing City of Melbourne Transport Strategy 2030 would take precedence over these interventions. The five interventions shown below were assessed as non-implementable within the nominated 12-month timeframe (the exception being the intervention for segregated bicycle paths, which duplicates an existing Council initiative).

Table 2: *Shortlisting of transport interventions based on a 12-month implementation timeframe*

Potential intervention	Estimated implementation timeline	Short-list?	Commentary
Density limits on public transport	24 months	✘	Requires the re-negotiations of each transport mode franchising agreement
Permanent off-peak public transport fare reduction	24 months	✘	Current trial underway – continue trial
Road pricing for vehicles undertaking through-trips of the CBD	24 months	✘	Community resistance to pricing
Construct and upgrade separated bicycle routes	12 months	N/A	Existing program at CoM – do not duplicate
Install mobile ticketing infrastructure for the public transport network	36 months+	✘	Procurement window beyond 12 months

Potential interventions to address transport bottlenecks

The remaining seven interventions were further evaluated in terms of their impact on central city recovery, value for money, alignment with the Council's existing transport strategy and ease of deliverability, as shown below. The intervention to subsidise active transport was assessed as having a lower impact on central city reactivation. The intervention to reallocate bicycle lanes for additional road space and parking was also assessed as having a lower impact on central city reactivation, given the resulting capacity uplift.

Table 3: *Proposed transport interventions to assist with Melbourne's recovery from Covid*

Potential Intervention	Reactivation impact	Value for money	Alignment with strategy	Ease of deliverability	Assessment outcome
Provide real-time transport tracking and capacity data	●	◕	◕	◑	✓
Encourage flexible work hours to reduce peak demand	◕	●	◑	◕	✓
Remove key physical touchpoints across the CBD	◑	◕	●	◕	✓
Subsidise individuals' investment in and use of active transport	◔	◔	◕	◑	✗
Trial demand-responsive parking pricing	◕	◕	●	◕	✓
Remove bike lanes to increase road and parking capacity	◔	◑	○	◕	✗
Reallocate road and parking space for local activation	●	◔	◕	◕	✓

Scoring legend

● Very high ◕ High ◑ Moderate ◔ Low ○ Very low

Recommended transport interventions

The report recommends the following five interventions for use by the Council to address the immediate challenges of rebuilding economic and social activity in central Melbourne.

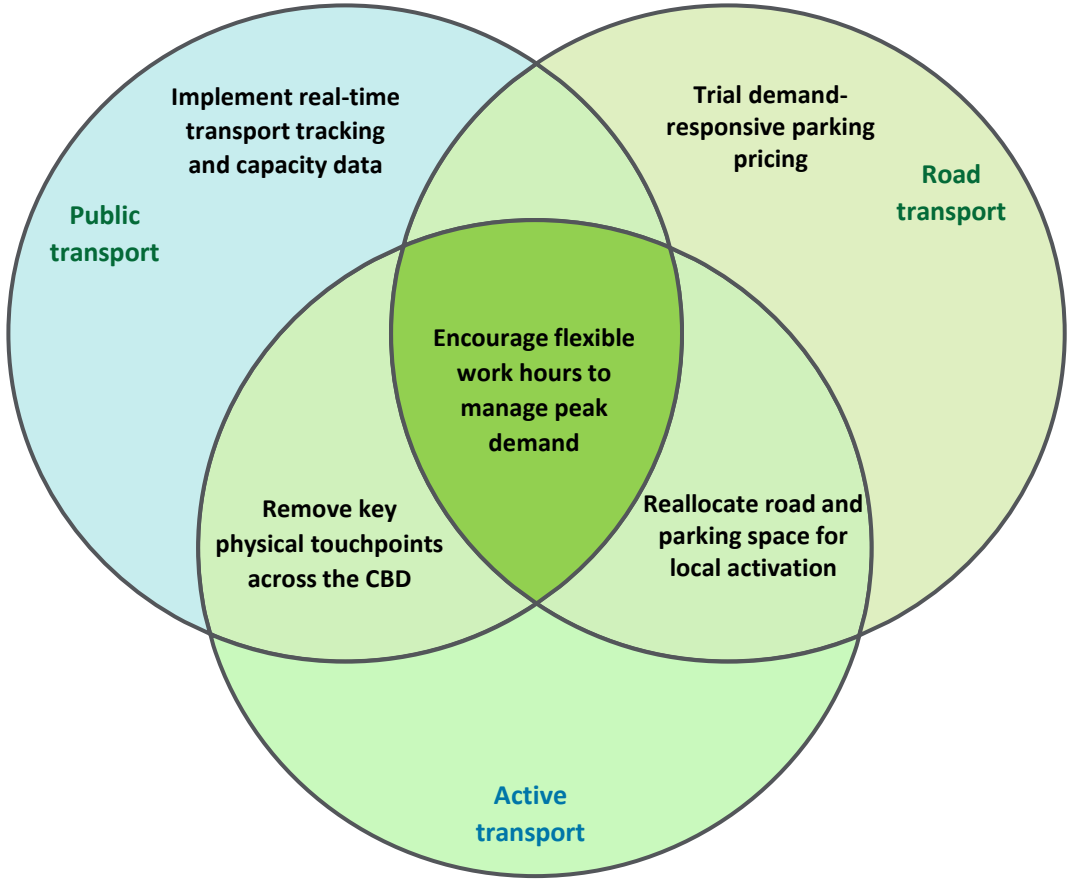
The combined effect of these measures would be to make it easier for people to visit and spend time in central Melbourne for high-value activities such as work, shopping, eating and drinking, and entertainment. This would be achieved by distributing demand for scarce road and parking resources and making public transport more convenient and safer in the eyes of users.

Table 4: *Final proposed transport interventions to assist with Melbourne's recovery from Covid*

Potential intervention	Description	Obstacle/s addressed
Encourage flexible work hours to manage peak demand	This intervention distributes trip volumes throughout the day across all modes and is an enabler of other recommended interventions.	Road capacity Kerbside parking Public transport
Implement real-time transport tracking and capacity data	A significant enabler for the public transport network would be introducing effective capacity-tracking software to provide citizens with real-time information to enable them to optimise their travel. This would increase convenience for travellers and reduce overcrowding.	Road capacity Through traffic Public transport
Trial demand-responsive parking pricing	It is expected that parking pricing that varies with demand will increase the number of people who are able to park in the CBD.	Kerbside parking
Remove key physical touchpoints across the CBD	Continued removal of physical touchpoints (such as manual 'walk' buttons and fare processing devices) is a high value-for-money measure to reduce the potential for virus transmission and align with long-term strategies to make the central city more convenient for travellers.	Public transport
Reallocate road space and parking spaces for local activation	It is recommended Council's existing parklet program enabling kerbside pop-up activity is continued with ongoing monitoring and refinement regarding location of implementation and timing relative to kerbside demand	Kerbside parking Public transport

By implementing these interventions in a packaged rollout there is an opportunity to compound the expected effects on the transport task and by association on the activation of the Melbourne CBD, as shown in Figure 8.

Figure 8: *Interdependencies and interrelationships of the recommended interventions*



Contents

1.
Introduction

Introduction

Deloitte and PBA Transit Planning have undertaken an independent review of pre-Covid and current transport patterns and designed transport interventions to support the reactivation of the City of Melbourne to pre-pandemic levels.

Deloitte and PBA Transit Planning (PBA) were engaged by the City of Melbourne (the Council) to undertake an independent review of pre-Covid and current transport patterns to:

- Assess the potential for each travel mode to support central city recovery from the impacts of Covid
- Recommend interventions to address near-term transport-related obstacles to recovery.

This report provides evidence-based analysis of transport patterns and behaviour in central Melbourne from 2019 to 2021. It recommends a suite of transport interventions to assist city recovery and provides a roadmap for implementation.

Key assumptions underpinning the analysis and findings

In undertaking this analysis and developing recommendations for interventions, Deloitte and PBA have assumed the following:

- 'City recovery' is defined in this report as the return of the numbers of inbound and outbound trips to pre-Covid levels. This definition reflects the absence of a uniformly accepted definition of city reactivation and recovery; and the availability of reliable data to measure recovery. A trip is defined as a person travelling to or from the Melbourne central business district (CBD) (which is defined as the Hoddle Grid).
- The interventions recommended in this report are short-term measures designed to incentivise efficient movement to and from the city and support the city's gradual recovery of from the impacts of Covid. The recommendations do not supersede the strategic directions in the City of Melbourne Transport Strategy 2030.
- The analysis underpinning this report and its recommendations are based on the most relevant and accurate data available during their preparation, in July and August 2021. Appendix A provides detail on the data used to develop this report.

Structure of this report

Following the introduction, this report is structured as follows:

Section 2: The impacts of Covid on trips – a summary of Covid-based restrictions between 2020 and 2021 that impacted activity and movement in Greater Metropolitan Melbourne, and the subsequent effects on trip levels in Greater Metropolitan Melbourne and to and from central Melbourne.

Section 3: City recovery and the transport task – a summary of the Council's aspirations for central city recovery, the role of transport in supporting central city recovery, factors impacting the scale and timing of recovery, and the quantification of the pre-Covid 'transport task'.

Section 4: Ability to meet the transport task and support recovery – mode-by-mode analysis of the rate of recovery to pre-Covid trip levels; obstacles to central city recovery, and options to address them; and a high-level analysis of multimodal 'bottlenecks' in the central city network.

Section 5: Potential interventions to support recovery – potential transport interventions defined by the modes impacted, the impacts on the transport task and central city recovery, test cases, deliverability and cost.

Section 6: Recommended interventions – evaluation of potential interventions based on their impact on central city recovery, value for money, timing and deliverability (including strategic alignment); and recommended interventions.

Section 7: Delivery roadmap – a roadmap for delivering recommended interventions.

2.
The impacts of Covid on trips

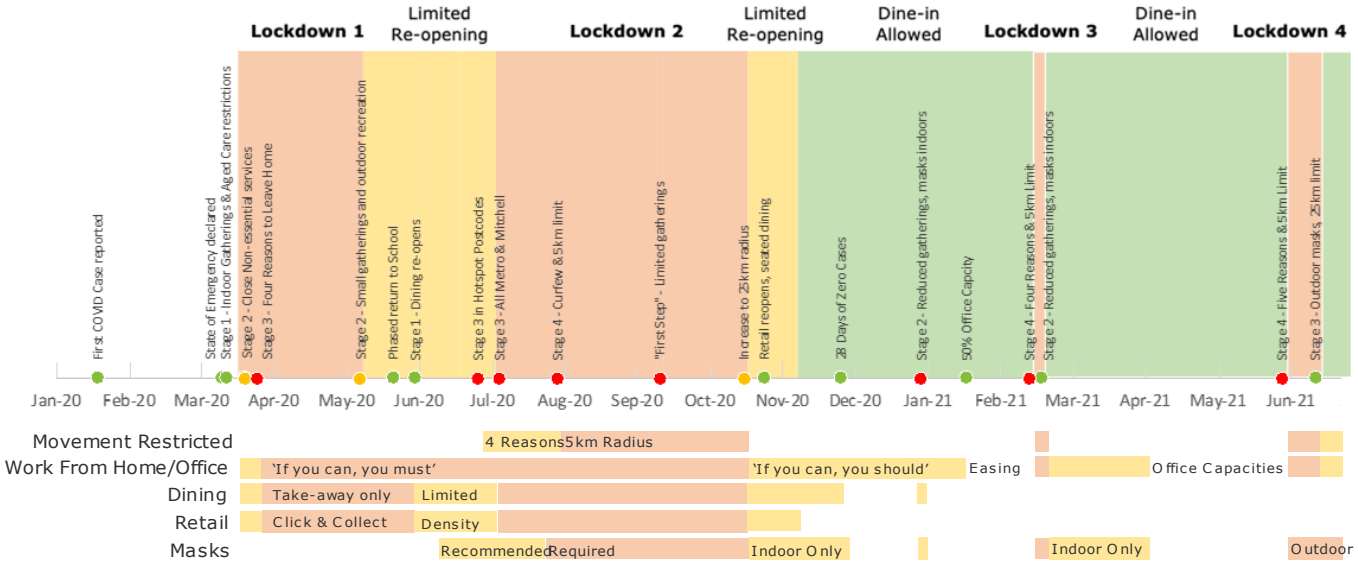
The impacts of Covid on trips

Rolling restrictions on activity and movement have been imposed throughout Greater Metropolitan Melbourne since early 2020 to curb the transmission of Covid.

Overview of the Covid restrictions imposed in Melbourne

The state government has imposed rolling lockdowns and restrictions with varying limitations on permissible activities and travel distances in Greater Metropolitan Melbourne since 2020 in response to community transmission of Covid. To date, there have been six lockdowns, which together amount to more than 200 days. Since 2020, those who can work from home have been encouraged – or required – to do so. Normal business activities across many industry sectors and occupations have been restricted or suspended. The timing and levels of restrictions are shown in Figure 9, and their duration is shown in Table 1.

Figure 9: *Covid restrictions – timing and restriction of movement*



Sources: vic.gov.au and coronavirus.vic.gov.au, various announcements

Table 1: *Summary of Covid restrictions, including duration*

Start	End	Duration (days)	Restrictions
–	20/3/20	–	Restrictions imposed following day
21/3/20	10/5/20	51	Full lockdown
11/5/20	3/6/20	24	Partial lockdown
4/6/20	21/6/20	18	Restaurants and cafes re-open
22/6/20	6/7/20	17	Partial lockdown
7/7/20	12/9/20	66	Full lockdown
13/9/20	17/10/20	35	Restaurants and cafes re-open
18/10/20	7/11/20	21	Increase to 25km radius
8/11/20	11/2/21	96	Full re-opening (with social distancing)
12/2/21	17/2/21	6	Full lockdown
18/2/21	26/5/21	98	Full re-opening (with social distancing)
27/5/21	10/6/21	15	Full lockdown
11/6/21	14/7/21	34	Restaurants and cafes re-open
Recent changes beyond scope of data analysis timeframe			
15/7/21	*30/7/21*	*16*	*Full lockdown*
31/7/21	*4/8/21*	*5*	*Restaurants and cafes re-open*
5/8/21	*Present*		*Full lockdown*

Sources: vic.gov.au and coronavirus.vic.gov.au, various announcements

The impacts of Covid on trips

Trips by car and public transport to the central city declined sharply following the first restrictions in 2020. Trips by car recovered in 2021 before plateauing, while the public transport recovery has been slow.

Impacts of Covid on trips by car and public transport

Trips by car and public transport to the central city declined dramatically from pre-Covid levels at the outset of the first tranche of restrictions – both on weekdays and weekends. Trips via both modes began to recover from November 2020, though at varying rates. Figure 10 and Figure 11 show:

- The rate of recovery has been faster for trips by car, with steady recovery in 2020 followed by substantial recovery starting in November 2020.
- Car trips fell to around 30% of pre-Covid levels at the low point of 2020, recovering after each lockdown – even when some restrictions were retained. They declined again with each subsequent lockdown before steadily recovering to a peak of about 90% of pre-Covid levels around March 2021 and plateauing thereafter (with a sharp but short-lived decline in lockdown). Weekday and weekend car trips have declined and recovered at a similar rate. This is consistent with trends observed for Greater Metropolitan Melbourne.
- Public transport trips have recovered at a slower rate than car trips – with minimal recovery from the initial decline to about 15% of pre-Covid levels and slow to no recovery until November 2021.
- From November 2020, the rate of recovery for public transport trips increased – with weekend trips reaching around 80% and weekday trips 46% of pre-Covid levels.
- The rate of recovery observed for trips around Greater Metropolitan Melbourne on weekdays was marginally higher than that for city-bound trips. Data was not available for Greater Metropolitan Melbourne on weekends.
- The weekend recovery to approximately 60% of pre-Covid levels (April–May average) suggests that passengers are more comfortable to use the services when public transport loads are lower and the ability to socially distance is higher. (Weekend passenger volumes have traditionally been lower and the patronage distributed more evenly across the day and evenings.)

Figure 10: *Road trip recovery – weekday vs weekend, CBD SCATS sites*

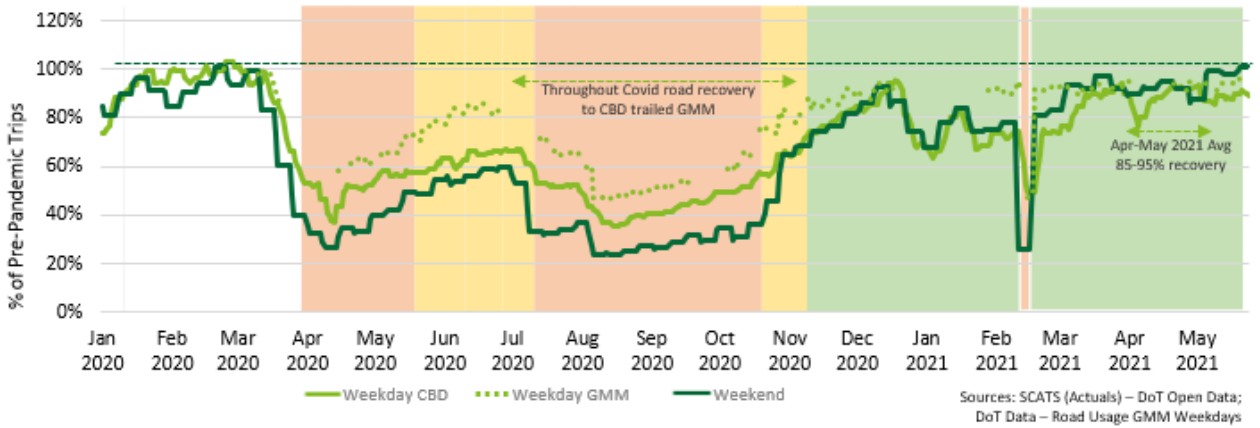
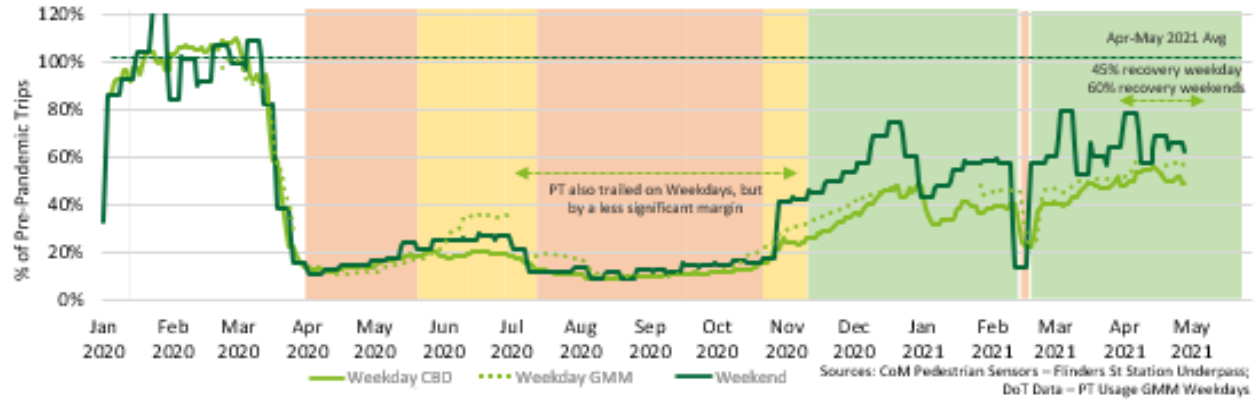


Figure 11: *CBD train trip recovery – weekday vs weekend (estimated)*



3.
City recovery and the transport task

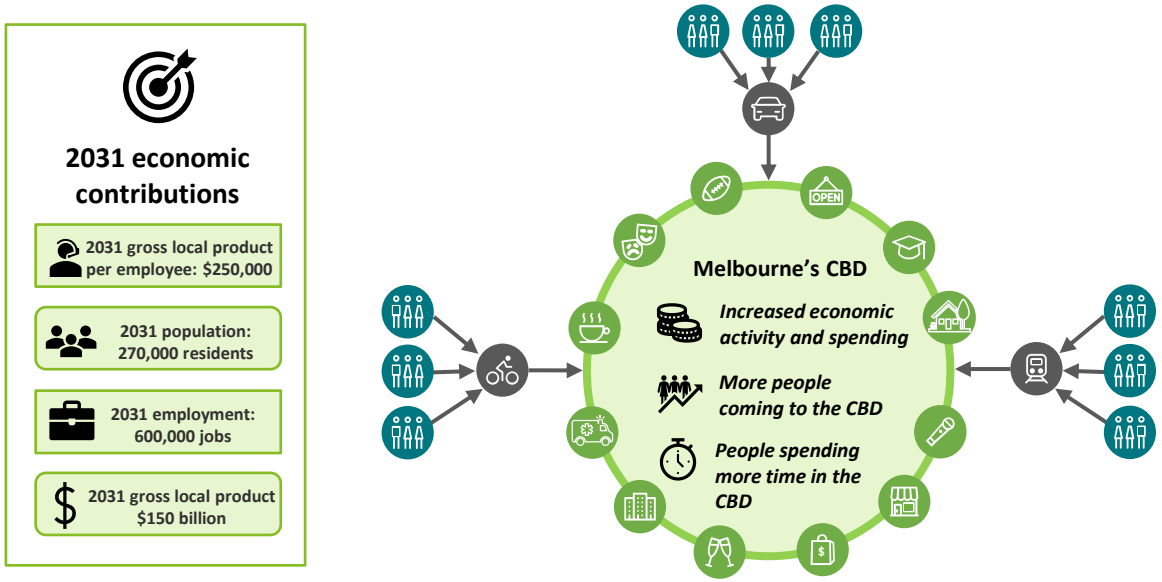
City recovery and the transport task

The scale and timing of central city recovery from the effects of the pandemic, and the size of the subsequent transport task are uncertain given the potential for further rolling restrictions and Covid-related changes to travel behaviours.

