CHAPTER THREE
PROBLEM

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CHAPTER SUMMARY AND CONCLUSIONS:

- Population and employment growth in SEQ, and the need to support economic growth and manage urban land use, are driving the need for investment in passenger transport.
- Problems to be addressed by the CRR Project have been investigated at three levels, specifically:
  1. Strategic problems facing SEQ:
     - Growing demand for mobility and connectivity is increasing pressure on SEQ's transport network.
     - Economic growth and productivity cannot be achieved without an effective transport system.
  2. Transport problems facing SEQ:
     - Growing road congestion, increasing car dependency and overcrowded public transport services are challenging the region's growth aspirations, restricting economic activity and impacting liveability.
     - Public transport trips are forecast to more than double between 2015 and 2036, which is beyond the capacity of the system. Limited capacity at the heart of the network is restricting its growth.
     - Servicing forecast growth in public transport demand, particularly for travel to and within Brisbane's inner city, will be impossible without additional infrastructure investment.
  3. Rail problems experienced on the SEQ network:
     - Rail is unable to function as the backbone of the transport network.
     - Brisbane's rail network has limited capacity and coverage compared with other major Australian cities, particularly across the inner city and CBD.
     - Limited inner-city rail tracks, river crossings and stations are creating bottlenecks in the system. Train services are becoming overcrowded, people are waiting longer at stations and reliability is decreasing as more passengers load onto limited services.
     - Demand for rail is expected to nearly triple by 2036 but the network will be unable to cater to this demand without new infrastructure.

3.1 Purpose and Overview of this Chapter

The purpose of this chapter is to clearly identify and articulate the problems to be addressed by the CRR Project.

This chapter outlines:

- The strategic context driving the need for a step-change in public transport capacity through Brisbane's inner city and CBD to improve access to inner-city jobs and unlock rail capacity constraints.
- Potential lost opportunities from continuing with the status quo, through a review of the role of high-capacity public transport in supporting economic growth and productivity objectives for the SEQ region.
- The current and future transport task and capacity constraints that are causing network congestion, overcrowding and reduced reliability.

3.2 Approach

The chapter initially discusses the relationship between land use, transport and the economy. It then describes current and future problems at three levels, specifically:

1. strategic problems facing SEQ
2. transport challenges facing SEQ
3. rail problems experienced on the SEQ network, considering rail's role as the mode best suited to meeting future travel demand.

Figure 3.1 summarises the key issues described in this chapter.

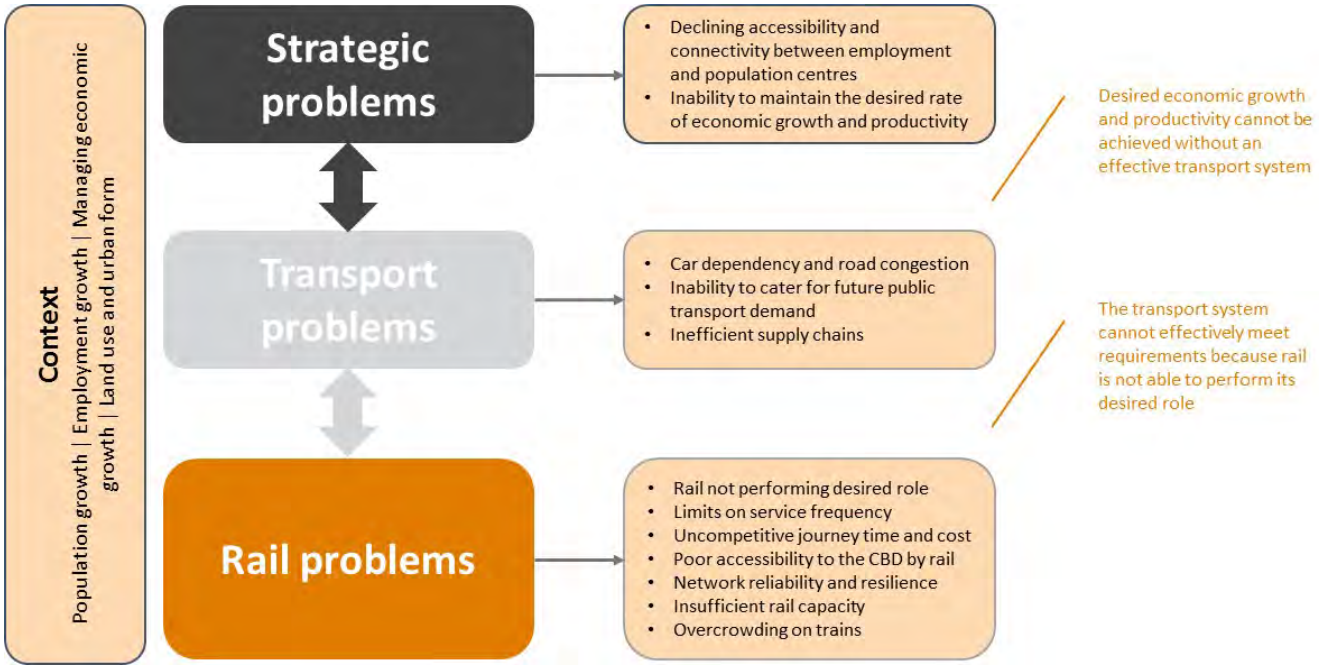

Figure 3.1: Summary of Key Issues as Presented in this Chapter

3.3 Context – Relationship Between Land Use, Transport and Economy

Efficient and effective transport infrastructure is essential to the growth and competitiveness of a city or a region. It is a key economic enabler, allowing efficient trading between businesses, workers to access job opportunities and residents and visitors to enjoy leisure activities.

It also shapes land-use planning by signalling where new or intensified urban development is feasible and underpins an appropriate spatial distribution of economic activity. By supporting denser land uses, well-planned transport infrastructure directly generates opportunities for agglomeration economies. Agglomeration is fundamentally about the productivity benefits that come from proximity, both in the physical sense and through good connectivity. Proximity lowers the costs of trade and of exchanging ideas and increases the pool of shared resources, both labour and capital, making cities more productive and attractive.

A well-planned transport initiative, coupled with appropriate land-use policies and interventions such as investment attraction, can make the transport system a catalyst for a wider site and city transformation.

The Australian Government's Smart Cities Plan indicates that most world-class cities have invested in fast, efficient public transport systems to provide viable alternatives to private vehicles[11]. These cities have used transport investments to reduce congestion, and its associated costs, and enable economic opportunity and growth.

Integrating transport, land use and the economy improves a city's competitiveness by:

- reducing the cost of commuting and trade by relieving congestion pressures
- improving the quality of life and the environment
- enabling efficient land use
- enhancing connectivity between businesses and people, thus boosting productivity.

Figure 3.2 presents an example of the city-building benefits of transport initiatives in Australia, specifically, Melbourne's City Loop (rail), City Link (road) and Western Ring Road projects (measured in gross value added between 1981 and 2011). This demonstrates the ability of rail projects to continue to deliver benefits in the long term.

[11] Smart Cities Plan

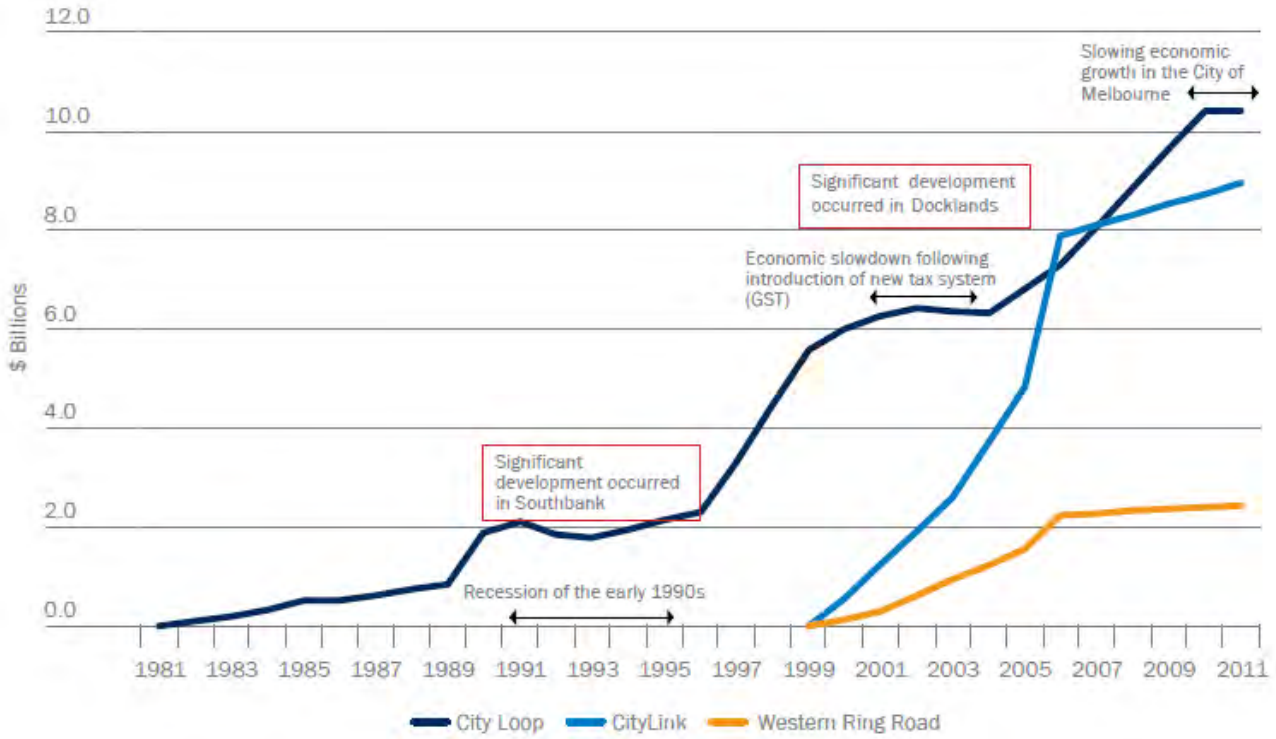

Figure 3.2: Benefit Stream Across Time of Selected Melbourne Transport Projects ($ billions), 1981–2011[12]

[12] State of Australian Cities 2014–15

3.4 Strategic Problems

When transport infrastructure does not achieve its primary purpose of connecting people with goods, activities and employment, economic growth and productivity become constrained. This erodes a city's attractiveness to residents, businesses and investors. Strategic infrastructure investment however can boost productivity, drive greater economic output and overcome accessibility constraints.

3.4.1 Accessibility

Growing demand for mobility and connectivity is increasing pressure on the SEQ transport network, resulting in longer and more variable travel times, crowding and congestion. As discussed in Chapter 2: Strategic Context, one of the biggest challenges facing the region is the distribution of forecast population and employment growth. As illustrated in Figure 3.3, the vast majority of the region's residential growth to 2036 is forecast to be outside Brisbane City but much of the employment growth is forecast to remain in Brisbane. This presents a considerable transport challenge.

