11.0 APPENDIX B

Transport Assessment

BALDIVIS ACTIVITY CENTRE STRUCTURE PLAN

TRANSPORT ASSESSMENT

transport planning • traffic engineering • project management

Baldivis Activity Centre
Structure Plan

Transport Assessment

Prepared for:
STOCKLAND

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Prepared by:
TRANSCORE PTY LTD
61 York Street, Subiaco WA 6008
PO Box 42, Subiaco WA 6904
Telephone (08) 9382 4199
Facsimile (08) 9382 4177

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Author: Robin White

Project manager: Behnam Bordbar

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TABLE OF CONTENTS

1	SUMMARY	1
2	INTRODUCTION	1
3	PROPOSED STRUCTURE PLAN	2
4	EXISTING SITUATION	2
4.1	EXISTING LAND USE	2
4.2	EXISTING ROAD NETWORK	2
4.3	PUBLIC TRANSPORT	4
4.4	PEDESTRIAN AND CYCLIST FACILITIES	5
4.5	CHANGES TO SURROUNDING ROAD NETWORK	6
5	TRAFFIC ASSESSMENT	7
5.1	ASSESSMENT PERIOD	7
5.2	TRIP GENERATION AND DISTRIBUTION	7
5.3	TOTAL TRAFFIC FLOWS	8
5.4	INTERSECTION ANALYSIS	10
5.5	SERVICE VEHICLE ACCESS	12
5.6	IMPACT ON SURROUNDING ROADS AND NEIGHBOURING AREAS	13
5.7	TRAFFIC NOISE AND VIBRATION	13
5.8	ROAD SAFETY	14
6	PARKING	14
7	PUBLIC TRANSPORT	16
8	PEDESTRIANS AND CYCLISTS	18
9	CONCLUSIONS	19

Appendix A. Proposed Baldivis Activity Centre Structure Plan

Appendix B. SIDRA Intersection Analysis

1 Summary

This Transport Assessment addresses the proposed Baldivis Activity Centre Structure Plan for the planned district centre located on Safety Bay Road, Baldivis.

The key access points are at several existing and proposed intersections along Safety Bay Road between Nairn Drive and Baldivis Road. These key intersections and access points have been assessed in this transport assessment and appropriate intersection treatments have been identified to accommodate forecast future traffic flows.

The Baldivis Activity Centre will also be served by enhanced public transport routes in future and a comprehensive network of shared paths to facilitate pedestrian and access to and within the activity centre.

2 Introduction

This Transport Assessment has been prepared by Transcore on behalf of Stockland. The subject of this report is the proposed Baldivis Activity Centre Structure Plan, which encompasses the Baldivis Town Centre zone in the City of Rockingham Town Planning Scheme No. 2 and extends south of Safety Bay Road as shown in Figure 1.

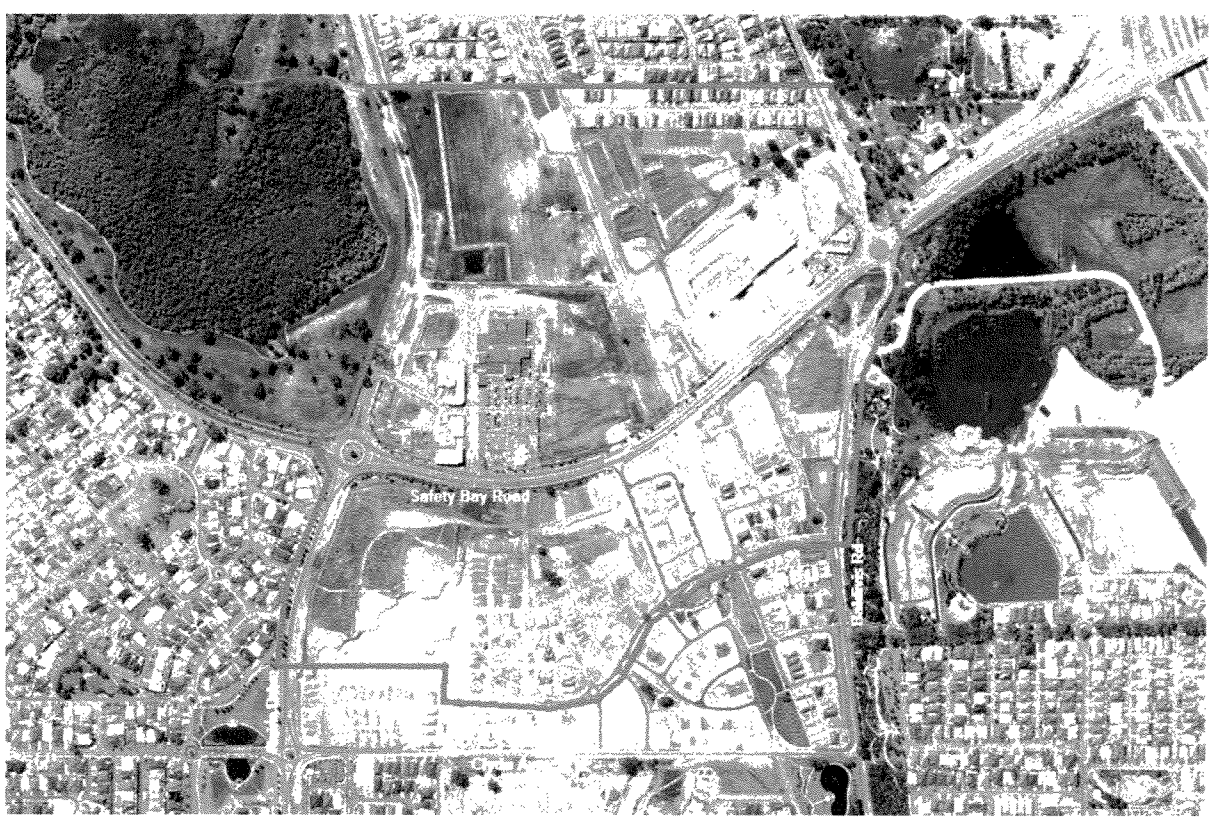


Figure 1. Baldivis Activity Centre Structure Plan location

3 Proposed Structure Plan

The proposed Baldivis Activity Centre Structure Plan (BACSP) is included at Appendix A.

As shown on the BACSP plan there is a core precinct (retail) north of Safety Bay Road and east of Nairn Drive. The eastern precinct north of Safety Bay Road and west of Baldivis Road will be predominantly bulky goods retailing. There is a transition precinct (mixed use) planned along the northern side of these two precincts. The northern precinct will be medium and low density residential. The southern precinct (south of Safety Bay Road) will also be medium and low density residential, including a retirement village.

4 Existing Situation

4.1 Existing Land Use

The existing Baldivis Shopping Centre (located at the northeast corner of the Safety Bay Road / Settlers Avenue intersection) is oriented toward the Settlers Avenue frontage of the site with one existing and one approved fast food outlet located along the Safety Bay Road frontage. The existing Baldivis Shopping Centre has a floor area of 6,504m^2 NLA (net lettable area).

There are a number of existing commercial developments on the western side of Settlers Avenue including a medical centre, bottle shop, café and tavern.

There is other commercial development at the northeast corner of Safety Bay Road / Baldivis Road roundabout, including a service station, one fast food outlet and a bottle shop. A major bulky goods development is currently under construction in the eastern precinct, as can be seen in Figure 1.

Residential development has already penetrated across the northern boundary of the BASCP area, as can be seen in Figure 1, and residential development is already underway in the southern precinct as well.

4.2 Existing Road Network

Safety Bay Road is a dual carriageway arterial road, with a 6m wide central median. Each carriageway has a trafficable pavement width of approximately 7 metres and approximately 1.5 metres sealed shoulder. There are no formal footpaths on either side of Safety Bay Road in the vicinity of the subject site; however, a footpath is proposed within the northern verge (shopping centre side). The speed zone of Safety Bay Road adjacent to the subject site is 80 km/h.

According to the Main Roads WA *Metropolitan Functional Road Hierarchy (1999)* document, Safety Bay Road is classified as a *District Distributor A* road. Safety Bay Road is classified as an Other Regional Road (Blue Road) in the Metropolitan Region Scheme (MRS).

Main Roads WA traffic count information indicates Safety Bay Road (west of Baldivis Road) carried approximately 21,750 vehicles per day (vpd) in June 2010. Main Roads' SCATS data from the Safety Bay Rd / Settlers Ave signalised intersection indicates average weekday traffic flows of 23,158 vpd in August 2011 on Safety Bay Road east of that intersection, with the highest day recorded (Friday) as 24,987 vpd.

Nairn Drive

Nairn Drive is currently constructed as a single carriageway road for about 1.6km south of Safety Bay Road and a dual carriageway for about 100m north of Safety Bay Road to Atwick Terrace. A City of Rockingham traffic count recorded average weekday traffic flows of 4435 vpd south of Safety Bay Road in October 2009. Nairn Drive is covered by an Other Regional Roads reservation in the MRS and is planned as a future dual carriageway District Distributor A road through the whole Baldivis area. The southern section of Nairn Drive has a shared path on the eastern side, opposite the structure plan area.

