

Options Analysis Report

Southland-Pennydale Structure Plan

V171334



Prepared for
Bayside City Council

29 January 2018

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1 Introduction

1.1 Overview

Cardno has been engaged by Bayside City Council to provide traffic and transport advice with respect to the development of the Southland-Pennydale Structure Plan.

This Options Analysis Report has been prepared to present the outcomes of a traffic and car parking assessment of Possible Future development options (herein referred to as 'Possible Futures') for the Southland-Pennydale Structure Plan study area, which included the following:

- > Reviewing relevant planning documentation for significant developments within and proximate to the study area;
- > Assessing the three (3) Possible Futures, based on the three (3) development schedules prepared by SJB Urban, from a traffic impact and car parking impact perspective; and
- > Providing recommendations regarding these Possible Futures, including measures to manage additional traffic volumes and car parking demand, and improvements to public transport, pedestrian and cycling networks in response to increased travel demand.

1.2 Options Analysis Report Context

This report forms one of four work packages to be provided as part of the Southland-Pennydale Structure Plan traffic and transport advice project, with the key purpose of this report being to present a concise assessment of three (3) Possible Futures, provide recommendations regarding these three outcomes, and reliably inform the development of the Southland-Pennydale Structure Plan Traffic and Transport Plan.

Within this report, reference is made to the Combined Highett and Southland-Pennydale Background Report (V171334REP002F02), which outlines the existing conditions of the study area, identifies the opportunities and constraints within the study area, and provides initial recommendations on improving the existing transport network.

1.3 Study Area

The Southland-Pennydale Structure Plan study area is located within Bayside City Council approximately 20 kilometres southeast of the Melbourne CBD.

The study area is generally bound by Park Road to the south, the Frankston Railway Line to the east, Bay Road to the north, and Jack Road to the west. The suburb of Cheltenham has a population of approximately 3,400 residents, a substantial proportion of which live within the Southland-Pennydale study area.

The majority of the land uses within the study area are residential in nature, being General Residential Zone, with a small Commercial Zone area located at the corner of Bay Road and Jack Road.

Figure 1-1 shows the study area in the context of the surrounding road network.

Figure 1-1 Southland-Pennydale Structure Plan Study Area



2 Existing Conditions

2.1 Overview

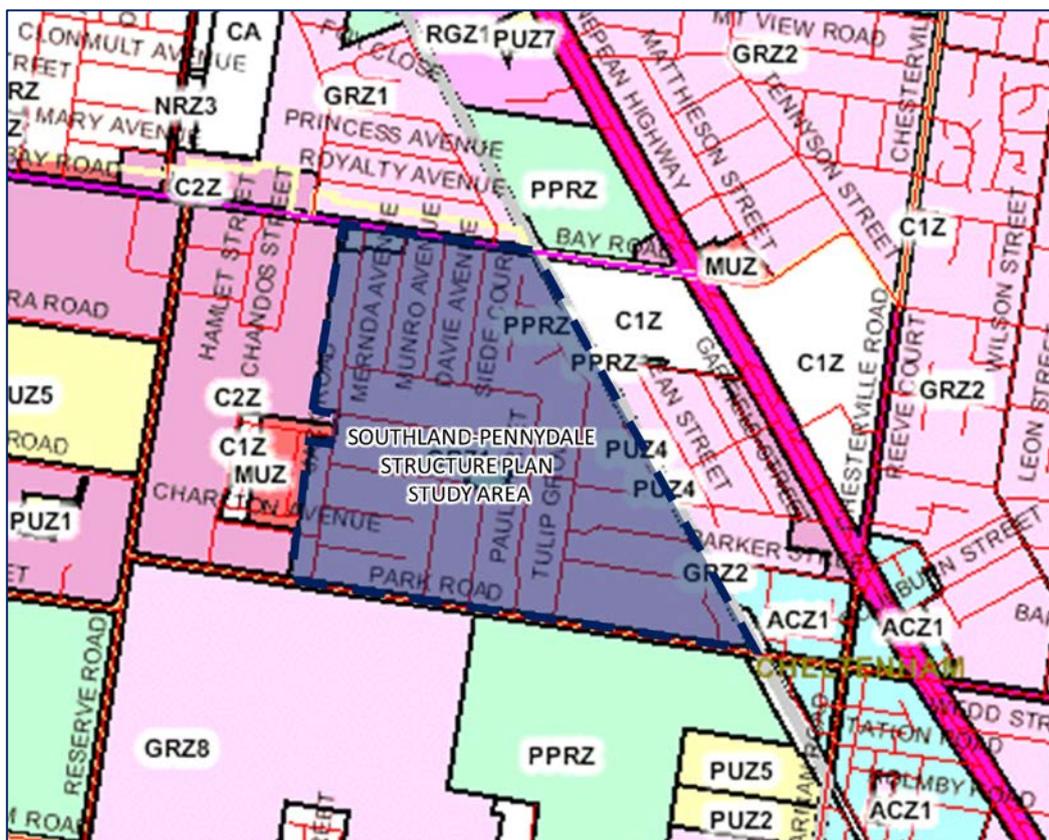
2.1.1 Land Use & Planning Zones

The study area generally comprises single or double storey dwellings within single or subdivided lots, with a number of multi-unit developments located along Park Road and dotted throughout the central area.

Immediately outside the study area is the Jack Road by Mirvac residential townhouse and apartment development to the southwest, an industrial area to the northwest, and Southland Shopping Centre and Southland Railway Station to the east.

The planning zones within the study area have been presented in Figure 2-1. The figure indicates that the majority of the study area is zoned as General Residential Zone – Schedule 1 (GRZ1), the permitted uses of which are described in Clause 32.08 of the Bayside Planning Scheme.

Figure 2-1 Planning Scheme Zones



Further information on the existing land uses within the study area can be found in the Background Report.

2.1.2 Road Network

The road network within the study area generally comprises the major/arterial routes being Bay Road and Park Road, the lower order collector route being Jack Road, and the local street network being the remainder of the streets in the study area.

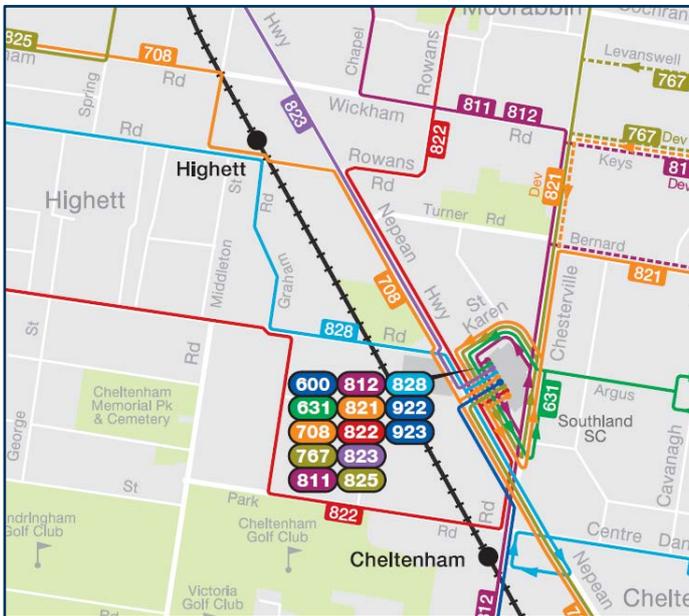
Bay Road is a VicRoads' arterial road which connects the study areas to the remainder of the arterial road network, and predominantly serves to move traffic east – west. Park Road functions as one of Council's major roads, providing a movement corridor for lower traffic volumes than the arterial routes, whilst also passing through activity centres where pedestrian and cyclist movements occur. The local road network generally serves to provide access for vehicles, pedestrians and cyclists to dwellings and other land uses, as well as movement corridors for vulnerable road users (pedestrians and cyclists).

Further detail on the road network is provided within the Background Report.

2.1.3 Public Transport Network

The public transport network servicing residents within the study area comprises two (2) bus routes and the Frankston Railway Line via Cheltenham and Southland Railway Stations, the latter of which opened in November 2017, which provide connections to the surrounding suburbs and directly to the Melbourne CBD. The public transport network is shown in Figure 2-2.

Figure 2-2 Existing Public Transport Network



Source: PTV

Further detail on the public transport network is provided within the Background Report.

2.1.4 Pedestrian & Bicycle Networks

Pedestrian footpaths are generally provided throughout the residential and commercial areas, with footpaths generally provided along both sides of local streets and arterial roads. Notably, along isolated sections of streets including Jack Road and Park Road, footpaths are provided on one side only where the other side fronts a large recreational or industrial site, or if the street is short and terminates in a cul-de-sac.

Facilities for cycling in the study area are limited, with no dedicated on-road bicycle lanes or off-road shared paths provided. Cyclists within the study area are therefore required to share the road with vehicles.

Further detail on the pedestrian and bicycle networks is provided within the Background Report.

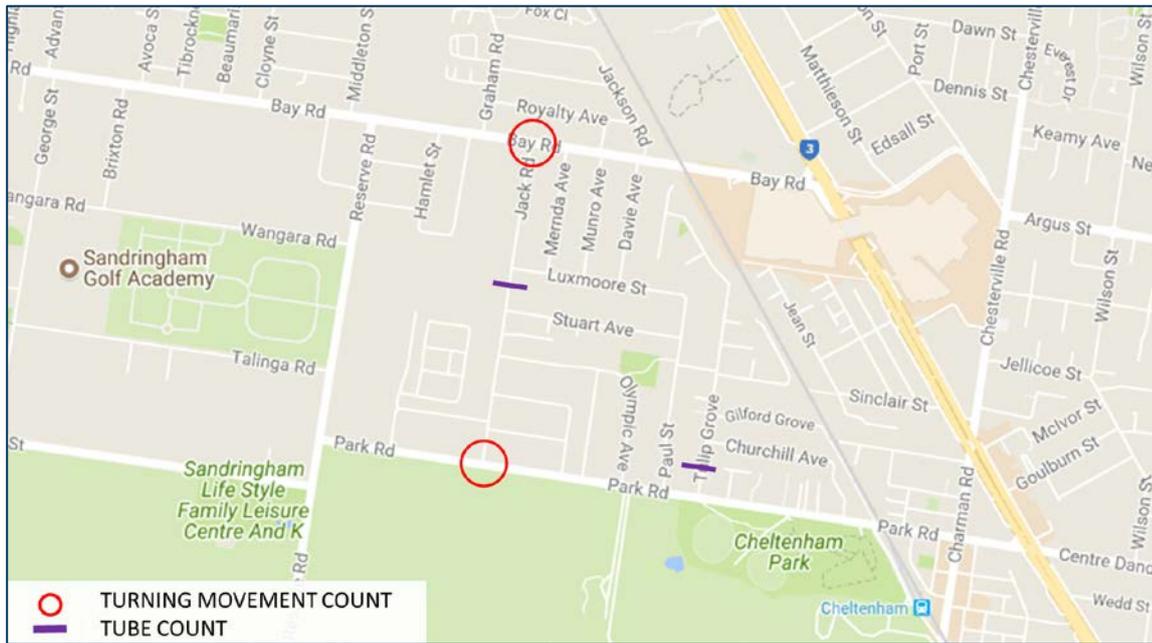
2.2 Traffic Conditions

To understand the existing traffic conditions within the study area, Cardno commissioned traffic surveys to be conducted at the following days and times:

- > Turning movement counts:
 - Thursday 14th September 2017 from 7:00am to 9:00am, and from 5:00pm to 7:00pm;
 - Saturday 16th September 2017 from 11:00am to 1:00pm;
- > Tube counts (7 day period):
 - Thursday 14th September 2017 to Wednesday 20th September 2017.