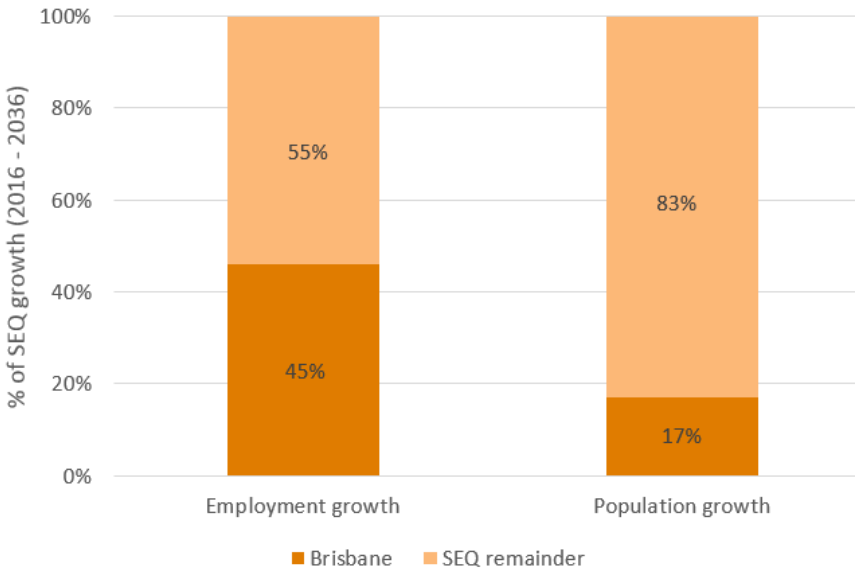

Figure 3.3: Forecast Brisbane Share of Population and Employment Growth 2016 to 2036[13]

The Bureau of Infrastructure, Transport and Regional Economics estimates that congestion costs in metropolitan capital cities was around $16.5 billion in 2015. It is forecast to reach between $27.7 billion and $37.7 billion by 2030[14].

When the costs of rapid population and economic growth increase faster than the benefits, regions can face significant issues. In SEQ, accessibility and connectivity decreases as the transport network struggles to meet demand under the weight of rapid population growth.

[13] Queensland Government population and employment projections, 2015
[14] Australian Government, Department of Infrastructure and Regional Development, Traffic and congestion cost trends for Australian capital cities, 2015

Poor land-use outcomes, such as unstructured growth in the form of urban sprawl, can also erode regional accessibility and connectivity. Areas with primarily homogenous land uses force residents to commute from their place of residence to areas of employment. The top corridors impacted by congestion within the Brisbane region, as identified by the 2015 Australia Infrastructure Audit, include north and south Brisbane extending to Logan and the Gold Coast. These hotspots represent core areas of concentrated transport movement, influenced by daily trips between residential areas and employment growth hubs.

Infrastructure that overcomes the issues of land-use segregation by connecting communities and markets is central to regional growth and productivity.

3.4.2 Economic Growth and Productivity

The world is becoming increasingly urbanised as people respond to the opportunities found in cities. Concentrating economic activity into urban areas boosts productivity, generating more jobs and jobs that are more productive.

The Australian experience of urbanisation is similar to the rest of the developed world. Australia has quickly become one of the most urbanised countries in the developed world with nine out of 10 Australians now living in urban areas. The United Nations forecasts that by 2050, around 93 per cent of Australians will be living in urban areas, as shown in Figure 3.4.

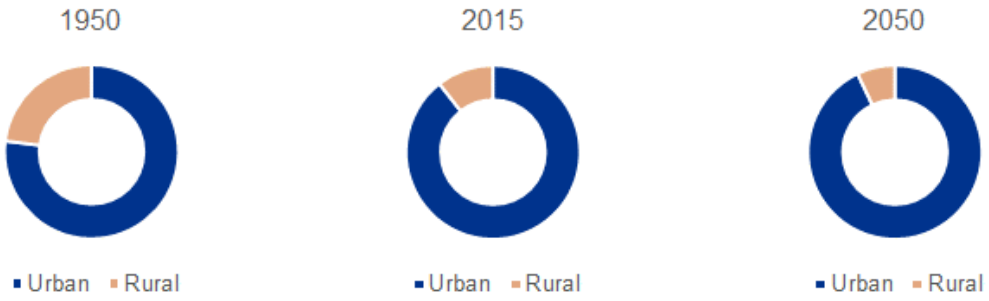

Figure 3.4: Australian Urbanisation Trends[15]

Connecting residential areas in the greater urban area with employment is essential to maintaining a productive city. Longer and more variable commute times, crowding and congestion are detrimental to meeting this fundamental need.

The Smart Cities Plan states that in the 21st century, cities need to be productive and accessible. Both Sydney and Melbourne are investing heavily in urban public transport to improve accessibility and enable economic opportunity. Without similar investment in strategic public transport infrastructure, Brisbane's economic strength will be weakened and SEQ will lag behind Melbourne and Sydney in urban competitiveness.

[15] United Nations World Urbanisation Prospects, 2015

3.5 Transport Problems

3.5.1 Introduction

SEQ's transport network is at a critical juncture as issues such as growing road congestion, increasing car dependency and overcrowded public transport services challenge the region's growth aspirations. This section explores the key regional transport problems, which are summarised in Figure 3.5, and how they culminate in the need for a major investment in the public transport system.

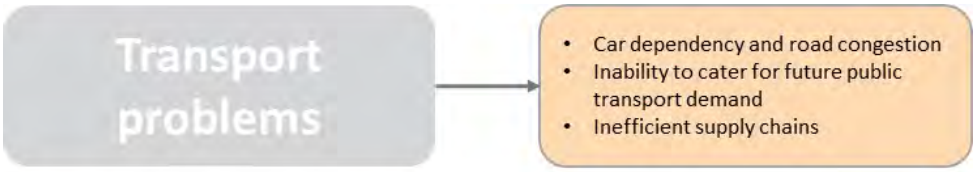

Figure 3.5: Summary of Transport Problems Presented in this Chapter

3.5.2 Car Dependency and Congestion

Private cars currently dominate the way people move around in SEQ, with more than 80 per cent of all trips made by car[16]. Figure 3.6 shows that cars and commercial vehicles have gradually become more dominant in Australia, over time.

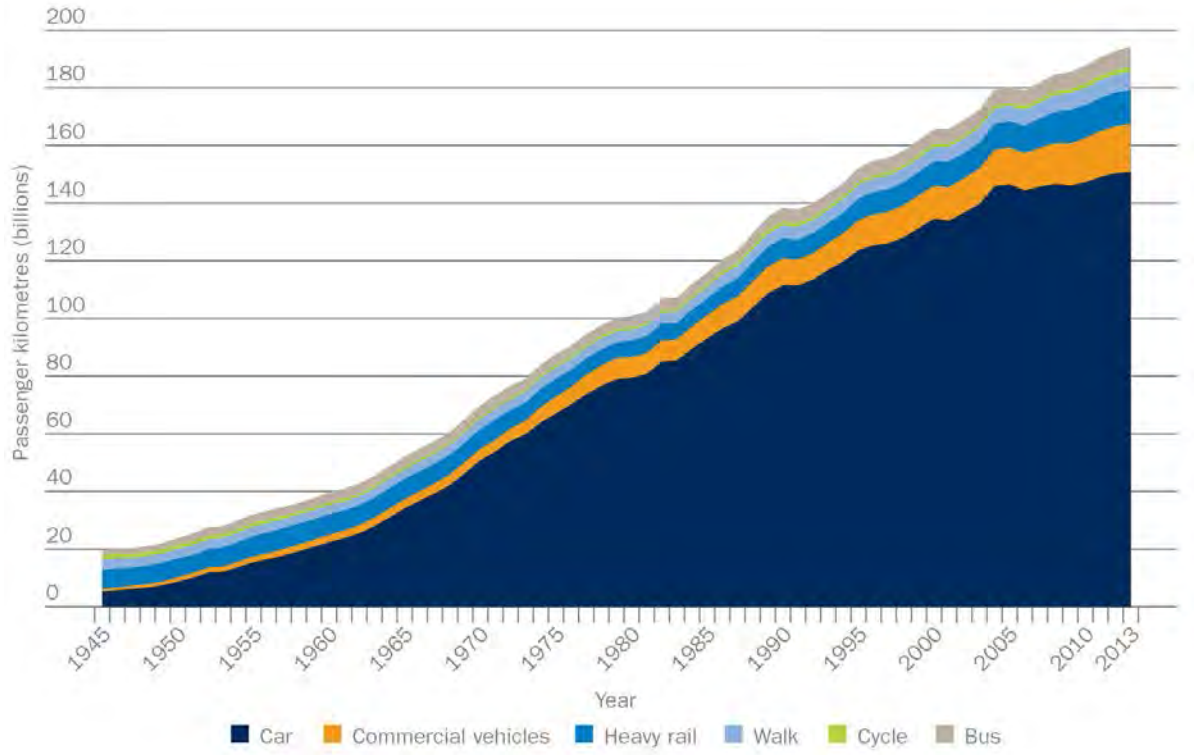

Figure 3.6: Total Urban Passenger Task for Australia (Selected Modes) 1945–2013[17]

[16] South East Queensland Travel Survey 2009–2012
[17] State of Australian Cities 2014–2015

Not only is the private car Australia's dominant mode of transport but the last 10 years have seen a steady decline in average vehicle occupancy, with most cars in SEQ increasingly having only one occupant for work-related trips.

Strong growth in private car use can incur significant infrastructure costs and restrict economic activity, if there is insufficient capacity to accommodate growth. In SEQ, continued growth in car travel will increase congestion and impact freight and commercial movements, increasing the cost of conducting business and transporting goods.

Focusing transport investment on private car travel can result in fewer quality alternatives, making it difficult for people who are unable to drive or afford a car to access employment, services and recreation opportunities.

Cars have less capacity to provide the same level of connectivity as in the past, especially to key economic nodes such as the CBD. Congestion caused by excessive demand – relative to road capacity – or incidents is already an issue, affecting network reliability.

Forecasts show that across the Brisbane metropolitan transport network, total trips will increase by around 36 per cent from 2015 to 2036 to almost 10.3 million trips per day. Of this, 8.2 million trips will be made by private vehicle, growing 30 per cent from 2015. Growth in public transport trips is forecast to increase at a much faster rate, more than doubling over the same period to 1.1 million trips per day. Modelling shows that worsening road congestion, coupled with strong jobs growth in the dense inner-Brisbane area where public transport is more competitive, will result in a strong increase in the share of daily trips made by public transport, from 6.8 per cent in 2015 to 10.9 per cent in 2036[18].

Even so, the expected increase in private vehicle trips and vehicle kilometres travelled will place further pressure on the road network, leading to increased travel times and economic costs. Congestion costs are already rising with delays reducing economic efficiency and costing industry millions per year. The Australian Infrastructure Audit estimates the cost of delays on the Brisbane–Gold Coast–Sunshine Coast transport network caused by congestion in 2011 was around $2 billion. In the absence of any additional capacity, the cost of delay across the region is projected to grow to around $9 billion in 2031[19].

Regular high-level congestion during weekday peak hours also affects the region's bus system, much of which relies on the road network. The resultant increased travel time impacts business and leisure time, with flow-on effects to the region's economy and lifestyle. Figure 3.7 shows the forecast state of the road network during the morning peak in 2036, illustrating chronic congestion across much of the network. Congestion is measured using the volume/capacity ratio (V/C ratio), which compares the number of vehicles (volume) to the road capacity. A V/C ratio of greater than one indicates that forecast demand will exceed available capacity.

Unless regional congestion is managed effectively, business will face significantly increased costs and the city's liveability and amenity will be undermined. In Brisbane, the challenge cannot be met by building more roads that funnel more traffic into an already congested urban core. This is due to the difficulty in channelling ever increasing numbers of vehicles through a fixed number of entry points, all competing for limited road space that is also being consumed by other functions such as pedestrian and social spaces.

[18] CRR Project model 2016
[19] State Infrastructure Plan

Recent road projects such as Clem7, Airport Link and Legacy Way have created bypass routes around the city to avoid further congesting the inner-city core. Significant investment has also been made in urban busways to increase capacity for commuters close to the CBD. However, bus-based systems are reaching their limits and are constrained in key areas through the inner city. Constraints on the busway network are already highly visible – during peak hours, queues of buses can be observed on key entries into the CBD such as the Victoria Bridge and the approach to the Melbourne Street portal. Similar constraints exist on the city street system where high bus volumes, limited on-street stopping space and mixed traffic operations cause queuing and reduce the reliability of services.