Baldivis Road

Baldivis Road is constructed as a single carriageway, two-lane, district distributor B road providing north south access through Baldivis for connections to the Kwinana Freeway at Mundijong Road, Safety Bay Road and Karnup Road. Baldivis Road has a 70km/h speed limit north of Safety Bay Road (then changes to 80km/h before Ingram Road) and 70km/h south of Safety Bay Road (then changes to 80km/h again south of Highbury Boulevard).

Settlers Avenue is a two-lane, undivided, local road with carriageway width of approximately 7.4 metres. It has indented parking on both sides of the road north of Atwick Terrace. Settlers Avenue has footpaths along both sides of the road in this vicinity. Settlers Avenue is a local road and operates under the default urban speed limit of 50 km/h.

Settlers Avenue intersects with Safety Bay Road at a signal controlled 3-way intersection. Based on SCATS count data supplied by Main Roads WA for the Safety Bay Road / Settlers Ave intersection for 16-18 June 2011, existing traffic volumes on Settlers Avenue are approximately 6880 vpd on Thursday, 7950 vpd on Friday and 7830 vpd on Saturday.

Atwick Terrace is a two-lane, undivided, local road with carriageway width of approximately 7.4 metres and speed limit of 50 km/h. It currently only has a footpath on the northern verge adjacent to existing development but would ultimately have paths on both sides like Settlers Avenue.

Atwick Terrace connects to the northern extension of Nairn Drive at the western edge of the Baldivis Town Centre zone. This provides a link to the Nairn Drive / Safety Bay Road intersection, which is constructed as a two-lane, four-way roundabout.

Atwick Terrace forms a four-way intersection at Settlers Avenue, with the eastern leg being the 7m wide northern access into the shopping centre car park. The intersection operates under give-way control with Settlers Avenue having priority.

The southern access to the shopping centre car park forms a T-junction with Settlers Avenue approximately 70 metres north of the signalised intersection of Safety Bay Road and Settlers Avenue. The drive-through exit of the bottle shop on the western side of Settlers Avenue also connects directly into this intersection.

In the southern precinct a number of single-carriageway residential streets have recently been constructed and most have a path provided on one side. Norwood Avenue has been constructed across the eastern half of the site to connect to Baldivis Road and a north south connecting road has been constructed on the eastern side of the future retirement village site with left-in-left-out access at Safety Bay Road and connecting to Norwood Avenue at its southern end.

4.3 Public Transport

The subject site is currently served by Bus Route No. 568 from Warnbro Train Station, which is shown in Figure 2. A deviation of route 568 links to the Stockland Baldivis Shopping Centre with a bus stop on Atwick Terrace, just to the west of the existing shopping centre, with this deviation operating from approximately 8.30am to 4pm on weekdays and 9am to 5pm on Saturdays.

Overall, bus route 568 provides an hourly service Monday to Friday between 8.30am and 9pm (with more frequent service in the peak direction in AM and PM peak periods) and hourly on Saturday and Sunday from 8 or 9am to 7pm, approximately.

Route 564, which serves south-western parts of Baldivis along Arpenteur Drive, shares stops with route 568 such as at Warnbro Station and therefore provides a connection through the Rockingham City Centre to Rockingham Train Station.

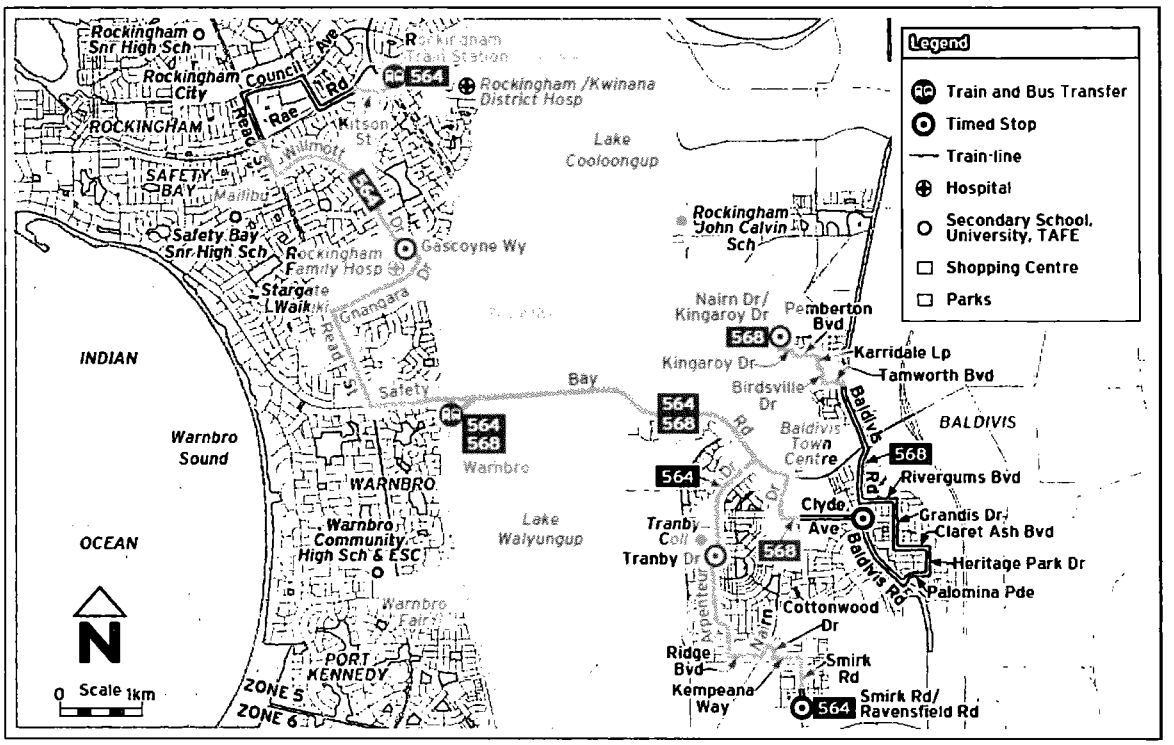


Figure 2. Existing bus routes

4.4 Pedestrian and Cyclist Facilities

Existing footpaths on each road are described above. Pedestrians are accommodated at the Safety Bay Road / Settlers Avenue intersection with parallel walk phases (i.e. pedestrian movements and traffic movements in parallel during the same traffic signal phases, not a dedicated pedestrian phase).

The Department of Transport's Perth Bike Map series (see Figure 3) shows that cyclists are able to use the sealed shoulders on Safety Bay Road, with connection to the a shared path east of Baldivis Road and the Principal Shared Path on the western side of the Kwinana Freeway.