City recovery and the transport task

As Figure 12 shows, the Council has set aspirational targets for city recovery. The sustained ability of the central city to recover from the impacts of Covid and realise these targets depends on the integrated reactivation of the diverse range of activities that create the city experience. Reactivation and subsequent attraction must be sufficient to counter changed needs and travel behaviours that have arisen during lockdowns and restrictions. A key element of reactivation is to address any obstacles to access and seamless circulation within the central city. City recovery will be facilitated at each stage of Greater Melbourne's recovery if the transport network efficiently enables individual transport decisions, and efficient and equitable access and circulation across all modes of transport.

Figure 12: *A model for central city recovery*



** City of Melbourne 2021, Economic Development Strategy 2031*

Timing and scale of city recovery

There is a prevailing sense of confidence in the ability of the central city to recover from the impacts of Covid and the associated restrictions. A recent survey undertaken by the Property Council of Australia to test user sentiment on the future of the CBD indicates that although 51% of respondents do not believe the central city will be as busy post-Covid, 82% believe that it will continue to evolve to meet the needs of people who live, work and visit there.

However, there is uncertainty surrounding both the timing of central city recovery and the extent to which changes in user behaviour will impact the future transport task given:

- The potential for further rolling transport restrictions on activity and movement up to – and potentially beyond – a threshold level of vaccinations
- Changes in travel behaviour that have occurred – and potentially stuck – during lockdown.

Permanent changes to the level of activity and travel patterns will have a profound impact on the future transport task, particularly in relation to work-related trip frequency and discretionary trips, as Figure 13 shows.

Figure 13: *Potential long-term impacts on travel behaviour*

CBD workers who want to continue to work flexibly at least some of the week, post-pandemic

Source: EY Sweeney

3.3 days

The average number of in-office days preferred by CBD users, with Thursday being the most popular day

Victorians who purchase more items online now compared to before the pandemic

Source: DoT sentiment data

+12%

Victorians who now regularly shop online compared to Australia-wide benchmark

City recovery and the transport task

This report assumes the future transport task will equal pre-Covid trip levels, allowing for the uncertainty surrounding the timing of central city recovery and future travel behaviour

Estimating the scale of the transport task

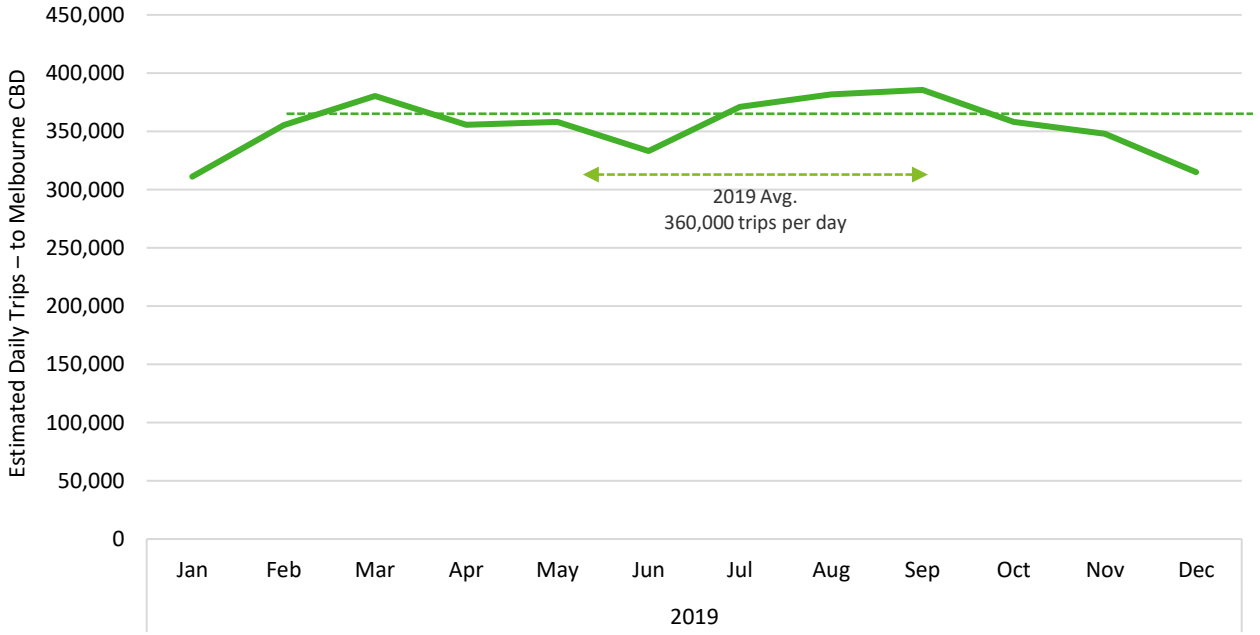
The first step in the investigation for this report was to estimate the scale of the transport task. Understanding the scale and attributes of the transport task is fundamental to designing impactful transport interventions that address obstacles to access to and circulation within the central city and city recovery.

The Victorian Integrated Survey of Travel and Activity (VISTA) and City of Melbourne population estimates suggest that the centre attracted 360,000 trips a day in 2018. The report has adopted this number as the post-pandemic transport trip 'target'. In our view this target is consistent with the raw data, population estimates and VISTA mode share estimates. It also allows for annual seasonal fluctuations such as school holiday periods. (See Figure 14).

The raw mode-by-mode data has been gathered from sources such as traffic signal and DoT public transport patronage estimates. Added together the raw data total shows the total capacity available from each mode. The 'raw data' total is higher than the trip 'target' adopted for the report. The difference is due to the fact that on all modes, many users travel in and through the CBD without stopping, failing to add any direct economic benefit to the CBD. For example, motor vehicle trips were found to be around 180,000 a day, but only 57% of these historically have a destination in the CBD.

To further interrogate the raw data would require more detailed trip modelling, which is unavailable at this time. It would be useful for future investigations to look for example, at the 43% of car trips that cross but do not stop in the centre, and how their travel has changed pre- and post-Covid. It would also be useful to quantify the number of intra-city Free Tram Zone trips.

Figure 14: *Estimated Daily Trips – to Melbourne CBD*



Sources: VISTA 2018, CoM Population Estimates, DoT Train, Bus, Tram Patronage, DoT SCATS, DoT Bike Sensor

4.
Current transport conditions and the transport task

Car trips

Vehicle entries to the central city declined sharply at the outset of the pandemic, recovering to around 88% of pre-Covid levels. However, 43% of the limited morning peak capacity comprised vehicles that did not contribute to CBD activation.

Trip recovery

Vehicle entries declined sharply at the commencement of Covid restrictions. Figure 15 shows that at the lowest point, in July 2021, vehicle entries had declined to around 66,000 per day – compared to a pre-Covid average of 180,000 per day. VISTA data reveals that approximately 60% car trips into the city between June and December 2020 were for work purposes, with another 12% attributed to drivers dropping off or picking up another person.

From November 2020, vehicle entries per day began to recover towards pre-Covid levels. In the May 2021 recovery period, private vehicle volumes peaked at around 153,000 per day (around 88% of pre-Covid levels).

Of the 180,000 pre-Covid average daily vehicle entries, only around 57% or 102,000 of those vehicles were defined as having stopped in the CBD. The remining 43% of vehicles passed through the CBD to another destination, therefore:

- Not contributing to the activation of the central city
- Using finite central city road capacity, particularly during peak times.

Capacity for growth

As shown in Figure 16, the total hourly vehicle capacity of the central city road network was estimated at 14,400 vehicles per day. The reallocation of road space to bicycle lanes in 2019 resulted in a reduction in capacity of around 800 vehicles in the 8:00 AM to 9:00 AM peak hour.

Figure 15: *Vehicles entering the CBD (all day)*

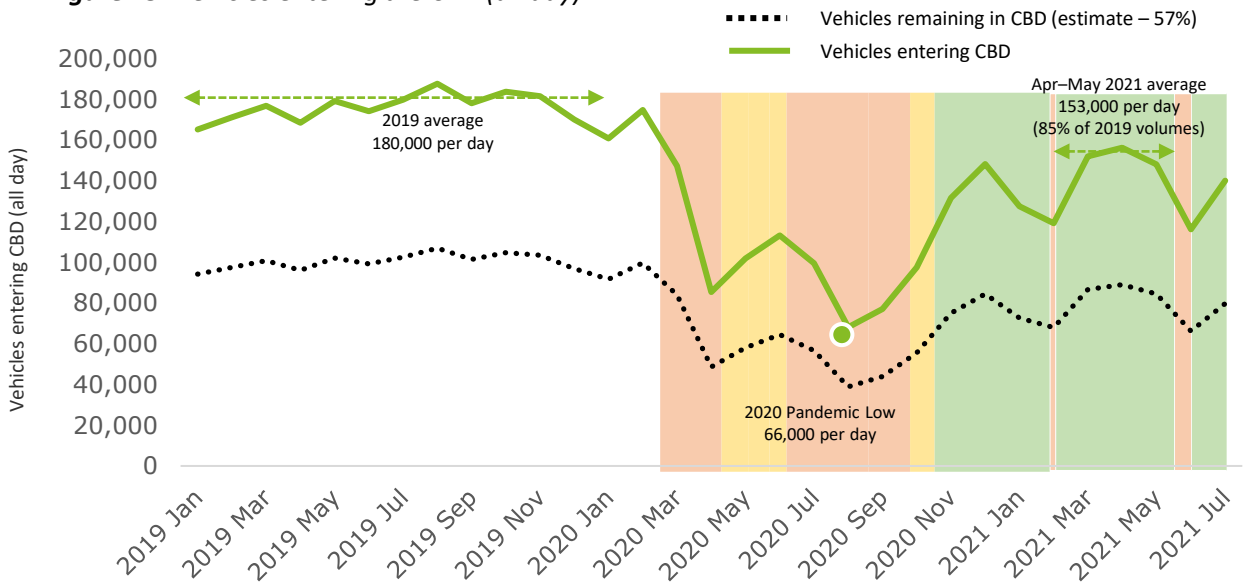
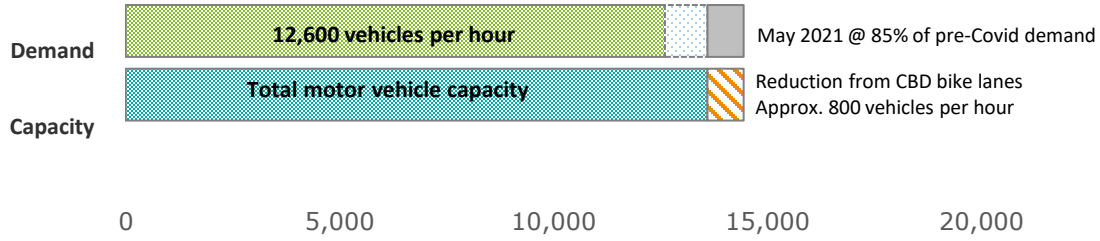


Figure 16: *Average hourly demand (8:00 AM – 9:00 AM peak) – May 2021*



Car trips

Vehicle road space is close to total capacity during the morning peak period, with capacity available in ‘shoulder’ periods and between the morning and afternoon peak periods.

Road capacity as an obstacle to city recovery

Vehicle road space is at capacity during the morning peak period, with capacity available in shoulder periods and between the morning and afternoon peak periods. Approximately 43% of this capacity is used for trips that do not contribute to central city activation (through trips).

Figure 17 shows the average number of weekday vehicle trips into the CBD in the morning peak before and during the pandemic, while Figure 18 indicates the average number of weekday vehicle trips into the CBD in the shoulder of the morning peak period. These figures show that:

- There was a reduction in capacity equal to approximately 800 vehicle movements in the 8:00 AM to 9:00 AM peak in early 2020 due to interventions such as the reallocation of road space to bicycle lanes
- Vehicle movements have recovered to around 88% of pre-Covid levels in the AM peak and use around 90% of available capacity.
- There is capacity for additional vehicle movements in the peak shoulder or between-peak periods.

Levers to address the obstacle

Road capacity can be managed to support central city recovery. Available levers to increase road space capacity in the AM peak (where capacity is fully used) include:

- Reallocating road space from bicycles to vehicles, enabling a greater number of vehicle movements
- Managing demand efficiency by discouraging through trips
- Managing demand efficiency by adopting a user-pays approach to finite road capacity, to discourage non-essential travel during peak periods and distribute trips to the shoulder and inter-peak periods
- Managing demand efficiency by providing incentives to switch to modes with unused capacity.

Figure 17: *Vehicles entering CBD in 8:00–9:00 AM peak period*

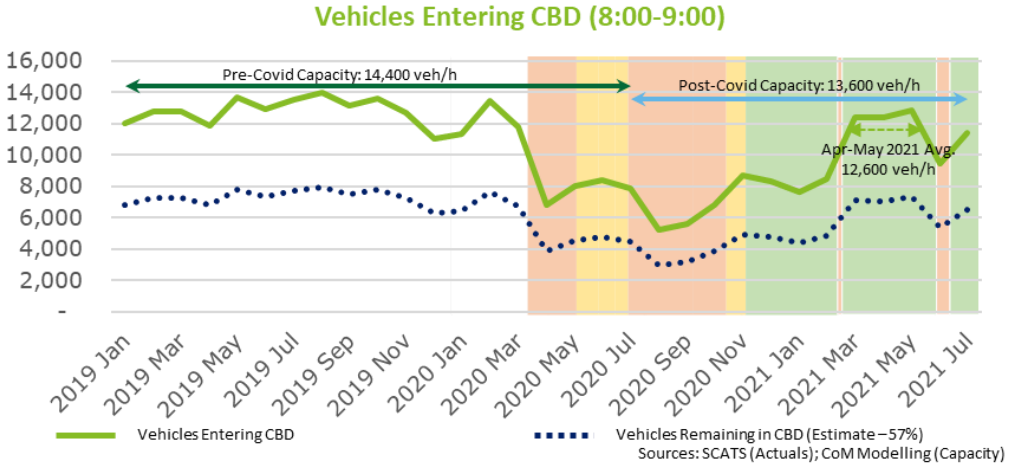
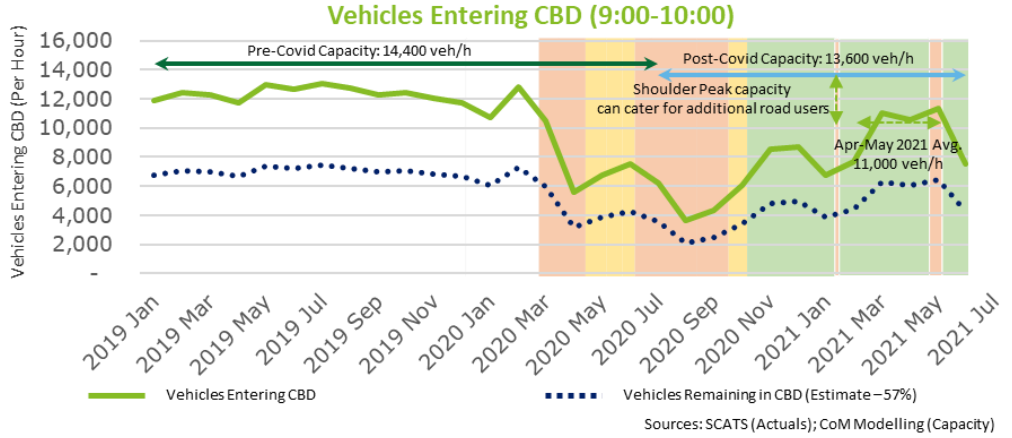


Figure 18: *Vehicles entering CBD in 9:00–10:00 AM shoulder period*



Car trips

Controlled kerbside parking has not reduced demand for trips by car, but it has improved parking bay productivity and has had a positive impact on central city reactivation.

Uncontrolled parking as an obstacle to city recovery

On-street parking bay sensor data shows that arrivals (new vehicles entering parking bays) in the central city at the onset of Covid did not decline as sharply as vehicle numbers on the roads.

Figure 19 compares daily arrivals per bay in Russell Street in April in 2019, 2020 and 2021. In April 2019, there were 32,736 arrivals. By April 2020, when vehicle entries to the central city had declined to around 36% of pre-Covid levels, parking arrivals only declined to 19,971, or 61% of pre-Covid arrivals. By April 2021, vehicle entries to the central city had recovered and parking arrivals had returned to around 85% of pre-Covid levels.

Although parking arrivals did not decline as sharply as other modes during 2020, parking bay productivity fell significantly. As shown in Figure 20, in Russell Street during the period that restrictions were suspended, each bay only supported 10 people across the day. The bays were fully occupied, but rather than turning over frequently, the parking stays were several hours longer than in pre-Covid times. The seven-hour parking stays increased to 795 in the month. These longer stays prevented other people from using the bays and reduced total arrivals. This had a negative impact on central city reactivation as it reduced the number of people visiting the city.

By April 2021, parking bay arrivals had recovered to around 85% of pre-Covid levels. Again, bays were fully occupied, but the number of people 'camping' in the bays for long periods fell. In April 2021, the seven-hour stays in Russell Street fell to 236. Nonetheless, these 236 people occupied the bays for 1,753 hours across the month, denying access to 2,500 people who needed an average 40-minute stay.

Levers to address the obstacle

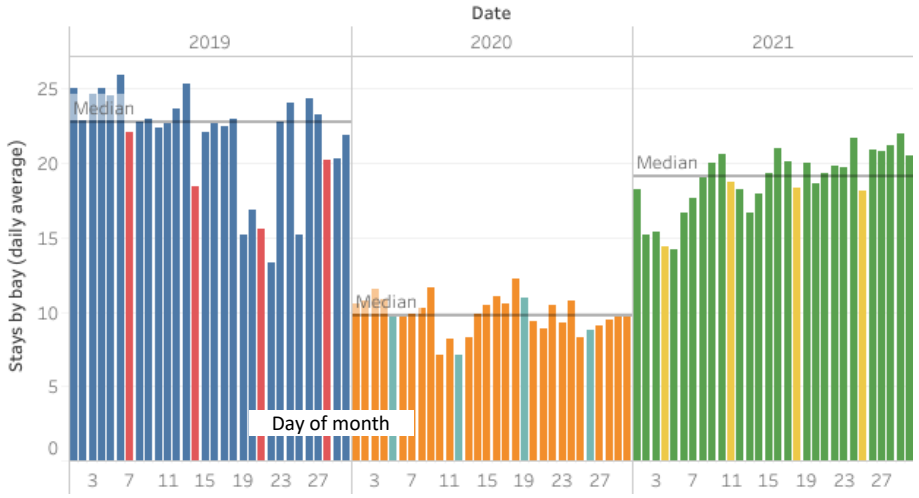
Council can maximise the number of people who arrive in the centre through the on-street parking system by moving away from a uniform meter fee across the day. Cheaper shoulder and off-peak fees can be introduced, while ensuring that the peak time controls keep bays occupancy turning over. Performance targets can be set area by area. In Russell Street, for example, a target of 20 people a day per bay could be set and the restrictions adjusted to achieve or surpass that goal. See intervention 6: Demand responsive parking as a possible lever to address the obstacle.

Note: In-ground sensors have not been deployed widely outside 'green sign' bays. Ideally, activity data for all kerbside movements of people and freight should be collected, including from loading zones, drop-off zones, taxi ranks, private coach bays and bays set aside for people with disabilities, to optimise use of kerbside space.

Car trips

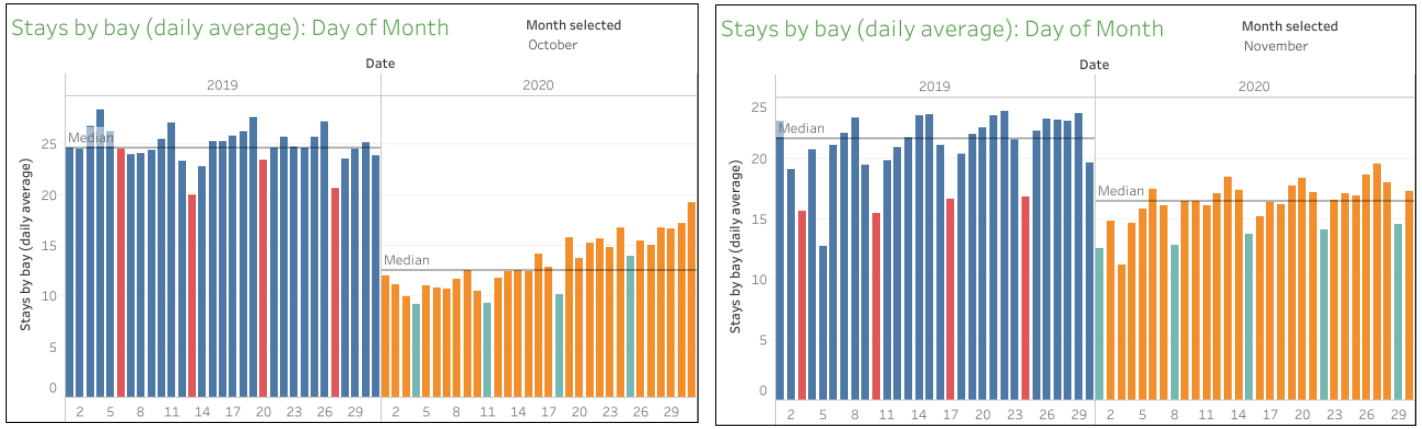
Controlled kerbside parking has not reduced demand for trips by car, but it has improved parking bay productivity and has had a positive impact on central city reactivation.