The locations of the tube counts and turning movement counts are shown in Figure 2-3.

Figure 2-3 Traffic Survey Locations



The results of the tube counts are summarised in Table 2-1 and 0.

Table 2-1 Existing Traffic Volumes – Jack Road

Volumes	Monday-Friday (Average)	Saturday	Sunday
24-hour (Daily)			
Northbound (vpd)	809	744	631
Southbound (vpd)	1,061	1,009	808
Total (vpd)	1,870	1,753	1,439
AM Peak Hour			
	8:00am to 9:00am	11:00am to 12:00pm	11:00am to 12:00pm
Northbound (vpd)	82	69	44
Southbound (vpd)	76	117	80
Total (vpd)	157	186	124
PM Peak Hour			
	5:00pm to 6:00pm	12:00pm to 1:00pm	12:00pm to 1:00pm
Northbound (vpd)	66	59	59
Southbound (vpd)	109	107	75
Total (vpd)	175	166	134

Table 2-2 Existing Traffic Volumes – Tulip Grove

Volumes	Monday-Friday (Average)	Saturday	Sunday
24-hour (Daily)			
Northbound (vpd)	480	576	450
Southbound (vpd)	574	746	551
Total (vpd)	1,054	1,322	1,001
AM Peak Hour			
	8:00am to 9:00am	11:00am to 12:00pm	11:00am to 12:00pm
Northbound (vpd)	32	44	33
Southbound (vpd)	72	60	43
Total (vpd)	104	104	76
PM Peak Hour			
	5:00pm to 6:00pm	2:00pm to 3:00pm	1:00pm to 2:00pm
Northbound (vpd)	53	52	40
Southbound (vpd)	42	47	49
Total (vpd)	95	99	89

The results of the tube count survey data indicate the following:

- > Jack Road is currently functioning as an Access Street Level 1, as classified within Clause 56 of the Bayside Planning Scheme, with a weekday average traffic volume of 1,870 vehicles per day operating within a 7.0-metre reserve; and
- > Tulip Grove is currently functioning as an Access Street Level 1, with a weekday average traffic volume of 1,054 vehicles per day operating within a 7.0-metre reserve.

The results of the turning movement counts are summarised in Figure 2-4 to Figure 2-7.

Figure 2-4 Existing Turning Movement Count – Bay Road and Jack Road Thursday 14th September

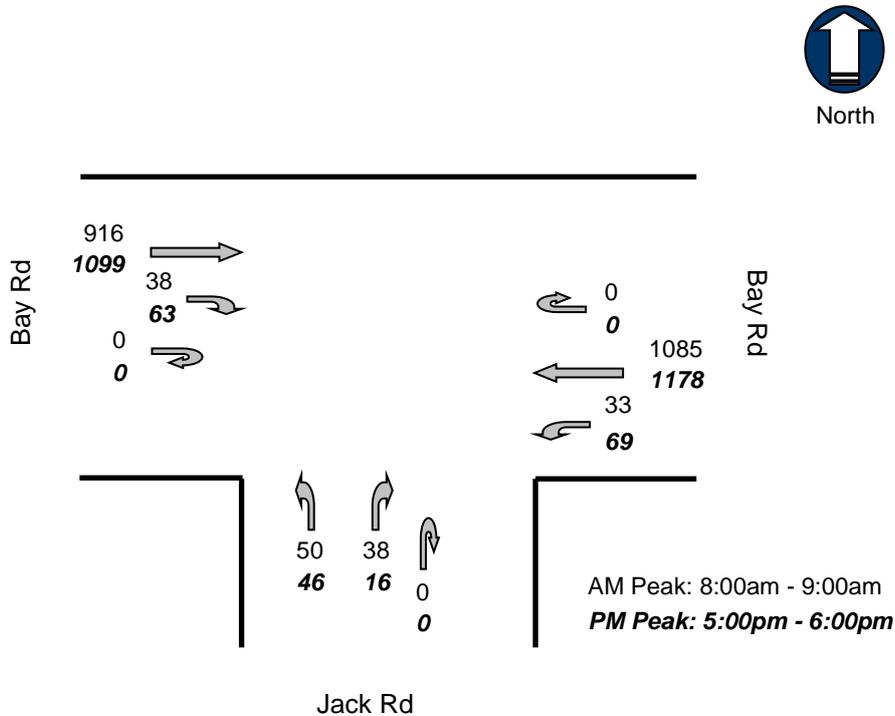


Figure 2-5 Existing Turning Movement Count – Bay Road and Jack Road Saturday 16th September

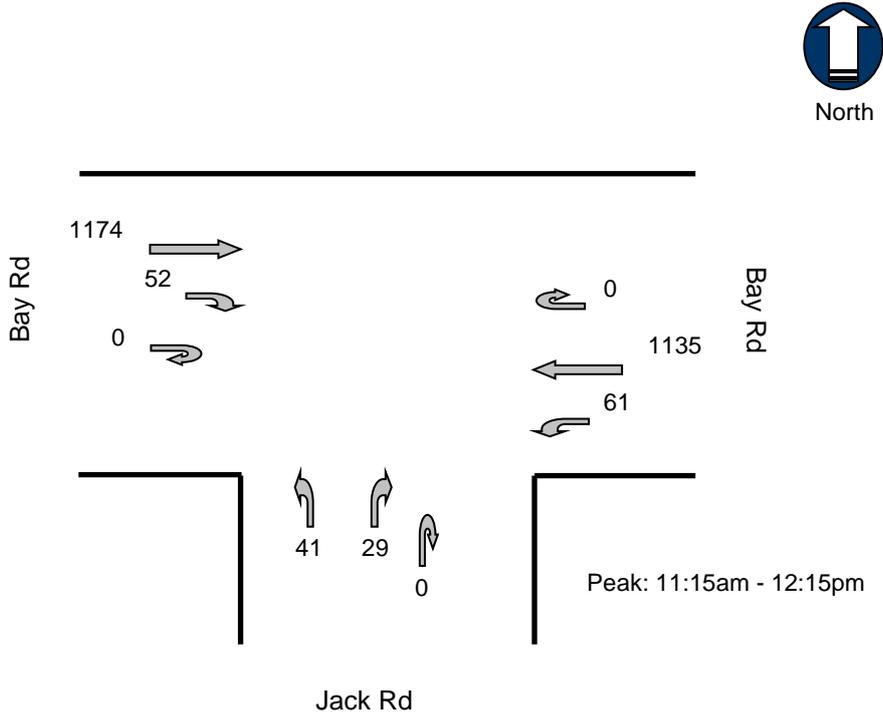


Figure 2-6 Existing Turning Movement Count – Park Road and Jack Road Thursday 14th September

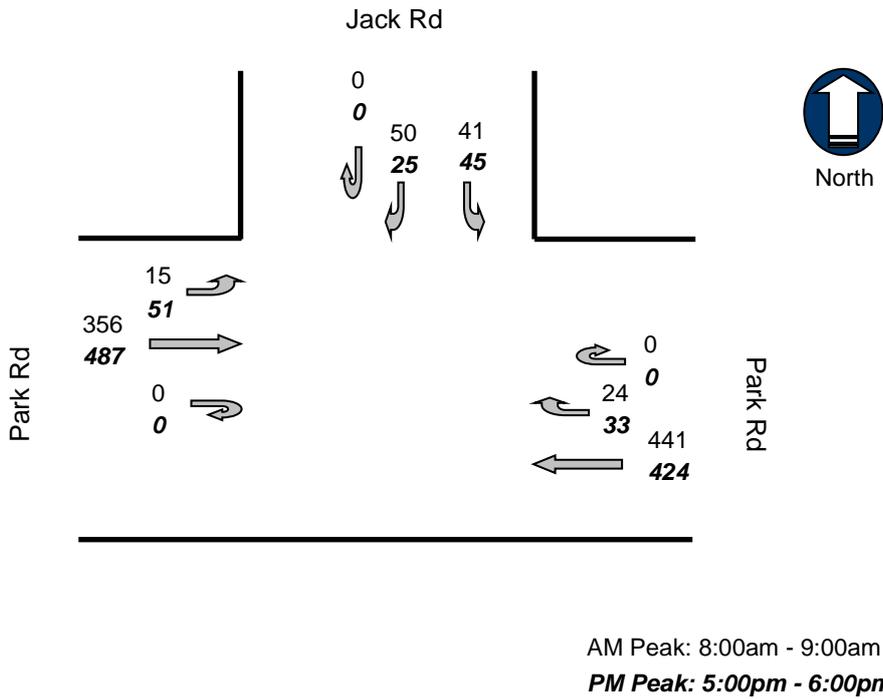
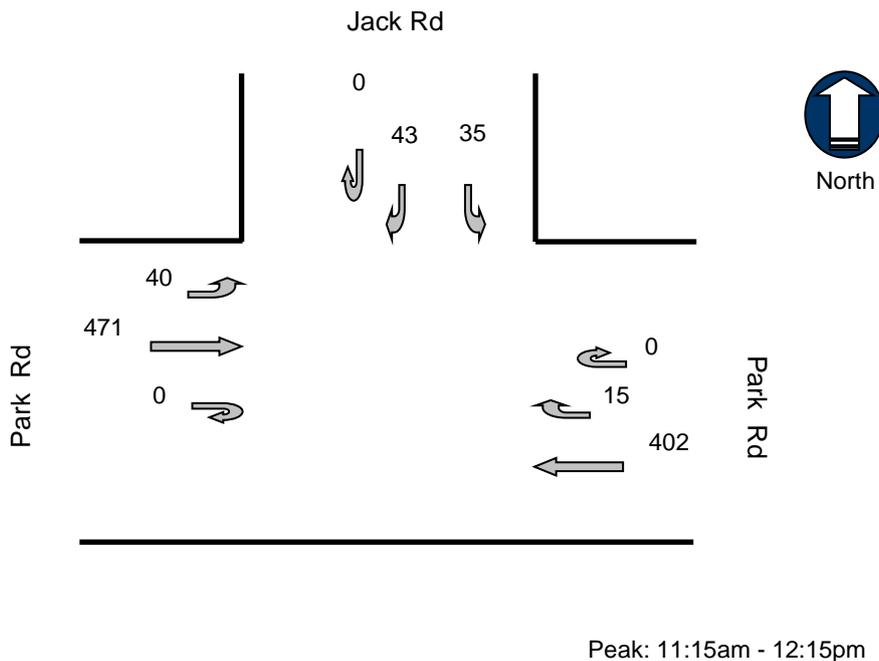


Figure 2-7 Existing Turning Movement Count – Park Road and Jack Road Saturday 16th September



A high-level, preliminary assessment has been made regarding the operating conditions of these intersections, from a general traffic capacity principle perspective. The results of the turning movement count survey data indicate the following with regards to the critical peak right turn movement:

- > Bay Road / Jack Road: there is an observable demand for vehicles turning right into and out of Jack Road, with a peak movement of 63 vehicles (approx. one vehicle every 45 seconds) turning right from Bay Road in the PM peak period on the weekday surveyed. This would be considered manageable in traffic engineering terms, however, given the traffic volumes along Bay Road and the close proximity to the pedestrian signals on the immediate east, queueing and delays could be expected;
- > Park Road / Jack Road: there is an observable demand for vehicles turning right into and out of Jack Road, with a peak movement of 50 vehicles (approx. one vehicle every minute) turning right from Jack Road in the AM peak period on the weekday surveyed. This would be considered manageable in traffic engineering terms and should be able to be accommodated within the existing intersection layout from a traffic capacity perspective.

