RAPID TRANSIT THEME OPTIONS

6.0 RAPID TRANSIT THEME OPTIONS

The Rapid Transit Corridor Theme is designed to provide a fast and reliable rail service along the median of the Eastern Freeway. The proposed service would be predominantly served by park-and-ride facilities, incorporating significant car parks and bus interchange facilities. The theme has three options at the western end, each of which is considered in more detail below.

6.1 ROUTE ALIGNMENTS AND STATION LOCATIONS

6.1.1 RAPID TRANSIT 1 ROUTE OPTION (RT1)

The Rapid Transit 1 Route Option would provide a fast rail service from Doncaster Hill to Flinders Street via the existing Clifton Hill group at Collingwood. The alignment examined by the study team starts at Doncaster Hill and connects with Doncaster Park-and-Ride, Bulleen, Kew Chandler Highway, Collingwood, North Richmond, West Richmond and Jolimont stations before passing through Flinders Street Station and the City Loop.

As discussed in Section 3.6.1 of this report, the Clifton Hill group of train lines does not have sufficient capacity to incorporate the addition of a Doncaster rail line in the manner proposed by this option, unless significant additional works are also undertaken on these existing lines. Therefore, these additional works form part of this option, with the inclusion of a new tunnel from a location near Northcote station passing south via the Parkville area to a new station adjacent to the existing Flagstaff station on the City Loop. It is expected that this new tunnel would carry the existing South Morang line, releasing capacity on the existing Clifton Hill to the City Loop link to carry trains from both the Hurstbridge line and the new Doncaster line. Further information about why a new alignment for the South Morang line is seen to be the best solution to introduce greater capacity to this group of lines is provided further in this report.

The RT1 Route Option proposed by the study team was based upon the following alignment:

The proposed railway line starts at Doncaster Hill, with a station located deep below Doncaster Road, accessible from street level and Westfield Doncaster Shopping Centre.

The line would continue in a tunnel to a station at the Doncaster Park-and-Ride, breaking ground west of Doncaster Road, where it continues at-grade along the northern edge of the Eastern Freeway.

Bulleen station would be located at ground level, just east of Bulleen Road near Thompsons Road. The rail line would enter a tunnel near Bulleen Road, to pass under the east-bound lanes of the Eastern Freeway and rise up in to the centre median of the freeway. It would travel above ground to a station at the Chandler Highway.

The line would then continue at-grade to Yarra Bend Road, where it would pass under the west-bound lanes of the freeway. It would rise up to bridge over Merri Creek, diving back down into a short tunnel before connecting into the Hurstbridge line at a location around Victoria Park.

The line would follow the existing Hurstbridge alignment through Collingwood, North Richmond, West Richmond and Jolimont stations, before heading through Flinders Street Station and the City Loop.

The travel time between Doncaster Hill and Collingwood along the proposed alignment would be around 14 minutes. Timetabling interfaces with other services along the Clifton Hill group will dictate the travel time between Collingwood station and Flinders Street Station and this would likely add a further seven to 16 minutes to the journey. As such, the total travel time would be between 20 and 30 minutes.

A total of four new stations are proposed as part of this potential alignment, located at Doncaster Hill, Doncaster Park-and-Ride, Bulleen and Kew Chandler. Further details of the proposed stations are included further in this report, although it should be stressed that these options are based upon a limited, high-level assessment of possible station types and positions. Further work is required before station designs and locations can be finalised.

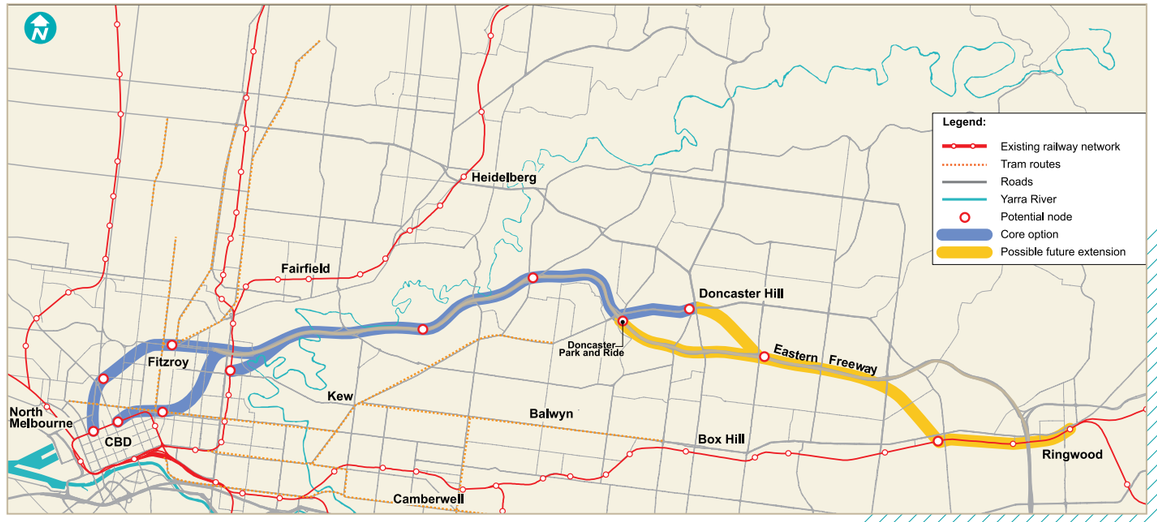
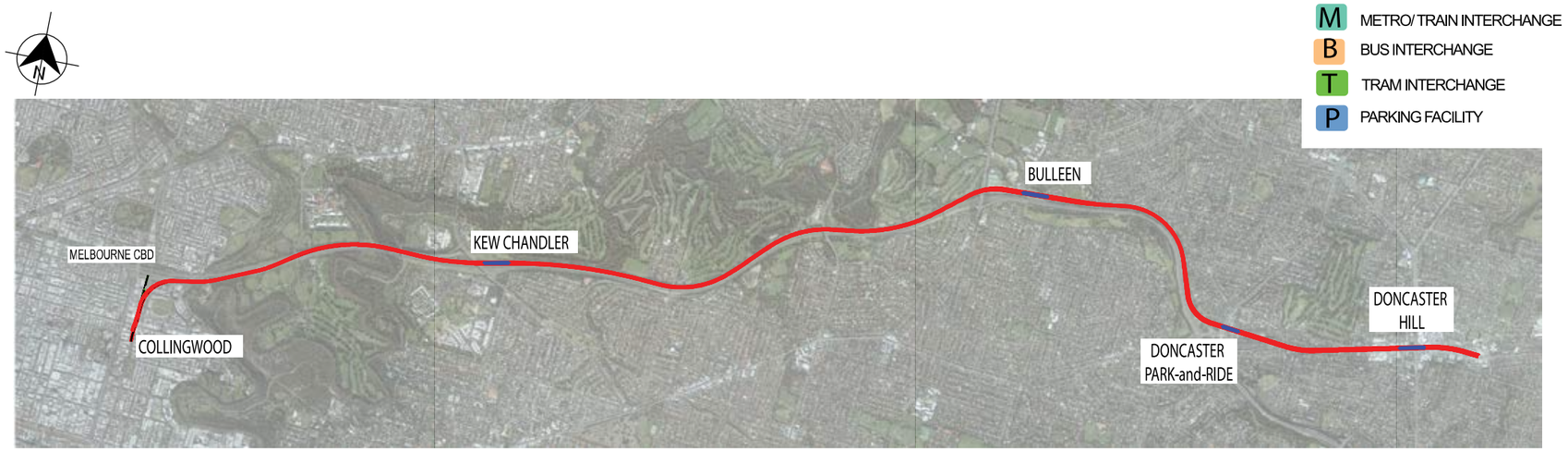
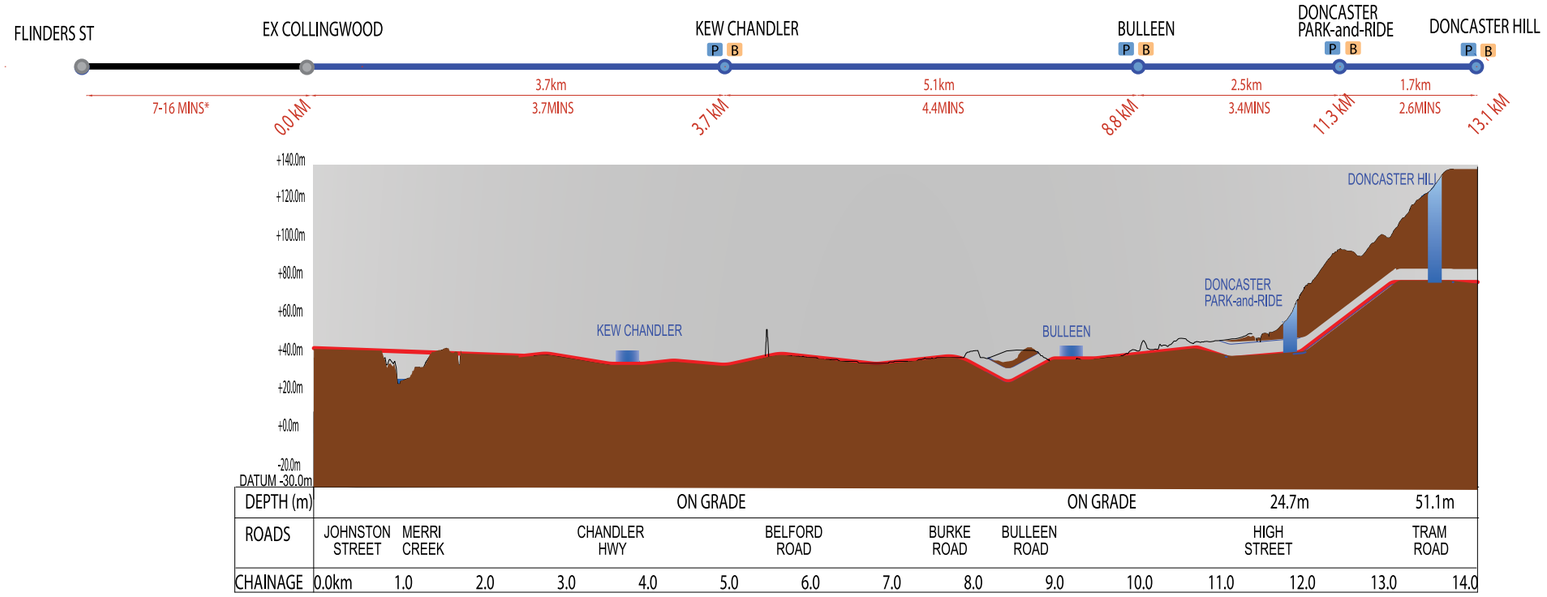


Figure 6-1: The Rapid Transit Corridor Theme





DEPTH (m)	ON GRADE									ON GRADE			24.7m		51.1m
ROADS	JOHNSTON STREET	MERRI CREEK		CHANDLER HWY			BELFORD ROAD		BURKE ROAD	BULLEEN ROAD			HIGH STREET		TRAM ROAD
CHAINAGE	0.0km	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0	11.0	12.0	13.0	14.0

*NOTE SUBJECT TO OPERATIONS THROUGH MURL AND FLINDERS STREET STATION OPERATIONS

RAPID TRANSIT OPTION 1 (RT1)

COLLINGWOOD TO DONCASTER HILL

Figure 6-2: Proposed Rapid Transit 1 Route Option

DE-COUPLING THE CLIFTON HILL GROUP

With a lack of capacity within the existing Clifton Hill group of lines to permit the connection of new Doncaster rail services to the existing tracks (refer to discussion on network constraints in Section 3.6.1), the study team were left with two potential options for increasing capacity: either build a completely new rail alignment into the CBD or upgrade the existing Clifton Hill corridor to improve capacity along the existing alignment. .