Figure 19: *Average arrivals in each parking bay each day in Russell St (April 2019, 2020 and 2021)*



Source: PBA Analysis of CoM Parking Data

Figure 20: *Average arrivals in each parking bay each day in Russell St (October 2020 on left and November 2020 on right)*



Day of month *Day of month*

When parking restrictions were reintroduced in November 2020, the number of arrivals increased by 10,000 (47%)

Source: PBA Analysis of CoM Parking Data

Car trips

Unnecessary driver frustration may be addressed by providing better directional information and guidance toward preferred routes.

Addressing driver frustration

Following the recovery of the 'city experience' the motor vehicle mode has recovered quickly, bringing back motor vehicle congestion and leading to driver frustration and lost time. It is beyond the scope of this report to identify time-specific and site-specific measures that would boost capacity for each of the modes. Issues that could be studied include pedestrian access across Spencer Street to Southern Cross Station, upgrading the Lonsdale Street bus lanes and identifying locations where further tram separation would have an impact.

From a motor vehicle perspective there will certainly be time-specific and site-specific measures that will increase throughput and will – to some extent – reduce frustration. Without in-depth analysis of intersection data along the inbound and outbound routes to the CBD, it is not possible to identify these measures and locations in this report.

Nonetheless, it is possible to identify the two areas where changes could be valuable: guidance and intersections.

Figure 21: *Old line marking is still visible on Exhibition Street between Collins St and Flinders Lane*

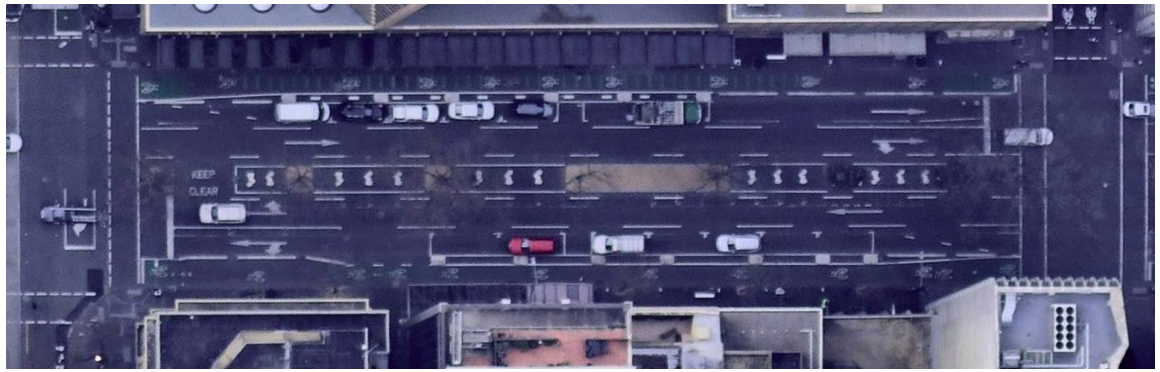


Figure 22: *Static and dynamic signage to direct vehicle flows onto preferred and more efficient routes*

Source: Google Maps, Transurban

Better guidance

In several locations, changes to the roads have introduced new line marking without completely eliminating the old line marking. It would be helpful to reduce this ambiguity.

Lane choice and merging decisions could be supported by additional on-road direction such as repeated direction arrows as well as a review of signage.

City entries and exits could be marked more clearly on the road surface and on signs. Entry and exit routes could be numbered and recommendations provided. A 'City Exit' system could be developed, similar to the current City Bypass on routes such as the bypass along Wellington Parade and Lansdowne Street (above left), with expansion to include dynamic travel time information to key locations (above right). Dynamic travel time signage has been deployed in the vicinity of major infrastructure works, such as level crossing removals, the Westgate Tunnel and North East Link, to provide drivers with daily information about their travel options through and around traffic hotspots.

Car trips

Reviewing traffic light and directional settings at intersections, particularly for peak hours, can reshape travel patterns and improve vehicle throughput.

One way to addresses driver frustration with delays is to review the traffic light and directional settings at intersections, as use of intersections rather the areas of roads in between determines the motor vehicle capacity of the road system. When people have a choice of direction at an intersection – left, right or straight ahead – the flow through the intersection is reduced, either formally by red and green arrows or informally as people wait for each other.

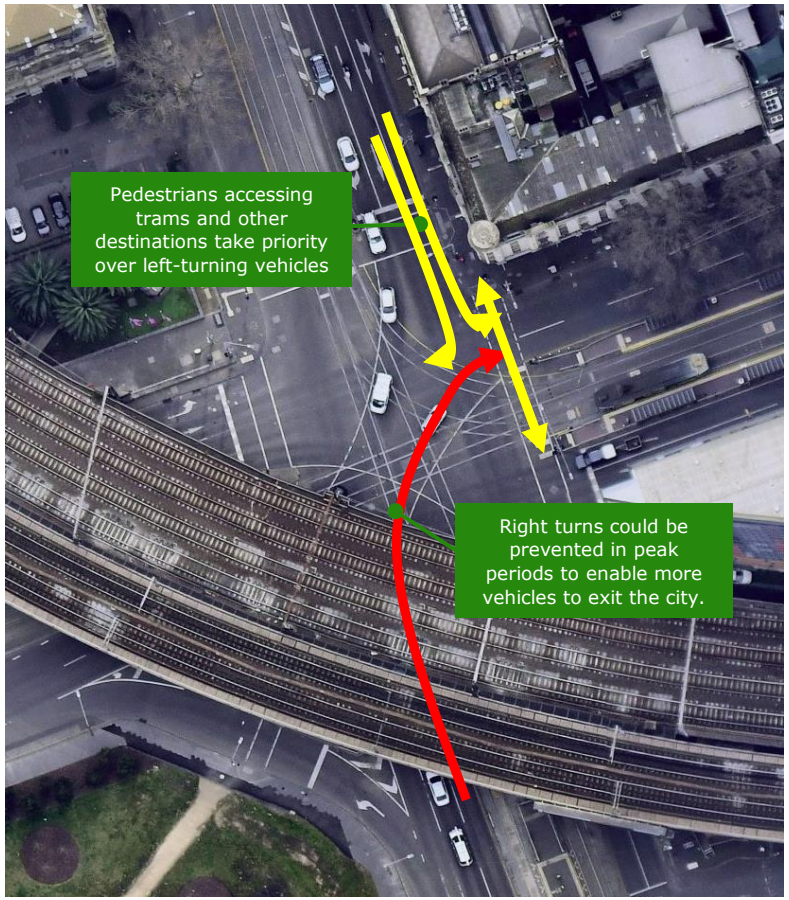
It is possible to increase the number of people who 'get through' an intersection with each change of lights by restricting this choice – for example, during peak times at city entrances and exits. Figure 23 shows the intersection of Spencer Street and Flinders Street. A driver on Spencer Street who wishes to head south across the river has to wait while others get what they want including left and right turns. Left turns may be delayed by pedestrians crossing Flinders Street (or pedestrians may be delayed while drivers turn east onto Flinders Street). In the evening peak, the choices could be reduced – left and right turns could be disallowed – to increase the number of southbound drivers who get through each signal phase. Some drivers would benefit and others would have to make adjustments.

Limitations of optimisation

It must be remembered that there are several things that optimisation cannot achieve:

- Optimisation cannot reduce congestion as any 'empty road space' will quickly be filled.
- Optimisation will facilitate through traffic. It may be that all additional capacity will be gobbled up by through traffic for no net gain to the CBD.
- Optimisation cannot make a significant difference to the number of people who can get in and out of the CBD by car because the road system is near to capacity. Any big increases in access to the CBD must, and will, come by public transport – mostly by train. Today the trains are only half full, but they still deliver more people to the CBD than the road network. Looking ahead, the train mode will expand significantly when the new Metro system opens.

Figure 23: *The city exit from Spencer Street is choked by left- and right-turn options.*



Source: NearMap

Car trips

There has been feedback that drivers are being delayed at several traffic hotspots around the CBD, particularly where bicycle users have not yet returned in similar numbers.

Driver hotspots in Melbourne's CBD

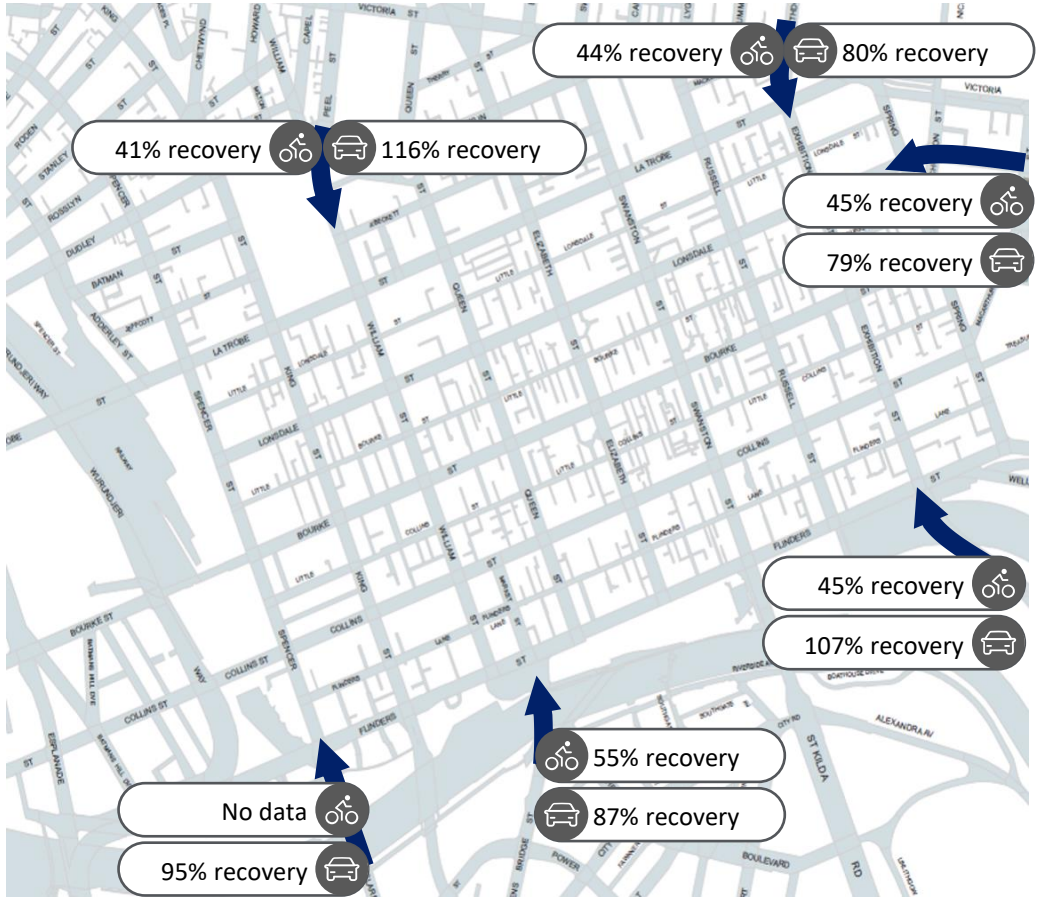
Figure 24 shows some traffic hotspots that have featured in feedback to the Council. As well as reporting delays, some drivers have suggested that the congestion is caused by the bicycle facilities on Exhibition Street, for example. Figure 24 also shows traffic and bicycle data from the morning peak, inbound. Motor vehicle flows from several directions have not fully recovered to pre-Covid levels, including Rathdowne Street into Exhibition (80%), Albert Street into Lonsdale Street (79%) and Queensbridge Street into William Street (87%). Concerns about these routes deserve investigation.

Conversely, William Street southbound and the tollway into Exhibition Street are carrying a greater number of motor vehicles than previously: 116% and 107%, respectively. Traffic on the Clarendon Street – Spencer Street route has increased to 95% of pre-Covid levels. Continued monitoring of vehicle counts would be appropriate. Data shows the recovery in bicycle trips is not nearly as strong. Only Queensbridge has recovered to more than half (55%) of its previous trip levels. Otherwise the bicycle routes are carrying less than half pre-Covid volumes.

It is difficult to say why traffic levels have changed in the morning peak without a detailed investigation upstream and downstream from each CBD entry. Large construction projects in the CBD, including the Melbourne Metro, are having a substantial impact on the road system, encouraging drivers to find new routes. The road layout has changed in some places, and use of the road space may have changed. More pick-ups and drop-offs may be slowing traffic. There may be more left and right turns at intersections and more traffic on cross routes. The return to the office is unpredictable, and this may cause unpredictable delays. Certainly pre-pandemic travel patterns have been disrupted and new patterns have yet to be stabilised. This fluidity makes it difficult for people to make choices of route or time of travel that are likely to lead to a 'better run'.

It is important that the Council monitors the performance of the road system. Where throughput drops significantly and persistently, a detailed investigation should take place and adjustments should be trialled to get the best possible outcome from the system.

Figure 24: *Volume recovery of selected hotspots of frustration*

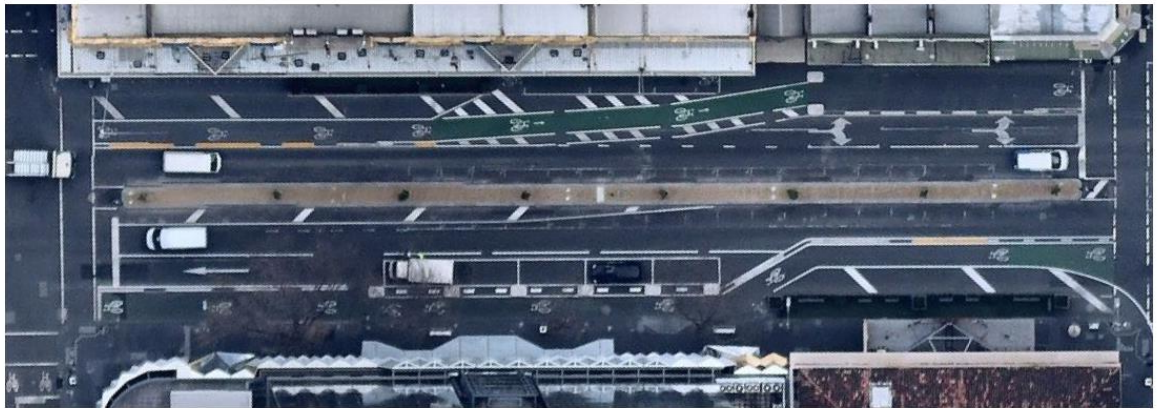


Sources: SCATS volumes (2019 vs. May 2021) and Super Tuesday Bicycle Counts (March 2019 vs. March 2021)

Car trips

In recent years, road space on several streets has been reallocated, but these changes have not significantly affected motor vehicle throughput.

Figure 25: *Example of improved bicycle infrastructure on Exhibition Street*



2021: Exhibition Street between Lonsdale Street (right) and Little Bourke Street

2017: Exhibition Street between Lonsdale Street (right) and Little Bourke Street

The bicycle facilities program

The recent bicycle facilities program introduced 14 kilometres of improved bicycle facilities on 14 streets and 12 routes. This equates to a 0.5% space reallocation from the central city road network. Four streets are on two CBD routes: Peel Street/William Street and Rathdowne Street/Exhibition Street. On six streets there was no change to kerbside access or motor vehicle capacity. On seven streets kerbside access was removed during peak times, and on one street (William Street) it was removed altogether. On-road motor vehicle space in the CBD has been reduced in two locations: some blocks in both directions on Exhibition Street and outbound through the S-bend under the viaduct on Queensbridge. In these locations, two motor vehicle lanes have been reduced to one.

Case study: Exhibition Street – more than bicycle lanes

Figure 25 shows Exhibition Street in 2017, when there were two general traffic lanes, kerbside parking and central median parking. In the 2021 picture, the footpath area extends in front of The Comedy Theatre (bottom right) and Her Majesty's Theatre (top left). A similar project outside the Princes Theatre in Spring Street has proved a popular part of the city experience. Changes to Exhibition Street have been welcomed by theatre businesses. In addition, the central median has been planted to provide a shade canopy. Some kerbside parking has been retained and a full-time, separated, kerbside bicycle facility has been introduced.

The transport impact of 'local activation' and bicycle facilities

To make space for these changes, two motor vehicle lanes were reduced to one and some parking bays were removed. This has not reduced the light vehicle flows on Exhibition Street across the day. Initially, it caused a bottleneck in the morning peak. However, the Council has found that after a period of adjustment, drivers are using other options, and minimal delays are now being experienced on Exhibition Street for most of the day.

Public transport – trains

Train trips declined at the outset of Covid and recovered slowly in 2020 before accelerating to around 45% of pre-Covid levels in 2021. Trains provide the largest capacity to support increased travel to the CBD.

Trip recovery

As shown in Figure 26, trips by train declined sharply at the outset of Covid from the pre-pandemic CBD daily average in 2019 of around 300,000 to 25,000 per day. VISTA modelling reveals that approximately 170,000 of these trips had destinations in the CBD in 2019, with the rest distributing to other areas, including Docklands, Southbank and Melbourne University. Post-lockdown in 2021, trip recovery commenced, but with each subsequent lockdown numbers declined to 25,000 daily trips.

In 2021, trips by train grew to around 45% of pre-Covid levels (130,000 daily trips), with 75,000 trips to CBD destinations. This suggest that train trips that end in the centre are still lagging behind road trips with destinations in the CBD. However, the trajectory prior to the May–July 2021 lockdowns shows that train trips are still increasing.

VISTA data for June – December 2020 indicates that around 75% of people use the train for work purposes, reaffirming the strong link between train patronage and CBD office jobs. In contrast, non-central-city train trips had recovered to 60% of pre-Covid trip levels in May 2021.

Capacity for growth

Figure 27 shows that current train loads are significantly smaller than pre-Covid levels and the capacity for growth in train trips is large. Note: pre-Covid peak-time volumes at times exceeded the formally rated capacity on some trains, leading to 'crush loads' and passengers left waiting on platforms.

In May 2021, there was an average of 36,000 city loop trips per hour relative to capacity of 100,000 trips per hour. This indicates that there is substantial capacity to add trips serving the central city.

The 'Covid capacity' of the network is unknown. Factors such as reduced in-vehicle and on-platform capacity to enable social distancing are likely to reduce overall capacity, but this can be offset by additional services and distributing passenger loads into the shoulder and off-peak periods.

Some additional peak services were added to the train network in 2021. Further capacity will be added with the opening of the Melbourne Metro rail tunnel, but this is beyond the focus of shorter-term Covid recovery.

Figure 26: *Average daily weekday train trips – inbound (all day)*

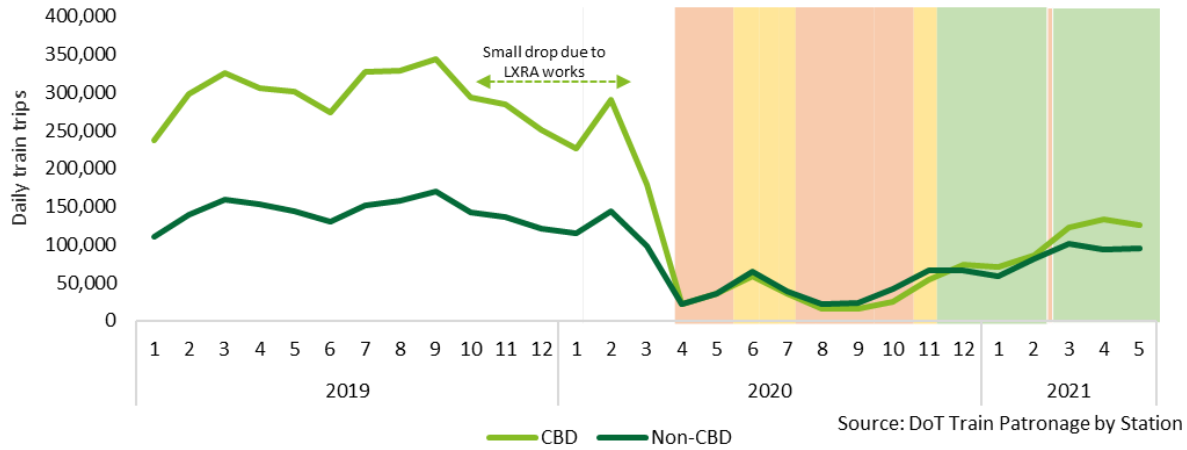
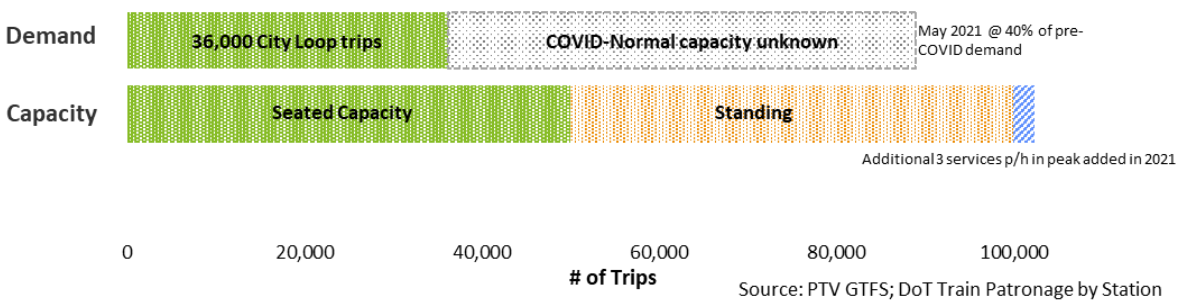


Figure 27: *Average hourly demand in the 8:00–9:00 AM peak, May 2021*



Public transport – trams

Tram travel was the mode most impacted by Covid, declining to around 4% of pre-Covid trip levels before recovering to 45%. Trams have growth capacity and a diversified patronage, which is positive for future recovery.