In summary, it is concluded that the existing intersections are operating within their theoretical intersection capacities, with the exception of the Bay Road/Jack Road intersection, which is considered to be approaching its capacity given the high volume of traffic travelling along Bay Road. It is also noted that during a site inspection, substantial delays were observed for right turning vehicles at this intersection.

2.2.2 Future Development

It is noted that whilst this assessment is concerned with the impact of the three Possible Futures in comparison to the existing conditions of the road network, there are a number of developments within or immediately outside of the study area of notable size and traffic impact, which would warrant consideration in the context of the traffic impact assessment for the Possible Futures.

The first major development near to the study area is the Jack Road development project by Mirvac located at 33 Jack Road, Cheltenham. The development comprises approximately 183 residential dwellings across a range of townhouses and apartments as well as areas of passive open space, with vehicle access via Jack Road and other surrounding roads.

Cardno was engaged by Mirvac in 2009 to undertake a traffic impact assessment of the proposed development, which included consideration of the traffic generation, distribution and impact on the surrounding street network.

The second development that has a notable traffic impact is the proposed residential development at 378-382 Bay Road, Cheltenham. The development comprises 30 apartments with 35 car parking spaces located within a basement car park, with direct vehicle access to Munro Avenue.

Traffic engineering consultants, Onemilegrid, previously prepared a transport impact assessment of the proposed development, including consideration of the traffic generated and its impact on the road network.

Given that these developments were not completed at the time of the traffic surveys, traffic generated by these developments would not have been included within the existing conditions. Therefore, these two developments have been incorporated in assessing the impact of each of the Possible Futures. The figures below represents the additional traffic generated by these two developments in the context of the surrounding road network.

Figure 2-8 Jack Road Development Peak Hour Traffic Volumes – Bay Road / Jack Road Intersection

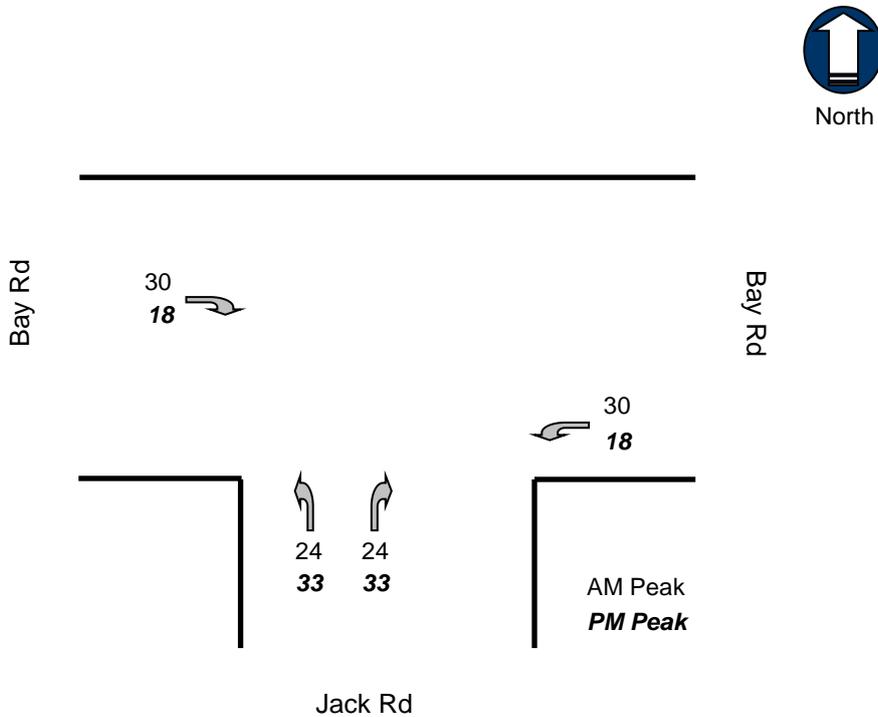


Figure 2-9 Jack Road Development Peak Hour Traffic Volumes – Park Road / Jack Road Intersection

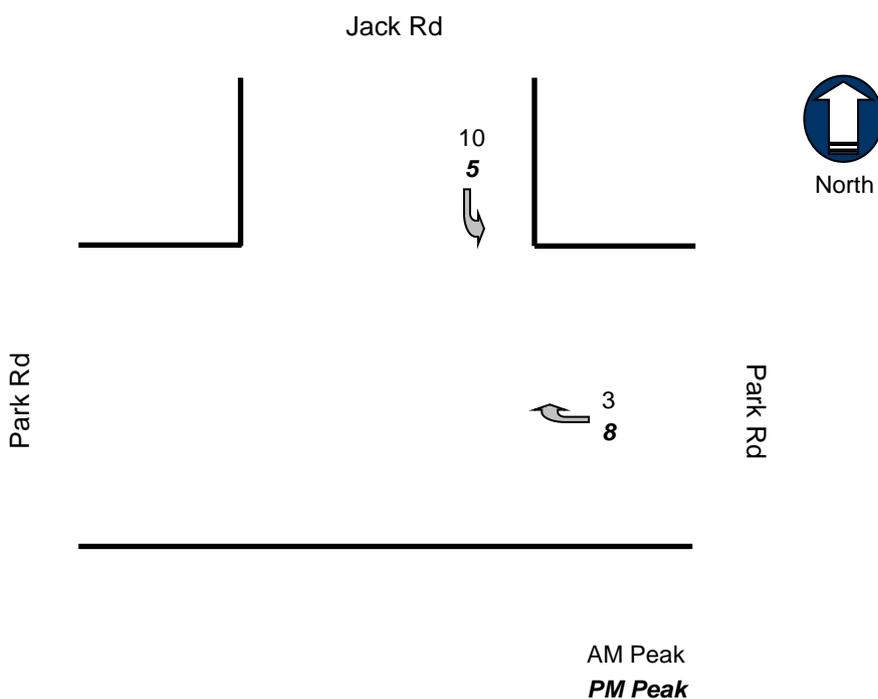
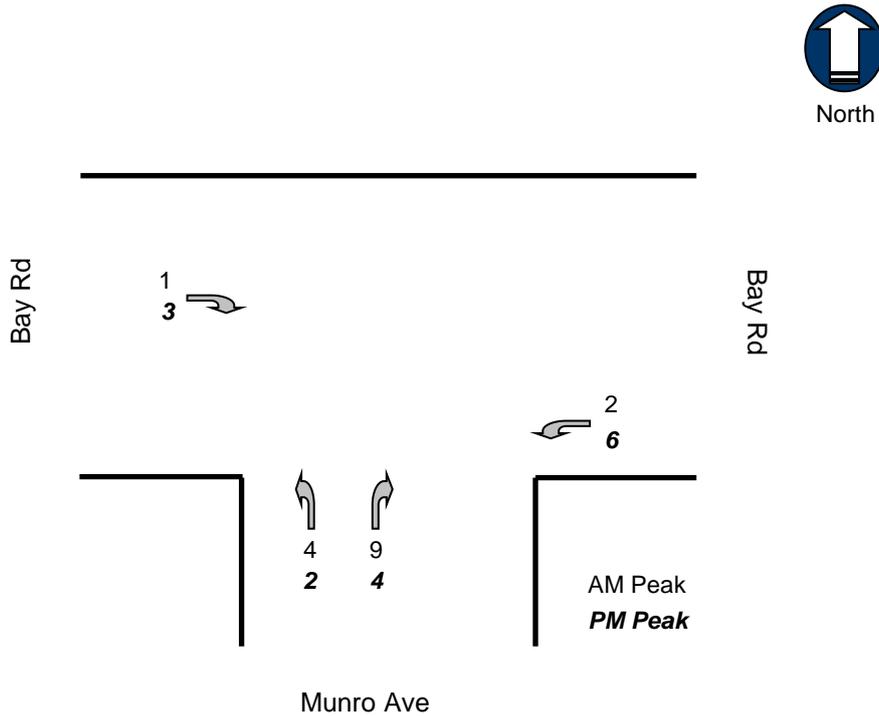


Figure 2-10 378-382 Bay Road Development Peak Hour Traffic Volumes – Bay Road / Jack Road Intersection



2.3 Car Parking Conditions

Public car parking is provided across the study area as on-street parking along local streets and along isolated sections of major/arterial routes. The general car parking characteristics within the study area are outlined in Figure 2-11.

Figure 2-11 Car Parking Details

Parking Type	Street Type	Parking Provision	Restrictions
On-street	Local Road	On-street parking generally on both sides	
	Major Local Road	On-street parking generally on both sides with regular no stopping zones	Generally restricted to 4P due to proximity to Southland Railway Station
	Major/Arterial Road	On-street parking generally not permitted	

Car parking occupancy surveys were conducted on Thursday 14th September and Saturday 16th September, between the hours of 7:00am and 10:00pm across the study area (on-street and off-street). The hours surveyed were chosen to provide insight into car parking behaviours across a range of peak activity periods.

The study area was separated into the two (2) residential precincts for the purposes of analysis.

Figure 2-12 Car Parking Precincts



The results of the survey indicate that within the on-street car parking provisions provided across the residential areas, approximately 1279 car parking spaces were available for use. The peak occupancy across the area generally occurred at 2:00pm on Thursday with 340 spaces occupied (27% occupancy), and at 2:00pm on the Saturday with 284 spaces occupied (22% occupancy). At any time during the Thursday and Saturday surveys, ample on-street car parking was available for use (at least 939 spaces on the Thursday and 995 spaces on the Saturday).

It is also noted that across this region of the study area, a 4P car parking restriction has recently been installed in response to community concerns regarding the opening of Southland Railway Station in November 2017. As a result, commuter and other long-term parking behaviour not associated with residents of the study area has been discouraged/removed through the parking implementation.

Further details of the car parking conditions within the study area can be found in the Background Report.

3 Possible Future 1

3.1 Overview

The first Possible Future is intended to represent the expected growth in land use under the scenario that no changes are made to the zoning of the land as GRZ1. Residential development under this zoning would be limited to no more than three storeys in height and would be subject to a number of other controls under Clause 32.08 of the Bayside Planning Scheme.

In this context, development has assumed to occur in the form of subdivision of blocks into two separate dwellings along the major traffic and public transport routes, being Bay Road, Jack Road and Park Road. These dwellings are assumed to be provided with three or more bedrooms, reflecting the existing development in the study area.

Regarding the transport network under the first Possible Future, it is proposed that the major traffic routes of Bay Road and Park Road remain movement corridors, whilst Jack Road is designated as a connector street carrying more traffic than a typical local street. The pedestrian and cycling networks are proposed to be improved in line with recommendations made in the Combined Background Report, including;

- > Advocating for / provision of bicycle routes along Bay Road and Park Road;
- > Advocating for / provision of a pedestrian and cycling corridor along the Frankston Railway Line;
- > Advocating for / provision of new pedestrian crossing points across the Frankston Railway Line via new underpasses to allow pedestrian movements between the Southland-Pennydale study area and areas to the east; and
- > Advocating for / provision of new pedestrian crossing facilities across Bay Road and Park Road.

An indicative development plan is shown in Figure 3-1, whilst an indicative development schedule is shown in Appendix A.

Figure 3-1 Possible Future 1 Indicative Development Plan (showing subdivided lot areas in blue)



3.2 Traffic Considerations

In order to assess the Possible Future scenario from a traffic perspective, Cardno has undertaken a traffic impact assessment based on the indicative development schedule and a number of assumptions regarding typical traffic generation rates for residential dwellings, the typical distribution of traffic across the surrounding road network, and therefore has determined the anticipated impact on the operation of the road network as a result.