Upgrading the existing Clifton Hill group was considered very early in the process but quickly discarded. This is because the existing Clifton Hill group is constrained by the capacity of the City Loop. As discussed previously, Clifton Hill group trains must run via the City Loop to enter/exit the city. Currently, these trains run on a single track via Flinders Street Station (normally Platform 1) to Southern Cross Station and then around the City Loop, connecting with the outbound ('down') track and on to Jolimont station. There would be insufficient capacity through this section to accommodate the combined South Morang, Hurstbridge and Doncaster lines.

As an alternative, it may be possible to run the Hurstbridge and South Morang trains via the City Loop and the Doncaster services direct to Flinders Street Station, terminating around Platform 2 and/or Platform 14 at Flinders Street Station as an example. This would present a number of operational and engineering challenges, however, including:

- Two additional tracks would need to be constructed at-grade between the Eastern Freeway and the Melbourne City side of Jolimont station. The rail corridor in this area is very narrow and in many areas it is elevated on embankments. The construction of two new tracks would require significant acquisition of land from homes and businesses along this corridor. The social and economic cost of such acquisitions would be high, with a significant adverse impact upon the local community.
- The operation of Flinders Street Station would need to be changed to accommodate Doncaster trains terminating there. As an example, Platform 2 would likely have to become a 'Doncaster' platform and the existing Burnley group trains would need to be cascaded across to new platforms. Track layouts on both sides of Flinders Street would also need to be changed, with significant associated cost and disruption.
- Doncaster line customers would be required to interchange at Flinders Street Station if they wanted to access the City Loop and northern parts of the CBD.

For these reasons, the study team felt that the construction of a new alignment offers the best long-term solution for the capacity issues in this area.

Doncaster Hill Station

Located in central Doncaster, where Doncaster Road intersects with Tram Road, the station proposed by the study team at this location would have an entrance centrally located over deep underground platforms, Due to restrictions on the gradient that trains can travel along, and the steep topography of Doncaster Hill, the platforms would have to located approximately 50 metres below ground. The main entrance to the station is proposed as being on the south side of Doncaster Road, where it would become the focal point of a newly created quality public realm, with areas for kiss-and-ride drop-off and pick-up as well as provision for taxi bays. The space could connect to a possible multi-storey car park integrated with a bus terminal located further south if desired.

The surrounding environment is largely commercial and dominated by the Westfield Doncaster Shopping Centre, with the wider surrounding area largely consisting of residential detached housing. Pedestrian connectivity could be improved by the provision of a public underpass across the busy Doncaster Road, connecting to a further station entrance to the north. A potential connection with a dedicated entrance from Westfield Doncaster Shopping Centre may also be possible with this solution, should this be desirable.

Doncaster Park-and-Ride Station

Located in Doncaster, to the east of the Eastern Freeway intersection with Doncaster Road, the Park-and-Ride station proposed for this option would be located in a tunnel approximately 25 metres beneath High Street and Doncaster Road. The intersection is a major road connection from the eastern suburbs and is an expanding transfer point, with the surrounding area being mixed use though dominated by detached residential housing.

The existing DART park-and-ride car park provides opportunity for expansion to multi-storey car parking and this is included as part of this option, with a number of major bus routes available to provide connectivity to the surrounding suburbs. A large number of kiss-and-ride and taxi bays are proposed and secure bicycle parking would likely be in high demand at this location.

The proposed solution has a single entrance located centrally to the platform serving the underground platforms, with the station building being the focus of a proposed multi-storey park-and-ride hub. Regardless of the final form of this station, there exists significant opportunity to integrate car parking with extensive bus facilities, as well as the potential for future expansion to form a bus terminal should that align with future needs.

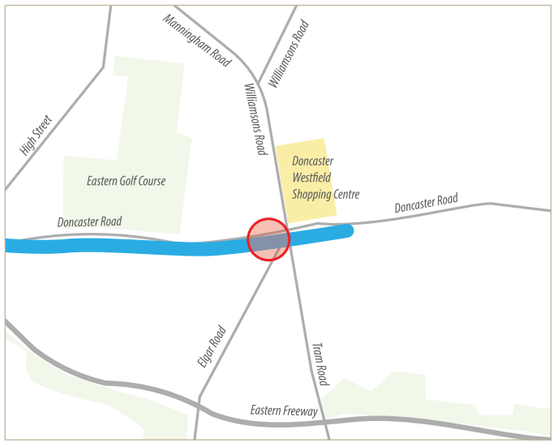


Figure 6-3: Proposed Doncaster Hill station location

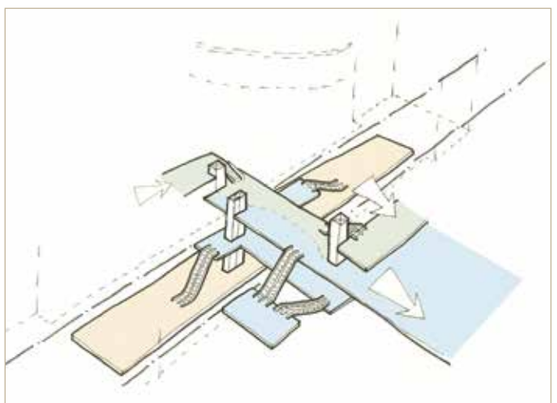


Figure 6-4: The depth of the Doncaster Hill station would likely require two levels of escalators to reach the platform, as shown in this sketch. Alternatively, high capacity lifts may be used.

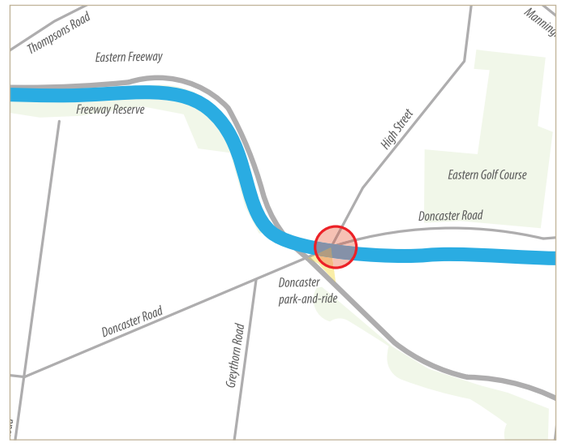


Figure 6-5: Proposed Doncaster Park-and-Ride station location

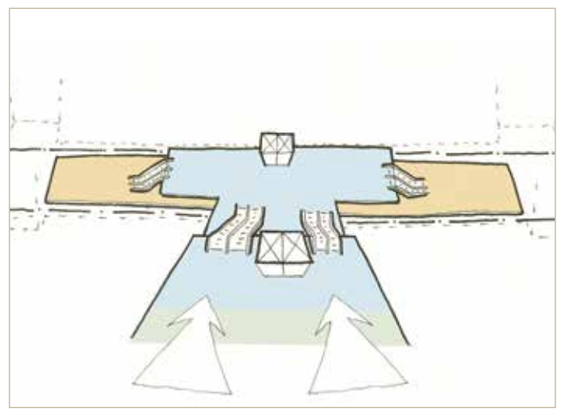


Figure 6-6: The option developed by the study team for the Doncaster Park-and-Ride station envisages passengers entering the station building through an access point that also forms an underground connection between the car parking area and the station platforms

Bulleen Station

The proposed Bulleen station developed as part of this route option is located at ground level, adjacent to the Eastern Freeway between Thompsons Road and the Eastern Freeway exit ramp. From the car park or top level bus station, stair or lift access would be required to access the side platforms below.

The site generally consists of open reserve land with a drainage creek running adjacent to the freeway. Some realignment of the existing slip roads and local road network may be necessary in this location in order to construct the station.

The main focus of this station is anticipated to be car and bus users. Multi-storey park-and-ride facilities are proposed, alongside significant 'kiss-and-ride' options for commuters. Secure bicycle parking is also expected to be under high demand.

Kew Chandler Station

Located between Kew and Alphington, the Kew Chandler station proposed in the Rapid Transit Option lies alongside and between the lanes of the Eastern Freeway, east of the intersection with Chandler Highway. The area is mixed use with the surroundings dominated by detached residential housing. The Royal Talbot Rehabilitation Centre and the greens and golf courses of the Yarra Bend area are within close proximity on the other side of the freeway.

The proposed station entrance would lie along the eastern edge of the station box, which would stretch southerly towards Princess Street. It is envisaged that the station entrance would be an overpass to enable passengers to safely cross the Eastern Freeway and gain access to the station.

Like the Bulleen station, the main focus of this station is anticipated to be car or bus users, with the station also serving as a secondary park-and-ride hub from the eastern suburbs. A number of major bus routes would provide connectivity to the surrounding suburbs, with a large number of kiss-and-ride and taxi bays also proposed. Again, secure bicycle parking would be expected to be in high demand.

Figure 6-7: Proposed Bulleen station location

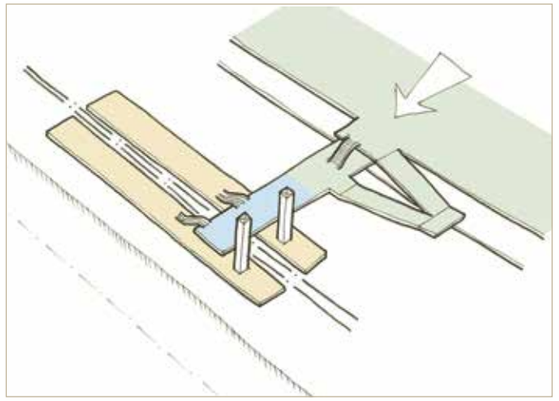


Figure 6-8: Access to a Bulleen station would likely require the construction of a pedestrian overpass over the train line

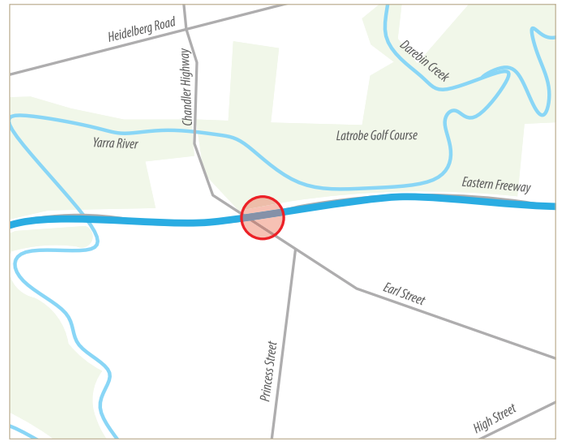


Figure 6-9: Proposed Kew Chandler station location

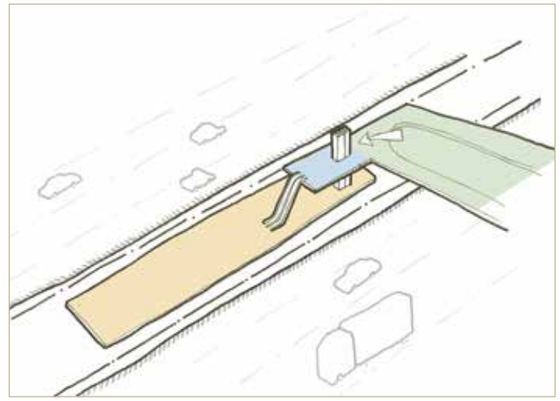


Figure 6-10: The Kew Chandler platform proposed by the study team is of 'island' construction, with the train lines and Eastern Freeway passing on either side

6.1.2 RAPID TRANSIT 2 ROUTE OPTION (RT2)

The route proposed for the Rapid Transit 2 Option (RT2) would provide the same fast, frequent rail service from Doncaster Hill to the CBD as Rapid Transit 1 Option (RT1), largely following the same alignment along the Eastern Freeway.