Trip recovery

As shown in Figure 28, pre-Covid CBD tram trips averaged around 38,000 per day. Trips by tram fell to the lowest level of all modes observed at the outset of lockdown 2, at 4% of pre-Covid levels. This was likely due to a large reduction in internal Free-Tram-Zone trips. In May 2021, CBD-centric tram trips had recovered to around 45% of pre-Covid levels. Monthly reporting of patronage data has made analysis of the impacts of short lockdowns more difficult to isolate.

In contrast, non-CBD tram trips have been less affected by the pandemic, with trip volumes returning to around 50% of pre-Covid levels.

VISTA data for June–December 2020 indicates that 40% of CBD tram journeys are for travelling to work, with retail and other personal travel (such as health appointments) being the next largest reasons for travel. The use of trams for non-work trips may mean that tram travel recovers more quickly than train travel.

Capacity for growth

Figure 29 indicates that there is substantial capacity for additional trips in the tram network serving the central city. The 'Covid capacity' of the network is unknown. Factors such as reduced in-vehicle and on-platform capacity to enable social distancing are likely to reduce overall capacity. Peak demand for trams includes trips in the Free Tram Zone. VISTA data from 2018 suggests these free trips account for up to half of all boardings in the CBD.

Figure 28: *Average weekday tram boardings – percentage of 2019 trip levels*

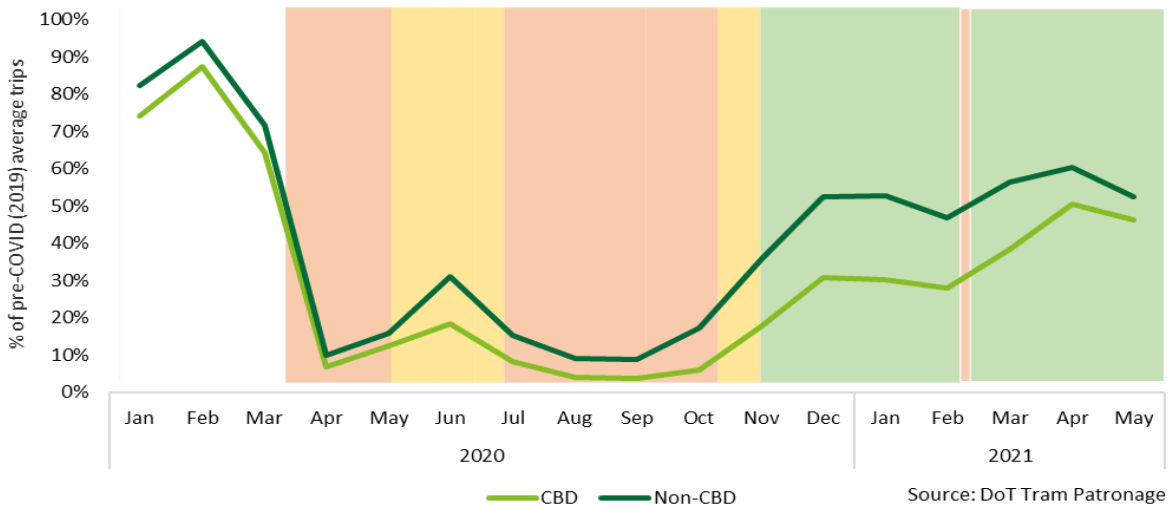
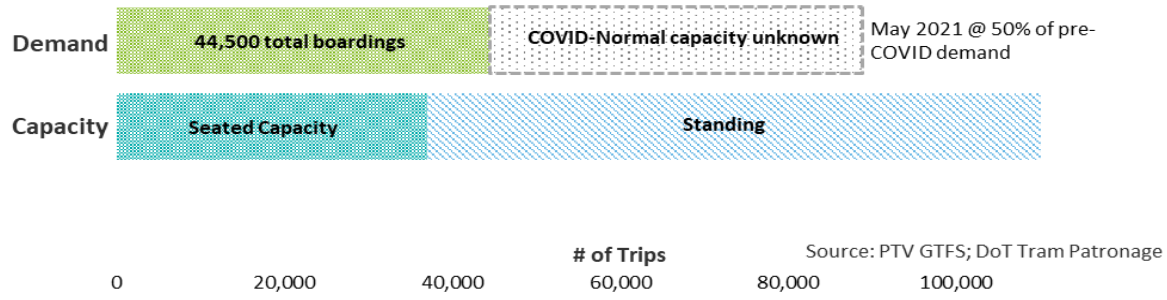


Figure 29: *Average weekday tram boardings – percentage 2019 trip levels*



Public transport – buses

Trips by bus declined to around 10% of pre-Covid trips at the outset of Covid and have recovered to around 60%. There is significant capacity for growth in bus travel, particularly in the shoulder and inter-peak periods.

Trip recovery

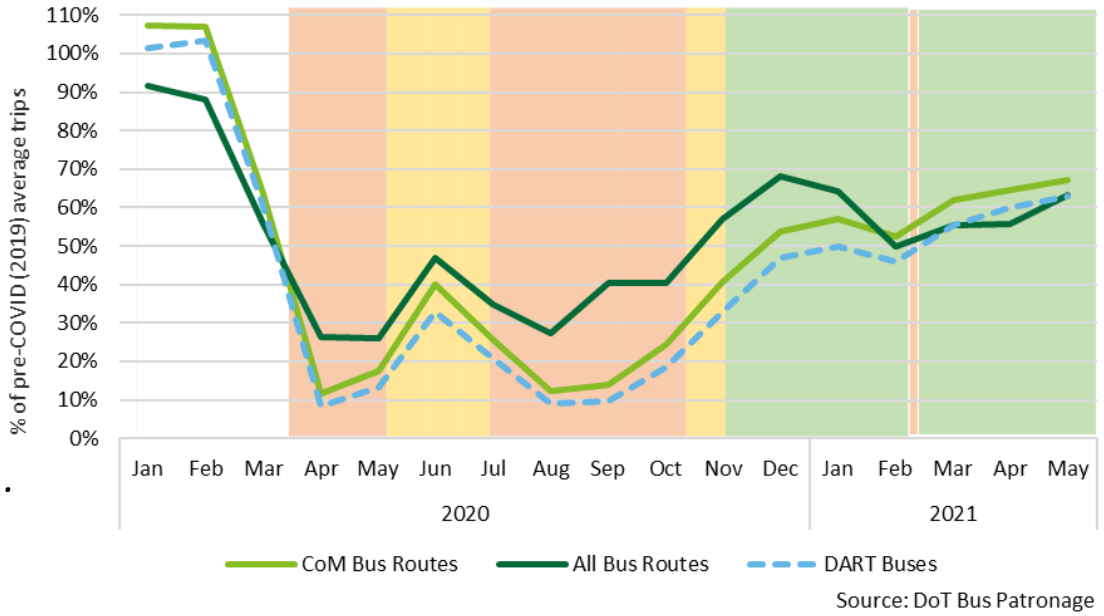
VISTA analysis indicates that pre-Covid CBD bus trips averaged around 9,500 per day. Figure 30 shows demand declining to 10% of this volume during lockdowns 1 and 2. Non-CBD trips were less affected over the pandemic, declining to around 30%.

In May 2021, CBD-centric bus trips had recovered to 60% of pre-Covid levels, similar to the recovery for non-CBD bus travel. VISTA data for June–December 2020 indicates that 58% of CBD bus journeys are for work-based travel, with social activities being the next largest trip purpose (37%). Monthly reporting of patronage data, and a lack of geographic breakdown of trips has made analysis of the impacts of short lockdowns more difficult to isolate.

Capacity for growth

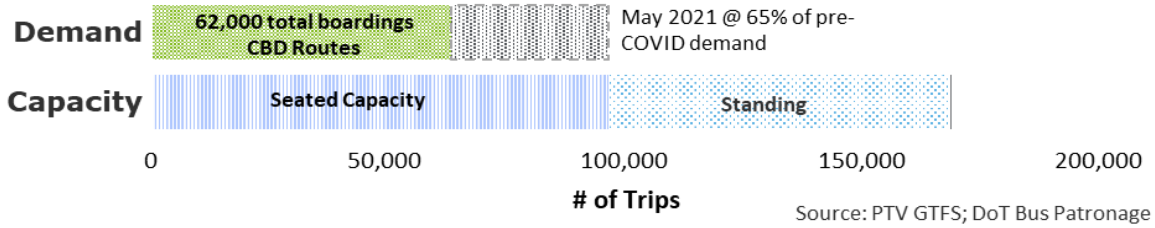
Figure 31 indicates that buses to the CBD have significant capacity, with opportunities to add trips, particularly in the peak shoulder and off-peak periods.

Figure 30: *Average daily bus boardings*



Source: DoT Bus Patronage

Figure 31: *Average daily (all day) demand – May 2021*



Source: PTV GTFS; DoT Bus Patronage

Bicycles

Bicycle trips have fallen by half during the pandemic. The return of motor vehicle congestion and higher patronage on public transport is expected to lead to a recovery in bicycle trips.

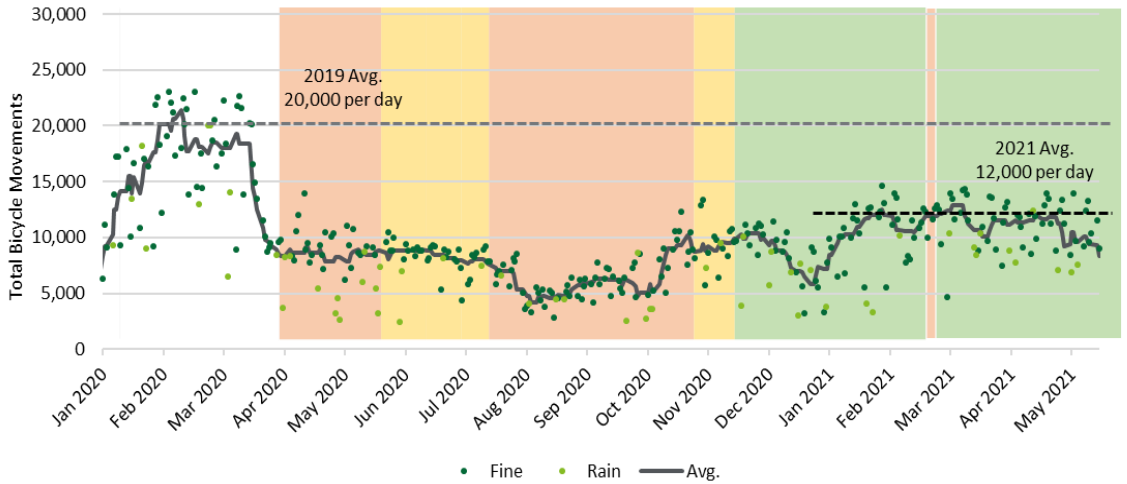
Trip recovery

Bicycle trips to the CBD are currently at around half of pre-Covid levels, with 'working from home' becoming the new normal, the need to and advantages of riding a bicycle to the CBD have declined. Further, as demonstrated in figures 17 and 18, the 2020 and 2021 lockdowns have reduced the number of cars on the roads, removing one of the main benefits derived from riding – avoiding congestion. Of the 20,000 observed bicycle movements captured by DoT sensors, bicycle trips to the CBD in 2019 were estimated at 15,000 per day, and are expected to continue to recover in line with a return to work in the CBD. The bicycle will return to competitiveness as on-road and public transport congestion returns to disrupt and slow motor vehicle and public transport trips, influencing a modal shift to bicycle riding. The City has also introduced 14 kilometres of improved bicycle infrastructure that provide safer travel for people on bicycles, which will further encourage the uptake of bicycle riding (see next page). Figure 32 shows that as restrictions eased in early 2021 and office workers were no longer encouraged to work from home, there was a spike in bicycle movements, indicating an uptake of riding.

Capacity for growth

Existing bicycle infrastructure has significant capacity to bring people into and help them move around the CBD. Pre-Covid, the bicycle system did not reach capacity. In March 2019, on Royal Parade, counts showed 800 bicycles in an hour (twice the number of people per lane as in motor vehicles). Based on European experience, this bicycle route could carry two or three times that number of people. Capacity was further expanded during the pandemic with the installation of new bicycle infrastructure. Like the motor vehicle, the bicycle is a low-risk mode of transport when it comes to the likelihood of Covid infection. Unlike the motor vehicle mode, there is significant room for expansion before bike riding reaches its 'maturity' as a transport mode. Figure 32 shows that current numbers of bicycle movements are well below the pre-Covid capacity. As restrictions begin to ease and white-collar workers return to offices, the number of riders is expected to increase. People who 'discovered' riding during the Covid period may continue to opt for this mode of transport. Others will be attracted to it due to the increased safety and accessibility offered by improved bicycle lanes, reduced Covid risk compared to public transport, increased awareness and use of electric-assist bicycles, and seasonal changes that bring more daylight hours and improved riding conditions.

Figure 32: *Total bicycle movements – all DoT counters within 3km of CBD*



Source: DoT Bicycle Counters – Weekdays Only

Competitive advantage: Typically, in urban areas with higher densities, bicycle trips compete over 5–10 kilometres with peak hour motor vehicle and road-based public transport trips. In this competition the bicycle has several advantages:

- Road congestion is avoided and journey times are predictable.
- Travel times are similar.
- Cost is lower.
- The bicycle offers flexible departure times and the chance to avoid crowded public transport.

Pedestrian movement

Pedestrian volumes reveal the strength of the city experience as all modes end in a trip by foot.

Trip recovery

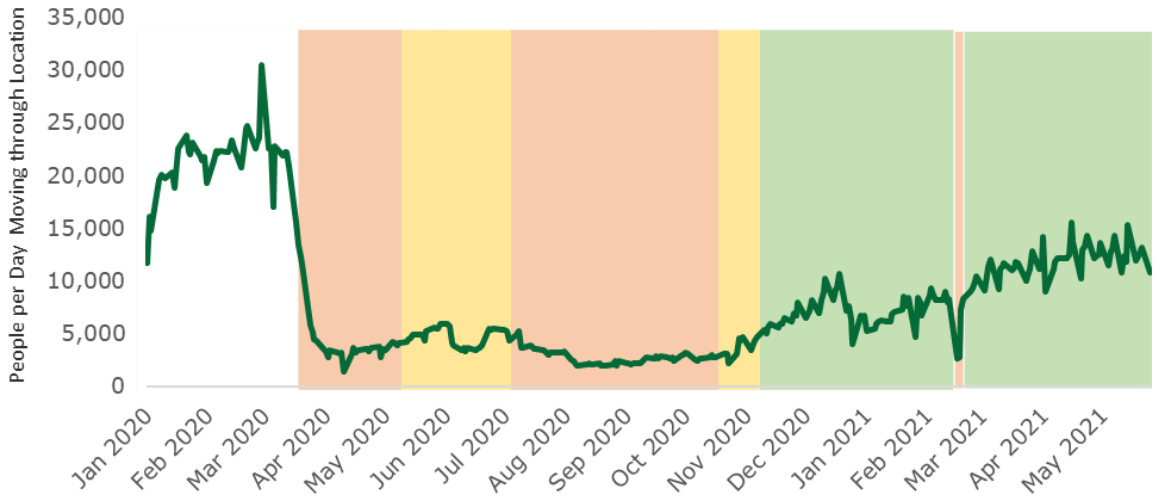
Pedestrian numbers in the CBD reflect the strength of the city experience as all modes end in a trip on foot to the destination or destinations. VISTA analysis shows that historically there were around 27,000 daily pedestrian trips into the CBD. However, lack of post-Covid data makes today's pedestrian movements difficult to quantify. Pedestrian access from outlying areas to the CBD has not been studied. There has been no change to the pedestrian network – indeed the quieter roads will have improved amenity – and the mode allows for effective social distancing. It isn't possible to determine how people arrived in the centre. The City of Melbourne pedestrian counters show numbers at a count site but do not report flows from one site to another (as traffic signal data does, for example).

Data for Bourke Street Mall as a proxy for intra-CBD pedestrian movement shows fluctuations of volumes across the week, both pre-Covid and through recovery phases. Volumes in May 2021 were a little over half those typically observed in pre-Covid times, lagging behind the recovery of total trips into the city. This suggests that the people who are coming to the city are less likely to move about during the daytime to business meetings or to lunch, for example. As overall movement returns to the city, pinch-points of pedestrians around train stations and other key nodes may re-emerge.

Capacity for growth

Figure 33 indicates that pedestrian activity in the CBD has significant capacity to increase, with pedestrian movements slowly increasing to around 70% of pre-Covid levels. The post-Covid capacity of the pedestrian movement network is, however, largely unknown. Implications from Covid – in particular, social distancing guidelines – continue to influence the numbers of people visiting establishments in the CBD, in turn influencing pedestrian movements in key zones. In the second half of 2020, an increase in the number of walking trips was due to the impacts of lockdowns and an exemption allowing residents to leave home for physical activity. This resulted in a much larger share of active mode trips than historically had been observed.

Figure 33: *Total pedestrian movements – Bourke St and Swanston St*



Source: CoM Pedestrian Counters – Mid Week (Tue to Thu) only.

Sentiment data – the central city and transport

Surveys and feedback on transport provide an insight into people's sentiments about travel to the CBD.

Typically, transport studies draw on both 'expressed preference' – what people say about their transport choices – and 'revealed preferences' – what they can be observed to do. People's preferences and actions do not necessarily align. Someone who works in the CBD may prefer to travel by train, but due to the pandemic may have begun to travel in by car and pay for all-day parking to reduce their risk of infection.

What people are doing

The data reported above shows that:

- Fewer people are going to the CBD.
- People have quickly returned to the motor vehicle mode. Some may have adopted it post-Covid.
- People are returning to public transport but not at peak times, and at different rates for different types of public transport.
- People continue to use bicycles but not at pre-Covid levels.
- People are not walking around the CBD as much.
- People are not going to the CBD as often for work.

What people are saying

Department of Transport and City of Melbourne surveys reveal what people are saying about the transport system post-Covid. The following slides provide more detail on people's expressed preferences. In summary:

- People see the car as a low-Covid-risk means of transport.
- People are anxious about public transport trips as they feel unable to control their risk of infection due to factors such as cleanliness and degree of crowding at the stop or on the platform, or in the carriage, tram or bus.
- Many people appreciate the recent improvements to the bicycle network. Many feel that more needs to be done.
- As roads become congested again in the CBD, drivers have expressed frustration at delays.
- Drivers have expressed opposition to past and recent changes to the roadways and kerbside areas across the CBD. Some feel the congestion they experience has been caused by the recent changes.
- People are reporting that working from home means that they do not need to travel to the CBD so often.
- Comments on walking trips were not collected.

What can be done about people's concerns

The concerns raised about crowding and cleanliness on public transport can be addressed directly. Addressing the concerns may not change everyone's perceptions about public transport but, on the other hand, they may influence many. Measures that address these concerns are included in the possible interventions and recommendations in this report. The general support for bicycle infrastructure does not need an immediate response. There is of course a difference between supporting the new bicycle measures and actually using the new facilities. Counts will tell if the new infrastructure has influenced people's actions.

The most complex issue noted in the feedback is driver frustration about the return of congestion. Those who drove in the CBD during lockdowns would have experienced few delays. Today, once again, the road system is full or near to full, and people are experiencing delays. Unfortunately, it is not possible to take steps to eliminate congestion as each congestion-reduction measure draws in more traffic until congestion is restored. The only proven and reliable way to reduce delay is to use road pricing. When these systems produce a 10% reduction in road traffic, drivers experience a noticeable and valuable difference in journey times. Road pricing is one of the possible interventions considered.

Just because congestion cannot be eliminated, it does not mean that nothing can be done or that concerns about congestion cannot be addressed. This report considers whether recent changes to the road system have made a significant difference to capacity, how transport bottlenecks have developed and will develop around the CBD, and how they might be addressed. One option is to make adjustments at intersections that facilitate travel by car in some directions. Of course, this improvement would be at the cost of more delays in other directions. This trade-off may be worthwhile in some places at some times.

The strong recovery of car trips

The strong recovery of car trips in 2021 to pre-Covid levels was primarily attributed to a shift away from public transport due Covid-related concerns about the risk of infection, cleanliness and the ability to social distance.