3.2.1 Traffic Generation

For residential developments, peak hour traffic generation is influenced by a number of locational factors such as:

- > The proximity to public transport;
- > The proximity to work places, shops and other facilities allowing residents to walk or cycle; and
- > Existing levels of traffic congestion on the road network that can influence choice of transport mode at peak times.

It is generally accepted that single dwelling lots in outer urban areas generate traffic at a rate of up to 10 vehicles per day per lot, with peak hour traffic generation rates being 10 percent of the daily rates. In areas of good public transport accessibility, lower traffic generation rates are often observed for medium density larger units/townhouses and higher density dwellings.

Further to this, Cardno and others have conducted surveys of a variety of residential developments, and observed typical rates as shown in Table 3-1.

Table 3-1 Typical Traffic Generation Rates for Residential Developments

Type of Development	24 Hour (vpd)	Peak Hour (vpd)
Dwelling houses	8.0 - 10.0	0.8 - 1.0
Medium density residential flat – larger units and townhouses	6.0 - 7.0	0.6 - 0.7
Medium density residential flat – smaller units and flats	2.5 - 4.6	0.25 - 0.5

In this context, it is considered that the subdivided lots would typically represent either dwelling houses or medium density residential townhouses. These three bedroom dwellings could therefore be expected to generate traffic at a rate of 6-10 movements per day.

For the purposes of an accurate but conservative assessment, and considering the study area location relative to public transport services, employment, and existing traffic congestion, a rate of 8.5 movements per day, or 0.85 movements during the morning and evening commuter peak hours, has been adopted.

During the morning peak hour it is anticipated that 80% of vehicle movements will be outbound, while it is assumed that 60% of vehicle movements will be inbound during the evening peak.

Applying this rate and directional split to the indicative development schedule (see Appendix A) equates to the daily and peak hour traffic generation levels shown in Table 3-2.

Table 3-2 Possible Future 1 Daily and Peak Hour Traffic Generation

Development Location	Dwelling No.	One-Way Peak Hour Traffic (vehicles per hour)				Two-Way Daily Traffic (vehicles per day)
		AM In	AM Out	PM In	PM Out	
Bay Road (Jack Road to Tulip Grove)	48 no. three bedroom dwellings	8	33	24	16	408
Jack Road (Bay Road to Park Road)	40 no. three bedroom dwellings	7	27	20	14	340
Park Road West (Jack Road to Tulip Grove)	56 no. three bedroom dwellings	10	38	29	19	476
Park Road East (Tulip Grove to Frankston Railway Line)	80 no. three bedroom dwellings	14	54	41	27	680
Total	224	39	152	114	76	1904

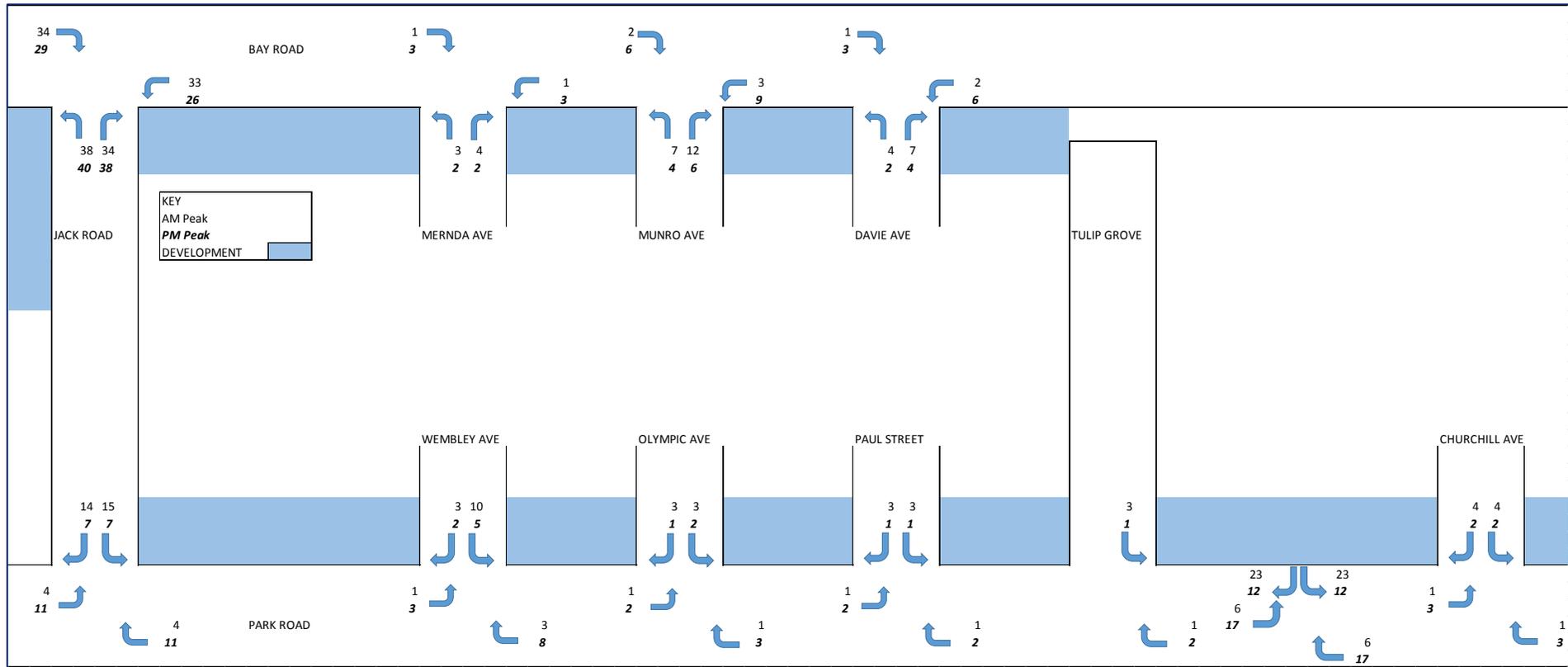
3.2.2 Traffic Distribution

The traffic volumes outlined in Table 3-2 were distributed onto the surrounding road network based on several assumptions, as outlined below:

- > The indicative developments along Bay Road and Park Road are assumed to be provided with vehicle access via the nearest local street, and are not provided with direct access from the indicative development location onto these major/arterial roads, with the exception of some of the developments along Park Road East, which have been represented as having a single vehicle access point;
- > The indicative developments along Jack Road are proposed to have direct access to Jack Road;
- > It is assumed that the following directional distributions apply:
 - Bay Road and Park Road: 50% of vehicles are assumed to travel to the west and 50% to the east; and
 - Jack Road: 70% of vehicles are assumed to travel north to Bay Road whilst 30% of vehicles travel south to Park Road, and are equally distributed to the west and east along these roads.

Following these assumptions, the traffic distribution for Possible Future 1 has been presented in Figure 3-2.

Figure 3-2 Possible Future 1 Development Traffic Distribution



3.2.3 Traffic Impact

The anticipated level of traffic generated by the level of development in Possible Future 1 is generally considered relatively low in traffic engineering terms across most of the local street network. By way of example, the volume of traffic associated with the critical movement at the intersection of Munro Avenue and Bay Road, being a right turn out of Munro Avenue onto Bay Road, is equivalent of approximately one right turn every five minutes during the morning peak hour.

Notably, the additional traffic volumes distributed onto Bay Road via Jack Road due to both the Jack Road development and the development within this Possible Future are higher than observed across the remainder of the road network. At the Bay Road / Jack Road intersection, approximately one additional vehicle every two minutes is anticipated to turn right onto Bay Road in the AM and PM peak periods, which is considered a moderate level of traffic increase. Given the current traffic volumes along Bay Road are in the order of 1,000 vehicles per hour during the morning and evening peak periods, this level of traffic is likely to cause additional delays and queues for traffic along Jack Road under the existing intersection arrangement.

Given the relatively low level of traffic generated across the study area in comparison to the high traffic volumes along Park Road and Bay Road (further detailed in the Background Report), it is generally expected that these major/arterial roads will continue to function appropriately, noting in the morning and evening peak period additional traffic queueing may occur.

3.3 Car Parking Considerations

Having consideration of the indicative development in this Possible Future scenario, an estimate of the expected car parking requirement based on the statutory requirements within the Bayside Planning Scheme and the possible on-street car parking demand has been undertaken.

3.3.1 Car Parking Requirement

The statutory car parking requirements relevant to the proposed development are listed within Clause 52.06 of the Bayside Planning Scheme, with car parking rates provided in Table 1 of Clause 52.06-5.

The statutory car parking requirements that apply to the development level within Possible Future one are presented in Table 3-3.

Table 3-3 Statutory Car Parking Requirements

Use	Car Parking Rate (No. of spaces)	Car Parking Measure
Dwelling	1	To each one or two bedroom dwelling
	2	To each three or more bedroom dwelling
	1	For visitors to every 5 dwellings for developments of 5 or more dwellings

Application of the above requirements to this Possible Future development schedule results in the car parking requirements outlined in Table 3-4

Table 3-4 Possible Future 1 Car Parking Requirement

Development Location	Dwelling No.	Resident Car Parking Requirement (No. spaces)	Visitor Car Parking Requirement
Bay Road (Jack Road to Tulip Grove)	48 no. three bedroom dwellings	96	-
Jack Road (Bay Road to Park Road)	40 no. three bedroom dwellings	80	-
Park Road West (Jack Road to Tulip Grove)	56 no. three bedroom dwellings	112	-
Park Road East (Tulip Grove to Frankston Railway Line)	80 no. three bedroom dwellings	160	-
Total	224	448	-

As presented, the level of development contemplated under this Possible Future does not generate a requirement for visitor car parking. Rather, the subdivision of existing residential lots would generate a requirement for resident car parking only.

3.3.2 Car Parking Demand

Typically for townhouses and similar dwelling types within outer urban areas, such as the study area, resident car parking requirements translate to resident car parking demand. This is supported by car ownership data for the suburb of Cheltenham within the recent 2016 Census, which has been summarised in Table 3-5.

Table 3-5 Car Ownership Data 2016 Census - Cheltenham

Description	2016 Average Car Ownership Rate / Apartment	Percentage that do not own a car	Percentage that own one car	Percentage that own two cars
Three-bedroom house	1.70 vehicles	5%	36%	46%

Further, it is also typically observed that townhouses and similar dwelling types are provided with on-site car parking to meet the requirements (and therefore the demands) for resident parking. In this context, demand for on-street car parking is expected to be limited to residential visitors.

Case studies held by Cardno that are regularly cited for residential development purposes indicate that residential buildings generate peak visitor parking demands at a rate of 0.12 spaces per dwelling. For the purposes of a conservative assessment, assuming that this demand is provided within on-street car parking provisions only, 27 additional on-street car parking spaces would be expected to be occupied during peak visitor periods.

Considering that the car parking surveys indicated a minimum availability of over 900 car parking spaces on a weekday and a weekend day, this level of additional demand would be readily accommodated without any noticeable impact on car parking availability.

3.3.3 Car Parking Impact

Considering the high likelihood that resident car parking demand will be accommodated on-site, and the relatively small amount of visitor on-street car parking demands in comparison to the availability of parking, the car parking impacts associated with Possible Future 1 are considered minimal and are unlikely to impact on existing on-street car parking availability.

4 Possible Future 2

4.1 Overview

Possible Future 2 is intended to represent a low to moderate level of growth in the study area under the scenario that changes are made to the zoning of the land such that development would be permitted to be a maximum of four storeys in height and would be subject to a number of other planning controls.