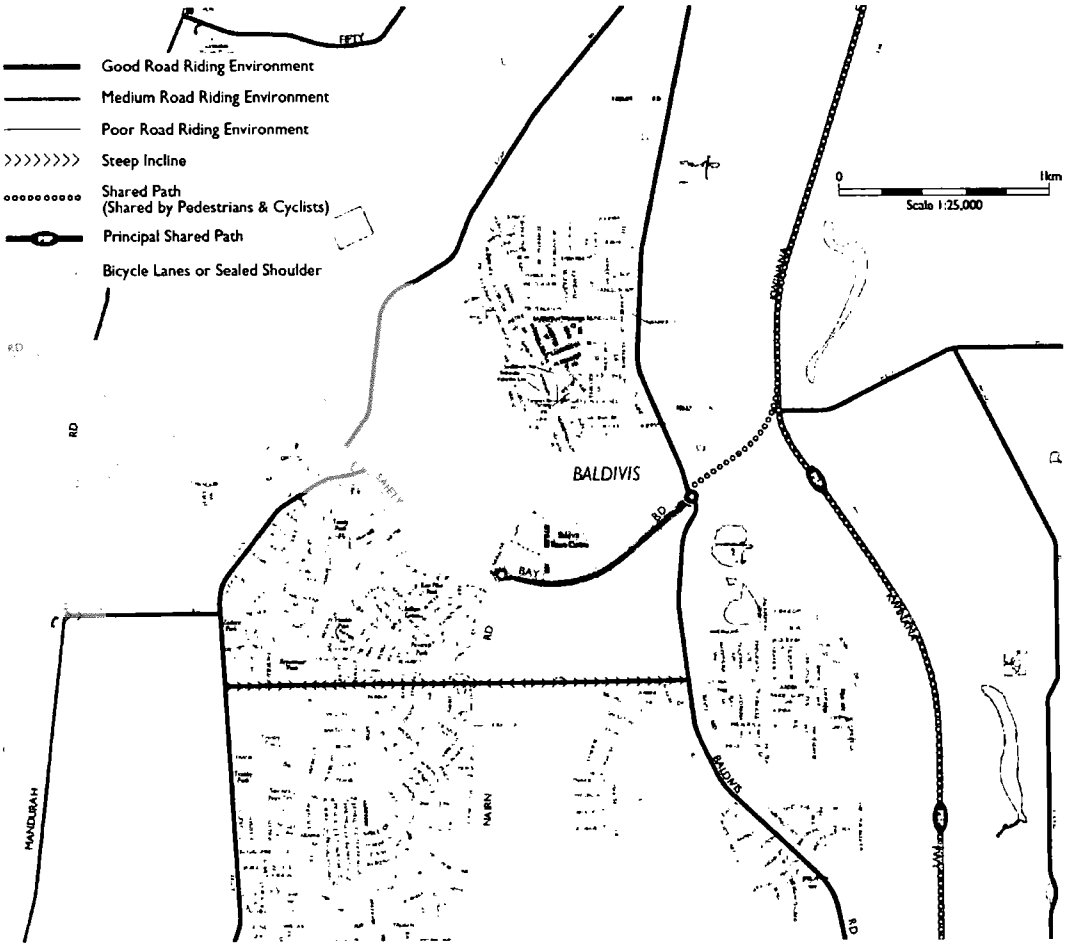


Figure 3. Bike map

4.5 Changes to Surrounding Road Network

Long-term road network planning for this part of the Metropolitan Region includes the future extension of Nairn Drive north and south as the main north south district distributor road through Baldivis and Karnup.

On the eastern side of the shopping centre site a new road link (called Norseman Approach north of Safety Bay Road and Burlington Drive to the south) will provide an additional north south link through the structure plan area with a full-movement connection planned at Safety Bay Road as shown in the structure plan at Appendix A. The structure plan also indicates the potential extension of Settlers Avenue south of Safety Bay Road, forming another four-way intersection at this location.

5 Traffic Assessment

5.1 *Assessment Period*

SCATS traffic flow data previously obtained from Main Roads WA for the Safety Bay Road / Settlers Ave intersection indicate that the weekday PM peak period is the critical period for intersection capacity in this area. This is due to the combination of peak traffic generation of the retail and associated land uses in this centre, combined with weekday peak hour through traffic between the freeway and existing residential areas west of the freeway.

The assessment year for this type of transport assessment is generally taken as 10 years after full development. With no timetable available for development of this activity centre the assessment year that has been adopted for this analysis is 2031, which assumes full development of the activity centre over the next ten years.

5.2 *Trip Generation and Distribution*

Detailed traffic modelling has been undertaken for this Transport Assessment.

The traffic volume that will be generated by the future land uses in the structure plan area has been estimated using weekday PM peak hour trip generation rates derived from the Roads and Traffic Authority of New South Wales *Guide to Traffic Generating Developments* (2002).

The resulting traffic generation of each of the precincts in the Baldivis Activity Centre Structure Plan is summarised in Table 1 below.

Table 1. Future Baldivis Activity Centre Traffic Generation (PM Peak Hour)

Precinct	Inbound (vph)	Outbound (vph)	Total PM Peak (vph)
Core Precinct	1089	1089	2178
Eastern Precinct	332	332	664
Transition Precinct	120	130	250
Northern Precinct	99	49	148
Southern Precinct	218	108	326
Total BACSP	**1858**	**1708**	**3566**

The surrounding areas of Baldivis have also been included in the traffic model for the land uses encompassed by the Baldivis North Structure Plan and the Baldivis South Structure Plan, north to Kerosene Road and south to Sixty Eight Road, respectively.

A significant number of the trips generated in these surrounding residential areas will be to or from the Baldivis Activity Centre but the distribution of trips to and from the external road network has been estimated based on the distribution of trips shown by Main Roads WA 2031 weekday traffic modelling for the Baldivis area. The estimated distribution of these trips is shown in Table 2.

Table 2. Trip distribution

External direction	Proportion of external trips
Northeast	20%
Northwest	40%
Southwest	20%
Southeast	10%
Extra traffic flow north from Baldivis north / south from Baldivis south	10%

5.3 Total Traffic Flows

An EMME3 traffic model of the Baldivis area was developed for this study to model 2031 PM peak hour traffic flows on the road network in the structure plan area.

The PM peak traffic generated by the Baldivis Activity Centre and residential development of Baldivis North and South was assigned to the future road network in this EMME3 traffic model.

Additional through traffic between external zones was also factored in to the traffic model to bring total traffic volumes on the external road links up to the levels projected by the Main Roads WA ROM traffic model for 2031.

However, ROM traffic model projections for 2031 have been questioned by City of Rockingham officers who are of the opinion that the ROM model traffic volume projections are too low in this area and do not reflect the extent of population growth anticipated in Baldivis. Existing traffic count information obtained from Main Roads for this study indicates that existing PM peak traffic volumes on Safety Bay Road between Settlers Avenue and Baldivis Road increased by approximately 2.6% in the between June 2010 and August 2011. If this rate of growth was maintained on Safety Bay Road the PM peak hour traffic flows would be around 3050 vph by 2031.

To address the City's concerns the modelled traffic flows on Safety Bay Road in the EMME3 model used for this study have been increased to this level by assigning additional through traffic along Safety Bay Road through the Baldivis study area.

An additional factor raised by City of Rockingham officers is the potential for Settlers Avenue and Norseman Approach (Burlington Drive) to be extended south of Safety Bay Road forming 4-way intersections at these locations. The Norseman Approach 4-way intersection is currently under construction so this is included in the future road network. Therefore two road network scenarios have been modelled in the EMME3 traffic model to test the effects of including or excluding the Settlers Avenue connections south of Safety Bay Road.

The modelled total 2031 PM peak hour traffic flows for these two road network scenarios are shown in Figures 4a and 4b. Note that there may be slight differences in the total traffic entering and exiting the area encompassed by these two figures, as the traffic model covers a wider area than this and re-routing of trips associated with the road network changes in these figures can extend to alternative routes outside of the area shown here.

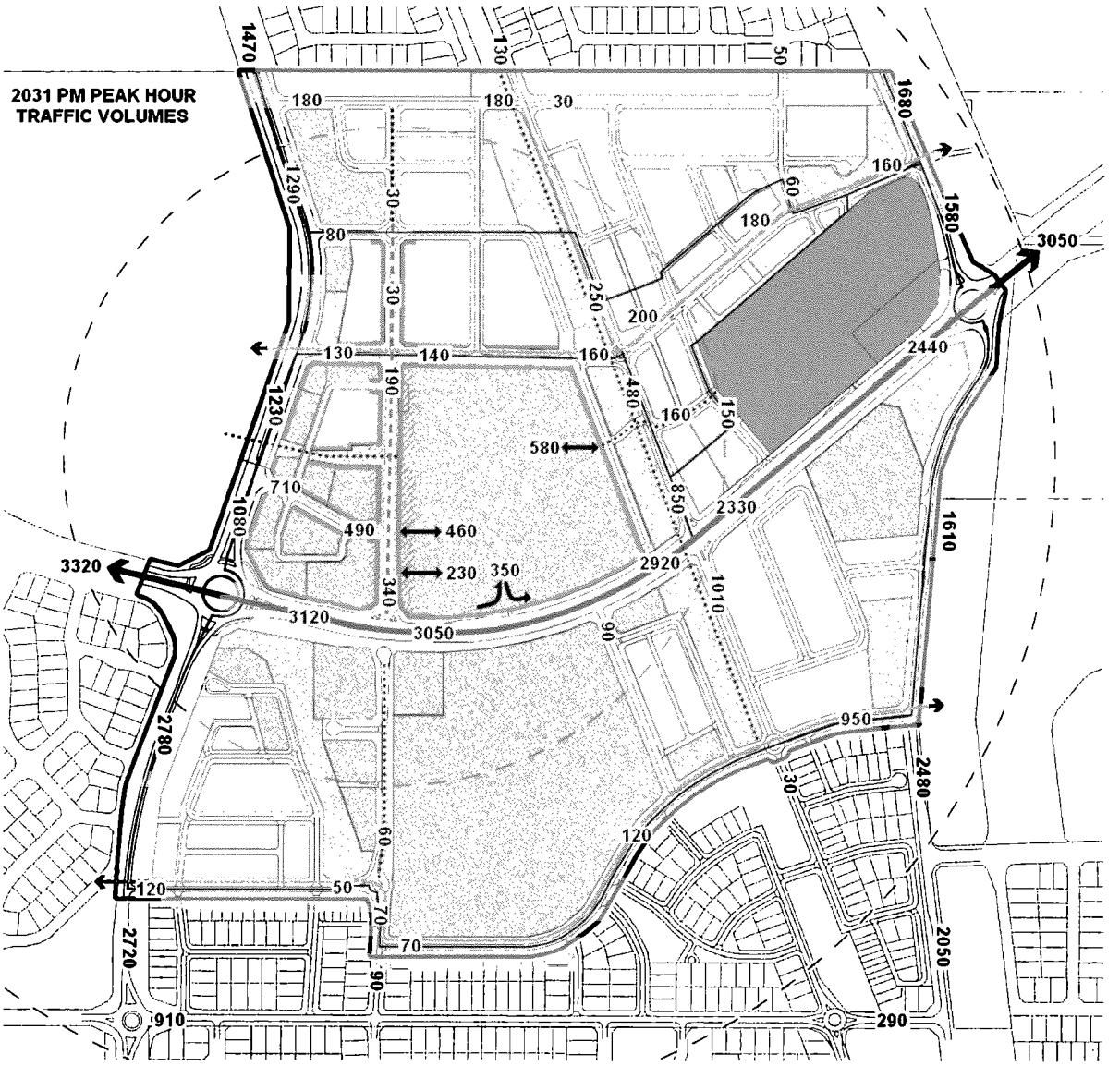


Figure 4a. 2031 PM peak hour total traffic flows with only Norseman Approach (not Settlers Avenue) connected south of Safety Bay Road