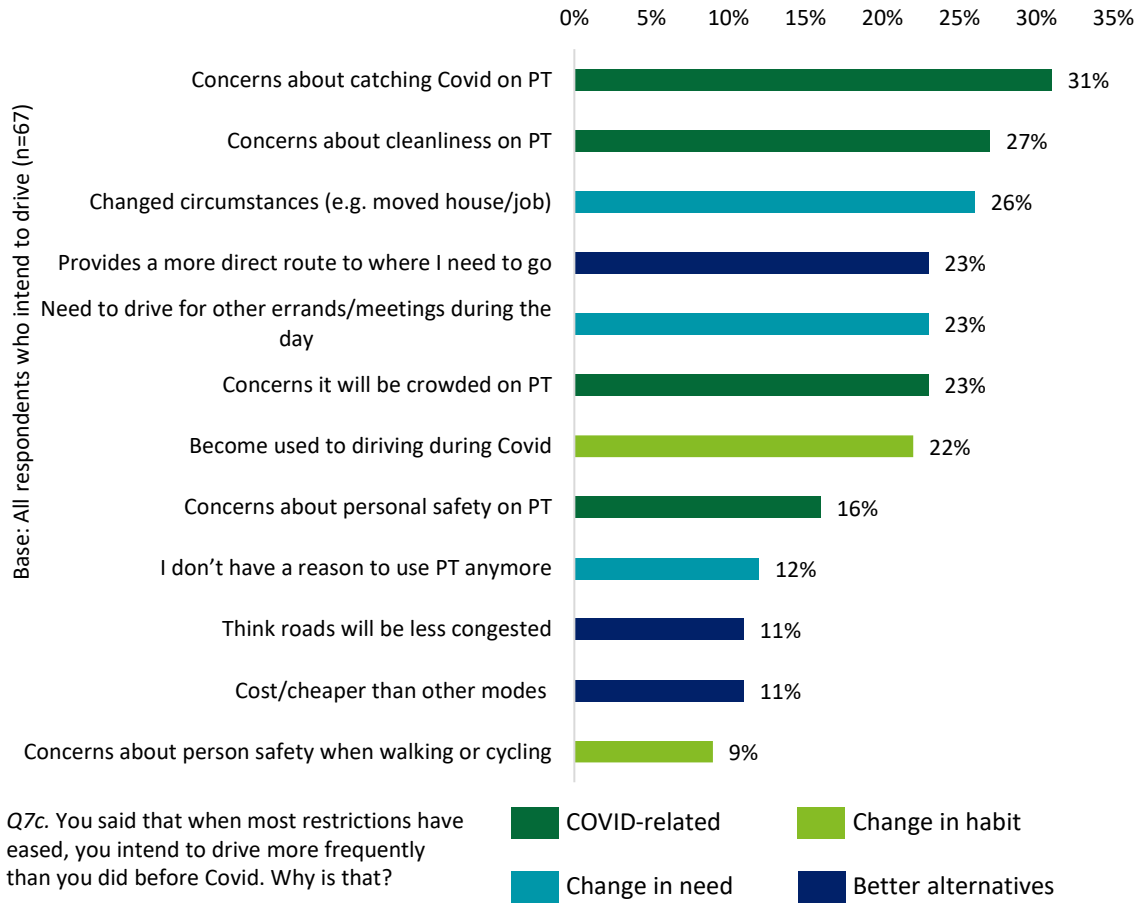
Causes of trip recovery

Changes in travel needs were less a factor in the recovery of car travel to pre-pandemic levels than Covid-related concerns. The cost of travel and network congestion were the least impactful factors. Figure 34 shows the results of a survey taken in Greater Metropolitan Melbourne as Covid restrictions eased, to determine the reasons for increased car trips. Respondents indicated that a high proportion of the trips they made by car during the pandemic were likely due to a shifting away from public transport. Many were concerned about catching Covid on public transport; the cleanliness of vehicles, platforms and station; their ability to social distance; and personal safety.

Respondents indicated that their decision to switch to car travel or avoid public transport was due to a lesser extent to changes in their personal circumstances, changes in the purpose of trips, changes in the origin or destination of travel, or a change in need for public transport. These changes are motivated by factors such as swings in economic activity and emerging trends to work from home and undertake discretionary trips in proximity to home.

A significant proportion of car users identified a preference for car travel as they could take a more direct route than with other modes of transport. Factors such as cost of travel on alternative modes and congestion have less impact on the recovery of car trips.

Figure 34: *Reason for drive more once restrictions have eased*



Source: Transport segmentation, COVID, October 2020, Nature

The weak recovery of public transport

The weak recovery of public transport trips has largely been caused by the impacts of Covid – including concerns about the transmission of disease, cleanliness, safety and crowding – and a reduced need for travel.

Why trip recovery is weak

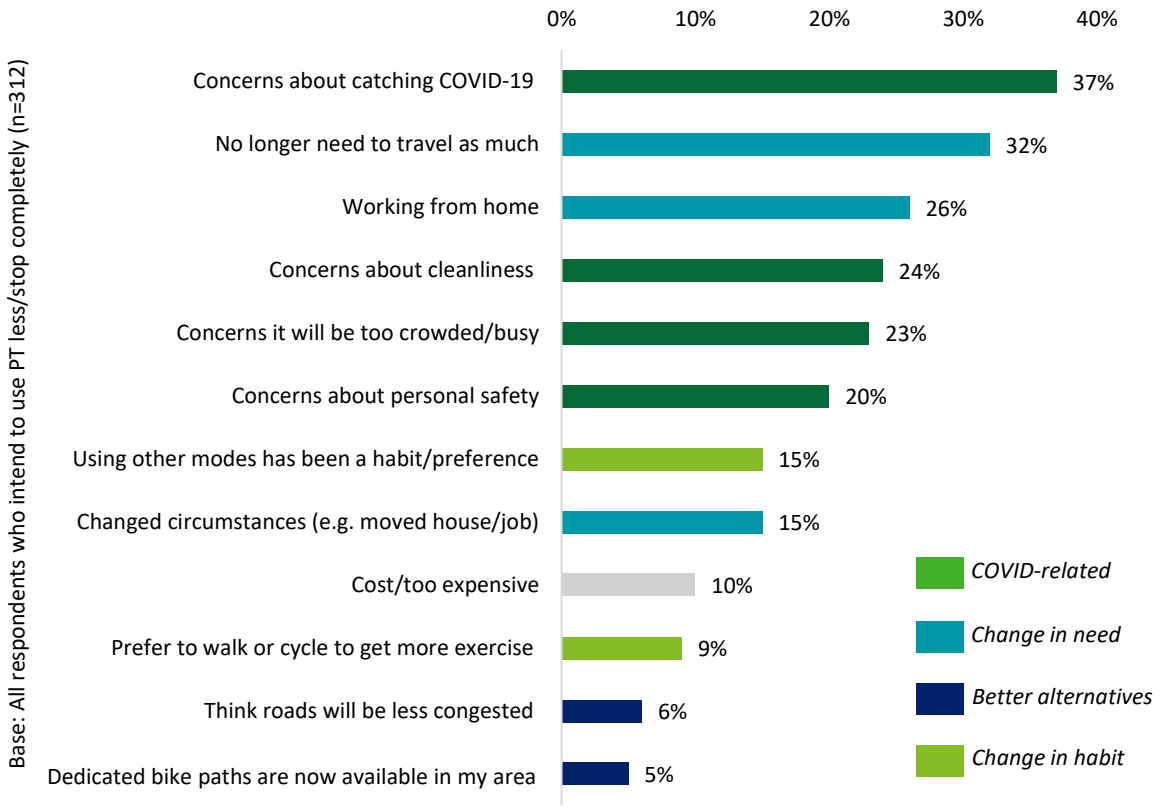
The weak recovery of trips on public transport has largely been caused by the impacts of Covid – including concerns about the transmission of disease, cleanliness, safety and crowding (including the impact on social distancing). As previously identified, these factors have resulted in a significant mode shift away from public transport and a quick return to car travel. There has also been a reduction in trip frequency as people have worked from home.

Figure 35 indicates that there are two primary reasons for the shift away from public transport:

- ***Direct Covid-related reasons:*** including concerns about catching Covid, cleanliness and overcrowding on services
- **Indirect Covid-related reasons:** including no longer needing to travel as much, working from home, or using other modes as a habit or preference because of the pandemic.

While Covid has influenced behaviours and general perceptions and attitudes towards catching public transport, it has also had a significant impact on the evolving transport task and the role of public transport as a part of a 'Covid normal' society. Flexible working arrangements have almost eliminated the need for white-collar workers to come into the office five days a week, with many people expecting to continue in a 'hybrid' way of working.

Figure 35: *Reasons for using public transport less when most restrictions have eased*



Q7b. You said that when most restrictions have eased, you intend to use public transport less frequently than you did before COVID-19. Why is that?

Source: Transport segmentation, COVID, October 2020, Nature

Encouraging a return to public transport

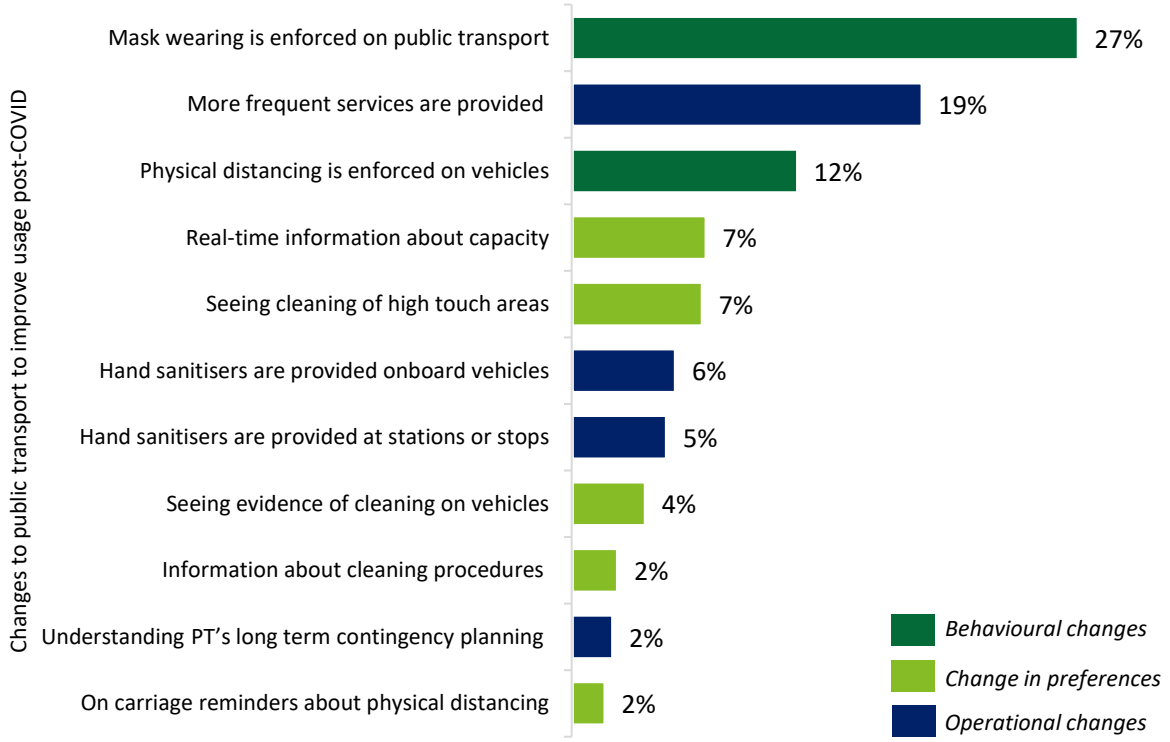
Levers to incentivise a return to public transport include enforcement of safety standards and distancing, reduced crowding, real-time information about in-vehicle load, and evidence of and infrastructure for cleaning.

Levers to address the obstacle

Figure 36 identifies public transport interventions that network users report will give them confidence to travel on public transport.

As shown, enforcement of mask wearing and social distancing are deemed as fundamental to ensuring personal safety and social distancing, which are key criteria for a return to public transport. Similarly, increased service frequency – which adds capacity and enables load spreading and reduces in-vehicle crowding – and enabling travel choice through real-time capacity information are also key criteria for a return to public transport. So to is providing infrastructure for cleaning, and communicating in-vehicle cleanliness standards.

Figure 36: *Actions that will increase the use of public transport once most restrictions have eased*



Source: Transport segmentation, COVID, October 2020, Nature

Feedback on bicycle use

Feedback received on the new bicycle infrastructure was largely positive, but unsupportive views were also recorded.

Reasons for feedback

The Council received feedback from 866 people about new bicycle lanes constructed during the pandemic. Broadly, the minority (26%) who were not supportive did not support the repurposing of roadway and kerbside areas for the bicycle facilities. The majority (61%) were supportive but felt that more needed to be done to support travel by bicycle.

Unsupportive

- One quarter of the respondents (26%) were unsupportive or very unsupportive of the facilities.
- 12% of respondents were very unsupportive. Around half of this group (56%) referred to the repurposing of roadway and kerbside areas for the bicycle facilities. Around a quarter (21%) expressed the view that there was already too much bicycle infrastructure.
- In the 'unsupportive' group (which accounted for 14% of all respondents), the majority (58%) did not support the repurposing of roadway and kerbside areas for bicycle facilities.

Neutral

- 13% of respondents' comments were neutral – neither for nor against the new facilities.

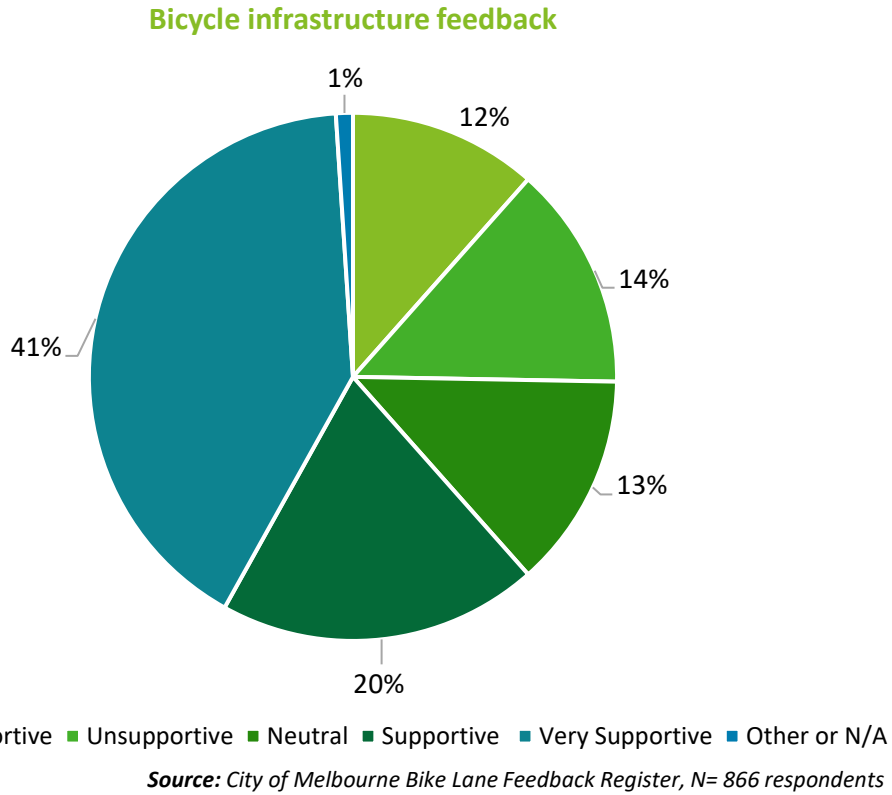
Supportive

- A substantial proportion (20%) of respondents were supportive.
- Most of the supportive comments (79%) were general comments of support.
- 10% of this group said they felt more work is required to reduce risk for riders.

Very supportive

- The largest category of respondents were very supportive (41% of all respondents).
- Some in this group provided general comments of support (19%). Most (60%) expressed the view that further work is required to enhance amenity and lower risk for riders.

Figure 37: *Summary of the bicycle lane infrastructure feedback received by City of Melbourne*



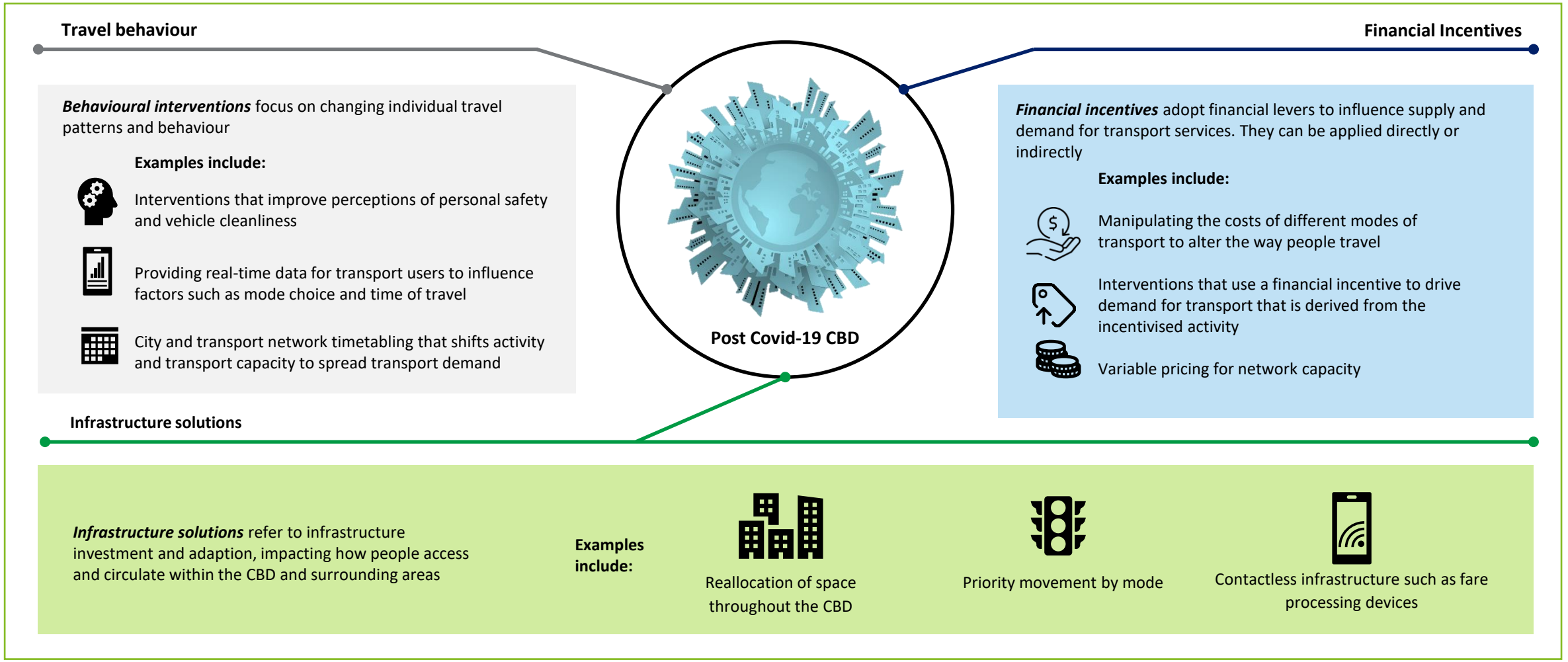
Source: *City of Melbourne Bike Lane Feedback Register, N= 866 respondents*

5.
Potential interventions to support the transport task

Transport Interventions Framework

Transport interventions that address city recovery and the impacts of Covid can be defined as travel behaviour interventions, financial incentives or infrastructure solutions.

Figure 38: *Interventions framework*



Potential interventions – travel behaviour

Transport interventions addressing travel behaviour have a strong emphasis on addressing crowding and personal safety concerns on public transport through the use of real-time data, reducing crowding and load spreading.

Behavioural interventions

Behavioural interventions seek to influence people's decisions. The interventions can be 'nudges' that change the way options are presented, or changes to the options themselves. By providing people with nudge information about crowding on public transport, it is expected that a proportion of people will adjust their travel time or mode. Regulatory limits on crowding at stations and work options provided by employers represent changes in the options themselves. Both approaches can be used to facilitate recovery. See Table 2 for potential behavioural interventions.

Table 2: *Travel behaviour interventions*

Possible travel behaviour interventions	Locations worldwide	Key inhibitors addressed	Key modes impacted	Timelines	Cost magnitude
Reduce in-transit crowding by providing public, real-time information	• Stockholm, Sweden • Amsterdam, Netherland • Frankfurt, Germany • Brisbane, Australia	• Provide confidence that the public transport system is Covid-safe • Demand management, encouraging the modal shift from road to public transport • Will encourage higher patronage on transit services	• Train • Tram • Bus	Medium (18 months)	Medium
Applying public transport density limits both on vehicles and at interchanges	• Curitiba, Brazil • Dublin, UK	• Reduce crowding during peak hours on public transport services • Demand management, encouraging the modal shift from road to public transport • Will encourage higher patronage on transit services • Provide confidence that the public transport system is Covid-safe	• Train • Tram • Bus	Long (24 months)	Medium
Encouraging employers and schools to introduce flexible hours to manage peak demand	• Multiple locations	• Reduce crowding during peak hours on public transport services • Reduce crowding during peak hours on the road • Demand management, encouraging the modal shift from road to public transport • Encourage the uptake of active transport	• Train • Tram • Bus • Active transport • Roads	Rapid (<6 months)	Very Low

Intervention 1: Reduce in-transit crowding by providing public, real-time information

Creating a more connected, collaborative and open approach to using transport data will be essential to supporting the long-term recovery of public transport, so passengers can more easily choose to travel at less-crowded times.

Intervention description

Data will play a large role in helping maintain social distancing on public transport. With the help of shared websites and apps, operators around the world are using real-time crowding information to help achieve social distancing on public transport. Real-time capacity tracking would support decision-making by service providers and help passengers reduce their risk of exposure. If people knew that they could travel on public transport while adhering to social distancing guidelines, it would help rebuild general confidence in the mode. The integration of live passenger data is part of the Victorian government's push to maintain social distancing and has been trialled throughout the state. In late 2020, a group of 50 commuters, largely essential workers – participated in the first phase of a transport department trial being rolled out across Melbourne's trains and several bus routes. This was further enhanced through a collaboration with Google Maps that provided commuters with real-time public transport capacity data in the form of a 'traffic light system'.

Where has this intervention been implemented and what were the outcomes?

***Sweden's Stockholm* Metro** launched a pilot study where ridership data used during a test period found that the technology would help public transport operators and agencies reduce crowding. During the pilot, it was estimated that nearly 25% of the passengers determined their travel plans based on crowding information provided.

Netherlands Railways (NS) uses historical data to fuel its journey planner, NS Reisplanner Xtra. Information about the level of crowding on services is depicted on scale of one to three, with one being quite empty and three crowded. Patrons can also use a feedback button to report the accuracy of information provided. Customers are rewarded for avoiding crowded trains by receiving points that can be used for buying coffee or gift vouchers.

RMV, Frankfurt, Germany has included vehicle occupancy analytics in its passenger travel information app. Providing a real-time estimation of passenger numbers helps customers to make an informed decision for their journey.

TransLink Queensland's app provides information about the space available on services, tailored to the passenger's specific travel days and times. The app provides an available-space forecast by mode, route and travel information. Green signifies that space should be available; Blue signifies that some space may be available, but the passenger should consider shifting travel to a quieter time or route if possible; and Orange shows that a service is likely to have limited space, and that shifting the time of travel is recommended.