In this context, development has assumed to occur in the form of residential apartment buildings along the major traffic and public transport routes, being Bay Road, Jack Road and Park Road. Dwellings within these indicative apartment buildings are assumed to be a mix of one, two and three bedroom dwellings.

As proposed within the first Possible Future, it is proposed that Bay Road and Park Road remain the primary movement corridors, whilst Jack Road is designated as a connector street. The pedestrian and cycling networks are proposed to be improved in line with recommendations made in the Combined Background Report as per Possible Future 1.

An indicative development plan is shown in Figure 4-1, whilst an indicative development schedule is shown in Appendix A.

Figure 4-1 Possible Future 2 Indicative Development Plan (showing development areas in blue)



4.2 Traffic Considerations

As per the first Possible Future assessment, Cardno has undertaken a traffic impact assessment based on the indicative development schedule and a number of assumptions regarding traffic generation rates, the distribution of traffic across the road network, and has therefore determined the impact on the operation of the road network.

4.2.1 Traffic Generation

As previously discussed, it is generally accepted that single dwelling lots in outer urban areas generate traffic at a rate of up to 10 vehicles per day per lot, with peak hour traffic generation rates being 10 percent of the daily rates. In areas of good public transport accessibility, lower traffic generation rates are often observed for medium density larger units/townhouses and higher density dwellings.

In this context, and considering the rates determined by Cardno and others, it is considered that the indicative developments within this Possible Future would typically represent medium density residential flats and apartments. Therefore, the one, two and three-bedroom dwellings indicatively presented could be expected to generate traffic at a rate of 2.5 to 7 movements per day.

For the purposes of an accurate but conservative assessment, and considering the proximity to public transport services, employment, and the existing traffic congestion, the following rates have been adopted:

- > For one-bedroom dwellings: 3.0 movements per day, 0.3 movements per peak hour;
- > For two-bedroom dwellings: 5.0 movements per day, 0.5 movements per peak hour; and
- > For three-bedroom dwellings: 7.0 movements per day, 0.7 movements per peak hour.

The same directional split used in the assessment of Possible Future 1 has been used (80% of movements in the morning peak will be outbound; 60% of movements will be inbound during the evening peak).

Applying this rate and directional split to the indicative development schedule (see Appendix A) equates to the daily and peak hour traffic generation levels shown in Table 4-1.

Table 4-1 Possible Future 2 Daily and Peak Hour Traffic Generation

Development Location	Dwelling No.			One-Way Peak Hour Traffic (vehicles per hour)				Two-Way Daily Traffic (vehicles per day)
	One bedroom	Two bedroom	Three bedroom	AM In	AM Out	PM In	PM Out	
Bay Road (Jack Road to Tulip Grove)	75	163	42	27	107	80	53	1334
Jack Road (Bay Road to Park Road)	33	172	45	25	102	76	51	1274
Park Road West (Jack Road to Tulip Grove)	31	62	16	10	41	31	21	515
Park Road East (Tulip Grove to Frankston Railway Line)	84	178	306	66	263	197	131	3284
Total	223	575	4109	128	513	384	256	6407

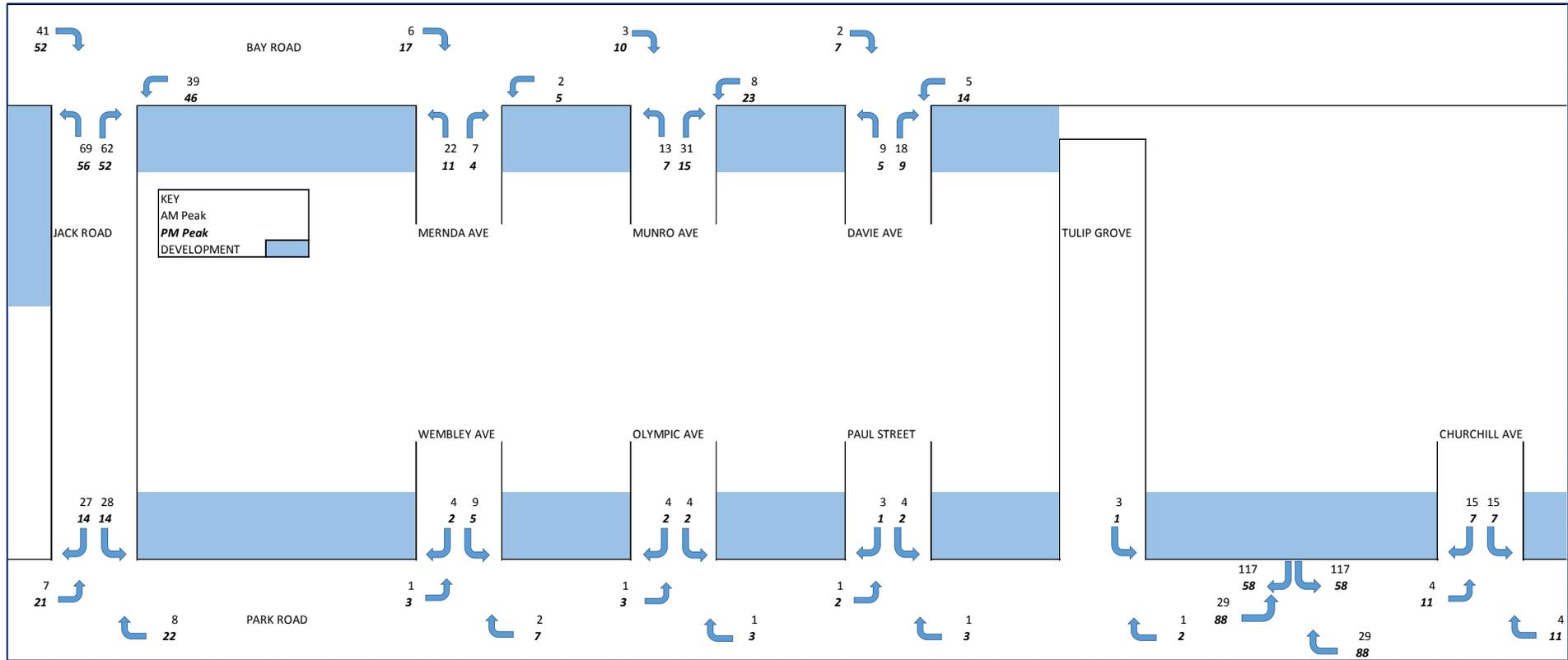
4.2.2 Traffic Distribution

The traffic volumes outlined in Table 4-1 were distributed onto the surrounding road network based on the same set of assumptions used in Possible Future 1, as outlined below:

- > The indicative developments along Bay Road and Park Road are assumed to be provided with vehicle access via the nearest local street, and are not provided with direct access from the major/arterial roads, with the exception of some of the developments along Park Road East, which have been represented as having a single vehicle access point;
- > The indicative developments along Jack Road are proposed to have direct access to Jack Road;
- > It is assumed that the following directional distributions apply:
 - Bay Road and Park Road: 50% of vehicles are assumed to travel to the west and 50% to the east;
 - Jack Road (north of Luxmoore Street): 70% of vehicles are assumed to travel north to Bay Road whilst 30% of vehicles travel south to Park Road, and are equally distributed to the west and east; and
 - Jack Road (south of Luxmoore Street): 50% of vehicles are assumed to travel north to Bay Road and 50% to the south to Park Road, and are equally distributed to the west and east.

Following these assumptions, the traffic distribution for Possible Future 2 has been presented in Figure 4-2.

Figure 4-2 Possible Future 2 Development Traffic Distribution



4.2.3 Traffic Impact

The anticipated level of traffic generated by the level of development in Possible Future 2 is considered moderate in traffic engineering terms across most of the local street network.

The traffic generated by the indicative development in Park Road East (between Tulip Grove and the Frankston Railway Line) has been represented by a single combined access point for the purposes of this analysis. In the scenario that this level of development eventuates, it is likely that the traffic volumes shown will be distributed across several access points, and would therefore have less traffic impact than indicated within Figure 4-2.

As observed within Possible Future 1, the additional traffic volumes distributed onto Bay Road via Jack Road due to both the Jack Road development and the development within this Possible Future are considerably higher than observed across the remainder of the road network. At the Bay Road / Jack Road intersection, more than one additional vehicle every minute is anticipated to turn right onto Bay Road in the AM and PM peak periods, which is considered a moderate to high level of traffic increase in the context of an unsignalised intersection. Given the current traffic volumes along Bay Road are in the order of 1,000 vehicles per hour during the morning and evening peak periods, this level of traffic is likely to cause additional delays and queues for traffic along Jack Road under the existing intersection arrangement.

Given the moderate level of traffic generated across the study area in comparison to the high traffic volumes along Park Road and Bay Road (further detailed in the Background Report), it is generally expected that these major/arterial roads will continue to function appropriately under this Possible Future option, however, in the morning and evening peak period traffic congestion and queueing is likely to be experienced more frequently than Possible Future 1, but is unlikely to reach capacity levels.

4.3 Car Parking Considerations

Having consideration of the indicative development under this Possible Future scenario, an estimate of the expected car parking requirement based on the statutory requirements within the Bayside Planning Scheme and the possible on-street car parking demand has been undertaken.

4.3.1 Car Parking Requirement

The statutory car parking requirements relevant to the proposed development are listed within Clause 52.06 of the Bayside Planning Scheme, as presented in Table 3-3.

Application of these requirements to this Possible Future development schedule results in the car parking requirements outlined in Table 4-2

Table 4-2 Possible Future 2 Car Parking Requirement

Development Location	Dwelling No.			Resident Car Parking Requirement (No. spaces)	Visitor Car Parking Requirement
	One bedroom	Two bedroom	Three bedroom		
Bay Road (Jack Road to Tulip Grove)	75	163	42	322	53
Jack Road (Bay Road to Park Road)	33	172	45	295	48
Park Road West (Jack Road to Tulip Grove)	31	62	16	125	17
Park Road East (Tulip Grove to Frankston Railway Line)	84	178	306	874	111
Total	223	575	409	1616	229

4.3.2 Car Parking Demand

Typically for apartments and similar dwelling types within outer urban areas, such as the study area, resident car parking requirements generally translate into resident car parking demands. This is supported by car ownership data within the suburb of Cheltenham within the recent 2016 Census, which has been summarised in Table 4-3.

Table 4-3 Car Ownership Data 2016 Census - Cheltenham

Description	2016 Average Car Ownership Rate / Apartment	Percentage that do not own a car	Percentage that own one car	Percentage that own two cars
One-bedroom apartment	0.90 vehicles	26%	67%	12%
Two-bedroom apartment	1.16 vehicles	14%	59%	24%
Three-bedroom apartment	1.53 vehicles	8%	41%	45%

Apartments and similar dwelling types within urban areas are also typically provided with on-site car parking to meet the requirements (and therefore the demands) for resident parking, and often for a proportion of residential visitors. In this context, demand for on-street car parking is expected to be limited to a proportion of residential visitor demand.

As previously mentioned, case studies held by Cardno indicate that residential buildings generate peak visitor parking demands at a rate of 0.12 spaces per dwelling. For the purposes of a conservative assessment, assuming that all visitor demand associated with the 1,207 dwellings in this Possible Future is to be accommodated within on-street car parking provisions only, 145 additional on-street car parking spaces would be expected to be occupied during peak visitor periods.

Considering that the car parking surveys indicated a minimum availability of over 900 car parking spaces on a weekday and a weekend day, this level of additional demand would be readily accommodated without any noticeable impact on car parking availability. Approximately 750 spaces would be expected to remain available for use – by way of a sensitivity analysis, this additional on-street car parking would allow for approximately one third of the residential car parking demand to be accommodated on-street (being in the order of 550 spaces), and still allow 200 spaces across the study area for use, should each development only accommodate two-thirds of the residential parking demand on-site.