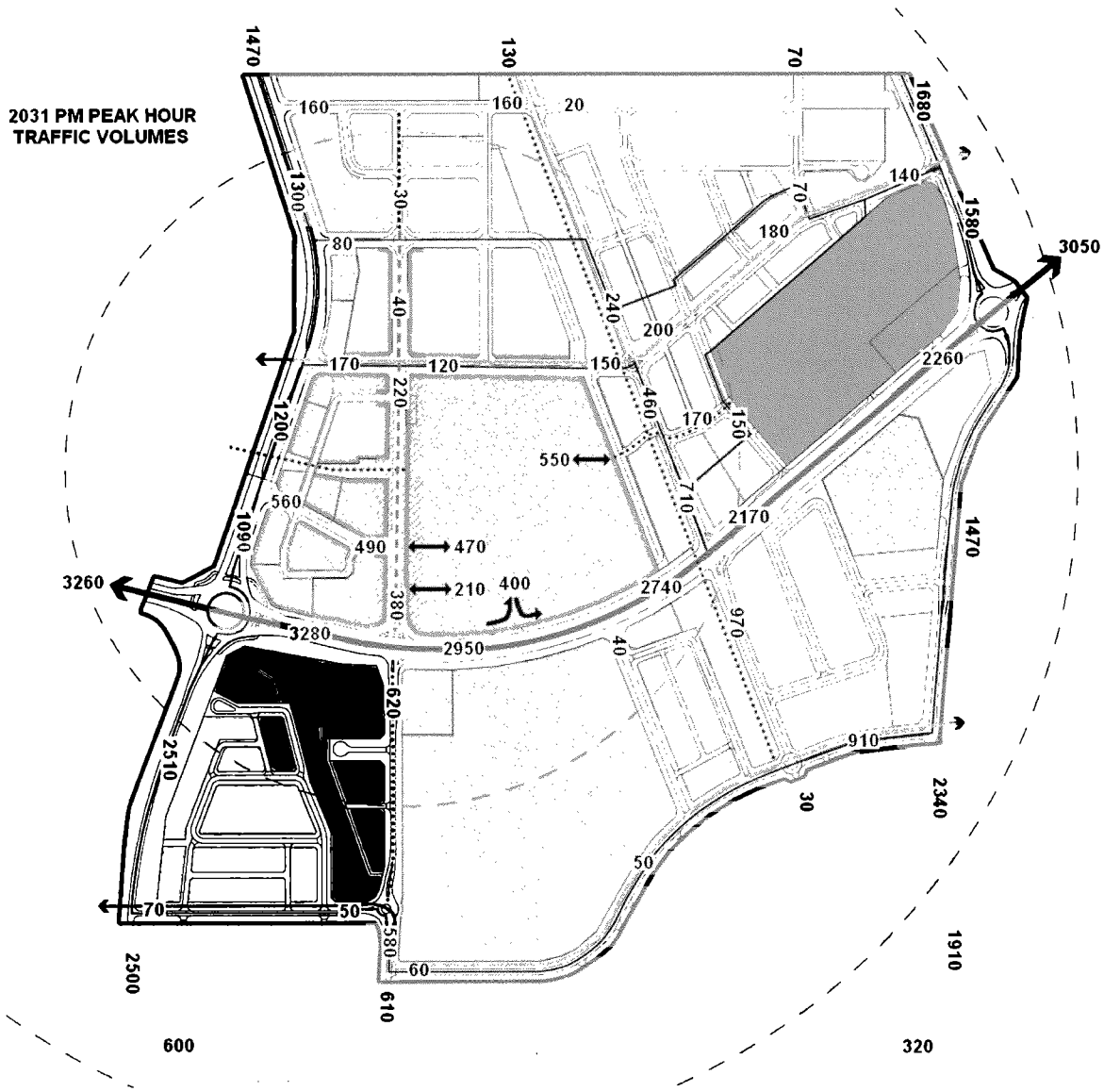


Figure 4b. 2031 PM peak hour total traffic flows with both Settlers Avenue and Norseman Approach connected south of Safety Bay Road

5.4 Intersection Analysis

Intersection capacity analysis has been undertaken for key intersections on Safety Bay Road for the modelled 2031 PM peak hour traffic flows corresponding to Figures 4a and 4b.

The four locations analysed are:

- Safety Bay Road / Settlers Avenue signalised intersection
- Safety Bay Road / Norseman Approach signalised intersection
- Safety Bay Road / Nairn Drive roundabout
- Safety Bay Road / Baldivis Road roundabout

Capacity analysis of these intersections has been undertaken using the SIDRA computer software package. SIDRA is an intersection modelling tool commonly used by traffic engineers for all types of intersections. SIDRA outputs are presented in the form of Degree of Saturation, Level of Service, Average Delay and 95% Queue. These characteristics are defined as follows:

- Degree of Saturation is the ratio of the arrival traffic flow to the capacity of the approach during the same period. The Degree of Saturation ranges from close to zero for infrequent traffic flow up to one for saturated flow or capacity.
- Level of Service is the qualitative measure describing operational conditions within a traffic stream and the perception by motorists and/or passengers. In general, there are 6 levels of service, designated from A to F, with Level of Service A representing the best operating condition (i.e. free flow) and Level of Service F the worst (i.e. forced or breakdown flow).
- Average Delay is the average of all travel time delays for vehicles through the intersection.
- 95% Queue is the queue length below which 95% of all observed queue lengths fall.

The results of the SIDRA analysis are summarised in Appendix B.

Safety Bay Road / Settlers Ave signalised intersection
If Settlers Avenue is connected south of Safety Bay Road in future the 4-way configuration of this intersection requires additional signal phases and a longer signal cycle time, resulting in longer queues and delays for all vehicles using this intersection. To achieve the required intersection capacity it would also require widening of the eastern approach on Safety Bay Road, as can be seen in Figure B2 of Appendix B. However, the critical constraint at this intersection is queue length on the western approach because queues longer than 160m would extend back into the Nairn Drive roundabout and block traffic movements. Queues of up to 240m are indicated in Table B2 on this western approach, so this 4-way configuration of Settlers Avenue cannot be supported.

The existing 3-way configuration will require some minor modifications in future to minimise queue lengths at this intersection. The proposed configuration is illustrated in Figure B1. It involves a change on the northern approach to replace the existing left turn pocket with a shared left and right turn lane, so that vehicles can turn right from two lanes instead of one. This will help to minimise queue lengths on Settlers Avenue. On the western approach the queue lengths have been minimised in the SIDRA analysis by introducing a second phase for the through movement from the western approach on Safety Bay Road, effectively giving more green time to this approach. This results in 95% queue lengths of less than 158m for the modelled 2031 traffic flows, so this signalised 3-way intersection should be considered satisfactory at this location.

It is therefore recommended that Settlers Avenue should not be connected south of Safety Bay Road. Consequently, Transcore has been advised that Stockland no

longer wishes to pursue the option of a 4-way intersection at Safety Bay Road / Settlers Avenue. The other intersections along Safety Bay Road have therefore only been analysed for the traffic volumes in Figure 4a (i.e. no connection of Settlers Avenue south of Safety Bay Road).

Safety Bay Road / Norseman Approach signalised intersection
The Safety Bay Rd / Norseman Approach / Burlington Drive 4-way signalised intersection is shown in Figure B3 and SIDRA results are presented in Table B3. The analysis indicates that a longer right turn pocket is required on the western approach (270m has been modelled) to accommodate the right turn queue from Safety Bay Road to Burlington Drive. The SIDRA analysis indicates this intersection would be close to capacity in the modelled 2031 PM peak but should be considered to operate satisfactorily.

Safety Bay Road / Baldivis Road roundabout
The SIDRA analysis of this roundabout indicates it will be necessary to widen the eastern approach to accommodate a short third approach lane, which would be marked for left turns only as shown in Figure B4. This results in satisfactory operation of the roundabout for the modelled 2031 PM peak traffic flows (Table B4).