Importantly, bus services do not provide the geographic reach needed to cater for the significant expected growth in longer distance commutes. A step-change increase in the capacity of public transport is required, which balances the demand across both bus and rail modes and allows each travel mode to perform its function within an integrated transport network.

Figure 3.7: Forecast Morning Peak Period Congestion in 2036

3.5.3 Inability to Meet Future Public Transport Demand

Public transport activity in SEQ is generally concentrated in the Brisbane metropolitan area and, to a lesser extent, on the Gold and Sunshine coasts[20]. However, public transport provides a key role in supporting longer distance travel from outer areas such as the Gold Coast to Brisbane. Public transport meets the bulk of travel demand to urban centres, such as Brisbane's CBD, where space is limited for infrastructure such as roads and parking spaces.

High-density destinations make public transport a more competitive mode over private vehicles. For example, currently about four in five people (78 per cent) who commute directly to work in the Brisbane CBD travel by public transport in the morning peak period[21].

Growth in demand means the SEQ rail network and Brisbane's busway system are both approaching capacity in Brisbane's inner city[22]. Capacity limitations through this central area will greatly impact on the overall capacity of both networks.

Public transport trips are forecast to more than double between 2015 and 2036, with peak period growth illustrated in Figure 3.8. Growth in rail demand is expected to be twice that of bus, primarily due to rail's ability to service increasing demand for longer distance travel (in line with the growth in population and employment illustrated in Figure 3.3). Additionally, rail is not affected by road congestion. Over the period to 2036, the share of public transport trips taken on bus compared to rail will experience a rebalancing. Currently bus accounts for 60 per cent of all peak period public transport trips. This will decline relatively to 51 per cent, with rail increasing from 40 per cent currently, to 49 per cent – which is an increase of 95,400 rail trips. Passenger rail demand is forecast to more than double from 2015 to 2026 and nearly triple by 2036[23]. This represents a significant rail travel task, well beyond the capability of the existing system to handle.

On current forecasts, it will be impossible to service the growth in public transport demand across the region without additional infrastructure, particularly for travel to and within Brisbane's inner city. A range of critical network constraints limit the ability to cater for future growth in demand. These are discussed in the following sections.

[20] Connecting SEQ 2031
[21] South East Queensland Travel Survey 2009–2012
[22] Connecting SEQ 2031, South East Queensland's Rail Horizon
[23] CRR Project model 2016

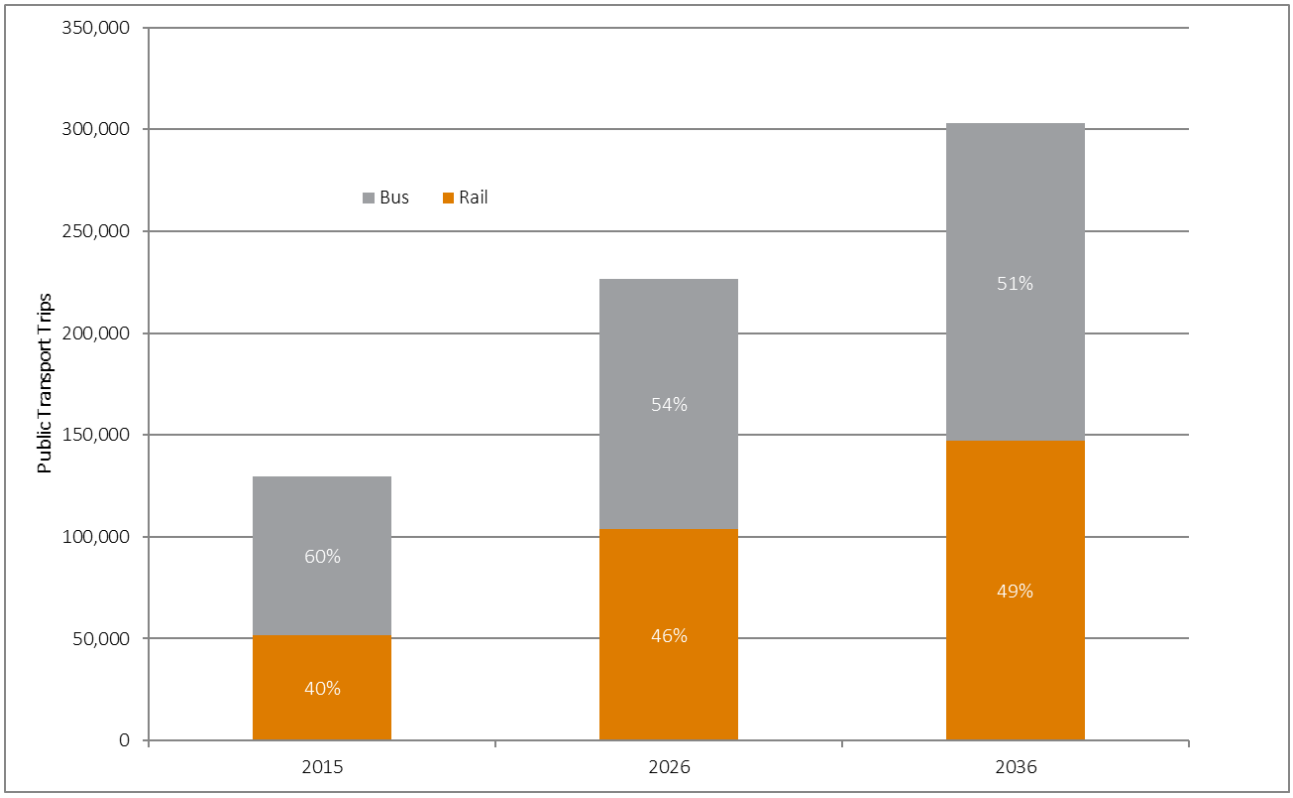

Figure 3.8: Forecast Peak Period Public Transport Trips[24]

3.5.3.1 Bus Network Capacity Constraints

Brisbane's busways have been a transport success but their popularity is pushing the system to its limits. Brisbane's bus network operates with limited interchange opportunities so most buses converge on inner-city and CBD infrastructure. As a result, key areas within the inner-city bus network are operating at or over their nominal capacity.

The current bus operating paradigm in Brisbane means most people have a single-seat journey from their suburb into the CBD, with limited need or opportunity to interchange. However, this style of operation can be inefficient – very large numbers of buses ultimately converge on inner-city sections of the busway and road networks.

Overall, existing bus infrastructure cannot accommodate significant growth based on the current operating profile. Moreover, while bus is ideal for short to medium-distance services, it is not well suited to meeting the anticipated demand for longer distance trips[25].

Restructuring Brisbane's bus network to optimise the network design and operations offers potential efficiency gains. BCC is examining aspects of this approach through the Brisbane Metro project. Efficiency measures to maximise the use of rail infrastructure have already been implemented including timetable improvements and measures to reduce train waiting times at CBD stations.

[24] CRR Project model 2016
[25] Connecting Brisbane

3.5.3.2 Rail Network Capacity Constraints

Like the Brisbane bus network, the SEQ rail network converges in Brisbane's inner city. Both systems depend on having sufficient capacity through this area. While the SEQ rail network is the 'heavy lifter' for longer distance travel, ongoing population and employment growth in outer areas is placing increasing pressure on the network.

Rail services to and through Brisbane's inner core continue to grow as more people travel there for work and services. Based on current forecasts, the rail network will be unable to meet the demand for travel to the CBD from city growth areas and regional greenfield development sites.

Figure 3.9 shows the key constraints on the inner-city rail network, which include:

- increasing demand from the north and south approaching or exceeding the capacity of the rail network in peak travel times
- limited inner-city rail tracks forcing merging and creating bottlenecks in the system including flat junctions at Park Road, Roma Street, Roma Street west and South Brisbane
- overcrowding on trains and station platforms as more passengers load onto limited services
- poor coverage of rail stations in the inner city reducing the attractiveness of rail as a preferred mode of travel to the CBD
- outdated signalling technology (which will be enhanced in some corridors to the west and north by the European Train Control System (ETCS) – Inner City Project currently being delivered by Queensland Rail)
- indirect nature of the rail network servicing the CBD
- junction conflicts, for example, at Mayne Yard.

As discussed in Chapter 1: Project Background and Chapter 2: Strategic Context, the Queensland Government's strategic vision for the transport system identifies rail as the backbone of the public transport network. As the highest capacity transport mode (refer Figure 3.10), it is best aligned with the region's forecast growth profile, which will see a greater number of longer distance trips between residential growth areas and Brisbane's inner city. Rail also provides urban development and city-building opportunities offered by no other transport mode. Expanding and modernising the SEQ rail network is critical to realising the economic potential of SEQ.

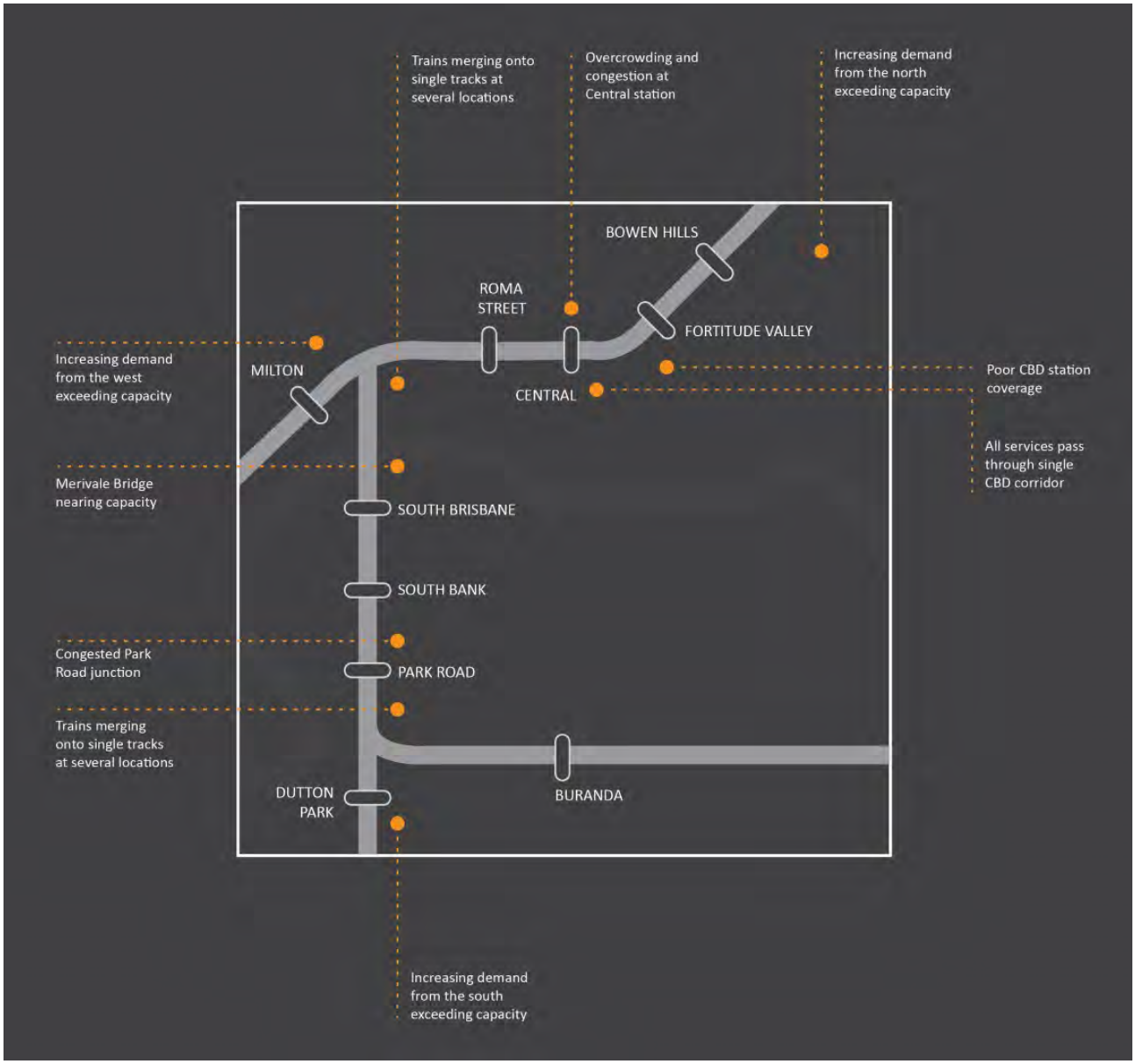

Figure 3.9: Existing Inner-City Rail Network Constraints[26]