It is also noted that on-street car parking provisions are provided for use by residential visitors, and as such it is considered that the abovementioned increase in occupancy aligns with the intended usage of these on-street provisions.

4.3.3 Car Parking Impact

Considering the high likelihood that a large portion of resident and visitor car parking demand will be accommodated within future on-site car parking provisions, and the reasonable amount of visitor on-street car parking demands in comparison to the availability of parking, the car parking impacts associated with Possible Future 2 are considered minimal and are appropriate in the context of the area. It is not expected that changes to on-street car parking restrictions or provisions will be required to manage/accommodate car parking demand.

5 Possible Future 3

5.1 Overview

The third Possible Future is intended to represent a moderate level of growth in the study area under the scenario that changes are made to the zoning of the land such that development would be permitted to be a maximum of six storeys in height in certain areas, and would be subject to a number of other controls.

In this context, development has assumed to occur in the form of residential apartment buildings along the major traffic and public transport routes, being Bay Road, Jack Road, Park Road and Tulip Grove, with the opening of 60 Tulip Grove to provide pedestrian access to Southland Railway Station. Dwellings within these indicative apartment buildings are assumed to be a mix of one, two and three bedroom dwellings, as assumed within Possible Future 2.

As proposed within the first and second Possible Futures, it is proposed that Bay Road and Park Road remain the primary movement corridors, whilst Jack Road is designated as a connector street. Unique to this Possible Future is the proposed continuation of Tulip Grove to Bay Road via Siede Court, and the designation of Tulip Grove as a connector street providing a second continuous connection from Park Road to Bay Road.

The pedestrian and cycling networks are proposed to be improved in line with recommendations made in the Background Report as per Possible Futures 1 and 2.

An indicative development plan is shown in Figure 5-1, whilst an indicative development schedule is shown in Appendix A.

Figure 5-1 Possible Future 3 Indicative Development Plan (showing development areas in blue)



5.2 Traffic Considerations

As per Possible Futures 1 and 2, Cardno has undertaken an assessment based on the indicative development schedule and a number of assumptions regarding traffic generation rates, the distribution of traffic across the road network, and has determined the subsequent impact on the operation of the road network.

5.2.1 Traffic Generation

Considering the rates determined by Cardno and others, it is considered that the indicative developments within this Possible Future would be in line with those used in the second Possible Future assessment. Therefore, the following rates have been adopted:

- > For one-bedroom dwellings: 3.0 movements per day, 0.3 movements per peak hour;
- > For two-bedroom dwellings: 5.0 movements per day, 0.5 movements per peak hour; and
- > For three-bedroom dwellings: 7.0 movements per day, 0.7 movements per peak hour.

The same directional split used in the assessment of Possible Future 1 has been used (80% of vehicle movements in the morning peak will be outbound; 60% of vehicle movements will be inbound during the evening peak).

Applying this rate and directional split to the indicative development schedule (see Appendix A) equates to the daily and peak hour traffic generation levels shown in Table 5-1.

Table 5-1 Possible Future 3 Daily and Peak Hour Traffic Generation

Development Location	Dwelling No.			One-Way Peak Hour Traffic (vehicles per hour)				Two-Way Daily Traffic (vehicles per day)
	One bedroom	Two bedroom	Three bedroom	AM In	AM Out	PM In	PM Out	
Bay Road (Jack Road to Tulip Grove)	75	163	42	27	107	80	53	1334
Jack Road (Bay Road to Park Road)	36	332	86	47	190	142	95	2370
Park Road West (Jack Road to Tulip Grove)	51	109	29	18	72	54	36	901
Park Road East (Tulip Grove to Frankston Railway Line)	113	241	63	40	159	119	79	1985
Tulip Grove (Bay Road to Southland Station)	20	177	46	25	101	76	51	1267
Total	295	1022	266	157	629	471	314	7857

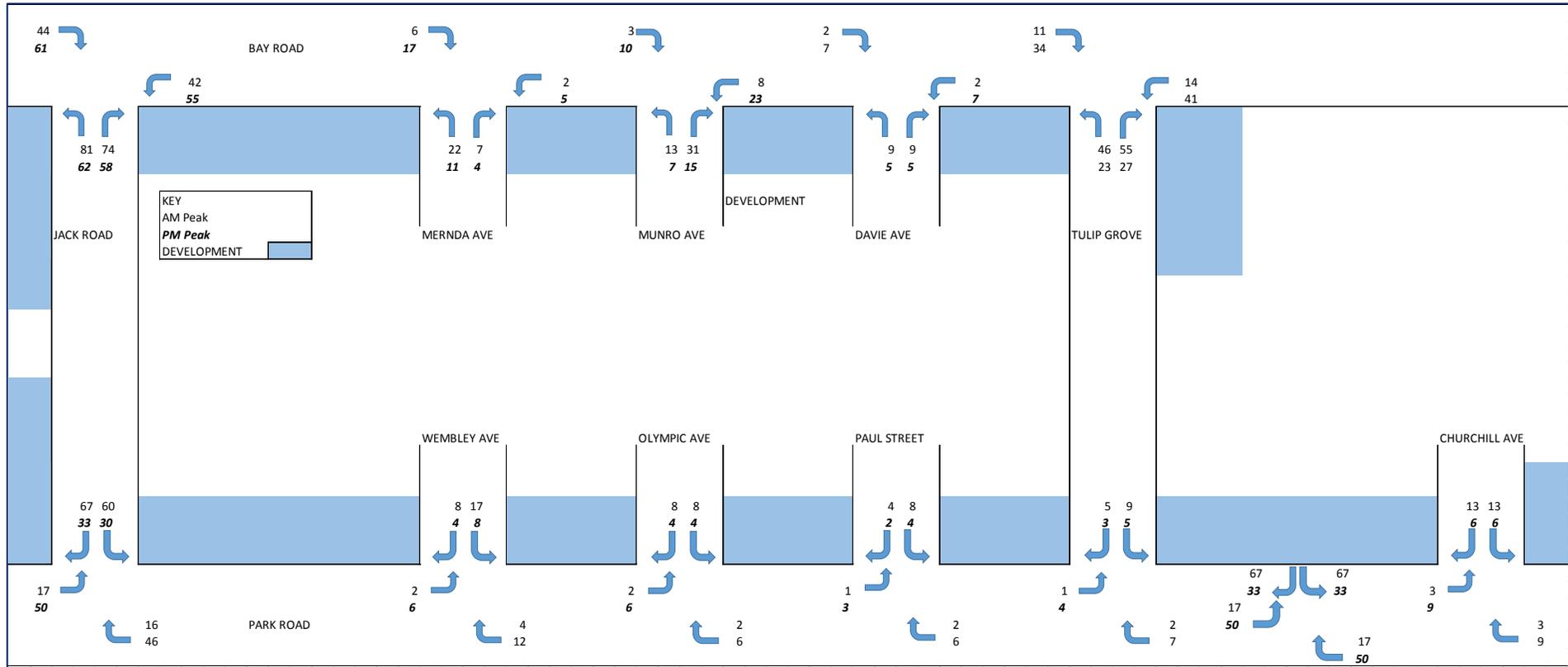
5.2.2 Traffic Distribution

The traffic volumes outlined in Table 5-1 were distributed onto the surrounding road network based on the same set of assumptions used in Possible Futures 1 and 2, as outlined below:

- > The indicative developments along Bay Road and Park Road are assumed to be provided with vehicle access via the nearest local street, and are not provided with direct access from the indicative development location onto these major/arterial roads, with the exception of some of the developments along Park Road East, which have been represented as having a single vehicle access point;
- > The indicative developments along Jack Road and Tulip Grove are proposed to have direct access to Jack Road and Tulip Grove respectively;
- > It is assumed that the following directional distributions apply:
 - Bay Road and Park Road: 50% of vehicles are assumed to travel to the west and 50% to the east;
 - Jack Road (north of Luxmoore Street): 70% of vehicles are assumed to travel north to Bay Road whilst 30% of vehicles travel south to Park Road, and are equally distributed to the west and east along these roads;
 - Jack Road (south of Luxmoore Street): 50% of vehicles are assumed to travel north to Bay Road and 50% to the south to Park Road, and are equally distributed to the west and east; and
 - Tulip Grove: 90% of vehicles are assumed to travel north to Bay Road and 10% to the south to Park Road, and are equally distributed to the west and east.

Following these assumptions, the traffic distribution for Possible Future 3 has been presented in Figure 5-2.

Figure 5-2 Possible Future 3 Development Traffic Distribution



5.2.3 Traffic Impact

The anticipated level of traffic generated by the level of development in Possible Future 3 is again considered moderate in traffic engineering terms across most of the local street network. By way of an example, the volume of traffic associated with the critical movement at the intersection of Munro Avenue and Bay Road, being a right turn out of Munro Avenue onto Bay Road, is equivalent to approximately one right turn every two minutes during the morning peak hour.

As observed within Possible Futures 1 and 2, the additional traffic volumes distributed onto and Bay Road the network via Jack Road due to both the Jack Road development and the development within this Possible Future are considerably higher than observed across the remainder of the road network. At the Bay Road / Jack Road intersection, more than one vehicle every minute is anticipated to turn right onto Bay Road in the AM and PM peak periods, which is considered a moderate to high level of traffic to be accommodated within an unsignalised intersection. As previously mentioned, the current traffic volumes along Bay Road are in the order of 1,000 vehicles per hour during the morning and evening peak periods, hence the level of traffic generated is likely to cause additional delays and queues for traffic along Jack Road under the existing intersection arrangement.

The intersection of Jack Road and Park Road also indicates considerably higher traffic volumes in comparison to other local street/major road intersections, with turning movements out of Jack Road both east and west equivalent to more than one per minute in the morning peak hour. Whilst traffic volumes along Park Road are considerably below those on Bay Road, this level of traffic may result in additional delays and queues for traffic along Jack Road under the existing intersection arrangement and under this Possible Future.

As mentioned in Section 4.2.3, the traffic generated by the indicative development in Park Road East has been represented by a single access point for the purposes of this analysis. In the scenario that this level of development eventuates, it is probable that the traffic volumes associated with this development will be distributed across several access points, and would have less traffic impact than indicated within Figure 5-2.

5.3 Car Parking Considerations

Having consideration of the indicative development under this Possible Future, an estimate of the expected car parking requirement and possible on-street car parking demand has been undertaken.

5.3.1 Car Parking Requirement

The statutory car parking requirements relevant to the proposed development are listed within Clause 52.06 of the Bayside Planning Scheme, as presented in Table 3-3.

Application of these requirements to this Possible Future development schedule results in the car parking requirements outlined in Table 5-2.

Table 5-2 Possible Future 3 Car Parking Requirement

Development Location	Dwelling No.			Resident Car Parking Requirement (No. spaces)	Visitor Car Parking Requirement
	One bedroom	Two bedroom	Three bedroom		
Bay Road (Jack Road to Tulip Grove)	75	163	42	322	53
Jack Road (Bay Road to Park Road)	36	332	86	540	88
Park Road West (Jack Road to Tulip Grove)	51	109	29	218	34
Park Road East (Tulip Grove to Frankston Railway Line)	113	241	63	480	81
Tulip Grove (Bay Road to Southland Station)	20	177	46	289	46
Total	295	1022	266	1849	302

5.3.2 Car Parking Demand

As previously discussed, resident car parking requirements in areas such as the study area generally translate into resident car parking demands. This is supported by car ownership data within the suburb of Cheltenham within the recent 2016 Census (see Table 4-3).