The RT2 option would deviate from that of RT1 around Yarra Bend Road. At this location, the alignment would move into a tunnel, crossing under the westbound carriageway of the Eastern Freeway before continuing to the south of Alexandra Parade. An underground station would be located near the corner of Brunswick Street and Alexandra Parade in Fitzroy.

The alignment would then head west to a proposed Parkville station where customers could interchange with the proposed Melbourne Metro service, continuing on to a new Flagstaff Gardens station adjacent to the existing Flagstaff station on the City Loop.

As this option would provide a new Doncaster rail line that would be operationally separate from the existing rail network, the additional works required to de-couple the Clifton Hill group discussed previously would not be required before this option could be constructed.

It is expected that the travel time between Doncaster Hill and Flagstaff Gardens would be in the order of 20 minutes. The Rapid Transit 2 Route Option would include the four stations discussed as part of RT1 and three additional stations of Fitzroy, Parkville and Flagstaff Gardens.

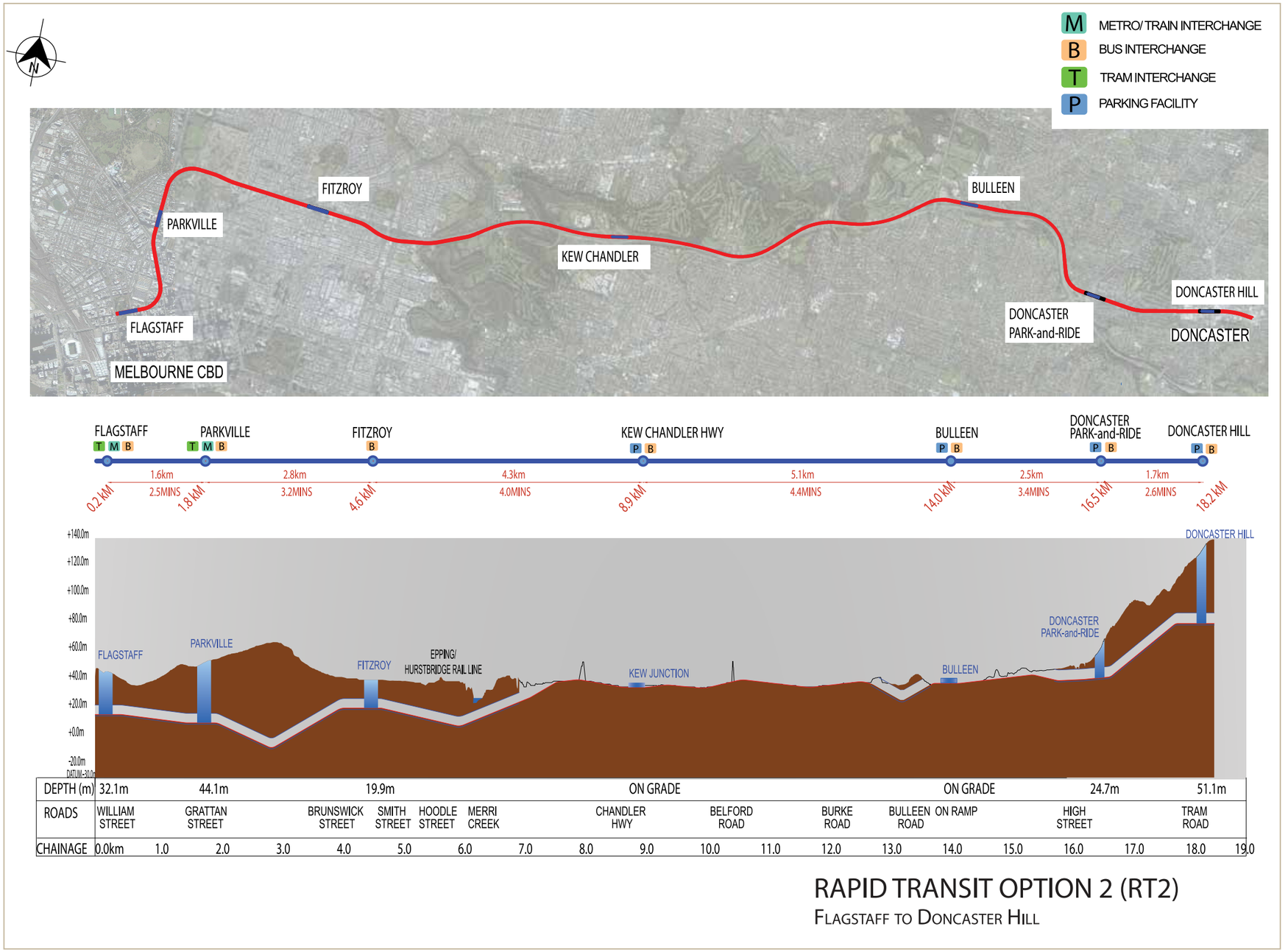


Figure 6-11: The proposed Rapid Transit 2 Route Option. Between Doncaster Hill and the western extent of the Eastern Freeway, RT2 is identical to RT1. Beyond the freeway, the new line would pass underground via a proposed new station at Fitzroy to Flagstaff.

Fitzroy Station

Located on Alexandra Parade, near its intersection with Brunswick Street, the Fitzroy station would be located within a tunnel, approximately 20 metres below the existing ground level. The area around the station is of mixed use with a large percentage of residential properties. The Fitzroy Swimming Pool is located within walking distance.

Car parking would not be encouraged at this location, but dedicated kiss-and-ride and taxi bays are proposed. Secure bicycle parking would be expected to be in demand.

A single station entry from the corner of Brunswick Street and Alexandra Parade is proposed, serving the eastern end of the shallow underground platforms. The corner location would provide the opportunity for the entrance to have development located above and alongside that station, integrating the station into the existing commercial fabric of the area.

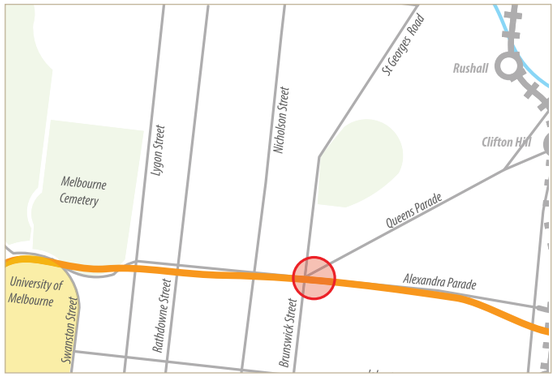


Figure 6-12: Proposed Fitzroy station location

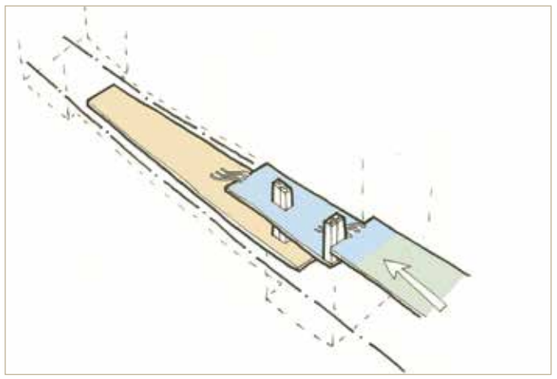


Figure 6-13: Lifts and escalators could be used to provide access to the island platform at Fitzroy station

Parkville Station

Situated approximately 44 metres beneath Royal Parade, the proposed Parkville station would be located perpendicular to the proposed Melbourne Metro Parkville station beneath Grattan Street. It is envisaged that both of the proposed Parkville stations could share a common station concourse, enabling passengers to easily transfer between services.

Located at the northern edge of the CBD, the area around the proposed station is mixed use within a largely commercial and medium to high density residential area, which is dominated by The Royal Melbourne Hospital and faculty buildings of the Melbourne University.

Flagstaff Gardens Station

The proposed Flagstaff Gardens station would be a major station and the terminus point for passengers on the RT2 Route Option. The track infrastructure could continue west if necessary, to provide train access to maintenance and stabling facilities on the existing rail network north of North Melbourne station.

The proposed station would be positioned beneath Flagstaff Gardens between King Street and William Street, located parallel to the existing Flagstaff Station. With excellent tram and train services located nearby, it is not proposed to provide any parking or bus bays at this station.

The possibility exists to connect the station to Flagstaff station on the City Loop by way of a pedestrian link.

Figure 6-14: Proposed Parkville station location

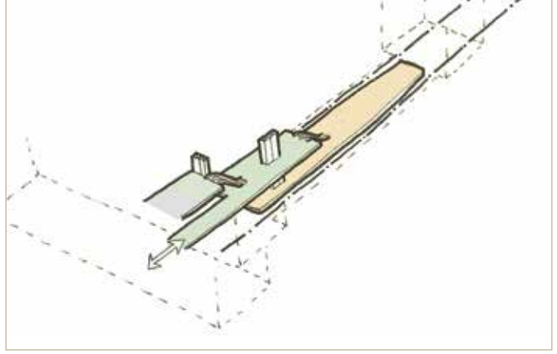


Figure 6-15: The proposed platforms at Parkville station are located deep underground, providing the opportunity to situate an entrance near Grattan Street if desired and integrate the station with a new tram super-stop on Royal Parade.

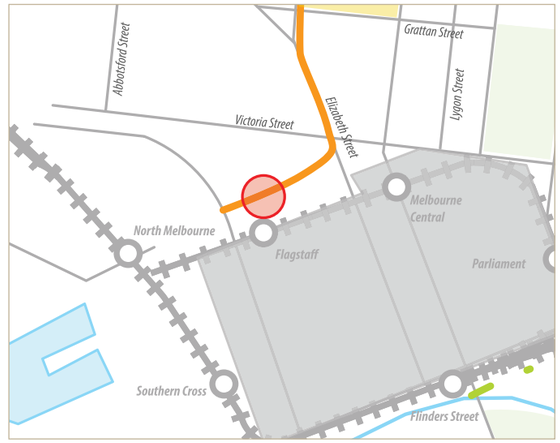


Figure 6-16: Proposed Flagstaff Gardens station location

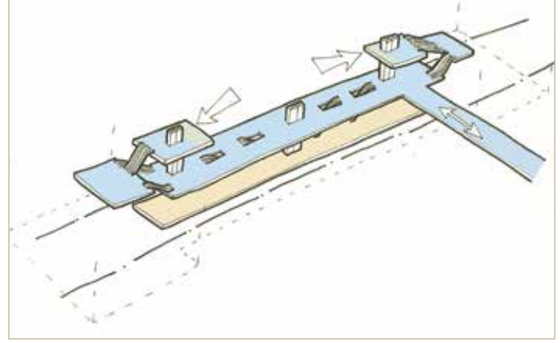


Figure 6-17: The study team's proposal envisages Flagstaff Gardens station to have platforms located deep underground, with entrances at either side. Both entrances would likely require both lifts and escalators.