Safety Bay Road / Nairn Drive roundabout
Full development in this area will also require some upgrading of this existing roundabout. The SIDRA analysis indicates the eastern and western approaches on Safety Bay Road could be widened to three lanes each (as shown in Figure B5) and would result in satisfactory operation of the roundabout for the modelled 2031 PM peak traffic flows (Table B5).

5.5 Service Vehicle Access

Baldivis town centre is recognised as a district centre in State Planning Policy 4.2 *Activity Centres for Perth and Peel*. SPP4.2 notes that the siting and planning of activity centres and management of traffic should, among other things, ensure loading / unloading facilities and associated vehicle manoeuvring areas are designed so as to optimise public safety and convenience. Freight / delivery must be balanced with the needs of other transport modes in the activity centre including cars, public transport, walking, cycling and access for people with disabilities.

The modified grid road network of the structure plan will provide multiple access routes for service vehicles to access each component of this activity centre. This means that there will generally be alternative routes available to allow service vehicles to avoid sensitive areas where the focus is more on pedestrian movements or residential environment.

In the Core Precinct, for example, the loading bays for the Baldivis Shopping Centre are located along the northern side of the shopping centre. They are currently accessed from the northern end of Settlers Avenue where it intersects Nancy Alley, but ultimately these service areas will be accessed from Mennock

Approach, which will link Nairn Drive and Norseman Approach along the northern boundary of the shopping centre site. This will remove the need for most service vehicles to travel on Settlers Avenue, which is the main street of this retail Core Precinct. Similarly, Atwick Terrace provides a suitable service vehicle access route from Nairn Drive to commercial land uses west of Settlers Avenue. There are also a small number of businesses located along the Safety Bay Road frontage such as existing fast food outlets. Service vehicles will access these businesses via a proposed left-in / left-out driveway on Safety Bay Road which will also help to reduce volumes on Settlers Avenue and minimise the need for service vehicles to enter that main street environment.

Similarly, in the Eastern Precinct the main bulky goods developments will also have their loading areas located along the northern side with access from an east west link road connecting to Baldivis Road and Norseman Approach, minimising conflict within the main car parks of those developments. Once again there are also a small number of businesses in this precinct along the Safety Bay Road frontage that have service vehicle access via driveways along Safety Bay Road. This is appropriate as it minimises service vehicle movements through the main car parks where customers are walking between their cars and the bulky goods stores.

5.6 Impact on Surrounding Roads and Neighbouring Areas

Future traffic flows on the road links connecting to the structure plan area are shown on Figure 4a. The higher order roads, such as Nairn Drive and Baldivis Road, will carry the highest traffic volumes, as they should do. Nairn Drive south of Safety Bay Road is ultimately planned to be upgraded to four lanes to accommodate future traffic volumes. The modelled volumes on Baldivis Road south of Norwood Avenue would also indicate the need to plan for future upgrading of this section of Baldivis Road as well

Lower order roads such as the access roads south of Norwood Avenue will not carry significant amounts of traffic to and from this activity centre, so the impact on these neighbouring residential areas is negligible.

5.7 Traffic Noise and Vibration

The Western Australian Planning Commission policy SPP5.4 Road and Rail Transport Noise and Freight Considerations in Land Use Planning is applicable in the vicinity of major roads carrying 20,000 vpd or more, as well as major freight routes and railway lines.

Traffic volumes on Safety Bay Road are already above 20,000 vpd and the 2031 PM peak traffic flows indicated in Figure 4a suggest that future daily traffic flows on Nairn Drive (south of Safety Bay Road) and Baldivis Road (south of Norwood Avenue) are also likely to be higher than 20,000 vpd when Baldivis is fully developed. Therefore appropriate design to ameliorate noise levels should be taken into consideration as part of development of noise-sensitive land uses such as residential development along these roads.

5.8 Road Safety

The existing intersections within the structure plan area have been checked for road crash records on the Main Roads Western Australia website. During the 5-year period 2006-2010 there were:

- 118 crashes recorded at the Safety Bay Road / Baldivis Road roundabout (ranked 96th in the state for crash frequency and 106th for cost);
- 41 crashes recorded at the Safety Bay Road / Nairn Drive roundabout (ranked 553rd for crash frequency and 122nd for cost);
- 11 crashes recorded at the Safety Bay Road / Settlers Avenue intersection (ranked 1728th for crash frequency and 1358th for cost);
- no crashes recorded at the Settlers Avenue / Atwick Terrace intersection; and
- no crashes recorded at the Nairn Drive / Atwick Terrace intersection.

The Main Roads WA website flags the number of crashes at the two roundabouts as being higher than expected. There are a number of factors that may help to explain this result. During most of this period the Kwinana Freeway ended at Safety Bay Road and freeway traffic flowed straight onto this section of Safety Bay Road. The sudden change in driving environment and speed limits, together with the unbalanced traffic volumes on these two roundabouts (Nairn Drive and Baldivis Road traffic volumes were only a fraction of those on Safety Bay Road) is likely to have contributed to the number of crashes. Traffic speeds is less likely to be an issue since the freeway was extended past Safety Bay Road and future forecast increase in traffic flows on these side roads will make the traffic flows more balanced, so it is anticipated that crash rates should become lower over time.

6 Parking

State Planning Policy 4.2 *Activity Centres for Perth and Peel* provides some guidance on parking provision in activity centres such as Baldivis Town Centre. This includes:

> "For land within the boundary of an activity centre, the responsible authority should as a rule, set upper limits to car parking in view of opportunities for reciprocal and shared parking, availability of on-street or other public parking and the need for land efficiency.
>
> "As a guide, two bays per 100m^2 for showrooms and offices and 4-5 bays per 100m^2 for shops. Minimums may be required, however, there should be flexibility for developers to provide less or no parking on-site and contribute cash-in-lieu towards facilities and services for common-use parking, public transport and alternative modes."

The City of Rockingham's Town Planning Scheme No.2 sets a minimum and maximum range for the required car parking rates within the Baldivis Town Centre as shown in Table 3.

Table 3. TPS2 Parking Standards for Baldivis Town Centre

TABLE NO.3

RECOMMENDED CARPARKING STANDARDS/ALLOWANCES WITHIN THE PRIMARY CENTRE CITY CENTRE & BALDIVIS TOWN CENTRE ZONES*

USE	MINIMUM PARKING STANDARD (and MAXIMUM PARKING ALLOWABLE - in brackets)
Single house, grouped dwellings and multiple dwellings	The provisions of the Residential Design Codes are taken to apply
Cinema, Theatre	1 bay per 8 (6) seats
Consulting Rooms	3 (4) bays per consultant
Fast Food Outlet	1 bay per 14 (11) m^2 NLA
Health Studio	1 bay per 20 (15) m^2 NLA available to the public, including swimming pools
Office	1 bay per 60 (40) m^2 NLA
Private Recreation, Restaurant, Reception Centre	1 bay for every 8 (6) persons the building is designed to accommodate
Shop	1 bay per 22 (17) m^2 NLA
Showroom, Warehouse	1 bay per 80 (60) m^2 NLA
Hotel, Motel, Tavern	1 bay per bedroom plus 1 bay for every 5 (4) m^2 of bar and public areas including lounges, beer gardens and restaurants
Child Care Premises	1 bay per employee and 1 bay per eight children
Public Assembly, Public Worship	1 bay per 8 (6) seats
Short Stay Accommodation	The provisions of the Residential Design Codes with respect to multiple dwellings are taken to apply

*Subject to the provisions and qualifications detailed under Transport Policy 6.5.6 - Parking, as contained within the Development Policy Plan.

The SPP4.2 suggested parking rates equates to 1 bay per $20m^2$ to $25m^2$ for shops and 1 bay per $50m^2$ for office and showrooms. These are compatible with the ranges currently specified in TPS2 so it is anticipated that these existing parking standards would be reflected in the proposed Baldivis Activity Centre Structure Plan.

The principle of reciprocal and shared parking is also supported by SPP4.2. This means that spare parking capacity during off-peak periods for one land use is available for use by customers of other land uses that have different peak times of parking demand. This principle is supported in non-residential precincts to improve flexibility and minimise the number of parking spaces that need to be provided within this activity centre.

7 Public Transport

Existing bus services in this area are described in section 4.3 of this report.

The *City of Rockingham Baldivis Road Needs Study Update Traffic and Infrastructure Report* (draft, January 2012) includes a Transperth service development plan that has been prepared by the Public Transport Authority (see Figure 5 below).