These types of dwellings within urban areas are also typically provided with on-site car parking to meet the demands for resident parking, and frequently for a proportion of residential visitors as mentioned. Under this assumption, the demand for on-street car parking would be limited to a proportion of residential visitor demand.

Assuming the case study rate for visitor parking of 0.12 spaces per dwelling and that all visitor demand associated with the 1,583 dwellings in this Possible Future is to be accommodated within on-street car parking provisions only, 190 additional on-street car parking spaces would be expected to be occupied during peak visitor periods.

A minimum availability of over 900 car parking spaces was recorded on a weekday and a weekend day. As such, the level of demand under this Possible Future would be accommodated, and over 700 spaces would be expected to remain available for use.

By way of a sensitivity analysis, should the indicative developments only provide two-thirds of their residential car parking demands on-site, this additional on-street car parking would allow for approximately one third of the residential car parking demand to be accommodated on-street (being in the order of 600 spaces), and still allow approximately 100 spaces across the study area for use.

It is also noted that on-street car parking provisions are provided for use by residential visitors, and as such it is considered that the abovementioned increase in occupancy aligns with the intended usage of these on-street provisions.

5.3.3 Car Parking Impact

Considering the likelihood that a large portion of resident and visitor car parking demand will be accommodated within future on-site car parking provisions, the reasonable amount of visitor on-street car parking demands in comparison to the availability of parking, and the appropriateness of accommodating visitor parking on-street as intended, the car parking impacts are considered appropriate and manageable in the context of the area and the indicative development schedule. It is not expected that changes to on-street car parking restrictions or provisions will be required to manage/accommodate car parking demand.

6 Sensitivity Analysis

6.1 Overview

The indicative development contemplated in Possible Future 3 and the preceding traffic assessment assumes that a connection is provided between Tulip Grove / Siede Court and Bay Road. In order to provide a thorough assessment of the transport network, a sensitivity analysis was undertaken assuming that no vehicle connection was provided at Siede Court / Bay Road. Under this sensitivity analysis, the traffic generated by the indicative development is consistent with the traffic volumes shown in Table 5-1.

6.1.1 Traffic Distribution

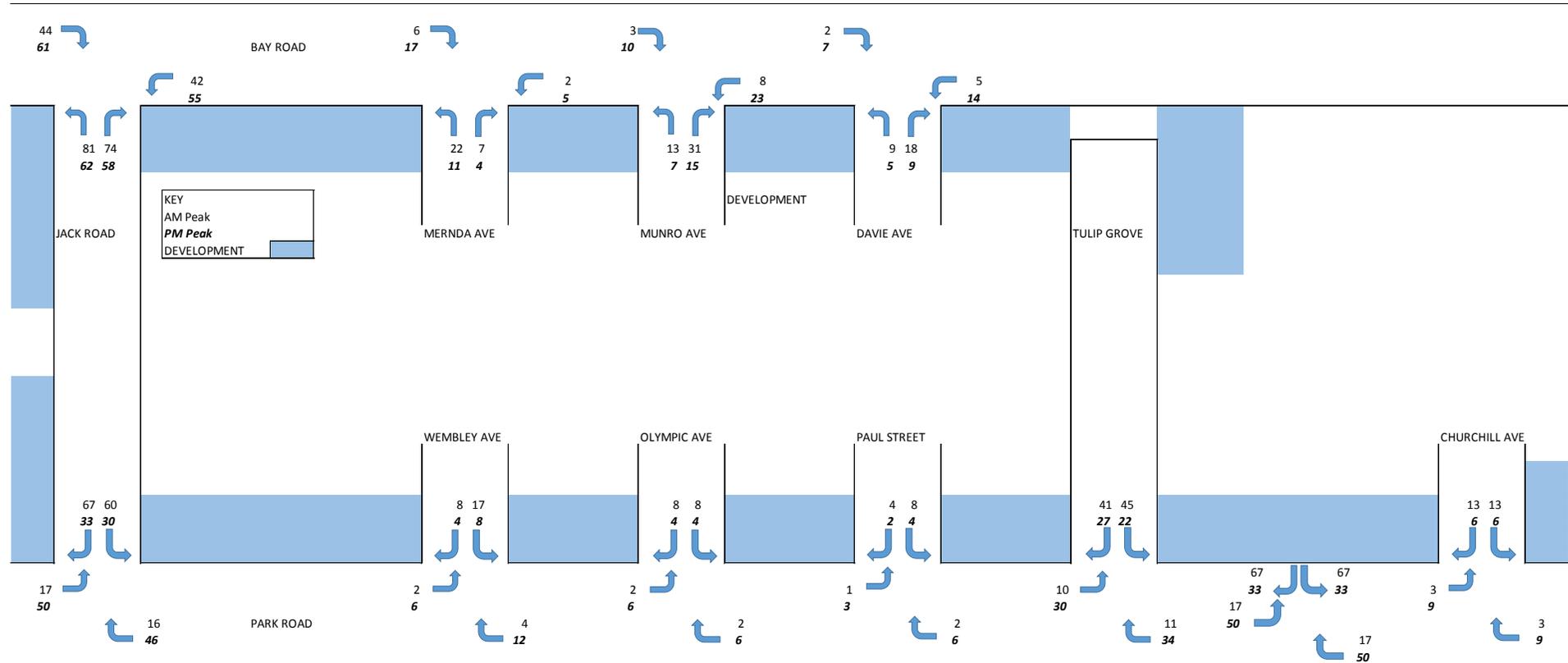
To undertake the sensitivity analysis, the traffic volumes outlined in Table 5-1 (applicable to Possible Future 3) were distributed onto the surrounding road network based on the following set of assumptions

- > The indicative developments along Bay Road and Park Road are assumed to be provided with vehicle access via the nearest local street, and are not provided with direct access from the indicative development location onto these major/arterial roads, with the exception of some of the developments along Park Road East, which have been represented as having a single vehicle access point;
- > The indicative developments along Jack Road and Tulip Grove are proposed to have direct access to Jack Road and Tulip Grove respectively;
- > It is assumed that the following directional distributions apply:
 - Bay Road and Park Road: 50% of vehicles are assumed to travel to the west and 50% to the east;

- Jack Road (north of Luxmoore Street): 70% of vehicles are assumed to travel north to Bay Road whilst 30% of vehicles travel south to Park Road, and are equally distributed to the west and east along these roads;
- Jack Road (south of Luxmoore Street): 50% of vehicles are assumed to travel north to Bay Road and 50% to the south to Park Road, and are equally distributed to the west and east; and
- Tulip Grove: 80% of vehicles are assumed to travel south to Park Road and 20% to the north via Fir Grove and the local road network to Bay Road, and are equally distributed to the west and east.

Following these assumptions, the traffic distribution for this sensitivity analysis has been presented in Figure 5-3.

Figure 6-1 Possible Future 3 Development Traffic Distribution – No Connection to Bay Road via Tulip Grove



6.1.2 Traffic Impact

Following this sensitivity analysis, the level of traffic anticipated to pass through the Tulip Grove / Park Road intersection has evidently increased in the absence of a connection to Bay Road, and is considered a moderate to high level of traffic to be accommodated within an unsignalised intersection. The current traffic volumes along Tulip Grove are in the order of 100 vehicles per hour during the morning and evening peak periods; as such the additional traffic (in the order of 125 vehicles per hour in the peak periods) is likely to increase delays and queues for traffic along Tulip Grove under the existing intersection arrangement.

It is noted that upon development of the residential land along Tulip Grove adjacent to Southland Railway Station to provide residential apartment-type dwellings up to three storeys in height, which is anticipated to generate less traffic than contemplated in Possible Future 3, it is considered that the Tulip Grove / Park Road intersection will experience moderate to high traffic volumes that would be expected to cause queues and delays under the current intersection arrangement.

7 Summary & Recommendations

7.1 Overview

The Southland-Pennydale study area, bordered by Bay Road, the Frankston Railway Line, Park Road and Jack Road, was assessed from a traffic and car parking impact assessment perspective based on three Possible Future development schedules.

7.2 Possible Future 1

Under the indicative development schedule, being the subdivision of lots along Bay, Park and Jack Roads into two dwellings on each lot, the following conclusions are made:

- > The traffic generated by the indicative development schedule is expected to be in the order of 1,904 traffic movements per day, distributed to the surrounding area via Bay Road and Park Road;
- > The traffic impact associated with Possible Future 1 is expected to be generally minimal and accommodated within the existing road network arrangements, with the exception of the Bay Road / Jack Road intersection:
 - The Bay Road / Jack Road intersection would be expected to operate within capacity, however traffic on Jack Road would likely experience queueing and delays;
- > The car parking requirement associated with this development schedule is 448 resident car parking spaces, which are likely to be accommodated on-site; and
- > The likely on-street car parking demand is estimated to be in the order of 27 spaces associated with residential visitors, which would be readily accommodated in the current provisions and not have any substantial impact on car parking availability.

Should development within the Southland-Pennydale study area be encouraged to occur in a manner similar to this Possible Future, the following key recommendations are made:

- > Advocating for / provision of bicycle routes along Bay Road and Park Road;
- > Advocating for / provision of a pedestrian and cycling corridor along the Frankston Railway Line, including new access and crossing points across the railway line;
- > Advocating for / provision of new pedestrian crossing facilities across Bay Road and Park Road; and
- > Investigation of potential intersection upgrades for the Bay Road / Jack Road intersection, such as signalisation, to reduce delays and queueing along Jack Road.

7.3 Possible Future 2

Possible Future 2 represents a low to moderate level of development across the study area, allowing for residential development up to four storeys along Bay, Park and Jack Roads comprising one, two and three bedroom apartments. Considering the preceding analysis, the following conclusions are made:

- > The traffic generated by the indicative development schedule is expected to be in the order of 6,407 traffic movements per day;
- > The traffic impact associated with Possible Future 2 is expected to be generally acceptable and accommodated within the existing road network arrangements, with the exception of the Bay Road / Jack Road and Bay Road / Park Road intersections:
 - The Bay Road / Jack Road intersection is expected to experience an increase in demand for right turns, likely to result in additional queueing and delays for vehicles along Jack Road;
 - The Park Road / Jack Road intersection is also expected to experience an increased demand for right turns, again likely to result in queueing and delays for vehicles along Jack Road; and
 - Traffic signals should be investigated at these two intersections to accommodate the anticipated traffic demand and to promote a safe crossing facility;
- > The car parking requirement associated with this development schedule is 1616 resident car parking spaces, which are likely to be accommodated on-site, and 229 visitor car parking demands, which are likely to be spread across on-street and on-site car parking provisions; and
- > The likely on-street car parking demand is estimated to be in the order of 145 spaces associated with residential visitors, which would be readily accommodated in the current provisions and not have any substantial impact on car parking availability, and allow for up to one-third of resident car parking demands to be accommodated on street without significant impact.

Should development within the Southland-Pennydale study area be encouraged to occur up to four storeys along the major vehicle movement and public transport corridors, the following key recommendations are made:

- > Advocating for / provision of bicycle routes along Bay Road and Park Road;
- > Advocating for / provision of a pedestrian and cycling corridor along the Frankston Railway Line, including new access and crossing points across the railway line;
- > Advocating for / provision of new pedestrian crossing facilities across Bay Road and Park Road; and
- > Investigation of potential intersection upgrades for the Bay Road / Jack Road and Park Road / Jack Road intersections (such as signalisation), to reduce delays and queueing along Jack Road and the major/arterial roads.