Key obstacles to recovery addressed	Provide confidence that the Public Transport system that it is Covid-safe Will encourage higher patronage on transit services		Demand management, encouraging the modal shift from road to public transport
Reactivation impact by mode		🟢	Potential for increased usage
		🟢	Potential for increased usage
		🟢	Potential for increased usage
		🟡	Possible start/end of trip increase in pedestrian activity
		🔴	No direct impact on road usage, maybe result in mode shift away from cars towards public transport
Timing		**Medium term (18 months)**	Will require research, pilot trial, procurement and implementation (noting DoT Victoria has commenced limited trials in 2020)
Cost		🟡	Investment required in technology systems and infrastructure
Interdependencies	Public transport density limits	Removing touchpoints	Potential station skipping

Intervention 2: Setting public transport density limits at stops and interchanges

The provision of adequate space on transport services and in high-flow interchanges will promote social distancing rules, reducing contact with other patrons and instil confidence in consumer safety.

Intervention description

It is essential to continue to monitor physical distancing levels on public transport services and at stations and key interchanges, and to provide clear directives. Data can be used to support social distancing at public transport stops and interchanges. Service providers can use real-time information to support decision-making and inform public service messaging, reminders and announcements across all communication channels, from station signage to social media. Passengers can use real-time information to time their arrival at a stop or station or switch their time of travel.

Where has this intervention been implemented and what were the outcomes?

The city of Curitiba, in Brazil, is trialling an app that monitors social distancing in high-flow stations and provides information to support maintenance and the enforcement of social distancing.

Developed by the Inter-American Development Bank (IDB) and made available free of charge to the municipality, the platform uses the infrastructure of video cameras installed in the city and algorithms based on artificial intelligence to measure the distance between people in the monitored locations.

The city of Dublin, in Ireland, has a Covid-19 mobility plan that aims to ensure social distancing can be maintained at and around bus stops. Bus stop locations on footpaths will be reviewed to ensure there is sufficient space for people to pass waiting passengers and, that passengers can retain their distance from areas with outdoor seating.

Dublin expects that bus stops will need to be distributed over a wider area to allow more room for social distancing, both while people are waiting for buses and while dispersing after disembarking. Multi-route stops may need to be disaggregated, and some stops may need to be removed. As a result, it is likely that some passengers will be required to walk further to bus stops.

Key obstacles to recovery addressed	Reduce crowding during peak hours on public transport services	Demand management, encouraging the modal shift from road to public transport	
	Will encourage higher patronage on transit services	Provide confidence that the Public Transport system that it is Covid-safe	
Reactivation impact by mode	🚆	🟢	Potential for increased usage
	🚊	🟢	Potential for increased usage
	🚌	🟢	Potential for increased usage
	🚲	🟡	Possible start/end of trip increase in pedestrian activity
	🚗	🔴	No direct impact on road usage, maybe result in mode shift
Timing	📅	**Long Term (24 months)**	Ability to rollout once software and technology is procured
Cost	$	🟡	Development of software and rollout of camera technology is required.
Interdependencies	Real time capacity data	Public transport density limits	Interactive safe transport network maps

Intervention 3: Encouraging employers and education providers to introduce flexible hours

While the pandemic saw thousands forced to work from home, unique government-supported, flexible-working initiatives will help further reduce pressure on peak public transport demand.

Intervention description

The 'traditional' working week generated a sharp, morning-peak load on all modes of transport. In the City of Melbourne in 2019, in the morning peak, the footpaths, roads and public transport were all overloaded. The morning peak was followed by a lower but longer evening peak. The City has no desire to return to that situation, even if it were possible. The pandemic revealed that much knowledge work and some education can be done or delivered remotely. The challenge now is to establish new timetables for work and education that retain the benefits of flexibility for employers and employees, and – from a transport perspective – avoid a return to system overload in morning and afternoon peaks each weekday.

Where has this intervention been implemented and what were the outcomes?

Flexible working has been implemented worldwide, particularly for those in occupations that allow for remote working. This does not solely refer to being able to work from home, as there are other alternatives that encourage flexibility and that will influence the transport task. Options include:

Working from home: A now familiar option.

Staggered hours: A staggered hours system may allow workers some discretion, within prescribed limits, in fixing the time when they start and finish work. For example, some employees may work from 7 AM to 3 PM, while others work 10 AM to 6 PM. Staggered shifts or hours can help ease congestion on public transport and traffic in certain peak hours, as well as avoiding having large groups of people arriving and leaving offices at the end of the day.

Compressed hours: Compressed hours allow employees to work their normal contracted hours over a reduced number of days. A typical pattern would involve working four longer days and not working on the fifth day. This pattern could reduce the number of employees in the office on some days.

Any five days from seven: Many workplaces (especially offices) operate between Monday and Friday. Where it is feasible to do so, opening seven days a week and asking or allowing employees to work some of their physical workplace hours on weekends can also reduce the number of people in the workplace at any time.

Key obstacles to recovery addressed	Reduce crowding during peak hours on public transport services		Reduce crowding during peak hours on the road
	Demand management, encouraging the modal shift from road to public transport		Encourage the uptake of active transport
Reactivation impact by mode		●	Potential to increase aggregate usage due to load spreading
		●	Potential to increase aggregate usage due to load spreading
		●	Potential to increase aggregate usage due to load spreading
		●	Potential to increase aggregate usage due to load spreading
		●	Potential to increase aggregate usage due to load spreading
Timing		**Rapid (<6 months)**	Ability to rapidly make available through collaboration with peak bodies, industries and unions.
Cost		●	Minimal cost, rather a behavioural change
Interdependencies	Sufficient transport capacity provided in shoulder periods		

Potential interventions – financial incentives

Interventions based on financial incentives adopt a fiscal lever to support behaviour change and efficient travel patterns, to increase total capacity or perceived safe capacity.

Financial incentives are widely used in transport (and other domains). Incentives applied in fixed-capacity systems aim to reduce the peak load and fill the unused capacity outside the peak. Typical techniques include time-of-use pricing to encourage people to avoid peak times, and place-based fees to encourage people to consider alternatives to the 'best seats in the house'. Applied to transport, these techniques can take the form of off-peak public transport fares, road tolls that switch on at 6:30 AM and differential tolls by direction (e.g. there are no northbound tolls on the Sydney Harbour Bridge and tunnel). Parking meter fees can increased in peak times and in highly desirable locations, and lower at off-peak times and where bays are more remote and less convenient. See Table 3 for details of possible financial incentives.

Table 3: *Financial incentive interventions*

Possible financial incentive interventions	Locations worldwide	Key inhibitors addressed	Key modes impacted	Timelines	Cost magnitude
Reduce peak loads on public transport by providing permanent off-peak public transport fares across all modes	• Auckland, NZ • Stuttgart, Germany • Sydney, Australia • Moscow, Russia	• Create a shift of passengers willing to travel during off-peak periods • Demand management, encouraging the modal shift from road to public transport • Will encourage higher patronage on transit services • Provide the option for cheaper fares and reduced costs for travelling	• Train • Tram • Bus	🔴 Long (24 months)	🟡 Medium
Reduce motor vehicle congestion and public transport loading by providing financial support for purchases of active transport equipment such as e-bikes	• Various, Italy • Madrid, Spain • Glasgow, UK • Edinburgh, UK	• Encourages new riders to use active transport, reducing road capacity • Allows for a more direct route of travel and ease of through trips in the CBD • Encourages new riders to use active transport, reducing public transport loading • Provide the option of cheaper entry prices to uptake forms of active transport	• Active transport	🟢 Short (6 months)	🟢 Low
Reduce congestion and increase kerbside access through demand-responsive meter fees	• Seattle, US • San Francisco, US	• Lost business revenue caused by clogged parking bays • Current meter fees are too high at some times and in some places • Difficulty of access to the centre via the kerbside parking system • Current meter fees are too low at some times and in some places	• Road	🟢 Short (6 months)	🟢 Low
Reduce congestion and through traffic via road pricing in the city	• Singapore • Stockholm, Sweden • London, England *Not implemented as a direct response to Covid but has been more widely implemented*	• Reduces through trips within the CBD, increasing capacity for direct trips • Reduces congestion for road users wanting to visit the CBD • Demand management, encouraging the modal shift from road to PT and bikes • Improves transit times, providing quicker and more direct travel routes	• Road	🔴 Medium (24 months)	🟡 Medium

Intervention 4: Reduce peak loads on public transport by providing permanent off-peak fares

With flexible working arrangements, permanent off-peak public transport fares across all modes will further encourage off-peak patronage.

Intervention description

Imposing physical distancing on public transport vehicles is unrealistic. Moving towards a different time schedule through financial and social incentives, to distribute peak commute hours and better manage the demand on public transport networks, will help. Permanent fare products may provide more flexible offers to existing customers and attract new customers to public transport. Pre-Covid travel behaviour saw 51.3% of train trips (February 2020) to and from the CBD made in the peak hours between 8:00 AM and 10:00 PM and between 4:00 PM and 6:00 PM. Post-Covid travel exhibits a similar pattern. with 47.5% of trips to and from the CBD made during the same peak hours (May 2021). A further price signal is required to reduce the peak loads and encourage travel during shoulder periods.

Where has this intervention been implemented and what were the outcomes?

Auckland Transport, in New Zealand, has offered discounted off-peak fares since June 2020. A 30% discount was offered during higher-level pandemic restrictions. The incentive was reduced to 10% during periods of lower-level pandemic restrictions.

Melbourne has trialled an off-peak fare offer for passengers who touch off between 9:30 AM and 4:00 PM, or touch on before 4:00 PM or after 7:00 PM on weekdays. At these times, the tickets are discounted by 30%. The trial period began on 1 February 2021 and finished on 27 August 2021. Travel on trains is free for those who touch off before 7:15 AM.

Sydney's Opal network across metro, train, bus and light rail services provides a 30% discount for passengers who travel in off-peak periods.

Stuttgart, in Germany, and its surrounding region, it covered by a monthly pass at a 23% discount for those who travel after 9:00 AM.

Moscow Metro, in the Russian Federation, is trialling a 30–50% discounted off-peak fare in the morning on the busiest Metro line. If successful, the trial could be expanded to other Metro lines.

Singapore has established the *Incentives for Singapore Commuters* program, which allows passengers to earn points by travelling on the system. The distance-based points can be redeemed for cash or prizes. If people travel outside peak time on weekdays, their rewards triple. The program has reduced the peak by 7.49%.

Key obstacles to recovery addressed	Create a shift of passengers willing to travel during off peak periods		Demand management, encouraging the modal shift from road to public transport
	Will encourage higher patronage on transit services		Provide the option for cheaper fares and reduced costs for travelling
Reactivation impact by mode			
		🟢	May result in increased aggregate load and also broader distribution of peak loads
		🟢	May result in increased aggregate load and also broader distribution of peak loads
		🟢	May result in increased aggregate load and also broader distribution of peak loads
		🔴	No direct impact, may result in slight mode shift
		🔴	No direct impact, may result in slight mode shift
Timing		**Long Term (24 months)**	Off-peak fare structure would need to be assessed and agreed through State Government and the network operators
Cost		🟡	Low implementation cost, will result in reduced farebox revenue
Interdependencies	Real time capacity data		Public transport density limits

Intervention 5: Providing encouragement and financial support for using active transport

While improving bicycle infrastructure will incentivise existing riders, supporting behavioural change and offering financial subsidies will encourage new riders to use active transport, reducing congestion on public transport and roads.

Intervention description

The bicycle has been described as a simple solution to some of the world's most complicated problems, including the pandemic. It has been instrumental in helping us survive the crisis and has a key role to play in helping us come out the other side stronger. Feedback to the Council suggests that during the pandemic, some people have 'discovered' the transport potential of the bicycle. For these reasons, cities around the world are investing in behavioural programs and upgrading bicycle networks to get more people on two wheels. Included in these efforts are financial incentives that encourage people try, use or adopt the mode. Subsidies for the purchase of bikes, especially e-bikes are likely to increase their popularity and use. Power-assisted e-bikes in particular are proving to be capable enough to function as a substitute for cars.

Where has this intervention been implemented and what were the outcomes?

In Edinburgh and Glasgow, in Scotland, free bike-share services encourage people to consider commuting by bicycle. The initiative came into effect as Covid-19 restrictions eased over the summer of 2020, to help alleviate the pressure on public transport, encourage active travel and help people without access to bikes. The scheme, made possible via Scottish Government funding, located more than 1,300 bikes that were available for free in the two cities for the first 30 minutes of every journey on a temporary basis.

Transport Scotland offers a $5,700 interest-free loan to purchase up to two e-bikes for each household. This facility can also be used to purchase a family cargo bike (suitable for moving several children) or an adapted cycle for people with disability.

In Italy a mobility voucher is designed to increase bicycle riding and reduce the use of motorcycles and cars. In cities with more than 50,000 residents, individuals can be reimbursed for buying bicycles, Segways, hoverboards, scooters and monowheels or for the use of shared mobility services excluding cars. Individuals can be reimbursed for 60% of the cost, up to $800. Individuals are eligible for one reimbursement for purchases.

The Government of France offered an $80 subsidy per person for bicycle repairs to encourage riding and limit car and public transport use as restrictions were lifted after the country's first lockdown. The government also provided financial support to help pay the costs of installing temporary bicycle parking spaces for communities, multimodal transport hubs, educational establishments, social landlords and student residences, financing up to 60% of the investment with a ceiling of $240.

Key obstacles to recovery addressed	Encourages new riders to use active transport, reducing road capacity	Allows for a more direct route of travel and ease of throughput trips within the CBD	
	Encourages new riders to use active transport, reducing public transport capacity	Provide the option for cheaper entry price to uptake forms of active transport	
Reactivation impact by mode		🔴	No direct impact, may result in slight mode shift
		🔴	No direct impact, may result in slight mode shift
		🔴	No direct impact, may result in slight mode shift
		🟢	Potential to increase the mode share of active transport, in particular bicycles
		🔴	No direct impact, may result in slight mode shift
Timing		**Short Term (6 months)**	Subsidy value would need to be analysed and implemented
Cost		🟢	Small cost due to subsidies of bicycle purchase
Interdependencies	Re-allocation of road space	Bike lane addition/removal	

Intervention 6: Flexible time and zone management of on-street parking through demand-responsive pricing

Performance-based parking management is a way of efficiently managing parking to provide a convenient and reliable parking experience for visitors.

Intervention description

Demand-responsive pricing is familiar in the worlds of airline ticketing and sporting stadiums. Flights at peak times and the best seats in the stadium cost more than off-peak travel and seats that are further from the action. Applied to parking meters, the system enables people to choose between 'peak', 'shoulder' and 'off-peak' meter prices. Unlike the current City of Melbourne system, which sets one price for all times and all places ($7 an hour in the inner area), responsive pricing allows the meter fee to 'float' – rising at times and in places when activity is high and falling when and where the pressure is off the parking bays. Changes to the fees are based on data from observation surveys, payment data and in-ground sensors. Adjustments are made at regular intervals and the public is provided with the evidence that shows why the fees are being raised or lowered.

Where has this intervention been implemented and what were the outcomes?

Seattle and San Francisco in the US both adjust kerbside meter fees up or down at regular intervals to ensure that there are vacant bays at all times for new arrivals. Both cities aim to maximise the number of arrivals through the kerbside system and reduce congestion caused by people hunting for vacant bays.

The Seattle Department of Transportation typically adjusts the fees across a zone at the start of each calendar year. During the pandemic, it adjusted fees every three or four months.

The San Francisco Municipal Transportation Agency typically makes a quarterly adjustment for each block-face. Five month-by-month adjustments were made early in 2021 before the agency reverted to quarterly adjustments.

Positive outcomes include:

- ***Higher business revenues***. In the US, cities collect sales taxes from retailers. Data from retailers has been used to show that business revenue increases when meter fees are 'synchronised' with the level of activity. This is because sales are lost when the bays are clogged and people cannot find a vacant bay. By adjusting the fees, the city ensures people are not frustrated in the moment or deterred from visiting based on past experience.
- ***No lost time.*** People coming to the centre by car know that even in 'peak times' they will be able to find a parking spot and will not have to waste time hunting for a vacant bay.

Key obstacles to recovery addressed	Lost business revenue caused by clogged parking bays	Current meter fees are too high at some times and in some places	
	Difficulty of access to the centre via the kerbside parking system	Current meter fees are too low at some times and in some places	
Reactivation impact by mode	🚆	🔴	No direct impact, may result in slight mode shift
	🚋	🔴	No direct impact, may result in slight mode shift
	🚌	🔴	No direct impact, may result in slight mode shift
	🚲	🔴	No direct impact, may result in slight mode shift
	🚗	🟢	More Arrivals through the kerbside parking system, No lost time for people parking at the kerb
Timing	📅	**(Short Term) 6 months**	The availability of 24/7 in-ground parking sensor data and the new parking technologies would permit a pilot to get underway quickly.
Cost	$	🟢	No additional physical or IT infrastructure is needed. Mainly 'soft' costs including establishing the process and public engagement.
Interdependencies	More permanent bicycle lanes	Removal of bicycle lanes to provide greater road and parking capacity	

Intervention 7: Reduce congestion and through traffic with the help of road pricing

Road pricing can be designed to reduce CBD through traffic, freeing up road space for city-bound trips that provide economic value to the central city.

Intervention description

Road pricing is an effective way to reduce congestion. For the CBD, the primary objectives of road pricing would be to spread the peak load to reduce congestion and discourage people from driving through the CBD without stopping. The fees would not be levied on vehicles that stop in the centre. Based on experiences in other cities, current traffic volumes could be reduced by 10%. Typically, road pricing is implemented alongside improvements in active and public transport. Revenue from the scheme is directed towards these alternatives. With a road price in place, it is possible to adjust fees to reflect the peak, shoulder and off-peak periods. As with public transport, differential fees encourage people to switch their trips out of the peak.

Where has this intervention been implemented and what were the outcomes?

There are limited examples of road pricing being introduced directly in response to the pandemic and in order to drive economic benefit for a CBD or equivalent area. Nonetheless, several cities have introduced successful and widely supported road-pricing regimes to drive economic and public health benefits for CBDs. The 2016 Infrastructure Victoria report, *The Road Ahead*, detailed how an efficient, fair and sustainable pricing regime can help tackle congestion. It provided an analysis of the impact of road pricing in other cities, summarised in Table 4.

Table 4: *Impact of road pricing on cities worldwide. Source: Infrastructure Victoria*

City	Objective	Outcome
London	Manage congestion	• Reduced traffic volume by 11% • Congestion at same level as in 2003 despite population increases
Milan	Reduce pollution and congestion	• Substantial reduction in traffic • 18% reduction in particulate emissions
Oregon	Replace revenue from petrol taxes	• Reduction in miles travelled • Revenue raised
Singapore	Manage congestion	• Reduction in traffic volume by 15% • Revenue raised
Stockholm	Manage congestion	• Substantial reduction in congestion

Key obstacles to recovery addressed	Reduces through trips within the CBD, increasing capacity for direct trips		Reduces congestion for people wanting to visit the CBD
	Demand management, encouraging the modal shift from road to PT and bikes		Improves transit times, providing quicker and more direct travel routes
Reactivation impact by mode		🔴	No direct impact, may result in slight mode shift
		🔴	No direct impact, may result in slight mode shift
		🔴	No direct impact, may result in slight mode shift
		🔴	No direct impact, may result in slight mode shift
		🟢	Will have impact on the types of road trips that occur into the CBD
Timing		**Long Term (24 months)**	Requires analysis, calibration, stakeholder engagement and implementation technology
Cost		🟡	Analysis and technological infrastructure required
Interdependencies	On-street demand management	CBD parking availability	Street speeds

Potential interventions – infrastructure solutions

Interventions based on infrastructure solutions enhance public safety on public and active transport networks and can increase road and pedestrian capacity within the CBD.

The impacts of infrastructure solutions on transport are well understood. Sometimes capacity can increase for one mode without capacity being removed from another mode. Examples include the Melbourne Metro tunnel or the 'deck' being built above Footscray Road for the West Gate Tunnel project. However, most changes to transport capacity occur by reallocating space from one mode to another. In these trade-offs the motor vehicle mode is at a disadvantage as all the other modes can move more people in the same space. Other infrastructure solutions can be implemented to reduce time or increase convenience. Modern public transport ticketing, for example, enables people to pay their fare instantly without queueing, or ensuring they purchase the right ticket, or the need to carry cash. See Table 5 for details regarding possible infrastructure interventions.