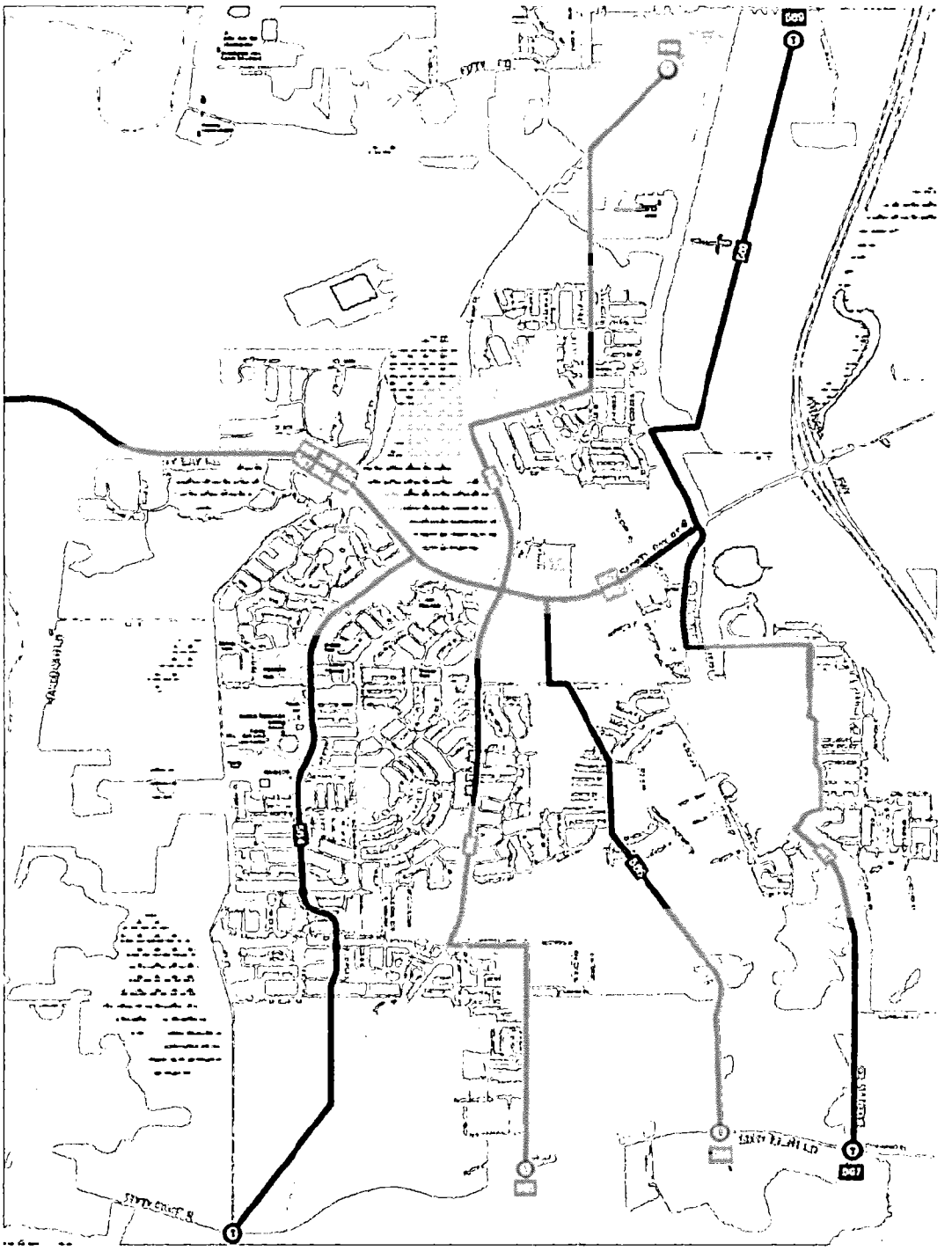


Figure 5. Transperth Service Development Plan Map

This includes four bus routes south of Safety Bay Road and two to the north. Five of these six bus routes would pass close through the Structure Plan area on Safety Bay Road or Nairn Drive.

One of the routes shown to the south of Safety Bay Road assumes that the Safety Bay Rd / Settlers Ave intersection will be a 4-way intersection. As this is recommended to remain 3-way without the southern connection, this future bus

route would need to be revised. The Structure Plan assumes this route would use Nairn Drive then the new road link at the southern edge of the structure plan area, which would provide suitable access to this route from within this area.

In addition, the Department of Transport's plan for *Public Transport for Perth in 2031* (Draft for consultation, July 2011) proposes bus rapid transit infrastructure linking from Baldivis to Warnbro station and Rockingham city centre by 2031. This may involve "providing priority bus lanes along routes that connect major centres and through congested intersections".

Therefore, the Structure Plan area will ultimately have good access by public transport.

8 Pedestrians and Cyclists

Appropriate provision of facilities for pedestrians and cyclists are identified in the Western Australian Planning Commission's *Liveable Neighbourhoods* policy guidelines. This includes provision of a path on at least one side of each access street and both sides of neighbourhood connector and integrator arterial roads. The City of Rockingham has also adopted a minimum width of 2 metres for all paths (and 2.5m adjacent to schools and shops) so that they are all classified as shared paths, usable by cyclists as well as pedestrians. It is anticipated that these existing policies would be reflected in the proposed Baldivis Activity Centre Structure Plan.

Within the Core Precinct, Settlers Avenue already has wide paths on both sides as appropriate for this 'main street' environment and Atwick Terrace is being developed similarly as development occurs adjacent to it. Safety Bay Road has a shared path on the southern side from Nairn Drive to the traffic lights at Settlers Avenue but does not yet have paths through the rest of the structure plan area. Suitable paths should be provided along the remainder of Safety Bay Road and other roads as they are developed in the structure plan area.

Pedestrian and cyclist access across Safety Bay Road is currently accommodated by the traffic lights at Settlers Avenue.

The signalised intersection to be constructed at Norseman Approach will similarly enhance pedestrian and cyclist access across Safety Bay Road from southeast of the site.

Future provision of appropriate paths along both sides of Safety Bay Road will facilitate access for pedestrians and cyclists to cross at these signalised intersections.

9 Conclusions

This Transport Assessment addresses the proposed Baldivis Activity Centre Structure Plan for the planned district centre located on Safety Bay Road, Baldivis.

The key access points are at several existing and proposed intersections along Safety Bay Road between Nairn Drive and Baldivis Road. These key intersections and access points have been assessed in this transport assessment and appropriate intersection treatments have been identified to accommodate forecast future traffic flows.

In particular, it is recommended that the Safety Bay Road / Settlers Avenue intersection should remain as a signalised 3-way intersection; Settlers Avenue should not be connected south of Safety Bay Road as traffic queues from this 4-way intersection would impact on operation of the Nairn Drive roundabout in future.

The Baldivis Activity Centre will be served by enhanced public transport routes in future including a potential bus rapid transit route linking from Baldivis to Warnbro station and Rockingham city centre by 2031.

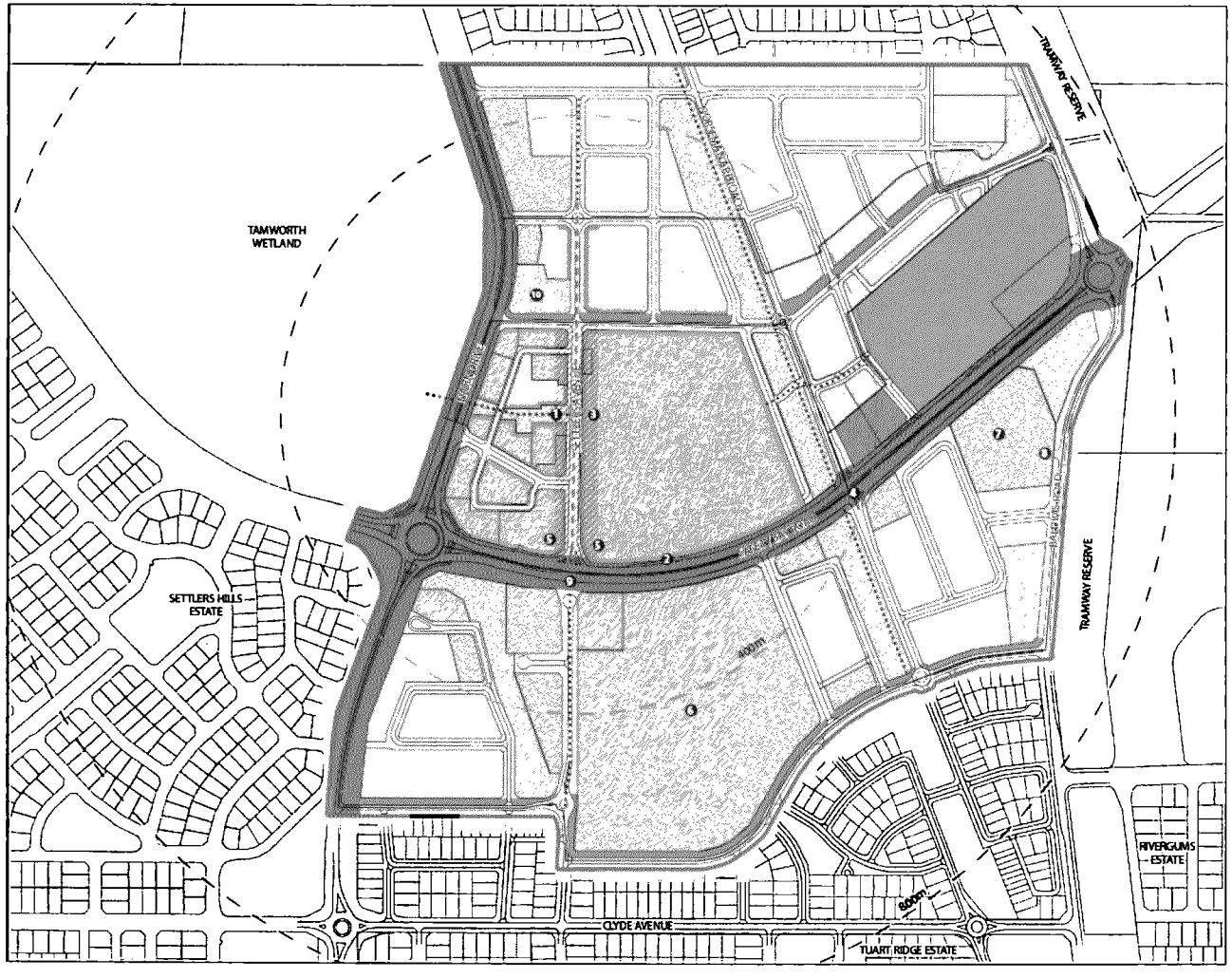
The Baldivis Activity Centre will include a comprehensive network of shared paths to facilitate pedestrian and cyclist access to and within the activity centre. The WAPC Liveable Neighbourhoods policy guidelines and Council policies provide appropriate guidance on provision of pedestrian and cyclist facilities.