CASE STUDY—MANDURAH LINE, PERTH, WESTERN AUSTRALIA

Figure 6-18: The Mandurah line, Murdoch Station shown from the edge of the Freeway

The Mandurah line in the southern suburbs of Perth is a 71 kilometre long railway linking the city of Perth with Mandurah. The railway opened in 2007, and passes through approximately one kilometre of tunnel under the Perth CBD before running along the central median of the Kwinana Freeway for the next 30 kilometres. The final 40 kilometres runs through a mixture of greenfield land and the developing southern suburbs of Perth.

The line has proved successful in capturing patronage of almost 60,000 passengers per day. Access to the line is predominantly provided by connecting bus or park-and-ride facilities. Due to the freeway-centred location of many of the stations, walk-up catchment is limited due to the distance of the line from residential areas.

The line has some similar characteristics to the Rapid Transit Theme considered as part of this study, in that both use a freeway alignment for part of the route and both lines rely on the extensive use of park-and-ride facilities. Direct comparisons between the two railways should only be made with great caution however. The Mandurah railway was constructed in a very different physical and economic environment from that predicted for the Doncaster rail line; they use different rolling stock and serve demographically different areas.

Due to the fully urbanised nature of the Doncaster route, tunnels are required for all parts of the alignments that are not along the Eastern freeway. This results in substantially more tunnelling than was required in Perth, where much of the route was constructed in greenfield pre-urban areas.

Further, the Mandurah line serves the rapidly growing southern growth corridor of Perth, where the population is growing at round five per cent per year. By contrast, the fully urban Doncaster corridor is experiencing slow annual population growth of significantly less than one per cent per year. This limits the ability of a Doncaster railway to facilitate and benefit from the type or scale of land use change that has occurred in Perth.

Cost comparisons have been drawn by some between the completed Mandurah line and a proposed Doncaster rail line. It is the opinion of the study team however that these comparisons seek to over-simplify the very different nature of these distinct rail lines, drawing comparisons where they are alike, but failing to recognise some very important differences between the two. Table 6-1 shows the likely effect that some of these key differences could have upon the construction costs of the two projects, highlighting some of the significant influencing factors which must be considered when seeking to draw comparisons.

DIFFERENCE	DONCASTER	MANDURAH	EFFECT	COST DIFFERENCE
Working Environment	Brownfield site, working in constrained environment and median of live freeway	Though partly constructed on a pre-existing busway, this was only for a relatively short section of the entire route. The Mandurah line is around 72 kilometres long, and in the southern sections the railway was constructed within a very wide median or, in some sections, before the second freeway carriageway was built. Access to the majority of the railway site was therefore relatively easy for construction.	Brownfield sites with access difficulties such as those expected on the Doncaster line create significant constraints upon working methods and construction techniques which reduce efficiency and impose addition costs	Construction within a brownfield environment could typically attract a significant premium when compared with greenfield construction. A tenfold increase in costs would not be unreasonable to assume
Stations	A number of underground stations are likely to be required	The majority of stations are constructed at-grade, with some underground stations which are significantly shallower than those proposed for the Doncaster rail line	Underground stations are generally more expensive to build than simple at-ground stations	Underground stations are generally in the order of five times more expensive than at-grade stations to construct
Construction Inflation	Price estimates have been provided at a 2012 price base	Mandurah line opened in 2007	Industry indices indicate that significant construction inflation has occurred between 2007 and today	Construction inflation could easily add 33% to any construction prices over the intervening period
Electrification	The proposed Doncaster line would utilise a 1500v DC system to ensure compatibility with the rest of the rail network	The Mandurah line utilises a 25kV AC system	DC is typically more expensive than AC to install, mainly due to the requirement for additional substation infrastructure	A DC system would typically cost twice as much as a comparable AC system
Bridges/Ramps	A number of large bridges would be required along the proposed alignments	Although the Perth Narrows bridge is a substantial structure, the majority of bridges constructed as part of the route were relatively minor in scale	Large complex structures spanning freeway and environmentally sensitive waterways are significantly more expensive to design and construct	Complex bridge construction sequences and detailing can make such structures in the order of twice as expensive as simpler designs
Ground Conditions	Melbourne has relatively complex ground conditions, with materials ranging from hard rock (basalt), through siltstones and sandstones, to soft alluvial deposits	The Mandurah line was largely constructed upon permeable sand subgrades	Having consistent, highly permeable subgrades would have made any earthworks or tunnelling required for the Mandurah line much simpler than that required in Melbourne. The permeability of the sandy subgrade would also substantially reduce the overall cost of drainage along the entire rail reserve.	Complex ground conditions can add considerably to both the cost and risk of construction when compared with simpler subsoil environments
Tunnelling	In all of the options considered as part of this study, it is likely that a significant proportion of any rail alignment will require to be in tunnel	The Mandurah line consists of only a very short section of tunnel (less than one kilometre), which accounts for only around one per cent of the entire route length	Tunnels are very expensive to construct and maintain. Having a proportionally greater amount of tunnelling will have a significant effect upon the cost of any civil engineering project.	Tunnelling operations are largely unique, and vary in cost depending upon a number of factors. Typically however, tunnelling costs in the order of ten times as much as construction above ground.

Table 6-1: Key differences between the Mandurah Rail Line and a Doncaster Rail Line

The Eastern Freeway was designed with a widened median between Hoddle Street and Bulleen Road. This provides the opportunity for the Doncaster rail line to be located within the existing road boundary.

6.1.3 RAPID TRANSIT 3 ROUTE OPTION (RT3)

The Rapid Transit 3 Option (RT3) proposed by the study team would follow the same alignment as RT1 and RT2 as it passed from Doncaster Hill to the Doncaster Park-and-Ride and along the Eastern Freeway. At the end of the Eastern Freeway this line would dive into a tunnel and then head underground for the remainder of the route to the city.

The line would turn southward from Alexandra Parade around Smith Street, with an underground station located near Smith and Johnston streets in Collingwood. The line would continue below Smith Street, before turning westwards under Victoria Parade. A station is proposed in the vicinity of St Vincent's Hospital, near the corner of Nicholson Street and Victoria Parade.

From here the line would continue westwards to the terminate at the last station at Franklin Street on the north side of the CBD located one city block north of the existing Melbourne Central station. The station would directly connect to the proposed CBD North station that is planned as part of the proposed Melbourne Metro Project.

Like RT2, the RT3 Route Option would operate as a stand-alone system and would not require any enabling works to be carried out upon the existing Clifton Hill group of rail lines. It is slightly shorter than the RT2 route, so the expected travel time between Doncaster Hill and Franklin Street would also be slightly less than the RT2 Route Option, at just under 20 minutes.

The RT3 Route Option is envisaged to include the four new stations discussed as part of RT1, alongside the three additional stations of Smith Street, St Vincent's and Franklin Street.

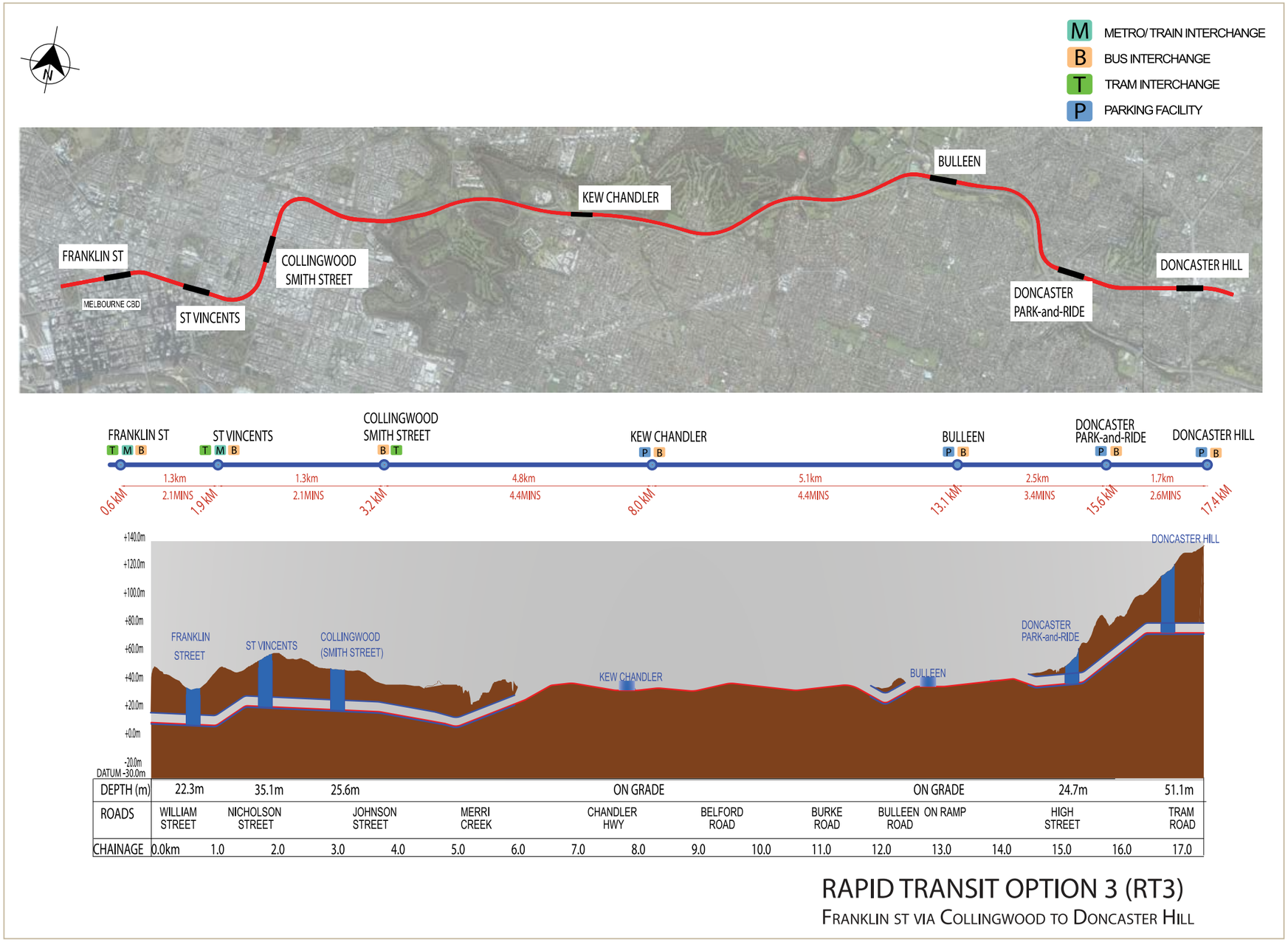


Figure 6-19: The proposed Rapid Transit 3 Route Option

Smith Street Station

The proposed Smith Street station would be constructed within a driven tunnel beneath Smith Street, just south of Johnston Street. The platforms are proposed to be at a depth of approximately 25 metres below existing ground level.

The urban environment surrounding the proposed Smith Street station includes medium density residential and commercial properties within Smith Street and Johnston Street, both of which are heavily populated with retail shops and restaurants. Current public transport provision within the area is focused upon buses and trams, with trams running along Smith Street, Johnston Street and Brunswick Street.

It is proposed to place the entrance into the station on Smith Street, enabling passengers to easily interchange with the existing tram network.

St Vincent's Station

Located in close vicinity to Carlton Gardens and St Vincent's Hospital, the proposed St Vincent's Station would lie underneath Victoria Parade, between Nicholson Street and Brunswick Street. The station could be accessed from either the Nicholson Street/Victoria Parade intersection at the western end, or close to the existing tram stop on Brunswick Street at the eastern end.