Table 5: *Financial incentive interventions*

Possible travel behaviour interventions	Locations worldwide	Key inhibitors addressed	Key modes impacted	Timelines	Cost magnitude
Reduce manual handling of ticket payments through contactless payments	• Porto, Portugal	• Provide confidence that the public transport system is Covid-safe • Demand management, encouraging the modal shift from road to public transport • Will encourage higher patronage on transit services • Provides a greater passenger experience for the use of public transport	• Train • Tram • Bus	🔴 Long (36+ months)	🔴 High
Remove key physical touchpoints across the CBD	• Sydney • Perth • Brussels	• Provide confidence that the public transport system is Covid-safe • Demand management, encouraging the modal shift from road to public transport • Will encourage higher patronage on transit services • Provides a greater passenger experience for the use of public transport	• Bus • Train • Active transport	🟢 Short (6 months)	🟡 Medium
Larger, more permanent, separated bicycle route upgrades	• Brussels, Belgium • Paris, France • Lisbon, Portugal • Milan, Italy	• Encourages new riders to use active transport, reducing road capacity • Allows for a more direct route of travel and ease of through trips within the CBD • Encourages new riders to use active transport, reducing public transport capacity • Encourages more exercise for people travelling to the CBD	• Active transport	🔴 Long (18 months)	🔴 High
Removal of bike lanes to provide more road capacity and parking bays	Not implemented as a direct response to Covid but has been more widely implemented	• Provides more capacity for road users travelling to the CBD • Increases the capacity of short-term parking bays throughout the CBD • Provides more capacity for freight services required to visit stores in the CBD • Reduces capacity on the road network, reducing congestion on the road	• Active transport • Road	🟢 Short (6 months)	🟡 Medium
Reallocate road and parking space for local activation	• Oakland, US • Toronto, Canada • Brussels, Belgium • London, England	• The increased local activation will encourage more people to visit the CBD • Demand management, encouraging the modal shift from road to public transport • The increased space for pedestrians will improve confidence in Covid safety	• Train • Tram • Bus • Active transport • Road	🟢 Rapid (<6 months)	🟢 Low

Intervention 8: Mobile ticketing and the removal of physical ticketing infrastructure

Contactless ticketing will play an important part in making public transport safe. It removes the need for passengers to handle cash and physical tickets and to interact with ticketing infrastructure, reducing the risk of infection.

Intervention description

Cash payments and single-purpose public transport ticket cards have long been a low-level barrier to public transport use and convenience. People without sufficient cash or who have neglected to top up their cards have to risk a fine, choose another mode or forego their trip. Those who want to travel have to sign up and lock in some of their money, ready for their next trip. Direct-from-the-bank and contactless smartphone payments remove these barriers and inconveniences. Smartphone payments also reduce physical contact, which in a pandemic reduces the risk of infection. Mobile myki allows passengers to use a virtual myki on their phone for payments, but still required users to sign up for a myki account and maintain their account balance.

Where has this intervention been implemented and what were the outcomes?

Many cities offer a form of account-based ticketing (ABT). Sydney's Opal network is an example. ABT systems deduct the fare directly from the bank account when the passenger touches on. Advanced ABT systems provide passengers with the best-value fare, calculated over the day, week or month.

ABT is especially attractive and convenient for passengers on a system ***where demand-based pricing is also applied to ticketing,*** as it provides the flexibility to support the new normal of unpredictable travelling and working patterns. Benefits include:

- A better passenger experience
- Support for flexible working patterns
- Inclusivity for all users
- Improved value for passengers
- COVID secure
- Major operational cost saving.

The Red Rose Transit Authority (RRTA), a bus system in Lancaster, Pennsylvania, in the US, allows passengers to use their mobile phones for contactless fare payment and to display tickets directly on their smartphones.

Porto, in Portugal, offers a contactless transit ticketing system. Passengers do not need to carry cash, queue for tickets or understand the local ticketing system. Payment is made by tapping a contactless debit, credit or prepaid card or payment-enabled device on payment readers.

In London, England, contactless payments were introduced for Transport for London services in 2014. Two years later, 40% of ticket payments were contactless.

Key obstacles to recovery addressed	Provide confidence that the Public Transport system that it is Covid-safe	Demand management, encouraging the modal shift from road to public transport	
	Will encourage higher patronage on transit services	Provides a greater passenger experience for the use of public transport	
Reactivation impact by mode		●	Potential to increase aggregate usage
		●	Potential to increase aggregate usage
		●	Potential to increase aggregate usage
		●	No direct impact, may result in slight mode shift
		●	No direct impact, may result in slight mode shift
Timing		**Long Term (36 months+)**	Need to identify, invest and procure infrastructure
Cost		●	High cost to update and change current ticketing system
Interdependencies	Real time capacity data	Public transport density limits	Interactive safe transport network maps

Intervention 9: Remove key physical touchpoints across the CBD

With the right measures, Melbourne can promote a city that is able to live with COVID through interventions that support the provision of space, the removal of touch points and perceptions of safety in the CBD and on public transport.

Intervention description

Many transport systems are supported by physical and mechanical infrastructure. Examples include pedestrian crossing call-up buttons, parking meters, parking guidance and capacity indicator signs, direction signs and ticketing barriers on public transport. With the widespread use of smartphones and the arrival of 'digital' alternatives, this infrastructure can be reviewed and replaced. Reduced physical interaction will reduce infection risk, reduce visual 'clutter' and eliminate many footpath obstacles.

Where has this intervention been implemented and what were the outcomes?

Various cities have altered traffic conditions in different ways to respond to Covid.

Automated walk signals: Melbourne, Perth and Sydney have automated pedestrian crossing lanterns in their CBDs in the past and as a measure against the spread of Covid, allowing pedestrians to cross the road without having to touch a button. The areas in which pedestrian crossings are 'auto on' can be extended across the Melbourne municipality.

Decreasing pedestrian wait times. Brussels Mobility has adjusted the settings on traffic lights at 100 intersections to reduce signal cycles. At one intersection, the pedestrian wait time was reduced by 40 seconds. In general, shorter cycles reduce waiting time and increase throughput for pedestrians, bicycle riders and public transport vehicles. (However, they do the opposite for people in motor vehicles.)

Touchless parking infrastructure: Melbourne has already implemented mobile parking meters through PayStay that also help identify vacant bays in real time. A move towards digital meter payments should be considered to eliminate the need to interact with parking infrastructure or carry coins, and to provide a better user experience.

Optimising traffic conditions for efficient buses routes: The response to the pandemic provides an opportunity to establish full-time, dedicated bus lanes. Not only do bus lanes reduce delays for passengers, they can enable the same number of buses to run more services.

Key obstacles to recovery addressed	Provide confidence that the Public Transport system that it is Covid-safe		Demand management, encouraging the modal shift from road to public transport
	Will encourage higher patronage on transit services		Provides a greater passenger experience for the use of public transport
Reactivation impact by mode		🟡	No direct impact, may result in slight mode shift
		🟡	No direct impact, may result in slight mode shift
		🟡	No direct impact, may result in slight mode shift
		🔴	No direct impact, may result in slight mode shift
		🔴	No direct impact, may result in slight mode shift
Timing		**Short term (6 months)**	A degree of planning required, but able to be rolled out in a short time frame
Cost		🟡	Development of detailed plan and rollout of walk signal technology is required.
Interdependencies	Implementation of 'Slow streets'		Real time capacity tracking data

Intervention 10: Larger, more permanent, separated bicycle route upgrades

With fewer people wanting to use public transport, larger, safer, permanent bicycle route upgrades will encourage more people to ride, as it provides a viable alternative.

Intervention description

When proven, temporary or 'pop up' bicycle lanes should be upgraded and extended into more permanent facilities. New routes can be developed using the pop-up techniques. The aim of the upgrades and new routes is to increase the number of people who can travel to the centre, and circulate throughout the CBD by bike. This provides people with an alternative to public transport without adding to the congestion experienced by those in motor vehicles. Europe has a plethora of cities implementing bicycle-related initiatives. Public transport poses great risks for Covid infection, especially in peak hours, due to overcrowding in buses, trains and public stations. Encouraging the uptake of bicycle riding will help indirectly reduce crowding on transit services.

Where has this intervention been implemented and what were the outcomes?

Brussels, Belgium, has implemented a 24.9-kilometre bicycle lane, 23.4 kilometres traffic-calmed roads and a 5.15-kilometre route where motor vehicle access is restricted and pedestrians and bicycle riders have priority. As a result, bicycle use increased by 44% from 2019 to 2020. In April 2020, the city reduced motor vehicle speed limits inside the ring road to 20 km/h, aiming to reduce the number and severity of collisions.

Paris, France, added 29.23 kilometres of bicycle infrastructure and 4.31 kilometres of traffic-calmed streets during the lockdown period. In conjunction with other measures that have been implemented, rider numbers have increased by 27% from 2019 to 2020.

Lille, France, has implemented 9.23 kilometres of pop-up bike lanes and 2.22 kilometres of traffic-calmed roads. These interventions were in response to a large increase in bicycle use (about 60% compared with the pre-Covid period).

In Lisbon, Portugal, the bicycle network was extended by 12 kilometres during the COVID-19 crisis. Pop-up bike lanes have created a network that connects employment and residential areas. The number of traffic lanes has been reduced and the space repurposed as bicycle facilities. Speed limits have also been reduced.

Milan, Italy, one of the most polluted cities in Europe, announced in April 2020 the regeneration of 35 kilometres of the city road network in order to improve the residents' quality of life. The plan included low-cost temporary bicycle lanes, new pavements, a maximum speed limit of 30 km/h and streets prioritising pedestrians and cyclists.

Key obstacles to recovery addressed	Encourages new riders to use active transport, reducing road capacity Encourages new riders to use active transport, reducing public transport capacity		Allows for a more direct route of travel and ease of throughput trips within the CBD Encourages more exercise for people travelling to the CBD
Reactivation impact by mode		🔴	No direct impact, may result in slight mode shift
		🔴	No direct impact, may result in slight mode shift
		🔴	No direct impact, may result in slight mode shift
		🟢	May result in increased demand
		🔴	No direct impact, may result in slight mode shift
Timing		**Long Term (18 months)**	Need time to plan, design and construct corridors
Cost		🔴	Significant investment in infrastructure
Interdependencies	Re-allocation of road space		Bike lane addition/removal

Intervention 11: Removal of bike lanes to increase road and parking capacity within the CBD

This solution would reverse the recent reallocation of road and kerbside space for bicycle facilities and reinstate travel lanes and kerbside vehicle access, increasing road and parking capacity.

Intervention description

Several hundred kerbside parking bays and loading zones throughout Melbourne's CBD have been replaced by parklets, and dedicated and separated bicycle corridors. On two routes – Queens Bridge Street under the railway viaduct and on the Rathdowne Street/Exhibition Street route – a travel lane has been removed, reducing the peak motor vehicle capacity on that route. The changes have led to a tripling of bicycle trips on some routes. Some argue, however, that the space at the kerb and on the two roads should be returned to its previous use to increase road capacity and the number of kerbside parking bays.

Where has this intervention been implemented and what were the outcomes?

There are limited examples of the removal of bike lanes in response to Covid. In 2015, a bicycle facility was removed from College Street in the City of Sydney. Generally, the trend in the pandemic has been in the other direction.

Reinstatement of the travel lanes and kerbside parking in Melbourne's CBD would be likely to reduce the number of people arriving in the centre on bicycles. On the other hand, it could make the centre more attractive to people travelling by car from outer suburbs who may choose to visit the CBD rather than shop in their local area. The impacts of bike lane removal are summarised in Table 6.

Table 6: *Impacts of road pricing on cities worldwide; Source: Infrastructure Victoria*

Outcome	Estimated impact	Implications
Increase space for parking	• Slight increase in street parking capacity	• Encourages people who prefer to travel by private vehicle to come to the CBD to buy goods and services • Provides more space for 'click and collect' services and loading zones
Increase space for vehicles on the road	• Slight increase in road capacity for vehicles	• Encourages trips to the CBD by those who prefer to travel by motor vehicle • May ultimately cause more congestion as through trips and motor vehicle use increase
Removal of bike lanes	• Slight decrease in persons willing to cycle to the CBD	• People will choose other forms of transport, i.e. vehicle or public transport • May cause further congestion to roads and overcrowding on public transport

Key obstacles to recovery addressed	Provides more capacity for road users travelling to the CBD	Increases the capacity for short-term parking bays throughout the CBD	
	Provides more capacity for freight services requiring to visit stores within the CBD	Reduce capacity on the road network, reducing congestion on the road	
Reactivation impact by mode		🔴	No direct impact, may result in slight mode shift
		🔴	No direct impact, may result in slight mode shift
		🔴	No direct impact, may result in slight mode shift
		🟢	May result in decreased demand
		🟢	May result in increased demand
Timing		**Short Term (6 months)**	Need to identify then change road space usage
Cost		🟡	Investment needed to change infrastructure layout
Interdependencies	Re-allocation of road space	Road pricing	

Intervention 12: Reallocate road and parking space for local activation

Economic stimulus could be provided by increasing spaces for pedestrians, lowering speed limits and prioritising pedestrian activity.

Intervention description

To support further reopening of the economy, Melbourne can make the CBD more attractive, welcoming and accessible for people on foot. Pedestrian spaces could be increased by extending kerbs and 'pop up' planters. This space could be used for walking, social gatherings and outdoor dining. Lower speed limits on 'slow streets' and pedestrian priority road crossings would make movement through the centre comfortable.

Where has this intervention been implemented and what were the outcomes?

Oakland, in California in the US, transformed 33 kilometres of streets into temporary pedestrian corridors. These traffic-free slow streets provide more safe space for people to exercise and move around the city, while making it easy to maintain physical distancing. It was reported that 77% of residents supported the Slow Streets initiative.

Toronto, Canada, has also focused on providing more space for pedestrian activity through the ActiveTO program. The aim is to make sure people have space to get around while maintaining physical distancing. ActiveTO included three main programs: major road closures, the creation of quiet streets and expansion of the cycleway network. Around 92% of 359 respondents supported the retention of the road closures after the pandemic.

Brussels, Belgium, created a 20 km/h zone in the downtown core, allowing pedestrians to walk comfortably on the roadway. Pedestrians have been given priority on all streets in the centre and may use the full width of the street to move around.

London, England, has pedestrianised streets and created 'streateries' to help people maintain social distancing and support the recovery of the food service industry. Areas has been identified where space can be provided for extended outdoor seating, socialising and pedestrian amenity. Spaces that have been repurposed include parking bays, adjacent pavements, squares, terraces and rooftops.

Key obstacles to recovery addressed	The increased local activation will encourage more people to visit the CBD The increased space for pedestrians will improve confidence of Covid-safety		Demand management, encouraging the modal shift from road to public transport
Reactivation impact by mode		●	Potential to increase aggregate usage
		●	Potential to increase aggregate usage
		●	Potential to increase aggregate usage
		●	May result in slight increase in active transport
		●	Will likely decrease demand and usage
Timing		**Rapid (<6 months)**	Four step process: Plan (which streets), Engage (Reach out to residents), Design + Implement (cones / bollards to block cars), Monitor (to ensure it is achieving its required task)
Cost		●	A relatively low cost, will need to pay for staff to monitor to ensure rules are adhered to
Interdependencies	Removal/Implement bike lanes		Re-allocation of road space

6.
Recommended interventions

Defining the potential interventions

Twelve potential interventions have been developed for the Melbourne transport network, each based on initiatives that have been successfully applied across the globe.

How the interventions have been scoped

The 12 transport interventions have been developed based on the case study interventions detailed in the previous section and refined in order to make them relevant for the Melbourne transport network. The objective of each intervention is to assist with Melbourne's recovery from the economic impacts of Covid-19. The interventions are summarised in Table 7.

It should be noted that while the interventions have been developed and defined based on the case study analysis, it is not an exhaustive list of potential actions and there are numerous variations of these interventions that could be considered to address transportation access. For example, providing non-financial incentives such as small food and beverage rewards or entry into rewards programs for entering the City of Melbourne could be considered to encourage travel.

As previously highlighted in this report, transport interventions act as enablers to the reactivation of the 'city experience' by addressing obstacles to access and circulation. They work in parallel with other reactivation initiatives, allowing maximum benefit to be generated from each reactivation initiative (such as the Melbourne Money dining initiative that was implemented by the Council in 2021). The transport interventions and other reactivation initiatives should be viewed in partnership and are not directly comparable.

Defining the potential interventions

Table 7: *Proposed transport interventions to assist with Melbourne's recovery from the impacts of Covid-19*

	Potential intervention	Application to Melbourne
Travel behaviour interventions	**Provide real-time transport tracking and capacity data**	Provide the user with real-time arrival and capacity information, allowing them to make informed decisions and reduce the risk of overcrowding and concerns about catching Covid.
	Set density limits on public transport and key network interchanges	Directives including mandatory mask wearing, capacity guidance on public transport, redistribution of space at interchanges and changes in the way services operate to support safer and more confident travel.
	Encourage flexible work hours to reduce peak demand	Through collaboration with employer peak bodies, industry and unions, promote flexible work hours to distribute demand on the transport network during the morning and afternoon peaks and reduce crowding.
Financial incentives	**Introduce permanent off-peak public transport fare reductions**	Provide financial incentive for commuters on public transport to adjust their travel behaviour towards off-peak travel, reducing demand and crowding during peak times on the network.
	Subsidise individuals' investment in and use of active transport	Create a financial incentive (e.g. subsidy) for purchasing bikes or e-bikes to help generate a mode shift to active transport and decrease the demand for other forms of transport.
	Trial demand-responsive parking pricing	Applied to existing parking meters, the system enables choices between 'peak', 'shoulder' and 'off-peak' prices based on parking demand, and also include options to revert to short-term drop-off/pick-up zones.
	Implement road pricing for vehicles making through trips across the CBD	Implement pricing for private vehicles travelling through the CBD, to provide more capacity for drivers with a destination in the CBD who are making an economic contribution to the CBD.
Infrastructure solutions	**Install mobile smartphone ticketing infrastructure for the public transport network**	Implement a new digital-ticketing system that reduces contact points through contactless payment and improves confidence in the public transport system as a result of safety perceptions.
	Remove key physical touchpoints across the CBD	Implement a package of initiatives including automated walk signals, pedestrian traffic clock counters, and shorter signal cycles to decrease waiting times and crowding, reducing concerns about cleanliness and social distancing. Reduce the number of parking meters on footpaths and transition to smartphone-based payments.
	Construct and upgrade separated bicycle corridors	Construct larger, permanent, separated bicycle corridors as an alternative to commuting on main roads and in shared lanes with cars, to provide more routes for bike riders and enhance their safety when commuting.
	Remove bike lanes to increase road and parking capacity	Reinstate short-term car parking spaces and loading zones that have recently been replaced with dedicated and separated bicycle corridors, to reduce congestion and increase parking options in the CBD.
	Reallocate road and parking spaces for local activation	Install temporary traffic restrictions and space reallocations to create more walking space and generate more room for pedestrians, social gatherings and outdoor dinning.

Shortlisting the potential interventions based on operational timing

Several interventions have been removed from the assessment due to the long lead time for implementation.

How the interventions have been shortlisted

The time taken to implement each intervention determines which interventions are best suited to assist Melbourne's recovery from the impacts of the pandemic.

A pass/fail criteria has been set based on the ability to have the intervention operational within an estimated 12-month timeframe (by late 2022). This will ensure that each initiative will be operational and providing user benefits in time for the summer months of 2022–23 at the latest. This period also aligns with the Australian Government's roadmap to a Covid-safe recovery.

Table 8 details the four interventions that will not be considered in the assessment due to their long estimated implementation timelines.

Table 8: *Interventions that will not be considered in the assessment due to long implementation timelines*

Potential intervention	Estimated implementation timeline	Shortlist?	Preliminary evaluation?	Commentary
Set density limits on public transport and key network interchanges	24 months	✘	Gather data on people flows around and in public transport interchanges using de-identified mobile phone signals. Use this data to identify peak times and places.	This intervention would require the re-negotiation of each transport mode franchising agreement, involving significant stakeholder engagement and commercial negotiations and analysis.
Introduce permanent off-peak public transport fare reductions	24 months	✘	A current off-peak fare discount trial is anecdotally producing the desired outcomes, so continue the trial to gather further data that is sufficient to propose adjustments to fares that reflect passenger loads.	This intervention would require the re-negotiation of each transport mode franchising agreement, involving significant stakeholder engagement and commercial negotiations and analysis.
Implement road pricing for vehicles undertaking through trips in the CBD	24 months	✘	Gather data on vehicle flows to and through the CBD using de-identified mobile phone signals. Use this data to identify peak times and places and gain insight on the routes used by through traffic.	Due to the contentious nature and commercial implications of road pricing, the required analysis and stakeholder management would be challenging to implement this intervention within the 12-month threshold.
Construct and upgrade separated bicycle routes	18 months	✘	This is an ongoing action from the City of Melbourne's Transport Strategy 2030. Rather than advocate for additional investment, we recommend that the City continues planned implementation.	Significant work has already been done within the City of Melbourne to improve bicycle routes. Further expansion would require collaboration with inner city councils and transport stakeholders.
Install mobile ticketing infrastructure for the public transport network	36 months+	✘	The City of Melbourne can prepare for the end of the myki contract in late 2023 by gathering data and identifying strategic aims to ensure the next Victorian ticketing system is appropriate for travel to the Melbourne CBD.	This intervention would require significant planning, due diligence, procurement and investment in long-term infrastructure and software to replace an existing network-wide asset. It would also require vast stakeholder engagement.

Intervention short-list assessment

Assessment of the remaining seven interventions against key criteria identified five interventions that meet the requirements and are implementable within the timing and cost parameters.

How the shortlisted interventions have been assessed

The seven shortlisted intervention have been assessed against the following criteria:

- The expected positive impact on the overall transport task
- Value for money, which considers both potential revenue and expected costs
- Alignment with key City of Melbourne, state and federal strategies
- The relative ease with which the intervention can be delivered.

The scoring has been done on a scale that ranges from very low to very high, and a summary of the outcomes of the assessment are shown in Table 9. More detailed scoring and analysis of each intervention against each criteria are provided on pages 61 to 64.

Four interventions have been recommended for implementation.

Further details of these interventions, their interdependencies and a proposed implementation roadmap are included on the next page and in section 7.

Table 9: *Short-listed intervention assessment*

Potential intervention	Reactivation impact	Value for money	Alignment with strategy	Ease of deliverability	Assessment outcome
Provide real-time transport tracking and capacity data	●	◕	◕	◑	✓
Encourage flexible work hours to reduce peak demand	◕	●	◑	◕	✓
Remove key physical touchpoints across the CBD	◑	◕	●	◕	✓
Subsidise individuals' investment in and use of active transport	◔	◔	◕	◑	✗
Trial demand-responsive parking pricing	◕	◕	●	◕	✓
Remove bike lanes to increase road and parking capacity	◔	◑	○	◕	✗
Reallocate road and parking space for local activation	●	◔	◕	◕	✓

Scoring legend

● Very high ◕ High ◑ Moderate ◔ Low ○ Very low

Recommended interventions and their interdependencies

The five recommended interventions will generate significant improvements in the transport system in the CBD.