[26] South East Queensland's Rail Horizon

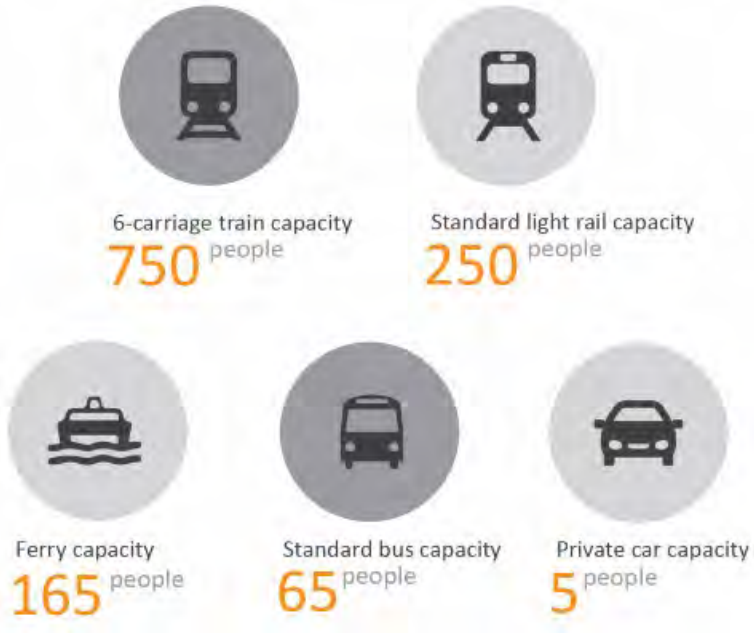

Figure 3.10: Indicative Maximum Capacity of Transport Modes

3.5.4 Inefficient Supply Chains

There is a strong relationship between freight demand and economic growth. As individuals become wealthier, their level of consumption increases. The need to connect goods to markets both locally and for export also grows as the economy grows. This increased production and consumption directly increases demand for freight to effectively link supply chains across the economy.

Freight movement (both rail and road) includes transit freight that traverses Brisbane, freight with an origin or destination in Brisbane and trans-urban freight for which both the origin and destination are within Brisbane.

The rail network needs to accommodate shared use of rail tracks between passenger and freight trains where there is limited rail infrastructure. As such, rail freight is prevented from using the metropolitan network during peak-passenger travel periods.

Information on the relationship between passenger and rail freight is provided in Section 3.6.2.2.

3.6 Rail Problems

3.6.1 The Role of Rail

Rail is currently unable to perform the role envisaged for it by government as the backbone of SEQ's public transport network. It simply does not have the capacity to accommodate additional services and future expansions of the network into new growth areas. This section provides a more detailed description of challenges facing the rail network, which are summarised in Figure 3.11.

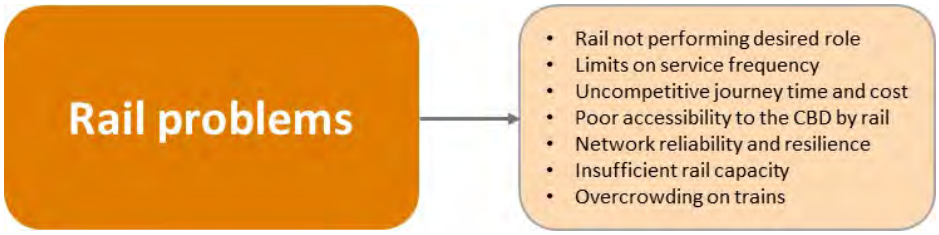

Figure 3.11: Summary of Key Problems Undermining the Rail Network

Compared to other major Australian cities, Brisbane's rail network has limited capacity and coverage, particularly within the region's economic heart, the Brisbane CBD. In part, this is due to limited river crossings and poorly located inner-city stations. Sydney and Melbourne's rail networks move almost twice the number of people into the inner-city areas as Brisbane, every day, and with much better coverage of the city.

Several aspects of the current rail network are undermining its desired function within the public transport system:

- Large areas of the region are not serviced by rail, placing greater pressure on the bus and road network.
- Rail service to the CBD from south of the Brisbane River is less direct – around 30 per cent longer (1.2km) – than a trip by car or bus using the Captain Cook Bridge.
- In some areas, services are not sufficiently frequent to make rail more attractive than other modes.
- Limited rail and bus service integration has led to rail and bus competing within similar corridors.
- Inner-city growth areas such as Woolloongabba, southern CBD, Bowen Hills, Newstead and West End are not well serviced by existing rail corridors.

Strategically, rail is the mode most suited to meeting the forecast public transport travel demands and economic growth aspirations of the region. In many cities around the world, rail network capacity is being expanded, not only to provide transport outcomes but to facilitate economic growth and city-building outcomes. For example, London's Crossrail project (under construction) will be used by an estimated 200 million passengers annually and is expected to add £42 billion to the United Kingdom economy for a reported investment of around £14.8 billion[27].

3.6.2 Limits on Service Frequency

The ability to improve rail service frequency levels is currently limited due to infrastructure constraints. As a result, the network cannot offer a true 'turn-up-and-go' level of service. Some of these limitations are discussed below.

[27] www.crossrail.co.uk/news/crossrail-in-numbers

3.6.2.1 Constrained Inner-City Rail Capacity

As described in Section 3.5.3.2, the inner-city rail network in SEQ is nearing capacity. In essence, there are too many rail lines converging into a limited number of inner-city tracks. Currently, five lines from the south–west and six lines from the north merge into two through the CBD. This limits the ability to increase services on each line and creates inefficient use of the approaching rail corridors. Furthermore, it reduces the system's overall resilience since all services pass through one corridor. This means an incident in the inner area impacts the whole network (discussed in Section 3.6.5).

Capacity assessments indicate the number of paths available on the main line (Caboolture–Ipswich sector) is limited currently to 20 trains per hour (tph) per direction during peak times and 24tph per direction for suburban lines (Merivale Bridge sector). With the completion of the ETCS – Inner City Project in this corridor, capacity will be increased to up to 24 tph per direction on the main line. It is forecast that by around 2021 demand for rail services in the peak periods will be at or beyond the capacity of the existing key inner-city corridors.

Once all available peak-train 'paths' are utilised, further growth in peak services will not be possible without the provision of additional inner-city rail capacity. As the population of SEQ grows, the capacity to put on additional train services for outer regions like the Gold Coast, Cleveland, Ipswich and Caboolture will be severely constrained. Only the construction of an additional Brisbane River crossing allows for the introduction of services to these regions to meet the demand resulting from this increased population growth.

The rail system is also increasingly constrained by other inner-city track and platform capacity issues with continuing growth in travel to the CBD. This is predominantly due to two further issues:

- Flat junctions, particularly at Roma Street West, require all trains from the west to merge at Milton so trains from the Merivale Bridge can operate on the second track heading to the city and further north. Adjacent development and the proximity of major roads limit the options for grade separation or augmentation of lines at this location.
- Passenger and service capacity growth through Central station is limited by space constraints on the platform and concourse areas, a combination of the low approach speed caused by the narrow and often crowded platforms (with potential implications for passenger safety) and the dated signalling technology currently in use.

It is critical that the rail network constraints within the inner city, including river crossing capacity, be addressed if the rail network is to cater for future growth. Without this, service frequency increases will be impossible and the network will be unable to expand into new growth areas.

3.6.2.2 Conflict Between Passenger and Freight Trains

Freight and passenger trains share some lines within the metropolitan network, with these lines operating under a 'freight curfew' during the peak period. This allows express passenger trains into and out of the CBD, increasing the overall capacity of the passenger service. After peak periods, freight trains are typically allocated paths not required for passenger services.

Without additional investments, passenger demand may require this curfew to be increased to cater for more passenger services in the 'shoulder' of the peak period. Freight paths would be reduced, potentially impacting freight capacity to the port of Brisbane and intermodal hubs.

The interaction and potential conflicts between passenger trains and freight trains in the metropolitan network will require a longer term solution to accommodate growth in both services.

3.6.2.3 Current Signalling System

Queensland's current rail signalling technology is based on a traditional track-side system that relies on train drivers interpreting visual signals. This visual system, mixed with variability in driver behaviour, limits the operational efficiency of the rail network and throughput of trains.

Recently, the Queensland government committed to begin the rollout of ETCS Level 2 (L2) in parts of the metropolitan network. This will improve operational characteristics that benefit both the capacity and safety performance of the rail network. Ultimately, this innovative technology solution will provide a better performing rail system for both the customer and the train operator.

The scope of the ETCS – Inner City Project is the area of rail network between Northgate and Milton, including both mains and suburban lines. This encompasses the key network section through which all trains must pass and includes the railway stations of Roma Street, Central, Fortitude Valley and Bowen Hills. While the ETCS – Inner City Project will improve the network capacity in the northern and western corridors, it does not provide additional capacity to the Gold Coast and Beenleigh lines.

3.6.3 Journey Time and Cost

As discussed in Section 3.6.1, the current rail network does not have good coverage over many areas in Brisbane and beyond and is relatively indirect in many corridors, particularly from the south and east (for example, the Cleveland line). Since the rail network cannot cover all areas, its success relies on good local access to stations and park 'n' ride opportunities (where appropriate) as well as relatively short waiting times (service frequency). In terms of station access, the rail network is not currently well supported by the bus network, which could provide a greater 'feed-to-rail' role as is common in most mature public transport networks.

When considering door-to-door travel times, even with the lower road speeds during congested conditions, rail often does not provide a competitive alternative to road travel due to the less direct route. Given the limitations in the rail network in terms of geographic coverage, travel times, service frequency and potential for overcrowding, the relative 'perceived cost' of a journey using the rail network in many areas is greater than that of private vehicle and bus travel.

The overall impact of the functional deficiencies and constraints in the SEQ rail network is that rail travel caters for a relatively low mode share, at around one third of morning peak travel into the CBD. This is low compared to Sydney and Melbourne, where rail accounts for around 50 per cent[28]. Brisbane consequently has a high reliance on buses, which are required to perform much of rail's line-haul role.

While the Brisbane busway network has been a success story, it too has reached its limits. Importantly, bus-based systems only have so much 'reach'; expansion of the busway network cannot cater for the significant increase in demand for longer distance trips expected in the region. Both bus and rail must work together to ensure an effective and efficient transport system.