7.4 Possible Future 3

Possible Future 3 represents a moderate level of development across the study area, allowing for residential development between four and six storeys along Bay Road, Park Road and Jack Road as well as near to Southland Railway Station along Tulip Grove, comprising one, two and three bedroom apartments. It is also proposed under this scenario to extend Siede Court to Bay Road to create a new vehicle movement corridor through the study area. Considering the preceding analysis, the following conclusions are made:

- > The traffic generated by the indicative development schedule is expected to be in the order of 7,857 traffic movements per day, distributed to the surrounding area via Bay Road and Park Road, in turn mainly via Jack Road and Tulip Grove;
- > The traffic impact associated with Possible Future 3 is expected to be within manageable levels and accommodated generally within the existing road network arrangements, with the following exceptions:
 - The Bay Road / Jack Road and Bay Road / Park Road intersections would likely experience existing delays and queuing due to an increased demand for vehicles turning right into and out of Jack Road; and
 - The proposed extension of Tulip Grove / Siede Court would carry a demand for right turn vehicles which, in an unsignalised arrangement, would likely result in queues and delays for vehicles along this new route;
 - In the absence of an extension of Siede Court to Bay Road, traffic would be expected to be distributed to Park Road via Tulip Grove. The additional traffic passing through this intersection would likely result in queues and delays for vehicles at this intersection;

- > The car parking requirement associated with this development schedule is 1849 resident car parking spaces, which are likely to be accommodated on-site, and 302 visitor car parking demands, which are likely to be spread across on-street and on-site car parking provisions; and
- > The likely on-street car parking demand is estimated to be up to 190 spaces, associated with residential visitors, which would be readily accommodated in the current provisions and not have any substantial impact on car parking availability. The remaining on-street availability would allow for up to one-third of resident car parking demands to be accommodated on street without significant impact.

Should development within the Southland-Pennydale study area be encouraged to occur in a manner similar to this Possible Future, the following key recommendations are made:

- > Advocating for / provision of bicycle routes along Bay Road and Park Road;
- > Advocating for / provision of a pedestrian and cycling corridor along the Frankston Railway Line, including new access and crossing points across the railway line;
- > Advocating for / provision of new pedestrian crossing facilities across Bay Road, Jack Road and Park Road;
- > Consideration of a future investigation into the opening of the Tulip Grove pedestrian access point to allow direct access to Southland Railway Station for local residents; and
- > Investigation of potential intersection upgrades for the Bay Road / Jack Road, Park Road / Jack Road and Park Road / Tulip Grove intersections, such as signalisation, to reduce delays and queueing along Jack Road and Tulip Grove.

Southland-Pennydale Structure Plan

APPENDIX

A

INDICATIVE DEVELOPMENT
SCHEDULES

Possible Future 1 Development Schedule

Table 7-1 Possible Future 1 Bay Road Development Schedule

Bay Road	Land Use	Storeys	1 BDR	2 BDR	3 BDR	TOTAL
B1	Res	3	-	-	12	12
B2	Res	3	-	-	10	10
B3	Res	3	-	-	10	10
B4	Res	3	-	-	12	12
B5	Res	3	-	-	4	4
TOTAL			-	-	48	48

Table 7-2 Possible Future 1 Jack Road Development Schedule

Jack Road	Land Use	Storeys	1 BDR	2 BDR	3 BDR	TOTAL
J1	Res	3	-	-	8	8
J2	Res	3	-	-	8	8
J3	Res	3	-	-	8	8
J4	Res	3	-	-	8	8
J5	Res	3	-	-	8	8
TOTAL			-	-	40	40

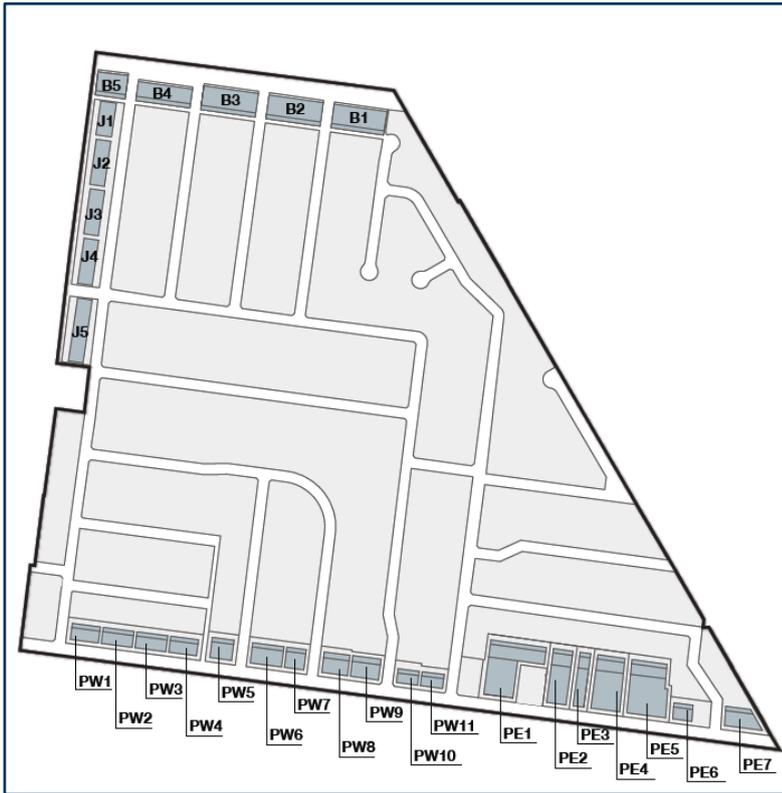
Table 7-3 Possible Future 1 Park Road West Development Schedule

Park Road West	Land Use	Storeys	1 BDR	2 BDR	3 BDR	TOTAL
PW1	Res	3	-	-	6	6
PW2	Res	3	-	-	6	6
PW3	Res	3	-	-	6	6
PW4	Res	3	-	-	6	6
PW5	Res	3	-	-	6	6
PW6	Res	3	-	-	5	5
PW7	Res	3	-	-	5	5
PW8	Res	3	-	-	4	4
PW9	Res	3	-	-	4	4
PW10	Res	3	-	-	4	4
PW11	Res	3	-	-	4	4
TOTAL			-	-	56	56

Table 7-4 Possible Future 1 Park Road East Development Schedule

Park Road East	Land Use	Storeys	1 BDR	2 BDR	3 BDR	TOTAL
PE1	Res	3	-	-	20	20
PE2	Res	3	-	-	8	8
PE3	Res	3	-	-	6	6
PE4	Res	3	-	-	14	14
PE5	Res	3	-	-	20	20
PE6	Res	3	-	-	4	4
PE7	Res	3	-	-	8	8
TOTAL			-	-	80	80

Figure 7-1 Possible Future 1 Development Map



Possible Future 2 Development Schedule

Table 7-5 Possible Future 2 Bay Road Development Schedule

Bay Road	Land Use	Storeys	1 BDR	2 BDR	3 BDR	TOTAL
B1	Res	3	13	28	7	48
B2	Res	3	13	29	7	49
B3	Res	3	32	68	18	118
B4	Res	3	10	22	6	38
B5	Res	3	7	16	4	27
TOTAL			75	163	42	280

Table 7-6 Possible Future 2 Jack Road Development Schedule

Jack Road	Land Use	Storeys	1 BDR	2 BDR	3 BDR	TOTAL
J1	Res	3	12	26	7	45
J2	Res	3	0	34	9	43
J3	Res	3	0	33	8	41
J4	Res	3	0	34	9	43
J5	Res	3	21	45	12	78
TOTAL			33	172	45	250

Table 7-7 Possible Future 2 Park Road West Development Schedule

Park Road West	Land Use	Storeys	1 BDR	2 BDR	3 BDR	TOTAL
PW1	Res	3	3	6	1	10
PW2	Res	3	3	6	2	11
PW3	Res	3	3	6	2	11

PW4	Res	3	3	5	1	9
PW5	Res	3	3	5	1	9
PW6	Res	3	4	8	2	14
PW7	Res	3	2	5	1	8
PW8	Res	3	3	6	2	11
PW9	Res	3	3	7	2	12
PW10	Res	3	2	4	1	7
PW11	Res	3	2	4	1	7
TOTAL			31	62	16	109

Table 7-8 Possible Future 3 Park Road West Development Schedule

Park Road East	Land Use	Storeys	1 BDR	2 BDR	3 BDR	TOTAL
PE1	Res	3	18	38	66	122
PE2	Res	3	16	34	58	108
PE3	Res	3	6	12	21	39
PE4	Res	3	15	32	54	101
PE5	Res	3	20	42	73	135
PE6	Res	3	3	7	11	21
PE7	Res	4	6	13	23	42
TOTAL			84	178	306	568

Figure 7-2 Possible Future 2 Development Map



Possible Future 3 Development Schedule

Table 7-9 Possible Future 3 Bay Road Development Schedule

Bay Road	Land Use	Storeys	1 BDR	2 BDR	3 BDR	TOTAL
B1	Res	0	13	28	7	48
B2	Res	5	13	29	7	49
B3	Res	5	32	68	18	118
B4	Res	5	10	22	6	38
B5	Res	5	7	16	4	27
TOTAL			75	163	42	280

Table 7-10 Possible Future 3 Jack Road Development Schedule

Jack Road	Land Use	Storeys	1 BDR	2 BDR	3 BDR	TOTAL
J1	Res	4	12	26	7	45
J2	Res	4	0	34	9	43
J3	Res	4	0	33	8	41
J4	Res	4	0	28	7	35
J5	Res	4	0	48	12	60
J6	Res	4	0	34	9	43
J7	Res	4	0	34	9	43
J8	Res	4	0	43	11	54
J9	Res	4	24	52	14	90
TOTAL			36	332	86	454

Table 7-11 Possible Future 3 Park Road West Development Schedule

Park Road West	Land Use	Storeys	1 BDR	2 BDR	3 BDR	TOTAL
PW1	Res	5	4	10	2	16
PW2	Res	5	5	11	3	19
PW3	Res	5	5	11	3	19
PW4	Res	5	4	9	2	15
PW5	Res	5	5	10	3	18
PW6	Res	5	7	14	4	25
PW7	Res	5	4	9	2	15
PW8	Res	5	5	11	3	19
PW9	Res	5	6	12	3	21
PW10	Res	5	3	6	2	11
PW11	Res	5	3	6	2	11
TOTAL			51	109	29	189

Table 7-12 Possible Future 3 Park Road East Development Schedule

Park Road East	Land Use	Storeys	1 BDR	2 BDR	3 BDR	TOTAL
PE1	Res	6	10	22	6	38
PE2	Res	6	6	12	3	21
PE3	Res	6	3	6	2	11
PE4	Res	6	38	81	21	140

PE5	Res	6	38	82	21	141
PE6	Res	6	7	15	4	26
PE7	Res	6	3	6	2	11
PE8	Res	5	6	13	3	22
PE9	Res	4	2	4	1	7
TOTAL			113	241	63	417

Table 7-13 Possible Future 3 Tulip Grove Development Schedule

Tulip Grove	Land Use	Storeys	1 BDR	2 BDR	3 BDR	TOTAL
T1	Res	6	5	11	3	19
T2	Res	6	0	12	3	15
T3	Res	5	0	23	6	29
T4	Res	4	0	8	2	10
T5	Res	4	0	34	9	43
T6	Res	4	0	56	15	71
T7	Res	4	15	33	8	56
TOTAL			20	177	46	243

Figure 7-3 Possible Future 3 Development Map