Existing parking standards for Baldivis Town Centre in City of Rockingham Town Planning Scheme No 2 are generally consistent with the principles recommended in State Planning Policy 4.2 *Activity Centres for Perth and Peel* so are considered appropriate to continue to form the basis for parking provision in the Baldivis Activity Centre Structure Plan.

Appendix A

Proposed Baldivis Activity Centre Structure Plan

BALDIVIS ACTIVITY CENTRE STRUCTURE PLAN



LEGEND:

- Structure Plan Area
- Precinct Boundary
- Core
- Bulky Goods
- Mixed Use
- Medium Density Residential
- Low Density Residential
- Civic / Community Use
- Public Open Space / Drainage
- Arbour Ways
- Other Regional Road
- Active Street Frontage
- Passive Street Frontage
- Pedestrian / Cycle Link
- Main Street (Settlers Avenue)
- Walkable Catchments (400/800m)
- Core Main Street

NOTES:

1. Town Square
2. Left In Left Out Only
3. Primary Entrance To Shopping Centre
4. Traffic Signals (4 way intersection)
5. Built Form Landmark
6. Retirement Living
7. Additional Use of Nursing Home In Accordance With Approved Settlers Hills East Structure Plan
8. Driveway Access Permitted To Baldivis Rd
9. Traffic Signals (3 Way Intersection With Pedestrian Phase)
10. Drainage Allocation Subject To Further Design Development As Part Of Future Urban Water Management Plan To Be Prepared At Subdivision Stage

0 25 50 100 200m

APPENDIX B

SIDRA INTERSECTION ANALYSIS

Safety Bay Road / Settlers Avenue signalised intersection

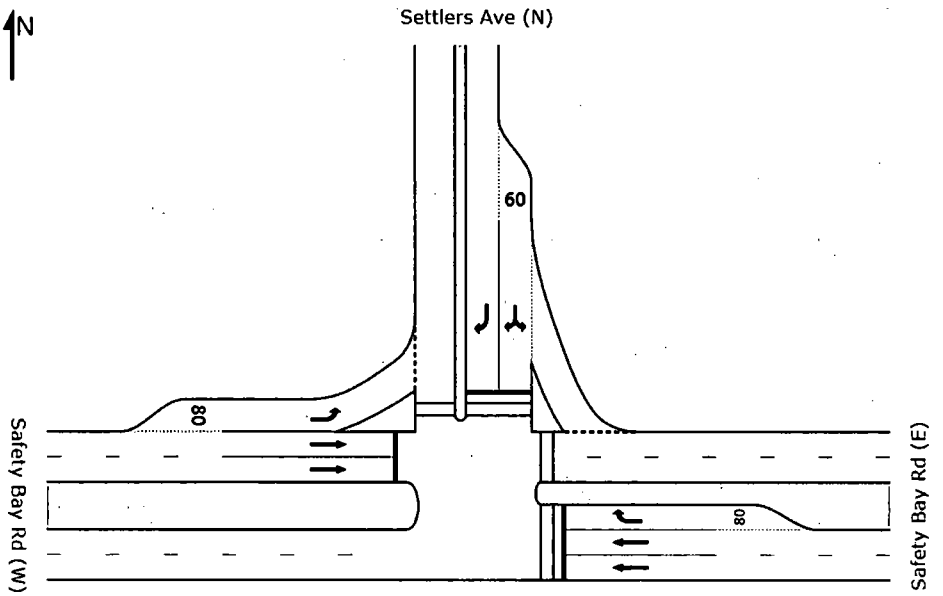


Figure B1. Safety Bay Road / Settlers Ave (3-way) intersection proposed layout

Table B1. SIDRA results – Safety Bay Road / Settlers Ave intersection (3-way) – 2031 weekday PM peak with full development of Baldivis Activity Centre (no Settlers Ave connection south of Safety Bay Rd)

Movement Performance - Vehicles								
Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m
East: Safety Bay Rd (E)								
11	T	1584	2.0	0.617	10.3	LOS B	21.9	155.6
12	R	121	0.0	0.606	65.3	LOS E	6.5	45.4
Approach		1705	1.9	0.606	14.3	LOS B	21.9	155.6
North: Settlers Ave (N)								
1	L	32	0.0	0.329	39.3	LOS D	3.5	24.8
3	R	218	0.0	0.329	41.9	LOS D	5.9	41.5
Approach		249	0.0	0.329	41.5	LOS D	5.9	41.5
West: Safety Bay Rd (W)								
4	L	105	0.0	0.085	10.7	LOS B	0.6	4.5
5	T	1475	2.0	0.824	17.1	LOS B	22.2	157.8
Approach		1580	1.9	0.824	16.7	LOS B	22.2	157.8
All Vehicles		3535	1.7	0.824	17.3	LOS B	22.2	157.8

Movement Performance - Pedestrians						
Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m
P7	Across E approach	53	44.2	LOS E	0.1	0.1
P1	Across N approach	53	30.4	LOS D	0.1	0.1
All Pedestrians		106	37.3	LOS D		