[28] Australian Bureau of Statistics Census, 2001-2011

3.6.4 Poor Accessibility to the CBD by Rail

3.6.4.1 Limited Capacity of CBD Stations

The greatest demand on the rail network is in the morning and afternoon peak periods. Records of passenger boardings from 2015 show that more than half of the 200,000 passengers who used the system each day did so during the four 'peak' hours, with 60,000 and 46,000 passengers recorded in the morning and afternoon peaks respectively.

The key origins or destinations of these peak period passengers are inner-city rail stations, with more than 34,000 passengers alighting during the morning peak at Roma Street, Central or Fortitude Valley station in 2015. Central station is the principal destination for CBD-bound passengers, with 22,000 (65 per cent of passengers to the CBD) alighting there in the morning peak period in 2015[29].

Higher patronage in the limited morning peak period and associated overcrowding on services impacts on the time for loading and unloading of trains at stations, exacerbating inner-city capacity limitations. Reliance on Central station capacity can only go so far, beyond which the ability of passengers to board and alight trains within the normal station dwell times would be impacted with flow-on impacts across the entire network.

As demand stretches network capacity, growing passenger numbers increase congestion around doorways (driven by increasing numbers of standing passengers) and on platforms (particularly in the afternoon peak). These factors drive increases in dwell times and the likelihood of passenger issues affecting service reliability. This reduces the likelihood of on-time operations and ultimately impacts on the achievement of service numbers.

Brisbane's passenger rail network is partially sectorised and comprises main lines and suburban lines to limit crossing conflicts and improve operations. Both these systems run through the inner-core area and are constrained by availability of rail paths and platforms through the CBD stations, including Central station (six platforms), Roma Street station (nine platforms with one for regional travel and two not generally suitable for through peak period operations), Fortitude Valley station (four platforms) and Bowen Hills station (four platforms). This limits the overall capacity of the system, the capacity of individual lines feeding into the core and service frequencies.

In comparison, Central station in Sydney has 10 'through' platforms used for regular suburban services and Flinders Street station in Melbourne has 12 platforms dedicated to the urban passenger task. The Victorian Government is currently planning the Melbourne Metro project to expand the underground rail network and enable independent running of suburban rail lines, providing a considerable capacity increase. The Sydney Metro project is predicted to increase the number of trains entering the CBD in the peak hours from 120 services to 200 services (an increase of around 60 per cent)[30].

The combined impact of station capacity and broader constraints in the SEQ rail network drives a need for a significant investment in new infrastructure to boost inner-city rail station capacity. Achieving throughput levels prior to this investment is highly sensitive to station dwell times and reliability of on-time operations through the key junctions.

[29] CRR Project model 2016
[30] www.sydneymetro.info

With demand for rail expected to almost triple by 2036, continued reliance on one main station in Brisbane's CBD to service the majority of passengers and facilitate a growing CBD will result in a range of issues, particularly as this station nears its capacity limits. Minor incidents and variability in demand at Central station will compromise its operational performance and the rail network more broadly. For example, a delay in services in the afternoon peak would quickly result in extreme levels of crowding on platforms, affecting operations and possibly fire and life safety requirements.

Overall, existing rail stations do not have the capacity to effectively provide for forecast levels of passenger demand while maintaining network reliability and operational efficiencies, nor are they well located within the CBD to adequately service the new high-growth areas of the CBD and inner city. The poor location of stations is discussed below.

3.6.4.2 Poor Location of CBD Stations

Beyond having an appropriate level of capacity (and other critical factors in meeting the needs of the customer), rail stations need to be adequately located to ensure destinations are easily accessible. Generally, a walking catchment of 400 metres around a quality public transport station or stop is considered attractive for customers. Although customer's preparedness to walk this distance may increase with the quality of the service (for example, express rail) the walking distances starts to become a limiting factor beyond 800 metres and by one kilometre the service may be considered only marginally attractive. For Brisbane's CBD, the topography and the historical development of the public transport system results in many areas of the city being outside the limit of the generally accepted walkable catchments.

The Brisbane rail network passes across the northern end of the CBD, providing good access to the northern areas, but there are considerable walking distances from new growth areas in the southern areas of the CBD. Brisbane rail passengers wishing to travel to and from the southern end of the CBD must walk from either Central station (1.2km) or South Brisbane or South Bank stations across the river. Alternatively, commuters can wait for an interchange service with a city loop bus (7am to 6pm, Monday to Friday) which passes Central station to connect passengers to the southern end of the CBD.

Figure 3.12 shows current walk access times to existing rail stations servicing the CBD, illustrating the significant gap in accessibility to the south-eastern part of the CBD, an area that will undergo a major transformation over coming years. Even in more central parts of the CBD, the walk to the nearest rail station is up to 15 minutes. Table 3.1 shows the growth in employment and population around the existing CBD stations (Central and Roma Street) between 1986 and 2011. It also shows that the southern part of the CBD has grown much more strongly for both employment and population compared to the existing CBD station catchments. This supports the need for a new rail station in the southern part of the CBD.

The commercial office tower at 1 William Street combined with new development in the Queen's Wharf Brisbane precinct will significantly increase the demand for frequent, efficient and reliable public transport services to this part of the city. Currently, there is no high-frequency, high-capacity public transport option within close proximity.

STATION	EMPLOYMENT GROWTH (1986–2011)	POPULATION GROWTH (1986–2011)
Southern CBD	152%	360%
Central	73%	280%
Roma Street	71%	71%

Table 3.1: Population and Employment Growth in CBD Station Precincts[31]

By comparison, both the Melbourne and Sydney rail networks provide excellent coverage of the inner city with stations that provide direct access to key areas. Melbourne also has an extensive tram network that further enhances passenger mobility around the inner-city areas. Sydney is also implementing a light rail system through the spine of the CBD to replace buses and enhance mobility.

Poor accessibility by rail also extends beyond the Brisbane CBD. While rail passengers travelling to inner Brisbane are able to access Central, Roma Street, South Brisbane, South Bank, Milton, Albion, Fortitude Valley and Bowen Hills, many major inner-city areas are outside a walkable catchment, including Woolloongabba–Kangaroo Point, Brisbane Showgrounds–Royal Brisbane and Women's Hospital, Newstead, West End, New Farm and Kelvin Grove.

To improve accessibility, more rail stations are needed in more parts of inner Brisbane. This will establish new trip opportunities, attract more passengers to the rail system, alleviate pressure on the bus network and help reduce urban congestion into the future. It will also catalyse growth in the CBD, helping to realise agglomeration benefits and contributing to broader city-building outcomes.

[31] Australian Bureau of Statistics

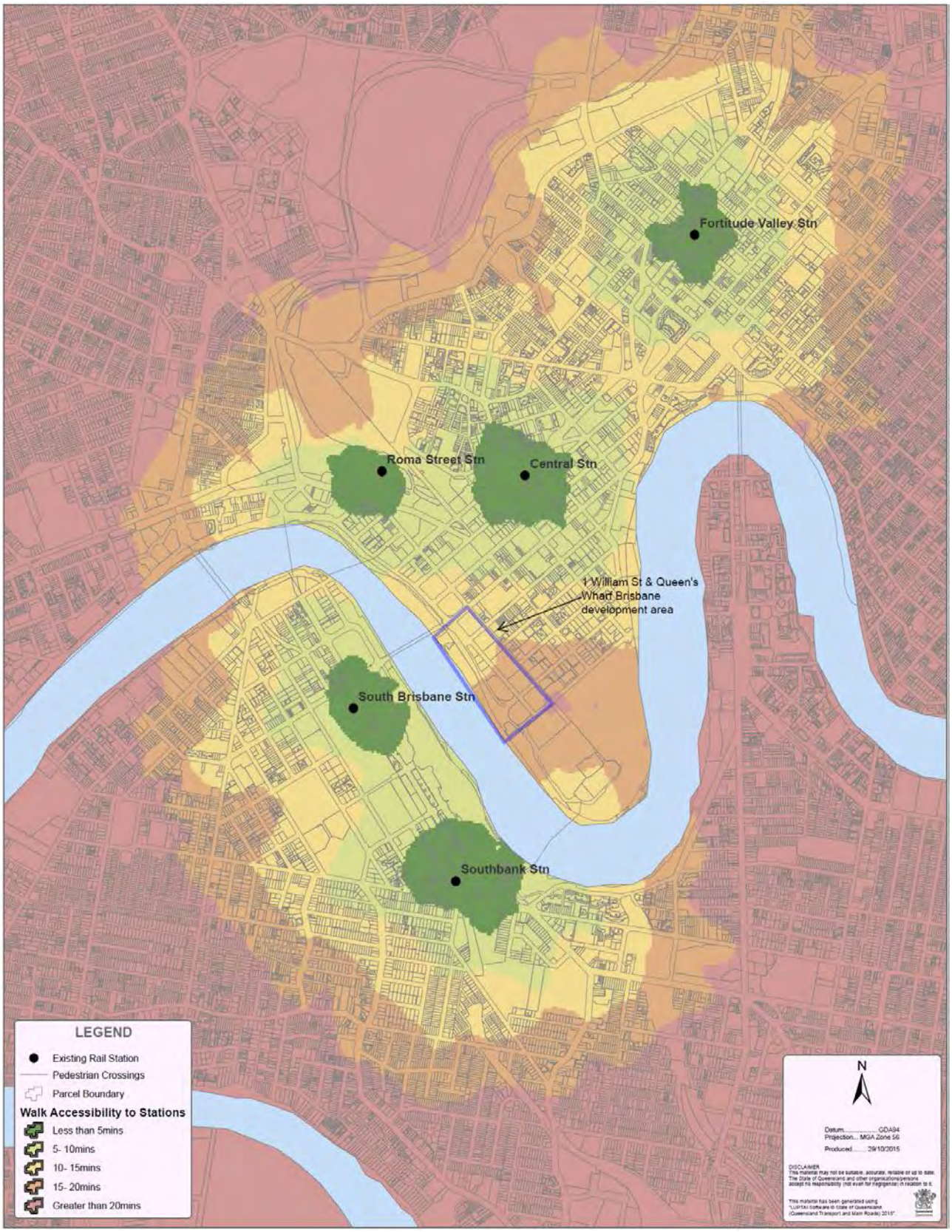

Figure 3.12: Walk Accessibility to Existing Rail Stations in the Brisbane CBD

3.6.5 Network Reliability and Resilience

The complex nature of rail network operations causes rail network operators to consider the concept of reliability when defining the capacity of the system. That is, once the minimum acceptable level of reliability is defined, there will be a flow-on impact on the operational capacity of the system under that adopted standard. This may be less than the absolute capacity of the system that can be achieved when all factors are working towards an optimal outcome for rail operations.

Once the reliability requirements are factored in, the number of services that can be operated under that regime, during a defined period, will define rail track capacity. As such, the key issues with future rail network capacity are as follows:

- As service frequency increases towards maximum capacity, the reliability of services can deteriorate rapidly across the whole network, due to the way rail operations need to be managed. As the capacity is utilised, despite mitigation measures, reliability is expected to continue to deteriorate, with minor delays, such as the increased dwell times required for boarding and alighting in overcrowded conditions having the potential to cumulatively escalate into significant impacts.
- Without an infrastructure or rail systems solution boosting line capacity to allow higher frequency services, peak period service performance on the passenger rail network is forecast to decline, resulting in significant reductions in service reliability and increased overcrowding.

Closely linked to network reliability is the concept of resilience – that is, the ability of the rail system to maintain acceptable operational performance in the face of planned or unplanned faults and challenges. It describes the adaptability of the network and its ability to recover from an incident within a reasonable timeframe. For SEQ it also relates to the system's resilience to adverse weather conditions such as storms and flooding.