The recommended interventions

The following five transport interventions are recommended to assist Melbourne's recovery from the impacts of the Covid-19 pandemic.

Encourage flexible work hours to manage peak demand

A key intervention that will act as a broad enabler of the wider transport network and the other recommended interventions. Collaboration with employer peak bodies, industry and unions to promote flexible work hours will distribute demand on the transport network during the morning and afternoon peaks and has the potential to increase the overall number of people entering the City of Melbourne.

Implement real-time transport tracking and capacity data

A significant enabler for the public transport network, the introduction of simple yet effective capacity tracking software will provide real-time information allowing users to make informed decisions about which services they use. It will reduce the risk of overcrowding, and concerns about catching Covid.

Trial demand-responsive parking pricing

It is expected that demand-responsive parking pricing will increase the number of people who arrive in the CBD and will facilitate a range of kerbside uses, including short-term pick-up/drop-off. This outcome is strongly aligned with immediate and longer-term strategic objectives.

Remove key physical touchpoints across the CBD

Elements of this intervention have been rolled out across the City of Melbourne to address concerns about cleanliness and crowding, in particular at the start and end of trips on public transport in the city. It is recommended that the removal of physical touchpoints continue to be accelerated where possible due to the high value for money and alignment with broader strategies.

Reallocate road and parking spaces for local activation

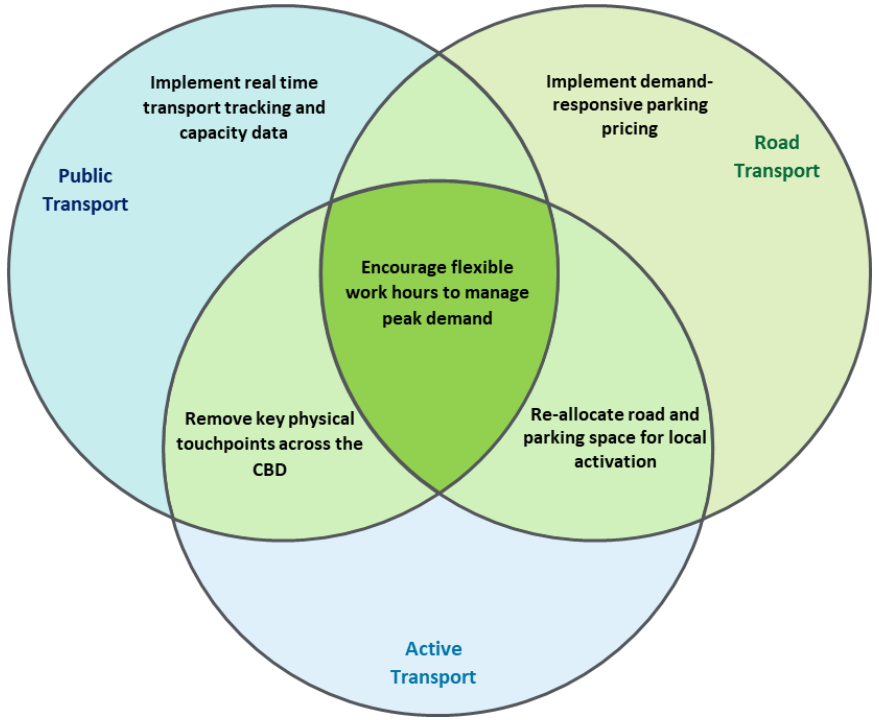
This intervention has already been implemented by the City of Melbourne and it is recommended that this program is continued with ongoing monitoring and refinement regarding location of implementation and timing.

In addition to these recommended interventions, 'preliminary actions' can be undertaken for other interventions that have not been recommended, which would enable these interventions to be trialled and potentially implemented in the longer term (see Table 8).

The interdependencies and compounding nature of the recommended interventions

There are interdependencies between the recommended interventions. By implementing these interventions in a packaged rollout there is the opportunity to compound the expected effects on the transport task and, by association, on the activation of the Melbourne CBD, as shown in Figure 39. This is further examined when considering the delivery roadmap.

Figure 39: *Interdependencies and interrelationships of the recommended interventions*



Detailed reactivation impact scoring

Further information regarding the scoring breakdown for each short-listed intervention against the reactivation impact objectives.

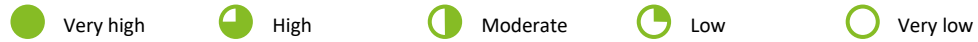
Detailed reactivation task impact assessment

Further details regarding the short-listed intervention scoring against the reactivation task impact objective is included in Table 10.

Table 10: *Detailed short-listed intervention scoring against the reactivation task impact objective*

Potential intervention	Reactivation impact	Commentary
Provide real-time transport tracking and capacity data		This intervention is feasible within the time available. It is likely to be seen as relevant and welcomed by public transport users who would like to return to the services. The information need not appear exclusively on smartphones but can be communicated through information boards, public address systems and the call centre.
Encourage flexible work hours to reduce peak demand		It is likely that workplace attendance will settle into several patterns, replacing the single five-day week pattern of the past. Information about public transport services in particular can be provided to inform conversations about travel options and attendance at work.
Remove key physical touchpoints across the CBD		This intervention can become a general principle that applies to all transport-related infrastructure, including crossing call-ups, parking meters, bus stops and road signs (not as necessary today with smartphone-based guidance). Clearing away visual clutter and footpath obstacles will meet other strategic goals set by the City of Melbourne.
Subsidise individuals' investment in and use of active transport		E-bikes have not yet reached the 'early majority' of users in Australia although they represent half of sales and exports in many countries. Incentives can help speed the take-up of unfamiliar but proven technologies. At a later stage, when adoption is more general, the subsidies can be withdrawn.
Trial demand-responsive parking pricing		It is very likely that the current 'flat' parking meter fee is at some times and in some places either too high or too low. It has been shown that when incentives are provided in both directions – that is, when the fee floats down in off-peak times and is set appropriately in peak times – that people experience no lost time in reaching their destination.
Remove bike lanes to increase road and parking capacity		Where a bicycle facility has been provided at the expense of a vehicle travel lane and riders fail to make good use of the new facility – after allowing time for them to adjust their behaviour – there is a strong argument for reallocating the space to a more relevant use. The reallocation could be to another transport purpose or to strengthen the 'place' through tree planting or other kerbside activation.
Reallocate road and parking space for local activation		Lightly used areas of roadway or kerbside parking can 'work harder' when allocated to another task. Many traders in Melbourne and overseas have preferred to expand their business into the nearby kerbside space than to see it used for parking. This reallocation of space seeks to strengthen the 'city experience', making people want to visit the centre.

Scoring legend



Detailed value-for-money scoring

Further information regarding the scoring breakdown for each short-listed intervention against value-for-money objectives.

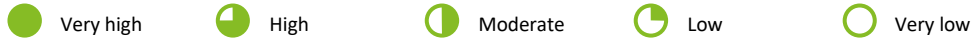
Detailed value-for-money impact assessment

Further details regarding the short-listed intervention scoring against the value-for-money impact objective is included in Table 11.

Table 11: *Detailed short-listed intervention scoring against the value-for-money objective*

Potential intervention	Value for money	Commentary
Provide real-time transport tracking and capacity data		The trend towards 'big data' has been apparent for some time, and the value that it can provide to system providers and system users is now well understood. Once the set-up costs have been expended and the analysis speeded through machine learning, the running costs each year should be relatively low.
Encourage flexible work hours to reduce peak demand		From an investment point of view, this is a high-impact, low-cost intervention as it rests on decisions made by workplaces.
Remove key physical touchpoints across the CBD		The replacement of hardware with software reduces or potentially eliminates infrastructure costs including maintenance and asset depreciation. Physical parking meters, to take one example, are functionally obsolete although regulations may require that some need to be retained.
Subsidise individuals' investment in and use of active transport		Investments in the adoption of new technology bring forward the time when the technology is normative and a subsidy is unnecessary. Subsidy qualification ensures that the available investment generates the most change. The subsidy should be the lowest necessary to generate the desired behaviour.
Trial demand-responsive parking pricing		This intervention requires the straightforward adjustment of settings within an existing system. The system has recently been upgraded, giving the City of Melbourne access to state-of-the-art technologies. It will be necessary to explain to stakeholders how the new approach works and establish trust in the adjustment setting mechanism.
Remove bike lanes to increase road and parking capacity		Reallocation of road space is costly as it requires consultation and evidence-gathering as well as physical works. These costs can be reduced by 'traffic experiments' in which temporary changes are made, adjusted and monitored before 'locking in' the optimum layout. There would need to be investment in origin-destination studies to understand motor vehicle movements in the area and on the route or routes in question.
Reallocate road and parking space for local activation		The City of Melbourne has demonstrated that temporary measures can be installed and adjusted over a trial period. The current program has provided the tool kit to support activation and established a process that can be followed in other locations.

Scoring legend



Detailed strategic alignment scoring

Further information regarding the scoring breakdown for each short-listed intervention against strategic alignment objectives.

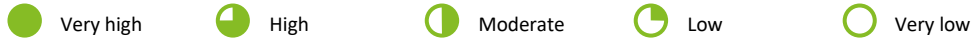
Detailed strategic alignment assessment

Further details regarding the short-listed intervention scoring against the strategic alignment objective is included in Table 12.

Table 12: *Detailed short-listed intervention scoring against the strategic alignment objective*

Potential intervention	Alignment with strategy	Commentary
Provide real-time transport tracking and capacity data		Evidence-based decision making has been fundamental to successive City of Melbourne transport strategies and underpins Transport Strategy 2030. Melbourne has a well established open data tradition. This intervention is consistent with both these established practices.
Encourage flexible work hours to reduce peak demand		City of Melbourne strategies have not considered the comprehensive change in the approach to on-site attendance that has occurred over the pandemic.
Remove key physical touchpoints across the CBD		The City of Melbourne has identified visual clutter and footpath obstacles as detrimental to the development of the 'city experience'. The Walking Plan 2014–17 led to a zone where the pedestrian signals are 'auto on'. This intervention carries forward these principles.
Subsidise individuals' investment in and use of active transport		The City of Melbourne encourages the use of active transport, but it does not provide direct subsidies for equipment purchase. More typically, it facilitates access to shared facilities such as libraries, swimming pools and services provided by third parties such as public transport and car share.
Trial demand-responsive parking pricing		The introduction of demand-responsive parking pricing is a recommendation in Transport Strategy 2030. The aim is to improve access and efficiency.
Remove bike lanes to increase road and parking capacity		City of Melbourne transport strategies have not included this option.
Reallocate road and parking space for local activation		Transport Strategy 2030 notes that much kerbside space currently used for kerbside vehicle access could be used more productively to benefit many more people. The strategy signals that road and kerbside space will be reallocated permanently or temporarily to enhance safety, commercial viability and place activation.

Scoring legend



Detailed strategic alignment and deliverability scoring

Further information regarding the scoring breakdown for each short-listed intervention against and deliverability objectives.

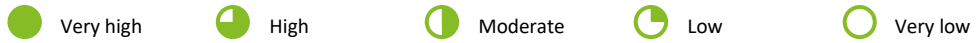
Detailed deliverability assessment

Further details regarding the short-listed intervention scoring against the deliverability objective is included in Table 13.

Table 13: *Detailed short-listed intervention scoring against the deliverability objective*

Potential intervention	Ease of deliverability	Commentary
Provide real-time transport tracking and capacity data		Wider stakeholder agreement and combined planning would be required between state agencies and the rail franchise operator.
Encourage flexible work hours to reduce peak demand		This will happen without intervention by City of Melbourne. There could be a role for the City in helping employers and workers develop template options to consider.
Remove key physical touchpoints across the CBD		These interventions can be generated internally and in concert with state agencies.
Subsidise individuals' investment in and use of active transport		The City of Melbourne does not have an established subsidy program.
Trial demand-responsive parking pricing		This intervention is within the regulatory and organisational remit of the City of Melbourne. Some consultation with the Department of Transport will be appropriate on state-managed roads.
Remove bike lanes to increase road and parking capacity		On local roads, this intervention is within the regulatory and organisational remit of the City of Melbourne. Consultation with the Department of Transport will be necessary on state-managed roads.
Reallocate road and parking space for local activation		On local roads, this intervention is within the regulatory and organisational remit of the City of Melbourne. There is an existing tool kit for providing on-street elements and an established process.

Scoring legend



The need for a regularly updated transport data dashboard

With an up-to-date transport dashboard, the City could compare economic activity with transport activity to identify how the transport system can be adjusted to provide a favourable business environment.

Linking transport and economic data

In Australia, economic activity in an area such as the CBD can be assessed using payment-system data from service companies such as Mastercard. This frequently updated data could provide the City with a quick and convenient indication of how City-based businesses are faring in the recovery.

Ideally, the City would be able to compare this expenditure information with a transport dashboard that showed how many people were entering the CBD, and which modes of transport they are using. The comparison would reveal whether changes observed in the transport system correlated with rises and falls in economic activity. In turn, this would enable the City to adjust the transport system so that city businesses could operate in a favourable environment.

Today, such a comparison is not possible as no such transport dashboard exists. In the absence of such a dashboard, the City commissioned this report.

Gaps in data, knowledge and understanding

Fortunately, some data is available for some modes, and it is this data that has been used in the report. However insights in the report have been limited by the following gaps.

Data gap. The 'data gap' is wide for active and road-based public transport. Total numbers are unknown for these modes as not every bicycle trip is logged by counters, road-based public transport passengers do not have to touch off, and those using the free trams do not have to touch on.

Knowledge gap. The data gap leads to a 'knowledge gap'. For active and public transport it is not known who is staying in the CBD and who is just passing through. This gap has been filled for motor vehicles. It is known that 43% of CBD trips are made by people who are passing through.

Understanding gap. The knowledge gap leads to an 'understanding gap' that stretches across all modes. Although the City knows how many pedestrians are at certain locations, it does not know how people on foot flow through the CBD. Nor is there an understanding of the entry and exit points and routes used by through traffic.

Information is difficult and slow to assemble. Finally, even the information that is available – including bicycle counts, myki touch-offs and traffic signal data – is not reported regularly in one place in a form immediately available for analysis. The exception is the City's pedestrian counter system, which is always up-to-date and available as open data. The lack of repeatedly updated data leaves the City reliant on 'snapshots' like this report.

The need for a publicly available transport data dashboard

It is important that the City begins to develop a comprehensive and regularly updated transport dashboard that reports mode-by-mode on the volumes, flows and trends. Such a dashboard would allow everyone to see whether an event such as Moomba or the Grand Final Parade was a success, how the return to the workplace is affecting the transport system and whether transport targets and benchmarks are being met.

Such a dashboard would be consistent with the City of Melbourne's Covid-19 Recovery & Reactivation Plan, which includes recommendations to:

- Develop a measurement framework to track our progress and assess impact
- Continuously review and evaluate the impacts of actions and initiatives within this plan.

Filling the gaps

To fill the 'gaps', it will be necessary to develop new data sources.

Expand existing collection methods. Some of the necessary data can gathered by expanding the existing 24/7 data collection network based on pedestrian sensors and in-ground bicycle counters. Rules-of-thumb can be developed through intercept surveys – for example, within the Free Tram Zone.

Expand the range of sources. Existing data and data collection systems can be incorporated into the overall dashboard. In-ground parking sensor data can be used to report on how many people arrive each day, through the kerbside 'car park'. Commercial parking providers might agree to hand over generalised monthly data. It may be possible to capture de-identified information from Transurban transponders to understand how motor vehicles travel to and through the CBD.

Explore the use of mobile phone signals. The most useful data would be de-identified and secure information from mobile phones. It is possible to turn the continuous signals from mobile phones into detailed movement information. The signals can be sorted into those given off by pedestrians, people on bicycles, people in public transport and people in cars. This data would reveal in detail and with certainty the patterns of movement mode-by-mode across the CBD and provide the insights and understanding that the City needs to track progress.

Mobile phone signal data has been used in this way across Australia, including Victoria.

The main barrier to the regular collection and use of mobile phone signals in the CBD is the legitimate and substantive concern about privacy and surveillance. It is likely that considerable effort would need to be put into a process to achieve consent. It is also likely that the value of the data would be worth that effort.

7.
Delivery roadmap

Intervention delivery considerations

There are key first steps and actions to accurately scope and implement each intervention and derive maximum benefits.

Delivery roadmap for recommended transport interventions

The roadmap in Figure 40 outlines the suggested way forward for the Council's implementation of the recommended transport interventions.

Encourage flexible work hours to manage peak demand

Flexible working has been a large part of the response to Covid since the initial lockdown. Work to refine and further manage the implementation of flexible hours could be implemented within six months.

Key first step: Stakeholder engagement with large employers, unions and education bodies.

Reallocate road and parking spaces for local activation

The reallocation of road and parking spaces for local activation is already in progress and has been implemented since the beginning of the pandemic (such as through a focus on outdoor dining).

Key first step: Continue to monitor and assess the success of the program and determine next steps.

Implement demand-responsive parking pricing

The availability of 24/7 in-ground parking sensor data and other new parking technologies would permit a pilot to get underway quickly. No additional physical or IT infrastructure is needed. Mainly 'soft' costs including establishing the process and encouraging public engagement.

*Key first step: S*takeholder consultation to determine a costing model and applicability.

Remove key physical touchpoints across the CBD

Since the beginning of the pandemic there has been a large focus on eliminating key touchpoints throughout the city – for example, by installing automated walking signals. However, as the City transitions from lockdowns to a 'Covid-normal' scenario, further work must be done to eliminate all touchpoints if possible.

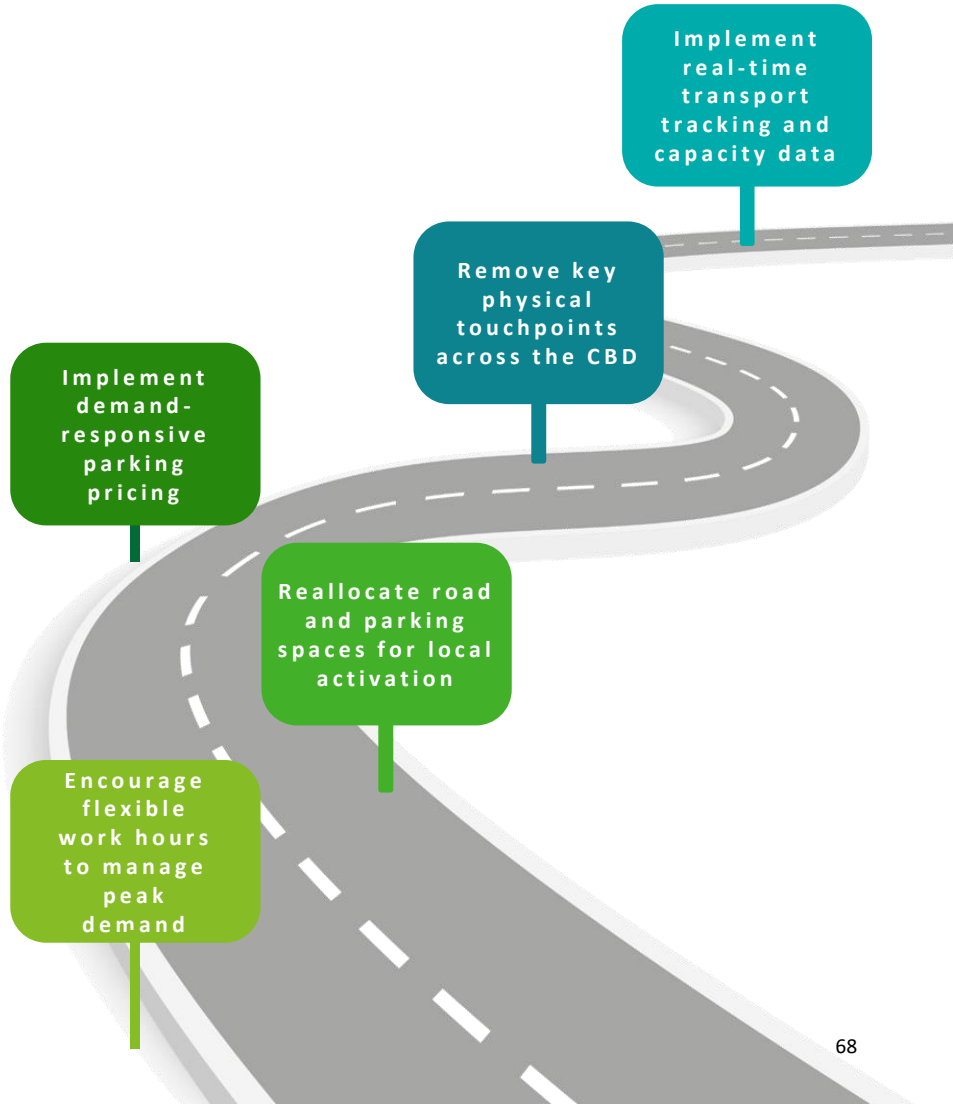
Key first step: A degree of planning is required, but such a program can be rolled out in a short time frame.

Implement real-time transport tracking and capacity data

The implementation of real-time capacity data would have the longest timeline for delivery, and is estimated to take at least 10 months.

Key first step: Stakeholder engagement with the Department of Transport to strategise a procurement plan for implementation, followed by in-depth market sounding to gauge interest and deliverability.

Figure 40: *Delivery roadmap for recommended transport interventions*



Deloitte.