Interchange at this station could also be possible for passengers wishing to access the City Loop, with Parliament station only a short (five-minute) walk to the south.

The westbound road lane of Victoria Street and adjacent tram tracks would likely require re-alignment to provide space for a station entrance north of the College of Surgeons if this option was pursued further. This area would provide opportunity for a dedicated entrance sensitively located within an improved landscape north of the existing college building, with lifts and escalators used to serve the deep underground platforms from the western end of the station.

Franklin Street Station

Located in close vicinity to the Queen Victoria Market at the northern perimeter of the CBD, the proposed Franklin Street station platforms would lie 22 metres below Franklin Street, between Swanston Street and Elizabeth Street. The station location would serve the CBD as the terminus of the RT3 Route Alignment, although trains could continue west to stabling and maintenance facilities on the existing rail network north of North Melbourne station.

The station could provide excellent interchange opportunities, with almost all major tram lines in close proximity to the proposed location. In addition, Melbourne Central and the proposed Melbourne Metro CBD North stations would both be located within a five-minute walk.

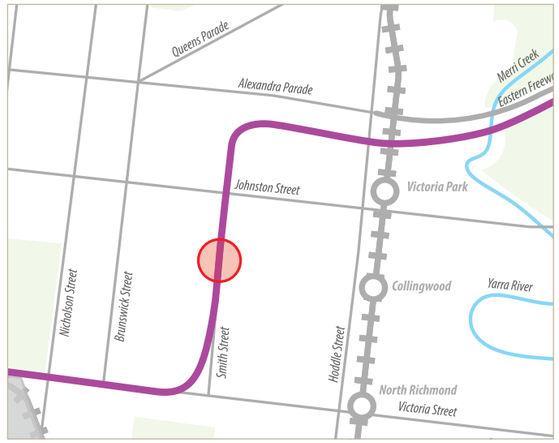


Figure 6-20: Proposed Smith Street station location

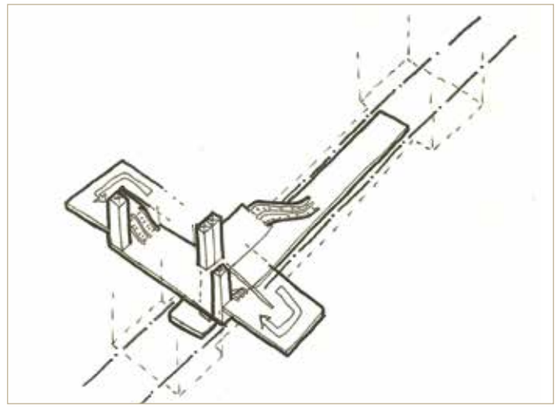


Figure 6-21: The proposed Smith Street station would predominantly use escalators to provide access to the underground platforms

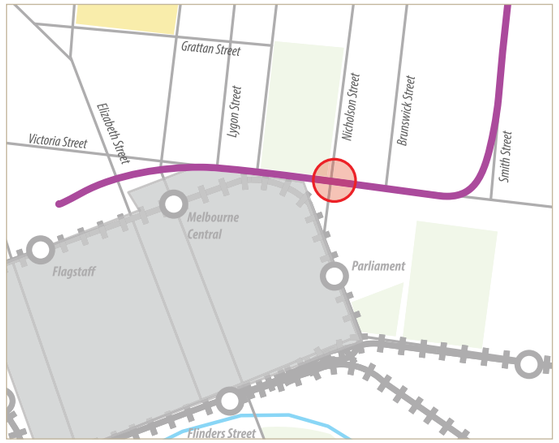


Figure 6-22: Proposed St Vincent's station location

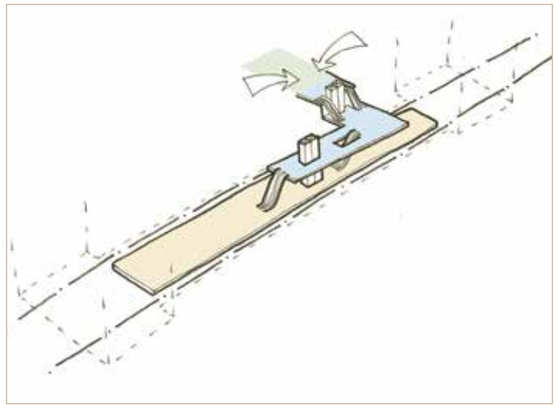


Figure 6-23: The proposed St Vincent's station would likely be accessed from a single entrance to the south of the station platform

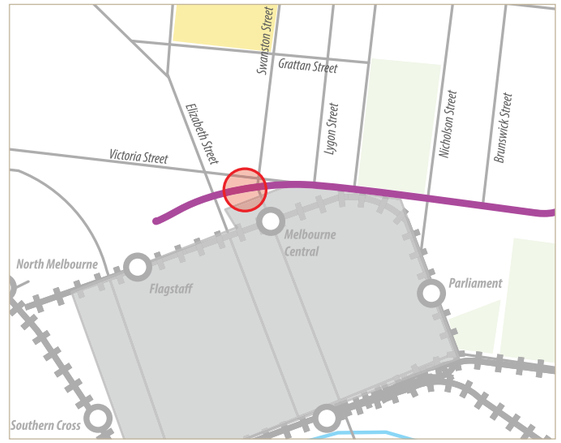


Figure 6-24: Proposed Franklin Street station location

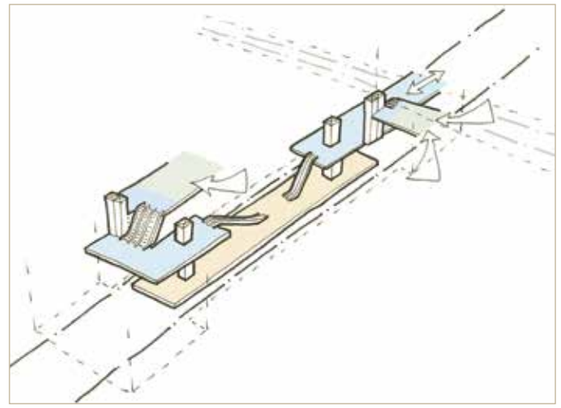


Figure 6-25: The proposed Franklin Street station platforms would be located underground, providing the opportunity to connect with the proposed Melbourne Metro CBD North station. Access would be provided through the use of escalators or lifts.

6.2 ENGINEERING/ENVIRONMENTAL ASSESSMENT AND COST ESTIMATES

6.2.1 ENGINEERING CHALLENGES

The main engineering challenges associated with the Rapid Transit Corridor Theme fall into four main categories: the challenges of tunnelling, constructing a railway within the median of a freeway, the complex connection into the existing rail corridor and constructing stations. Each is considered in turn:

Tunnelling

All of the Rapid Transit route options take advantage of the available surface corridor along the Eastern Freeway. However, topography dictates that the section from the Eastern Freeway intersection to Doncaster Hill would need to be located in a tunnel (surface running would be impossible due to the steep gradients of the hill). Similarly, where the options extend into the CBD either directly, or in the case of RT1 with the de-coupling of the Clifton Hill group, the land value and potential impact upon the dense urban environment would result in tunnelling again being required.

The two sections of tunnel required by each option are too remote from each other to enable efficiencies to be gained by using the same tunnelling methods or construction plant Therefore, each was considered independently by the study team.

Figure 6-26: A Tunnel Boring Machine (TBM) similar to that which could be used to construct a Rapid Transit Option underneath the CBD

Looking first toward the section of tunnel between Doncaster Hill and the Eastern Freeway, this section of tunnel would likely lie within a type of rock known as the Melbourne Formation, comprising sandstone and siltstone. Given the relatively short length of tunnel, it is unlikely that a Tunnel Boring Machine (TBM) would be economically favourable for this section. In addition, the requirement for rail crossovers between the two tunnels approaching the terminus would mean that a more traditional, 'mined' tunnelling approach would be more likely.

The tunnels required underneath the CBD are much longer, however. It is likely that they would also predominantly lie in the Melbourne Formation of sandstone and siltstone, with volcanic intrusions. It is likely that a TBM may be the most efficient way to excavate these tunnels.

Constructing Within the Freeway Median

The Rapid Transit alignments are all proposed to take advantage of the wide central median of the Eastern Freeway between Yarra Bend Road and Bulleen Road. Construction within the median of an operational freeway involves challenges and consideration would have to be given to the optimum construction methodology should any of these options be considered further.

Figure 6-27: An example of traffic lanes being diverted onto the road shoulder, with a barrier separating construction from traffic

It is likely that the freeway lanes could generally be maintained by installing barriers to separate traffic from the rail works and diverting the traffic lanes either to the side or over sections of any structures that have been completed.

Figure 6-28: Access to the works within the operating freeway could be either through the section of completed tunnel from a work site, or by entry directly off the freeway lanes

COMMON TUNNELLING TECHNIQUES

There are two common tunnelling techniques that have been proposed by the study team for different parts of the various alignments proposed: driven tunnels and cut-and-cover tunnels.

Driven tunnels are constructed by excavating below the surface and supporting the ground as it is removed. While there are many techniques available, the tunnels in this project would be excavated by Tunnel Boring Machines, which comprise a rotating cutter head, a section containing the operating equipment and a section within which the structural lining of the tunnel is assembled. The type of TBM proposed controls the material entering it by limiting the material that is removed from behind the cutting head. This system also limits the inflow of groundwater. The lining of the tunnel is erected as a ring of individual segments, sealed against water. The TBM pushes itself off the completed section of the lining to advance into the next cut.

Cut-and-cover tunnels are constructed from the surface. The two methods proposed for this project are 'top down' and 'bottom up'. Where possible, the 'bottom up' method is used. To limit the width of excavations, the tunnel walls are constructed from the surface, acting as retaining walls during excavation. The ground is then removed down to the base level, installing temporary props between the walls for support. The tunnel structure is then constructed back up to its roof slab level and the tunnel is covered. When it is necessary to reuse the area above the new tunnel as quickly as possible, the 'top down' sequence can be employed.

After installing the tunnel walls, the roof slab is constructed as soon as the excavation reaches the required level. This allows backfilling to surface level as early as possible. The tunnel is then completed, with the soil removed and the tunnel structure being completed beneath the roof slab.

Connection to Existing Clifton Hill Group

Previous alignments considered for the Doncaster rail line have included routes along the Eastern Freeway, with a connection onto the Clifton Hill group of lines at or near the existing Victoria Park station. Developed mostly around the time of the construction of the Eastern Freeway, these early concepts envisaged the railway running within the freeway median to a point east of Merri Creek and then diving down into a shallow cut-and-cover tunnel constructed just beneath the freeway off-ramp to Hoddle Street. The concepts then envisaged the railway rising up and connecting onto the existing railway tracks via an at-grade rail junction (a flat junction) and then onto a reconfigured station at Victoria Park.

This concept was considered as part of this study and although the concept may have met the standards and functional requirements of the day, it was not considered to provide suitable option for a new Doncaster rail line for two key reasons.

- The installation of a new flat rail junction would adversely impact the existing train timetables and overall reliability of the rail network. Flat junctions require trains to slow down considerably before they cross and in this case, would mean that the Hurstbridge/South Morang trains would have to be stopped each time a train left or re-joined the existing tracks en-route to Doncaster. With the significant increase in rail services seen on the corridor since the 1970s and the anticipated on-going growth in patronage demand, it was the opinion of the study team that it would be undesirable to add a constraint of this magnitude into the rail network.