Currently, the inner-city rail network funnels through a select number of stations on a single corridor through Roma Street, Central, Fortitude Valley and Bowen Hills stations. As such, incidents on this part of the network or at one of these stations can have serious flow-on impacts for the entire SEQ rail network. Because of the cascading effect across the network, it can take significant time to recover to normal operations. A new corridor through the inner city would considerably boost network resilience.

3.6.6 Insufficient Rail Capacity to Accommodate Growth

3.6.6.1 Strong Demand for Rail

As discussed in previous sections, passenger rail demand is forecast to double from 2015 to 2026 and nearly triple by 2036, as shown in Figure 3.13. The growth rate is expected to remain strong between 2015 and 2026 (with a total change of around 100 per cent in the morning peak period), with growth continuing at a lower rate between 2026 and 2036. For trips to the CBD, the share of travel by rail is expected to increase from 31 per cent in 2015 to 47 per cent in 2036[32].

The growth analysis also shows that peak period growth rates are similar to those across the day. Notably, growth in interpeak services remains strong across much of the network, while overnight off-peak growth is lowest, demonstrating the continued success of introducing 15-minute interpeak services on selected lines.

[32] CRR Project model 2016

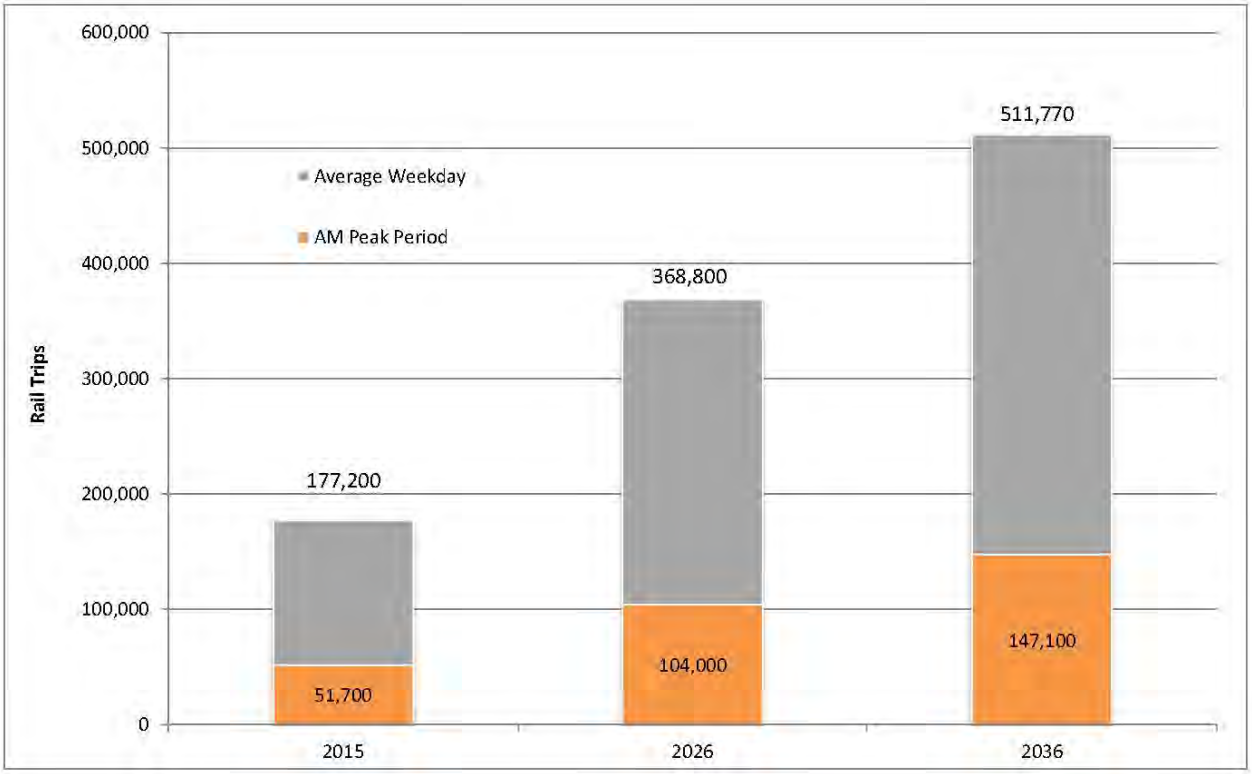

Figure 3.13: Forecast Growth in Rail Patronage (Without the CRR Project)

Historical trends support the forecast growth in rail. For almost the decade to 2009, rail patronage across Brisbane grew strongly and consistently at rates of between three and six per cent. The three years to 2013 saw a flattening of demand, which evidence suggests was due to a large real increase in fares (40 per cent), minimal employment growth in inner Brisbane, a slowing of the economy and multiple infrastructure projects to increase road capacity. These projects include 14 traffic lanes across the Brisbane River in 2010, removing through traffic from the CBD and completion of the Northern Busway and Gateway Upgrade South in 2013. Since 2013, demand has picked up[33] and is expected to reflect pre-2009 rates – or slightly higher – in the period to 2026 as employment and economic growth picks up, fares remain steady, congestion increases, the inner-city bus network reaches capacity and SEQ's population grows.

The forecast growth in rail patronage of 6.9 per cent per annum between 2015 and 2026, is not without precedent in Brisbane or elsewhere in Australia. Research conducted by the Bureau of Infrastructure, Transport and Regional Economics, which compares urban public transport growth rates across Australian cities (2014) indicates that similar, sustained high periods of growth were evidenced in Brisbane (6.7 per cent per annum between 1979 and 1989), Melbourne (6.1 per cent per annum between 1999 and 2009) and Perth (15.2 per cent per annum between 1991 and 2001 and 7.4 per cent per annum between 2004 and 2014). Figure 3.14 below shows the recorded annual growth in rail patronage in Brisbane, Melbourne and Perth between 1970 and 2015.

[33] TransLink ticketing data

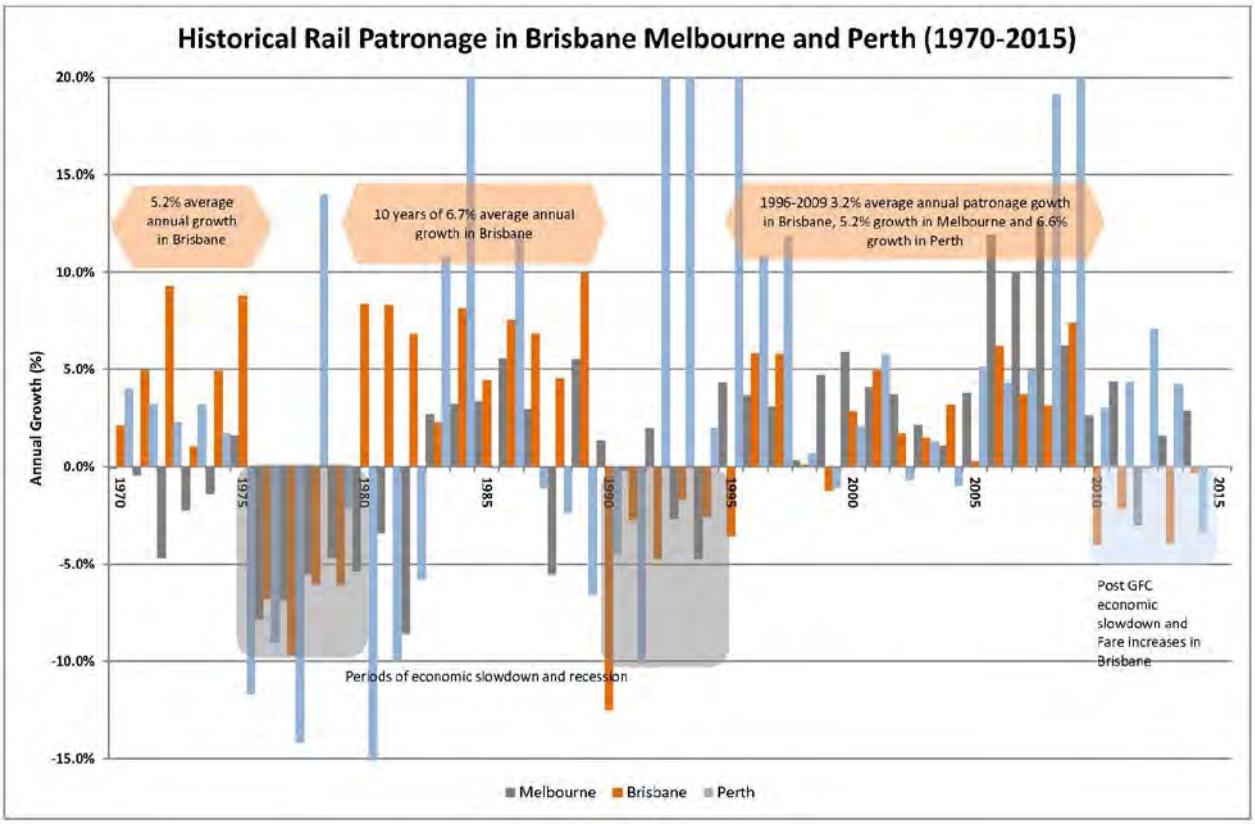

Figure 3.14: Historical Rail Patronage in Brisbane, Melbourne and Perth (1970-2015)

The primary drivers of the forecast growth in rail patronage are the population and employment projections for SEQ and the Brisbane LGA and the increase in rail capacity delivered by the CRR Project. Figure 3.15 below shows the inputs contributing to the forecast growth in rail patronage between 2016 and 2026 and their contribution to the total forecast growth in rail patronage.