  The alternative options proposed as part of this study (the RT1 Route Option) instead allows for a full rail/rail grade separation, permitting the optimisation of rail timetables and enhanced reliability within the proposed arrangement.

  It is likely, however, that the existing Victoria Park station would have to be abandoned in order to permit this option to be constructed, with passengers instead directed to Collingwood station located around 600 metres to the south.

- Were it to be determined that a new flat rail junction would be acceptable on the existing Clifton Hill line, it could be possible to accommodate a new Doncaster rail line by reconstructing Victoria Park station slightly to the south of its current location. However, the new station platforms would need to be on grades significantly steeper than the maximum permitted by current rail standards. Further, it is likely that the reconstructed station could not be made compliant with the requirements of the *Disability Discrimination Act 1992*, which is mandatory for any new infrastructure. Instead, with minor modifications proposed to Collingwood station, the study team feels that accessibility to the rail network for the local community could be improved, even with the removal of Victoria Park station.

Building New Railway Stations

All of the Rapid Transit route options include both underground and surface stations. A typical objective in underground station design is to lift the station as high as possible, both to reduce construction and operational costs and provide better public amenity within the station. However, the depth of stations proposed by the study team is in some cases controlled either by constraints of rail gradients or by the need to avoid other infrastructure.

Shallow underground stations are typically built as cut-and-cover. While opening a greater surface area, this method is often more rapid and usually the only feasible method if there is insufficient rock to form an arch over a mined excavation. On the other hand, deep stations might lend themselves to underground excavation. Where this is feasible, using a cavern excavation will reduce the volume of spoil to be removed and also reduce the surface area opened for the worksite.

However, excavation of the caverns requires the installation of ground support during excavation to control ground movements, whereas open cut excavation involves installing part of the support before excavation. This method can provide a stronger ground support, reducing ground movement.

With so many competing variables in determining the optimum construction method for each station, it is impossible for the study team to provide a definitive opinion regarding the types of construction that should be used for any particular option. Further consideration will be required regarding optimum construction methods should any option be considered further.

6.2.2 ENVIRONMENTAL IMPACTS

Flora and Fauna Effects

The Rapid Transit alignments predominantly use the central road reserve of the Eastern Freeway. This minimises impacts to flora and fauna values, as those within the reserve are considered degraded and are unlikely to have significant ecological values. There are certain areas, however, where these options have the potential to have an adverse impact, particularly in the vicinity of the Yarra River, its tributaries and associated areas of open space. A notable difference between the three Rapid Transit options is their treatment of the Merri River Crossing: both RT2 and RT3 pass under this sensitive area and so avoid impacting upon it, however the RT1 alignment crosses over the river on a structure, and is likely to require some clearance of native vegetation. This could impact upon water quality/aquatic habitat, and may result in the loss of habitat for a range of flora and fauna species.

Further adverse impacts of the Rapid Transit options are possible between the Doncaster Park-and-Ride and Bulleen Road stations. In this section, it is proposed that all three alignments pass immediately to the north of the Eastern Freeway, before crossing into the median using a cut-and-cover tunnelling technique.

Vegetation on the northern side of the Eastern Freeway is considered to be of higher value than the vegetation of the central road reserve. The origin of the trees in this location is unknown, but the area is likely to comprise of planted native and exotic vegetation mixed with remnant vegetation. Invasive weed species and garden escapees are also likely to be prevalent. Detailed analyses of these areas and potential mitigation techniques should be investigated if any of the Rapid Transit options are developed further.

Figure 6-29: Existing vegetation to the north of the Eastern Freeway

Historical Heritage

With the majority of the Rapid Transit options either following the existing freeway or being located in tunnels, any adverse impacts of the options with regard to historical heritage are expected to be focussed in the vicinity of the proposed station locations within the CBD area.

The study team undertook an analysis of potential effects of the various station forms proposed and identified a number of sites of historical significance, although none were deemed to involve a significantly adverse impact. These issues should be considered further should any of the Rapid Transit options be developed in more detail.

Figure 6-30: Dights Falls

The only other significant feature of historical significance along the routes is the Dights Falls Reserve at the junction of Merri Creek and the Yarra River. Dights Falls is included on the Register of the National Estate and the remnants of Dights Mill at this site are included on the Victorian Heritage Register and also listed on the National Trusts of Australia register as a heritage place of state significance. Measures would need to be taken to minimise or mitigate any potential effect that a final alignment would have within this area.

Aboriginal Cultural Heritage

Due to the highly disturbed nature of the lands through which the Rapid Transit options pass, areas of potential Aboriginal cultural heritage sensitivity along the route options are confined those located in proximity to waterways, principally the Merri Creek and the Yarra River.

The Wurundjeri-willam people were the original occupants of what are now the northern suburbs of Melbourne. The abundance of waterfowl, fish and other food in the area of the junction along the Merri Creek and Yarra River meant that the Wurundjeri-willam people would have chosen to camp here, especially during favourable seasons. It was also an important meeting place for trade, marriage, dispute resolution and other ceremonies.

The rocky outcrop at Dights Falls was a natural crossing place used by the Wurundjeri and the area remains an important spiritual place for Wurundjeri people today.

There is the potential that the Merri Creek and Yarra River crossings proposed as part of the RT1 alignment will impact upon this area. Further work should be carried out to understand this potential impact, should this option be considered further.

6.2.3 COST ESTIMATES

The study team has developed a high-level, indicative cost estimate to allow for the fair comparison of the various route options considered here. This assessment was based largely upon the lengths of tunnel required and indicative unit costs for the major construction components. The estimates quoted are total project costs, including new rolling stock requirements, planning and design costs and are based upon 2012 prices.

The estimates provided here should not be considered as detailed cost estimates for the route options considered, as only high level assessments of the route options have been carried out as part of the Phase One study process. It is recommended that more detailed cost estimates are provided for any options taken through to Phase Two of the study.

Rapid Transit 1

As discussed in section 6.2.1, the RT1 Route Option is the shortest of the three rapid transit options considered and would require the least amount of expensive tunnel construction. This results in this option having the lowest cost estimate:

ESTIMATED COMPARATIVE COST OF RT1:
$4 billion — $6 billion*

* It must also be remembered that this option cannot be constructed without significant additional works being carried out on the existing Clifton Hill group of lines, including de-coupling the South Morang line to provide it with an alternative route into the CBD. For this reason, the cost of these additional works must also be included when considering the RT1 Route Option. The study team has not developed cost estimates for these additional works, but recognise that these could cost around the same as the RT1 works.

Rapid Transit 2

The RT2 option is significantly longer than the RT1 Route Option, with additional bored tunnel required in order to reach Flagstaff Gardens station and provide the opportunity for passengers to interchange with the City Loop. Three additional stations are also required for this option, all of which would be constructed at depth within the inner city. These additional works would add significant cost to the construction of the new rail line, as can be seen in the total cost estimate:

ESTIMATED COMPARATIVE COST OF RT2:
$8 billion — $10 billion

Rapid Transit 3

The RT3 Route Option is similar in length to RT2 and also requires the construction of complex stations under the CBD. The estimated project cost would therefore be similar to RT2:

ESTIMATED COMPARATIVE COST OF RT3:
$8 billion — $10 billion

6.3 TRAVEL DEMAND AND TRANSPORT INTEGRATION

Expected Patronage Levels

As discussed previously, VITM was used to model the expected patronage levels for each of the corridor themes. For the purpose of this study, VITM was run on what is known as an 'unconstrained basis'. This means that the model did not take into account the actual capacity of public transport services and car parking facilities, although it does account for the actual capacity of road links. The benefit of this method is that it allowed the study team to identify the available demand for services and parking facilities irrespective of future decisions regarding provision.

Where this demand can not be satisfied, for example at the Doncaster Park-and-Ride station where there is insufficient space to provide the number of car parking facilities that the model suggests may be desired, it is likely that a redistribution of travel modes would occur across train users. This would have the effect of increasing the number of people walking, cycling and using available bus services to reach the new train stations from that shown by the model, thereby reducing the number of people using their cars. It is recommended that more detailed analysis of this effect is undertaken once preferred route options are known.

The results of the 2031 VITM patronage modelling carried out for the rapid transit options are shown in Table 6-2.

Due to the improvements required on the Clifton Hill group to facilitate the construction of the RT1 Route Option, the VITM modelling found this option also increased patronage demand on the redeveloped South Morang line by around 6,000 passengers per day in each direction.

The demand for passenger boardings at each station, as well as the associated modes of access and egress was assessed by the study team for each option. The results for each of the rapid transit alignments were found to be very similar, with the RT1 results shown in Figure 6-31.

RT1—Where Do Passengers Come From?

The VITM patronage modelling results indicates a negligible difference in the quantum of public transport passengers between the base case (assuming no rail line, but retaining DART) and the rapid transit rail options. There is no significant mode shift from private vehicles use to rail as provision of a Doncaster rail line itself does not create additional public transport demand.

Passengers currently using the DART service simply transfer to the new train service and other customers are largely attracted from the existing Lilydale/Belgrave and Hurstbridge lines. DART is already achieving a significant reduction in congestion on the Eastern Freeway in particular, and demand for DART is forecast to continue to grow to 2031.

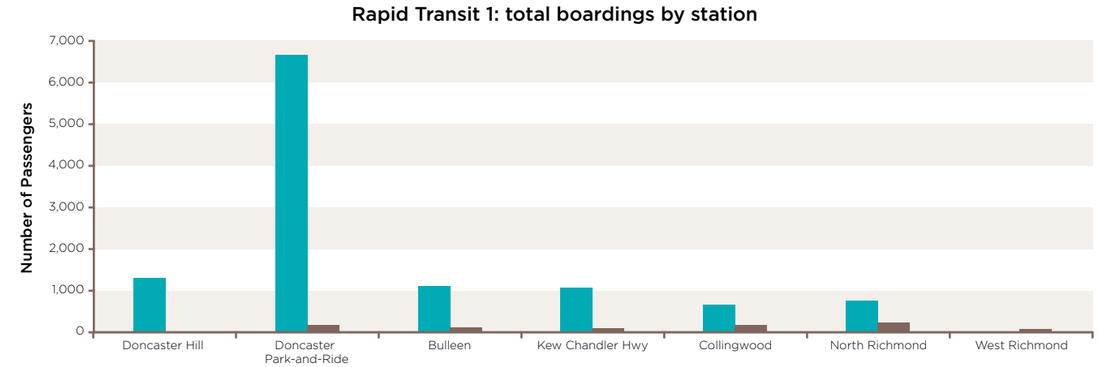
The percentage of customers that would be expected to shift from each mode in 2031 is shown in Table 6-3.

	2031 PATRONAGE ON THE BUSIEST INBOUND SECTION OF LINE DURING THE MORNING PEAK PERIOD (7.00 AM TO 9.00 AM)	2031 PATRONAGE ON THE BUSIEST OUTBOUND SECTION OF LINE DURING THE MORNING PEAK PERIOD (7.00 AM TO 9.00 AM)	2031 DAILY TRIPS IN EACH DIRECTION
Rapid Transit 1	11,800	3,800	28,000
Rapid Transit 2	11,700	4,500	31,000–35,000
Rapid Transit 3	11,100	4,000	30,000

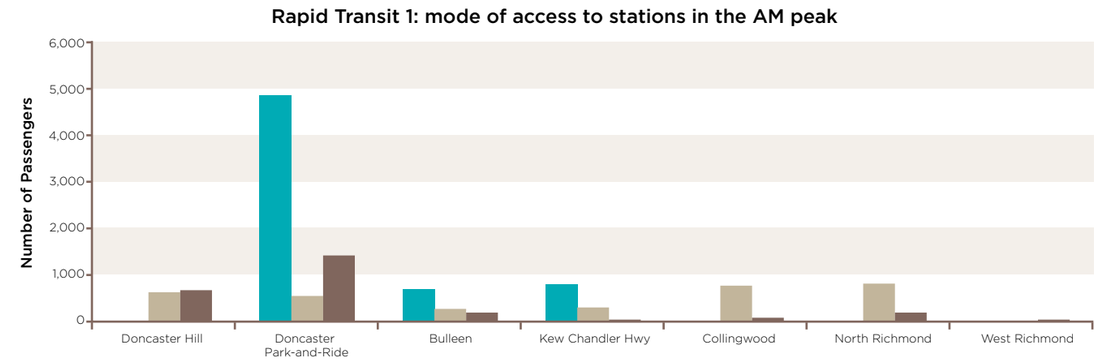
Table 6-2: Expected 2031 patronage levels

WHERE WOULD THE RAIL PASSENGERS COME FROM?	2031 PERCENTAGE OF CUSTOMERS TRAVELLING INBOUND DURING MORNING PEAK PERIOD (7.00 AM TO 9.00 AM)
Existing DART customers	50%
Existing rail customers currently travelling on the Lilydale/Belgrave and Hurstbridge lines	48%
Private vehicle	2%
Total mode shift	**100%**

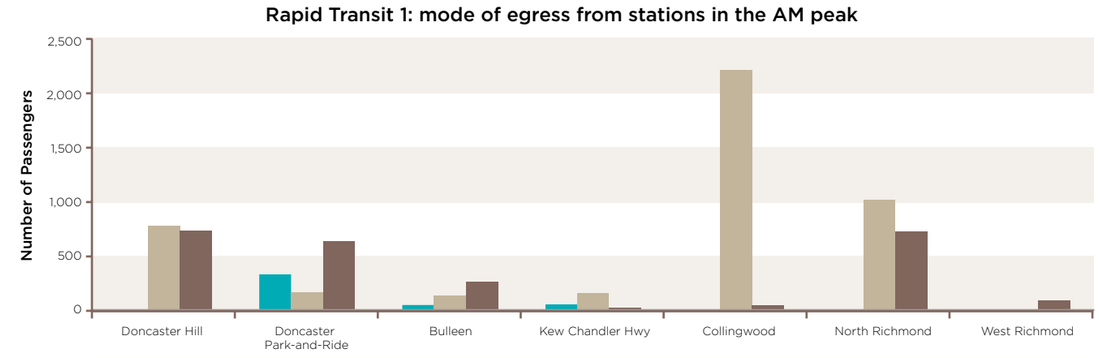
Table 6-3: Expected 2031 mode shift



	Doncaster Hill	Doncaster Park-and-Ride	Bulleen	Kew Chandler Hwy	Collingwood	North Richmond	West Richmond
Inbound	1,293	6,645	1,108	1,074	663	759	3
Outbound	0	170	36	26	178	237	13

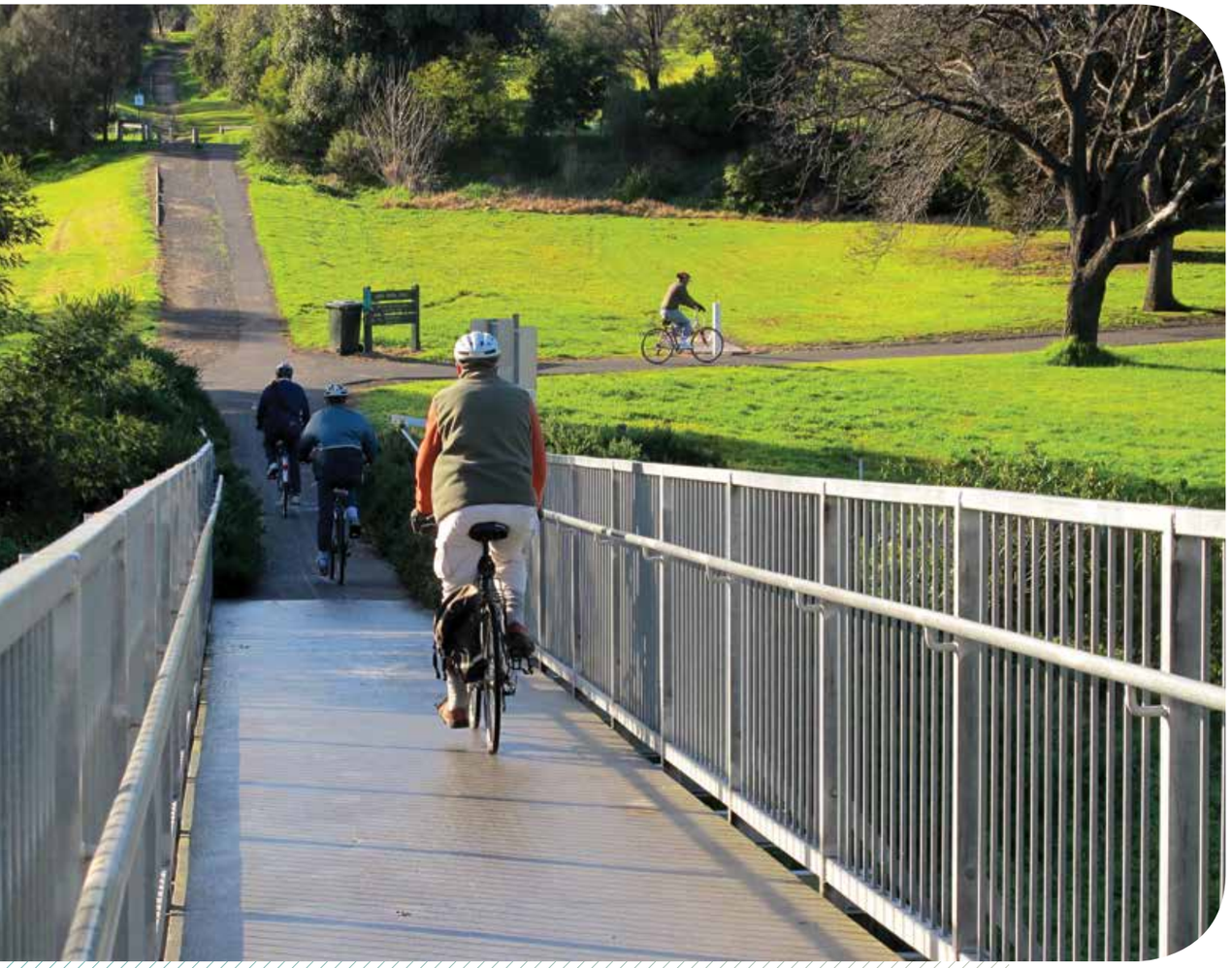


	Doncaster Hill	Doncaster Park-and-Ride	Bulleen	Kew Chandler Hwy	Collingwood	North Richmond	West Richmond
Park-and-Ride	0	4,858	692	795	0	0	0
Walk	624	544	264	295	764	809	0
Tram/Bus	669	1,413	188	10	76	187	16



	Doncaster Hill	Doncaster Park-and-Ride	Bulleen	Kew Chandler Hwy	Collingwood	North Richmond	West Richmond
Park-and-Ride	0	330	48	53	0	0	0
Walk	774	164	133	156	2,210	1,016	0
Tram/Bus	732	630	262	21	43	723	89

Figure 6-31: Expected passenger boardings for Rapid Transit 1 Option in 2031



Potential Changes to the Bus Network

One of the major benefits of bus services generally is that their routings and service frequencies are both flexible and relatively inexpensive. Therefore, with the introduction of a new Doncaster rail line, it is expected that the bus network within the study area would change significantly in order to maximise the efficiency of the entire public transport system. Consideration was given to the types of changes that may be most beneficial for each of the Rapid Transit alignments proposed. Both the SmartBus (DART) and local bus networks were considered.

Looking first to the DART network, the breadth of coverage that this network provides would allow it to be used as an effective 'feeder' service to the new train lines, while also continuing in its role as a local distributor. It is therefore envisaged that should any of the Rapid Transit options be progressed, the existing city-bound DART services would be terminated at an appropriate park-and-ride station. It is also envisaged that no other significant changes would be made to the existing network.

In general, the existing bus network provides good coverage to each railway station along the proposed rapid transit options. However, the study team feels that there would be merit in introducing a new bus service in Ivanhoe East along Lower Heidelberg Road, which would continue further onto Bourke Road. This new route could service a larger catchment north of the proposed Bulleen Road station, which could have the potential to support a greater level of bus/train transfer.

Various other minor bus re-routings were also considered by the study team, primarily with the aim of diverting existing services to stop as close to the rail stations as possible and thereby provide a better connection for passengers. These adjustments were included within the VITM model of passenger behaviour, however it is recommended that further work be completed in this regard should any of the Rapid Transit options be taken further.

It is also recommended that the operational hours, frequency and type of bus services operating throughout the study area are reviewed prior to the opening of any new Doncaster rail line. Although a good network of bus routes was identified as part of this study, many services are infrequent, as was confirmed by community and stakeholder feedback. This is particularly the case outside of the peak periods and at weekends. This infrequency does not encourage the use of these services, which could become a particular issue if there were to be poor connectivity with the new rail services. Bus and rail timetables should also be coordinated to provide efficient interchange opportunities and enhance the overall journey experience for users.

Walking and Cycling Opportunities

For each of the station locations on the new Doncaster line, consideration was given to the impact on cycle use by passengers and particularly, potential improvements to the Principal Bicycle Network (PBN) to provide this improved connectivity.

To assess accessibility to the proposed stations for cyclists, the study team considered the station's proximity to the PBN from all directions. The PBN is proposed to provide a high quality strategic cycle network across Melbourne. While it is recognised that many PBN routes are still under development, it has been assumed that the final network will be completed by the opening of the Doncaster line.

Both the existing and proposed PBN provide very good coverage in relation to the locations of the proposed Rapid Transit stations. Any proposed alterations should therefore be minor, with the main purpose being to provide better connections along each of the routes. The community identified seamless pedestrian and bicycle access to stations as a high priority from the engagement feedback received.

For the Rapid Transit options, the main recommended changes to the PBN are minor extensions into the proposed railway stations for improved connectivity. The only major recommendation is the consideration of a further pedestrian/cycle link across the freeway adjacent to Bulleen Station.

6.4 RAIL OPERATION IMPACTS

The most significant impact that the Rapid Transit options have upon the existing rail network is the requirement of the RT1 Route Option to de-couple the South Morang and Hurstbridge rail lines, in order to provide the requisite capacity for Doncaster services. This is discussed further in Section 3.0 of this report.

The operation of any of the proposed rapid transit options would change the passenger demand throughout the existing rail network. The results of the VITM modelling undertaken by the study team are shown in Table 6-4.

6.5 LAND USE, DEMOGRAPHIC CHANGE AND SOCIAL CONNECTIONS

The land use change potential and opportunities for residential development/intensification around stations are limited across the Rapid Transit theme options, with the key potential land use benefits to be realised in the Doncaster Hill Principal Activity Area. A Rapid Transit direct rail link to Doncaster would further stimulate the mixed use development that has already commenced and bring forward the timing of intensification of the Doncaster Hill area. However, it is unlikely that residential development and employment opportunities would be generated around stations along the freeway alignment as this serves a purely transport movement function.