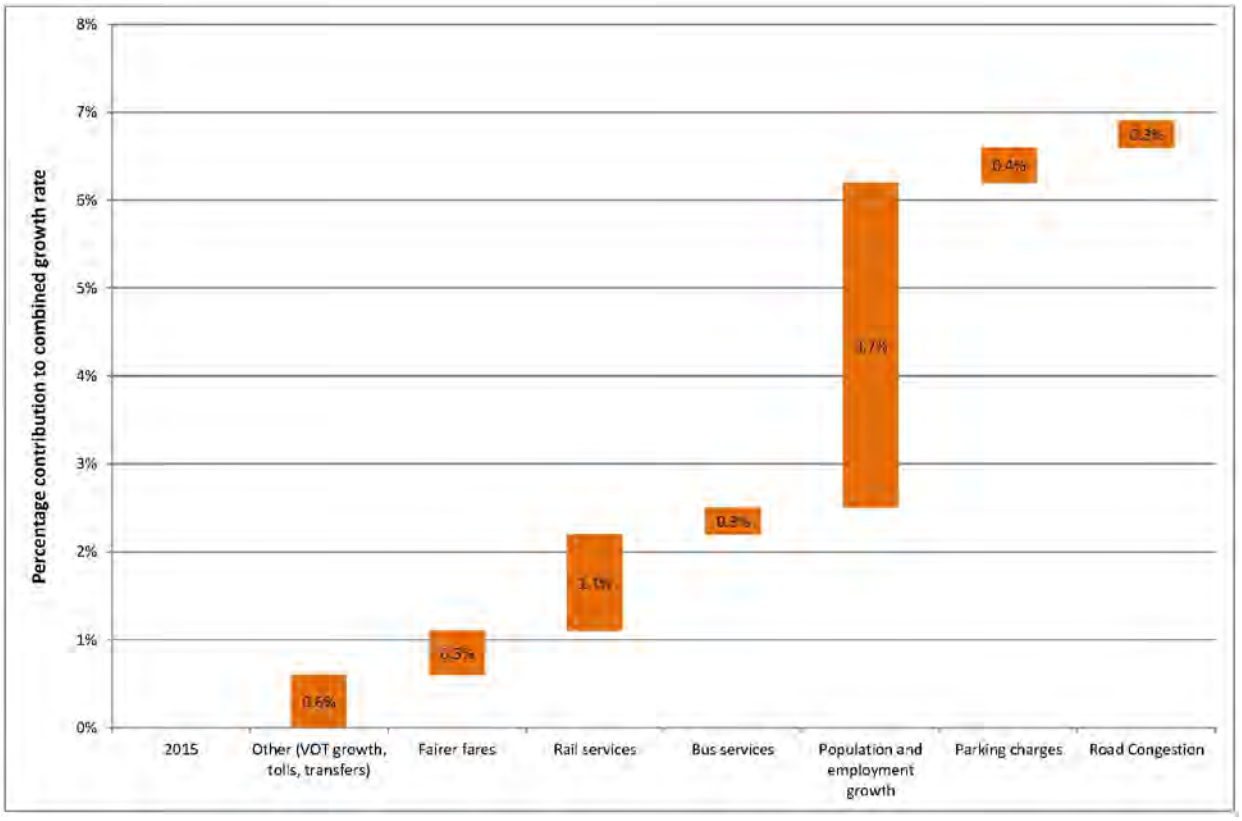

Figure 3.15: Contribution of inputs to forecast growth in rail patronage

Anticipated growth in longer distance commuting due to the continued expansion of residential areas outside the Brisbane LGA underpins these demand forecasts. Figure 3.16 shows the predicted growth in employed people who commute to Brisbane for work. The data predicts growth of approximately 200,000 commuters between 2015 and 2036 and includes approximately 60,000 commuters from the Gold Coast and Logan, more than 90,000 commuters from Ipswich and 45,000 commuters from Moreton Bay and the Sunshine Coast. This represents a very significant growth in demand for travel during the peak periods, which is likely to place pressure on the rail network.

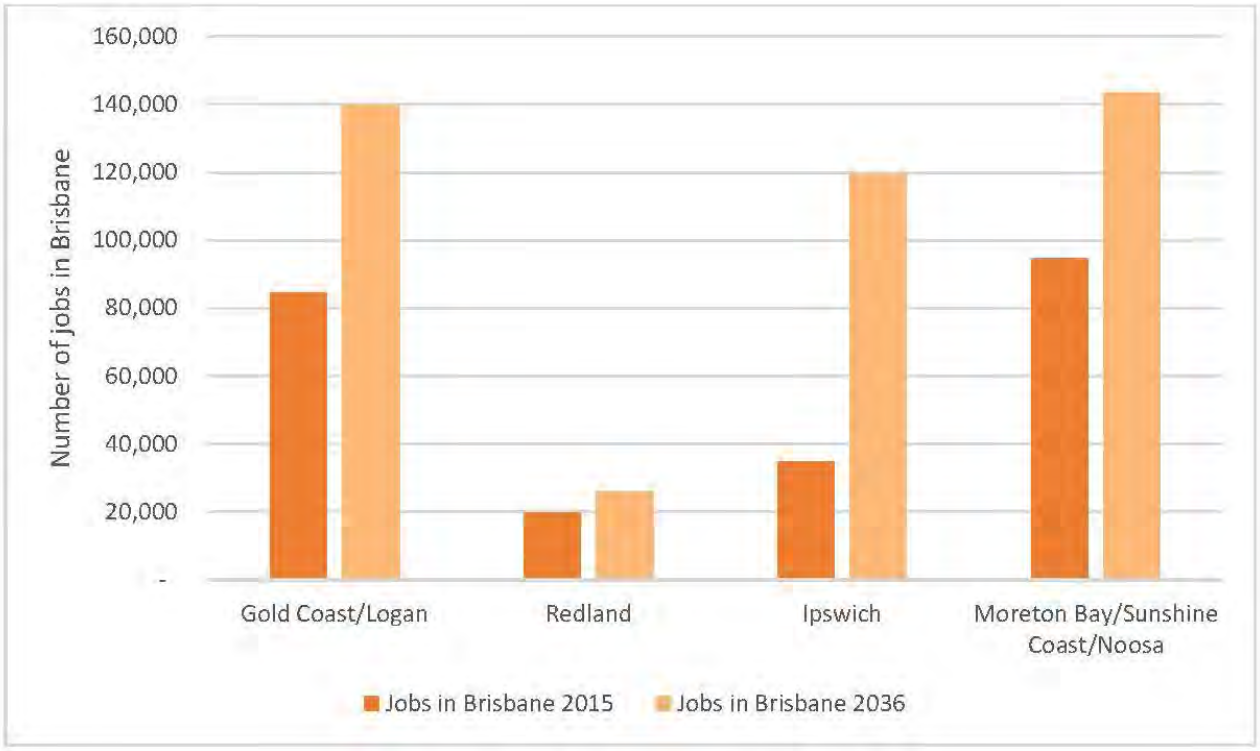

Figure 3.16: Growth in Employment within the Brisbane LGA by Place of Residence, 2015 to 2036[34]

The rail system already experiences periodic overcrowding on key corridors yet it would need to cater for an additional 52,500 passengers in the morning two-hour peak period by 2026, equivalent to 116 full seated train loads (six-car train with 450 seats). By 2036, an extra 95,500 passengers would need to be catered for, equivalent to 212 full train loads in the peak hour.

This demand, if not carried by rail, will be forced to other parts of the transport network, primarily the already constrained road network with associated congestion and lost economic opportunities. Forecasts show the road network will already be heavily congested, particularly on key links through Brisbane's inner city, even without the additional demand that would be forced away from an unattractive rail network. Without a step-change in capacity for the rail network, Brisbane's long-term future and economic aspirations could be at risk.

3.6.6.2 Demand Growth on the North–South Corridors

While very strong demand growth is anticipated across the entire rail system, the pressure on the rail network will differ by corridor and ultimately depend on where residential population growth occurs most strongly.

Forecasts show that pressure will initially be most concentrated on the southern (Brisbane–Gold Coast) and northern (Brisbane–Sunshine Coast) corridors. In the longer term, substantial pressure is also expected on the western (Brisbane–Ipswich) corridor.

[34] Queensland Government Statistician's Office 2015

Figure 3.17 summarises the forecast combined demand for rail in the morning one-hour peak from south of the Brisbane River on the Gold Coast, Beenleigh, Cleveland and Flagstone[35] lines in 2021, 2026 and 2036, and compares this to available capacity. It shows that by 2021, in order to meet passenger demand, the corridor will need to operate above its theoretical maximum capacity in terms of the number of trains. Prior to and irrespective of investment in future growth corridors by 2026, in order to meet demand an additional six (full) trains per hour would be required beyond the capacity of the corridor to run, rising to an additional 19tph in 2036.

Significant increases in demand for rail services are also expected from the north, fuelled by population growth to the north of Brisbane and the extension of the rail network to Kippa-Ring. As illustrated in Figure 3.18, in 2021 the corridor will also have passenger demand beyond its capacity threshold. In 2026 there is demand for an additional five trains per hour beyond corridor capacity, rising to an additional 11 in 2036.

The shortfall in trains is based on the difference between passenger demand and the theoretical maximum capacity of the network. In practice, it is unlikely that maximum capacity could be achieved without impacting operational performance (reliability) since the network would be operating at its limit.

If left unaddressed, as passenger demand increases towards the limit of available capacity, overcrowding (beyond accepted loading standards) will worsen on individual services. This will result in higher numbers of boarding and alighting passengers and increased congestion around doorways and on platforms. These factors will drive an increase in dwell times (time a train is stopped at a station), reducing the likelihood of on-time operation and ultimately reducing the number of services able to be run. The overall result is that passengers would choose alternative methods of transport (primarily private vehicles), change residential location or be forced to travel outside peak periods.

[35] The Flagstone line is assumed to be operational from 2036 only.

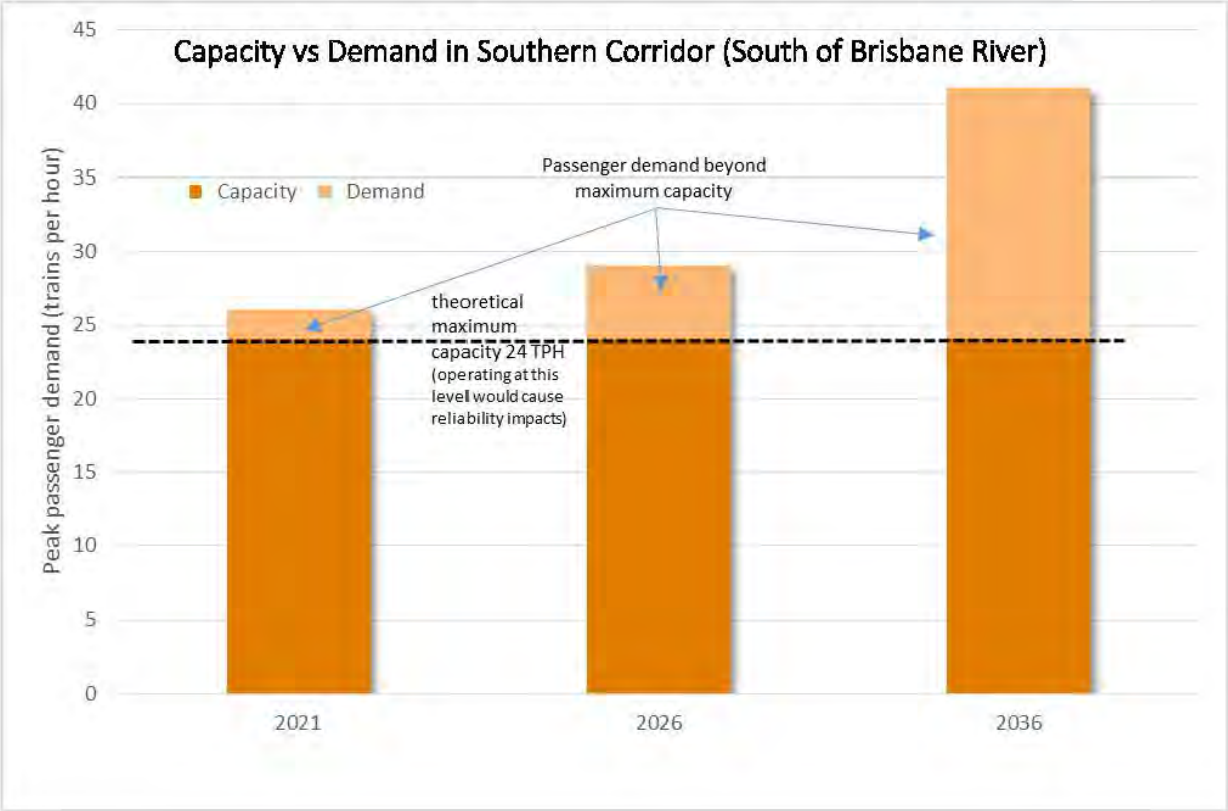

Figure 3.17: Rail Demand in Brisbane's South: Corridor Versus Available Capacity in the Morning One-Hour Peak[36] [37]

[36] CRR Project model 2016

[37] Note the Merivale Bridge has a capacity of 24tph. In 2036, bridge paths are allocated to: Cleveland/Manly (8tph); Flagstone (4tph); and Gold Coast/Beenleigh (12tph) making up the theoretical maximum capacity across the southern and eastern corridors. In 2021 and 2026 capacity constraints are limited to the Gold Coast–Beenleigh corridor.