The exception for development potential and change is the land surrounding the proposed Collingwood station (within RT1) and Smith Street station (within RT3), which have a moderate capacity to facilitate new residential development. It is estimated that up to 800 new residents could be added to the Collingwood station walkable catchment area by 2031 while the Smith Street station could generate in the vicinity of 1,000 new residents within the walkable catchment over the same timeframe.

It is considered that development potential around the proposed Parkville station is likely to occur regardless of the Doncaster rail line due to its significance on a state level as an education and medical precinct (Specialised Activity Area), albeit within significant local heritage planning controls.

While RT2 and RT3 slightly improve access to higher order health and education facilities at the proposed Parkville station, St Vincent's station and Franklin Street station (which links well to RMIT), these options do not traverse the established residential areas where the majority of these services are located and therefore offer minimal benefits.

Overall, the Rapid Transit theme options are not expected to substantially improve social connections by enhancing access to a range of social and community facilities, as very few of these are located within proximity to the Eastern Freeway.

	CHANGE IN LOADING DURING THE MORNING PEAK (7.00 AM TO 9.00 AM) (2031)		
	Rapid Transit 1	Rapid Transit 2	Rapid Transit 3
Lilydale/Belgrave line	-2468 (-9%)	-3618 (-13%)	-3500 (-12%)
Glen Waverley line	-257 (-5%)	-239 (-4%)	-239 (-4%)
Hurstbridge line	-341 (-2%)	-485 (-4%)	-485 (-4%)
South Morang line	2031 (+12%)	-126 (-1%)	-126 (-1%)
Route 48 Tram	-200 (-28%)	-200 (-28%)	-200 (-28%)

Table 6-4: Change in loading on existing rail and tram network after the opening of a Doncaster Rail Line

CORRIDOR OPTION	NO. OF HOUSEHOLDS WITHIN WALKABLE CATCHMENT AREA		POPULATION		FURTHER INCREASE ATTRIBUTED TO RAIL	
	2006	2031 (forecast)	2006	2031 (forecast)	Possible additional population in 2031	Total population forecast
Rapid Transit 1 (RT1) (Note: excludes South Morang de-coupling)	16,752	27,477	41,789	68,838	1,700	70,538
Rapid Transit 2 (RT2)	30,933	63,931	70,952	145,412	1,200	146,612
Rapid Transit 3 (RT3)	35,729	66,970	80,925	153,926	1,950	155,876

Table 6-5: Projected walkable resident population and household growth between 2006 and 2031 (walk-up population assumed to live between 800 metres and one kilometre of station locations)

6.6 COMMUNITY AND STAKEHOLDER FEEDBACK

The feedback collected and analysed throughout the study to date can be grouped into two parts: initial feedback received relating to issues, as well as ideas-gathering to address the community's concerns and understand potential opportunities and constraints. The engagement and feedback process then moved on to responding to the three corridor themes that were launched for community input in March 2012.

Throughout the engagement process relating to the three potential corridor themes, community and stakeholder views were particularly sought in relation to three key viability drivers. These were determined by the study team to be the most significant factors in assessing the viability of each option and included:

- **Customers:** the level of patronage each option could be expected to attract
- **Cost:** the estimated cost of constructing and operating each option
- **Land Use Potential:** the types of changes around station locations that could make the best use of existing infrastructure and help off-set the costs of constructing the new rail line.

The principal aim of gaining community and stakeholder input on each theme using this structured format was to explore how each option could be strengthened by reducing potential weaknesses and highlighting positive aspects. At the three community workshops held in March 2012, a series of prompt questions were used by table facilitators to help generate group discussion. For the Rapid Transit theme, these were:

- What factors are likely to affect commuters' decisions about whether to park-and-ride or drive into the CBD?
- What alternatives to park-and-ride facilities might attract rail passengers?
- How might this theme stimulate changes in land use?

The following is a summary of feedback regarding the rapid transit, relating to the three viability drivers of customers, cost and land use potential.

Customers

Many participants noted the attractiveness of the frequency of services and quicker travel times provided by this option. They highlighted the need to have well-serviced inter-model interchanges (which may be based on bicycles, buses or trams) to boost patronage, decrease car use and overcome the issue of having to locate car parking along the freeway. However, concerns were also expressed regarding the possibility of poor off-peak services, fewer stations and station locations that would make walking or cycling to the station difficult, especially for older people or those with limited mobility. Additionally, it was noted the existing DART buses provide an excellent service to the CBD along a very similar route.

Participants highlighted the need to enhance public transport for commuter travel to the CBD and the University of Melbourne/Parkville precinct, as well as improving travel options within the City of Manningham. However, concern was expressed that this option was CBD-focussed and should extend past Doncaster Hill to provide rail connectivity to the Templestowe and Warrandyte areas.

Given the existing capacity constraints currently experienced at the Doncaster Park-and-Ride facility, concerns were expressed regarding the lack of car parking proposed in the Rapid Transit theme options, as there are fewer stations and one is proposed at the existing Doncaster Park-and-Ride. Other community concerns related to the potential that this option would not reduce car reliance or freeway congestion. However, there was recognition that reduced congestion on the freeway was desirable and that a Rapid Transit heavy rail option could help achieve this.

Personal safety issues (isolation of station locations in freeway reservation or nearby parkland) and operational matters (potential accidents given proximity between cars and train line) were also raised by some participants as concerns.

Cost

It was generally considered that this option would be costly to build, but would be cheaper than the local access options. This was considered due to the lower amount of tunnel required, the availability of the median strip on the Eastern Freeway and links to existing public transport services.

However, concern was expressed regarding potential land acquisition, capacity issues on the existing rail network and the high cost of constructing a heavy rail solution. It was suggested that alternative transport options be considered to either reduce cost or replace the heavy rail option.

A number of separate participants throughout the engagement process, including the online blog forum users, expressed their view that the best heavy rail solution would be to combine parts of the Rapid Transit theme with parts of the local access theme to achieve a hybrid approach. This would essentially involve the undergrounding of all stations from the CBD to Kew Junction as per the local access theme which stops at frequent station intervals. The alignment would then cross to the Eastern Freeway north of Kew Junction and follow the rapid transit alignment to Doncaster via the freeway median, stopping at few stations between Kew Junction and Doncaster Hill.

Land Use Potential

Participants indicated that there was potential for development along the corridor, but that this should not come at the expense of green space and parklands. Concern was expressed regarding the possibility of local traffic congestion, as well as possible land use impacts associated with the project.

As noted previously, car parking provision is considered a key issue for this option. Additional parking would be required and how it should be accommodated is of particular concern. The amount required and its impact on the community and local environment was considered a key issue for this option.

There was generally recognition that this option would support or contribute to retail and economic growth in the area.

Summary

From the quantitative data collected from a total of 133 community participants during the engagement activities relating to the three theme options, it can be determined that:

- 61 per cent of respondents rated Rapid Transit Theme as their first preference
- 25 per cent or respondents rated Rapid Transit Theme as their second preference
- 14 per cent of respondents rated Rapid Transit Theme as their third preference

It is clear the Rapid Transit Options received a very positive response from members of the community and stakeholders who provided input during the engagement activities.

It is understood from many discussions at shopping centre information booths, workshops, feedback form comments, social media and the online blog forum that the community generally considered the Rapid Transit group of options to be the most practical of the three themes to be implemented. This was due to two key factors: a perception that the construction costs would be substantially less than the Local Access Theme as less tunnelling would be required and that travel times would be substantially faster given this option would not need to stop as frequently. From the feedback provided by those who participated, there was a general consensus that it would be preferable that this option was built as opposed to a 'do nothing' scenario, despite it potentially not attracting as many passengers as the Local Access Theme.

VIABILITY DRIVERS	POSITIVES	NEGATIVES
Customers	• Fast and frequent service seen as key benefit • Good access to CBD, Parkville and Melbourne University	• Access to stations difficult for non-car users • DART provides this service already • Safety concerns/isolated stations
Cost	• Expensive, but cheaper than Local Access options	• Disruption costs to freeway during construction period • High cost of heavy rail
Land Use Potential	• Develop car parking over airspace on top of Freeway • Maximise kiss-and-ride potential	• Large car parks likely to be required • Potential impact on parks and open spaces • Adverse pollution and noise impacts

Table 6-6: Summary of feedback relating to the proposed 'Rapid Transit: Express to City' theme from the three community workshops undertaken in March 2012

6.7 KEY OPPORTUNITIES

Connection to Clifton Hill Group—Fairfield Option

Early in the route identification process, a route option was considered by the study team that generally followed the alignment shown as RT1, but broke away from this alignment around the proposed Kew Chandler Station. Here the alternative alignment headed north-west to connect with the existing Hurstbridge line around Fairfield and then followed the existing Hurstbridge line south to the City Loop. This option was ruled out early in the study however, as it would have imposed additional travel time upon passengers seeking to reach the CBD, reducing passenger benefit for no associated increase in patronage.

Further demand modelling undertaken by the study team on the three corridor themes has shown the Parkville area to be a significant draw for passengers, however and it is possible that significant benefit could be derived from facilitating this passenger movement for passengers of the proposed Doncaster line.

It is therefore recommended that a variant of RT1 be considered in Phase Two of the Doncaster Rail Study, which follows the alignment of RT1 along the Eastern Freeway but then heads up to connect with the Hurstbridge line around Kew Chandler Station. This would allow passengers to interchange with the required new (de-coupled) South Morang line at Clifton Hill, providing passenger access to the north and west of the CBD. Such a solution would also overcome many of the engineering challenges inherent in connecting around the vicinity of Collingwood or Victoria Park stations.

Tunnel to Doncaster Hill

The eastern termination of each of the Rapid Transit themes would be relatively complex to construct and therefore expensive. Constrained by the location of the Eastern Freeway at the bottom of Doncaster Road, the alignment would have to travel in a tunnel up Doncaster Hill to a new station location. The steep gradient of Doncaster Hill, although not an issue for cars or buses, is too steep for trains to climb. For this reason, the depth of the tunnel would gradually increase as the alignment passed up the hill. At the terminus, a very deep station would have to be constructed that would require significant ventilation, access and emergency egress facilities. The study team estimates that the cost of constructing this additional tunnel length and new station would be in the order of $800 million to $1 billion. For these reasons, the study team feel that opportunity exists to reduce the cost of the Rapid Transit Corridor Theme by terminating the line at the Park-and-Ride station.

Patronage modelling shows that a new Doncaster Hill station would be relatively lightly trafficked. Figure 6-31 shows less than 1,300 passengers would board the train at that station each morning in 2031, with around half of that number walking to the station and half travelling there by bus to board the train.

RAPID TRANSIT—AT A GLANCE

- **Peak Hour Frequency:** 5 minutes minimum
- **Doncaster to City Journey Time:** around 25 minutes compared to DART, currently 35 minutes
- **DART Service:** altered to feed Doncaster Park-and-Ride station
- **Patronage:** forecast to be up to 56,000 average weekday boardings in 2031
- **Car Parks:** strong demand for car parking
- **Network Enabling Works:** Clifton Hill group must be de-coupled, providing South Morang Trains with dedicated city rail connection
- **Cost Estimates:**

  Rapid Transit 1: .....$4 billion — $6 billion (requires additional capacity on Clifton Hill group)

  Rapid Transit 2: .....$8 billion — $10 billion

  Rapid Transit 3: .....$8 billion — $10 billion


39M