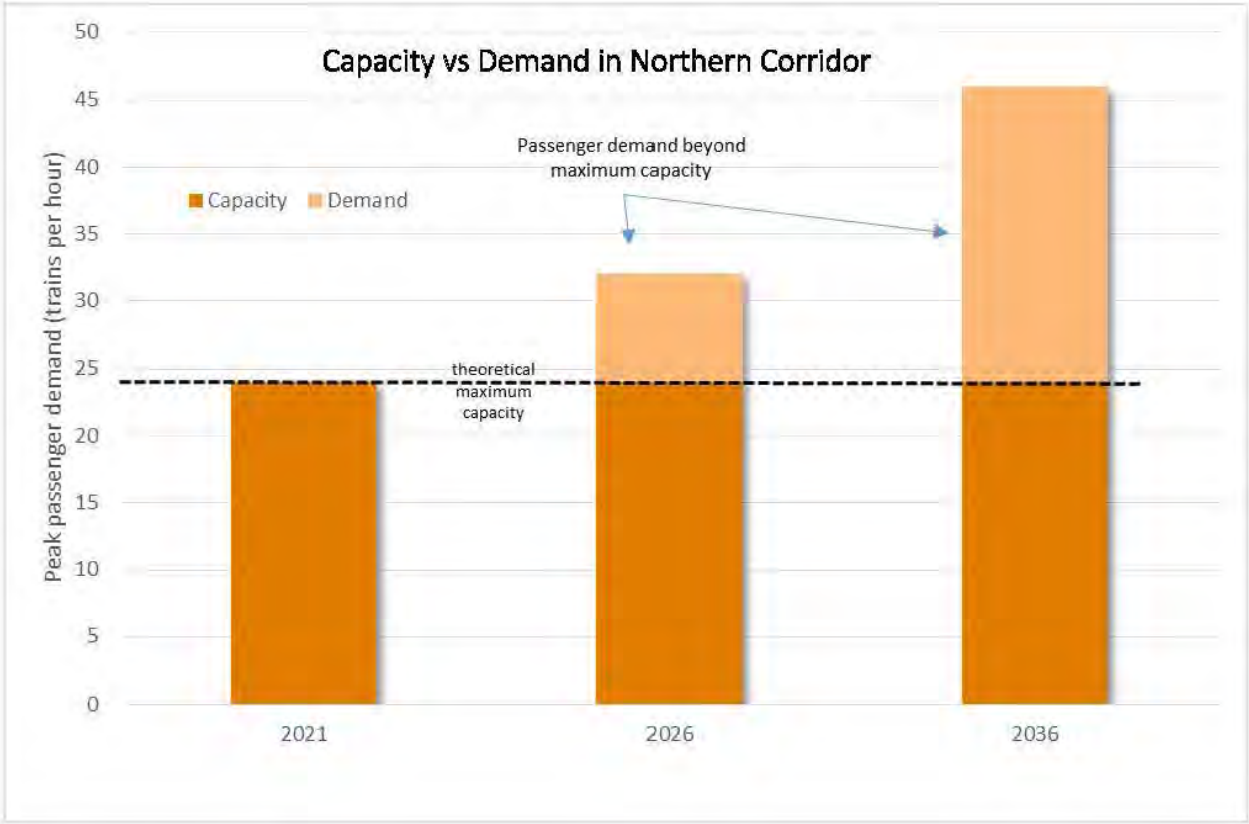

Figure 3.18: Rail Demand in Brisbane's North: Corridor Versus Available Capacity in the Morning One-Hour Peak[38]

[38] CRR Project model 2016

3.6.6.3 Overcrowding on Trains

As part of its 'customer first' focus, TransLink aims to ensure a 'comfortable load' for passengers on train services. The definition of comfortable load is based on the principle of minimising the number of passengers having to stand for an extended period. This is defined as standing for 20 minutes or longer, measured from Roma Street and Fortitude Valley stations. The location of the 20-minute threshold therefore varies by rail corridor, for example on the Gold Coast–Beenleigh line it would be around Salisbury station. The 20-minute criteria has a direct impact on the design capacity of trains. Continuing the Gold Coast–Beenleigh line example, currently a train travelling from Beenleigh to the CBD has a design capacity of 450 passengers until around Salisbury (20 minutes from Roma Street station) where it 'increases' to 750 since it can now count both standing and seated passengers (the equivalent of 1.67 times the seated capacity)[39].

Passenger loads above 750 passengers on individual services would result in passengers unable or unwilling to board the overcrowded trains, and the resulting dwell times of these overcrowded services would reduce the maximum number of trains that could be operated.

Without additional rail network capacity, it will be impossible to run the additional train services necessary to meet demand. Peak period service crowding is expected to increase without intervention. In 2026, considerable crowding is expected on all but one rail corridor approaching the CBD, measured as over 25 per cent of all passengers are standing. By 2036, the degree and extent of crowding will worsen significantly. The extent of crowding will be beyond inner-city stations on all rail approaches to the CBD such that, on average, over 50 per cent of passengers will be standing.

Without intervention, passenger overcrowding on the rail network will lead to customer dissatisfaction and service deterioration. Resulting delays, for example from longer dwell times in overcrowded conditions, have the potential to cumulatively escalate into significant impacts across the rail network.

[39] This capacity applies to individual trains and not average hourly loads produced in the CRR Project model.

3.7 Benefits Sought

The previous sections outlined a number of key strategic, transport and rail specific problems for SEQ over the next 20 years. Table 3.2 summarises the problems in this chapter and links them to identified business requirements and provides a list of benefits sought.

PROBLEM	BUSINESS REQUIREMENT (OUTCOME SOUGHT)	BENEFIT SOUGHT
Note: SIP objectives: 1. improving prosperity and liveability 2. infrastructure that leads and supports growth and productivity 3. infrastructure that connects our communities and markets 4. improving sustainability and resilience.		
STRATEGIC		
Inability to maintain desired levels of economic growth and productivity	▪ Ensure sustainable outcomes for the transport system by providing the right choice of mode for each transport task. ▪ Provide connections to markets. ▪ Support economic growth opportunities.	▪ Connect people, places and businesses to the Brisbane CBD, the economic heart of the region. ▪ Provide new and improved opportunities to connect to markets and improve productivity. *Links to the State Infrastructure Plan (SIP) objectives 2 and 3 (see table note)*
Declining accessibility and connectivity between population and employment centres	▪ Ensure residential growth areas are well connected with employment centres through efficient transport modes. ▪ Enable the transformation of the city to support agglomeration opportunities. ▪ Support the move to a knowledge-intensive economy by providing improved access to knowledge-based inner-city jobs. ▪ Increase transport capacity during peak periods to service access to the job market. ▪ Provide efficient and effective connections to the surrounding region. ▪ Improved access by rail to growth areas in the Brisbane inner city and CBD.	▪ Increase accessibility to more areas of the CBD and inner city. ▪ Maximise agglomeration benefits at key growth locations in the CBD and inner city. ▪ Allow the rail network to expand to connect new communities e.g. Flagstone. ▪ Improve accessibility at local and regional levels. ▪ Improve access for people who are transport disadvantaged. *Links to SIP objectives 1, 2 and 3*

PROBLEM	BUSINESS REQUIREMENT (OUTCOME SOUGHT)	BENEFIT SOUGHT
City building and urban growth	▪ Support new urban development opportunities. ▪ Manage urban growth in a sustainable manner. ▪ Support city-building outcomes. ▪ Provide better rail station coverage in the inner city.	▪ Provide the frame around which the city grows. ▪ Facilitate and catalyse urban renewal opportunities at station precincts. ▪ Improve the level of transport service, triggering further urban consolidation around rail corridors. ▪ Provide new stations in key inner-city growth areas. ▪ Avoid externalities such as emissions and congestion costs. *Links to SIP objectives 1, 2, 3 and 4*
TRANSPORT		
Car dependency and road congestion	▪ Increase inner-city public transport capacity and service frequency to support improved access to jobs and services. ▪ Enable a mode shift from private cars to public transport.	▪ Reduce road congestion and associated costs. ▪ Enable more efficient use of scarce road space, allowing for greater business travel and good access for road-based public transport and freight. ▪ Improve access to the inner city, the location of high-productivity jobs, for more community members. ▪ Reduce reliance on private vehicle access to the CBD. ▪ Reduce journey times and improve accessibility for a larger portion of the resident population. *Links to SIP objectives 1 and 3*

PROBLEM	BUSINESS REQUIREMENT (OUTCOME SOUGHT)	BENEFIT SOUGHT
Inability to cater for public transport demand	▪ Support increased travel demand. ▪ Alleviate inner-city rail network constraints. ▪ Match expected rail network demand with capacity. ▪ Allow rail network expansion to outer areas and new greenfield sites. ▪ Increase inner-city public transport capacity and service frequency to support improved access to jobs and services. (Rail is to provide the backbone of the public transport network.) ▪ Enhance the integration between the bus and rail networks. ▪ Increase the use and mode share of rail to the Brisbane inner city and CBD. ▪ Position rail as the preferred mode for longer distance commuter travel to the CBD and key urban centres.	▪ Provide a 'step change' in public transport capacity. ▪ Meet forecast demand. ▪ Enable connections to growth areas. ▪ Increase service frequency. ▪ Reduce crowding. ▪ Increase incremental fare revenue. ▪ Achieve a mode shift to rail. ▪ Provide better interchanges with the bus network. ▪ Allow bus network operational changes (feed to rail) and more efficient use of the bus network. *Links to SIP objectives 1, 3 and 4*
Inefficient supply chains	▪ Improve road conditions with reduced congestion. ▪ Reduce travel time for freight by road. ▪ Preserve sufficient rail freight capacity to meet the projected freight task.	▪ Improve connectivity to markets by both road and rail freight. ▪ Improve opportunities to leverage rail freight opportunities. *Links to SIP objective 3*
RAIL		
Rail not performing desired role	▪ Make rail the 'backbone' of the public transport system. ▪ Encourage travel by the most efficient and sustainable mode (i.e. allow rail to perform its intended role). ▪ Match capacity to expected rail network demand. ▪ Enable the rail network to expand into new growth areas. ▪ Achieve a competitive level of service to other modes.	▪ Ensure capacity to meet long-term demand forecasts. ▪ Unlock SEQ rail network capacity, enabling the network to expand and meet demand. ▪ Increase service frequency. ▪ Improve accessibility. ▪ Reduce journey times. ▪ Increase service reliability. *Links to SIP objectives 2, 3 and 4*
Limits on service frequency	▪ Ensure public transport supports turn-up-and-go frequencies during peak periods. ▪ Enable service frequency to expand in-line with passenger demand forecasts.	▪ Increase the frequency of services. ▪ Enable a mode shift to rail. *Links to SIP objectives 2, 3 and 4*

PROBLEM	BUSINESS REQUIREMENT (OUTCOME SOUGHT)	BENEFIT SOUGHT
Uncompetitive journey times and cost	▪ Enable sustainable journey times to be achieved. ▪ Integrate the bus and train networks with enhanced opportunities for interchanging.	▪ Reduce travel time, across all transport modes. ▪ Reduce wait times. ▪ Enable a mode shift to rail. ▪ Provide better interchange opportunities with the bus network. *Links to SIP objectives 3 and 4*
Network reliability and resilience	▪ Enhance the resilience of the public transport network to unplanned outages and incidents. ▪ Reduce reliance on a single rail corridor through the CBD.	▪ Provide an alternative route and improved resilience in the core rail network. ▪ Reduce downtime due to incidents. ▪ Increase customer confidence in the rail system. *Links to SIP objective 4*
Overcrowding	▪ Ensure the capacity of the rail network matches forecast demand. ▪ Ensure crowding does not impede effective and efficient operations and network reliability.	▪ Reduce crowding. ▪ Make the customer experience more comfortable. ▪ Increase service reliability. *Links to SIP objectives 1 and 2*

Table 3.2: Benefits Sought