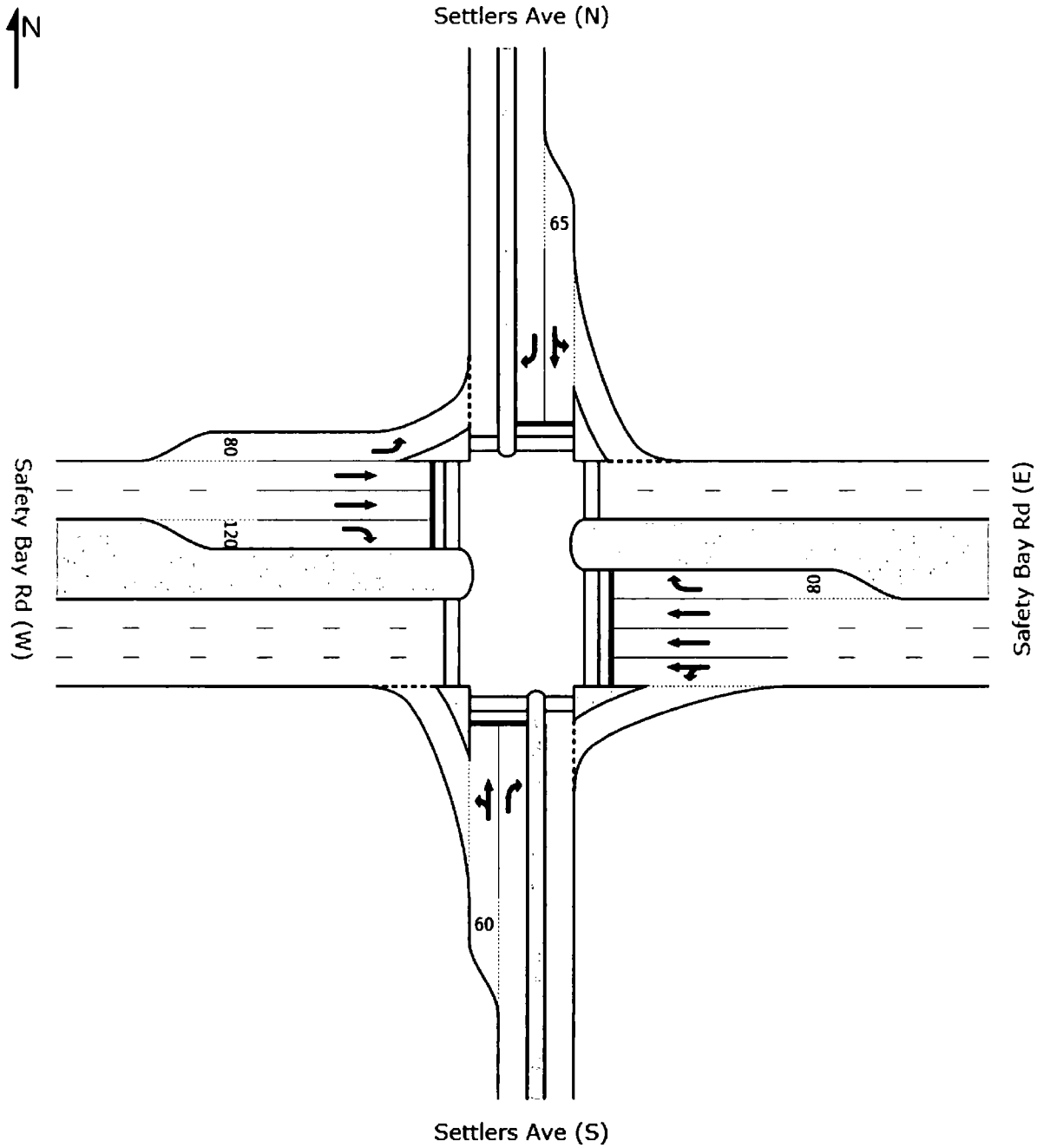


Figure B2. Safety Bay Road / Settlers Ave (4-way) intersection layout

Table B2. SIDRA results – Safety Bay Road / Settlers Ave intersection (4-way) – 2031 weekday PM peak with full development of Baldivis Activity Centre (with Settlers Ave and Norseman Approach connections south of Safety Bay Rd)

Movement Performance - Vehicles								
Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m
South: Settlers Ave (S)								
1	L	48	0.0	0.274	37.3	LOS D	4.0	28.0
2	T	37	0.0	0.274	29.5	LOS C	4.0	28.0
3	R	102	0.0	0.762	82.3	LOS F	7.4	51.7
Approach		187	0.0	0.762	60.3	LOS E	7.4	51.7
East: Safety Bay Rd (E)								
10	L	36	0.0	0.816	68.7	LOS E	33.6	238.7
11	T	1552	2.0	0.816	52.2	LOS D	34.4	244.7
12	R	62	0.0	0.662	85.8	LOS F	4.5	31.4
Approach		1649	1.9	0.816	53.8	LOS D	34.4	244.7
North: Settlers Ave (N)								
1	L	20	0.0	0.455	64.9	LOS E	6.2	43.1
2	T	94	0.0	0.455	57.2	LOS E	6.2	43.1
3	R	173	0.0	0.605	78.8	LOS E	12.4	86.7
Approach		286	0.0	0.605	70.8	LOS E	12.4	86.7
West: Safety Bay Rd (W)								
4	L	105	0.0	0.094	10.2	LOS B	0.6	3.9
5	T	1338	2.0	0.678	27.4	LOS C	33.7	240.3
6	R	338	0.0	0.613	68.1	LOS E	23.2	162.7
Approach		1781	1.5	0.613	34.1	LOS C	33.7	240.3
All Vehicles		3904	1.5	0.816	46.4	LOS D	34.4	244.7

Movement Performance - Pedestrians						
Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Pedestrian Back of Queue ped	Pedestrian Back of Queue Distance m
P1	Across S approach	53	37.9	LOS D	0.2	0.2
P7	Across E approach	53	64.1	LOS F	0.2	0.2
P1	Across N approach	53	21.7	LOS C	0.1	0.1
P3	Across W approach	53	67.0	LOS F	0.2	0.2
All Pedestrians		212	47.7	LOS E		

Safety Bay Road / Norseman Approach signalised intersection

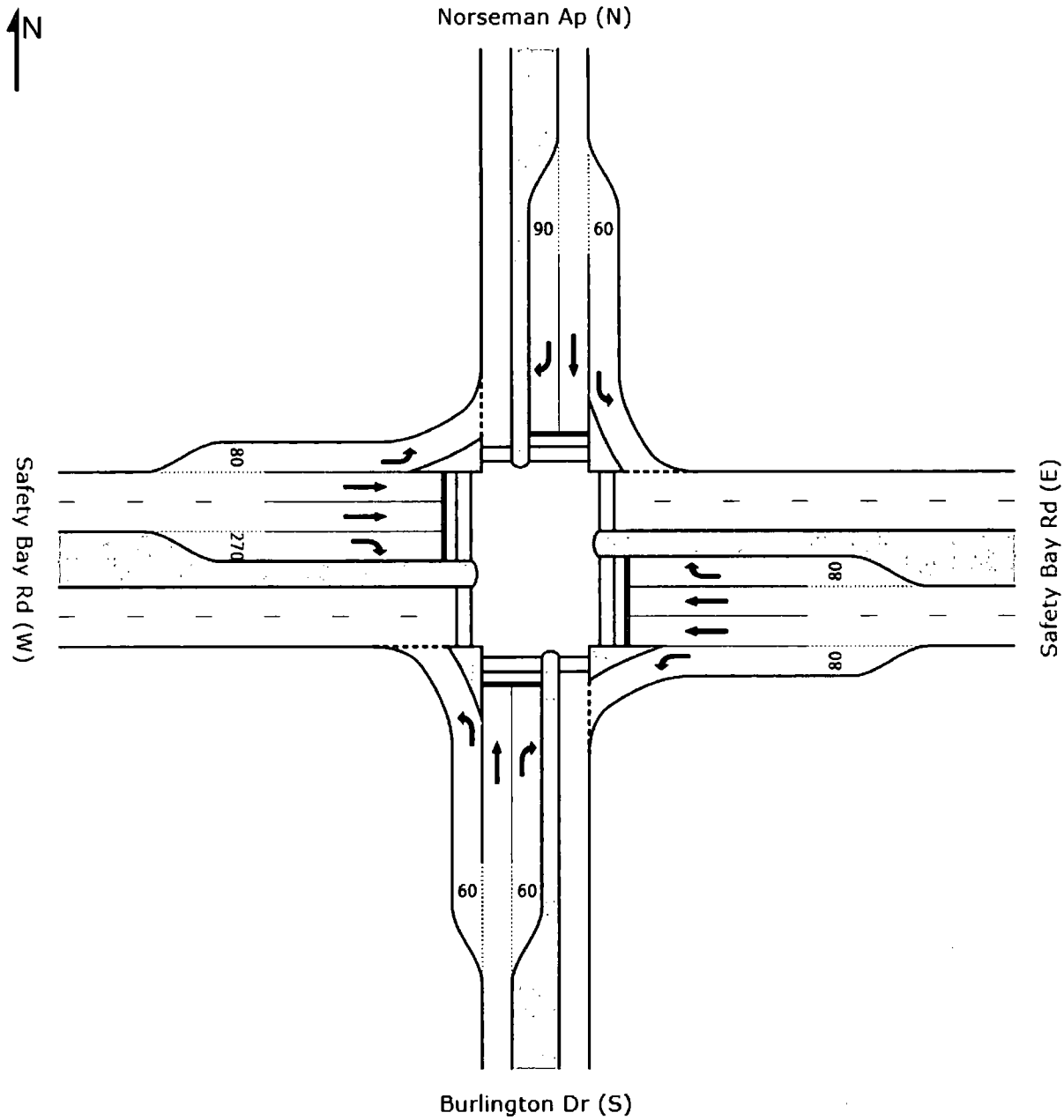


Figure B3. Safety Bay Road / Norseman Approach (4-way) intersection layout

Table B3. SIDRA results – Safety Bay Road / Norseman Approach intersection (4-way) – 2031 weekday PM peak with full development of Baldivis Activity Centre (with Norseman Approach connection south of Safety Bay Rd but no Settlers Ave connection south of Safety Bay Rd)

Movement Performance - Vehicles								
Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m
South: Burlington Dr (S)								
1	L	204	0.0	0.516	26.1	LOS C	7.8	54.5
2	T	256	0.0	0.856	72.8	LOS E	19.3	135.2
3	R	22	0.0	0.142	75.4	LOS E	1.5	10.4
Approach		482	0.0	0.856	53.1	LOS D	19.3	135.2
East: Safety Bay Rd (E)								
10	L	1	0.0	0.002	16.7	LOS B	0.0	0.2
11	T	1389	2.0	0.959	76.5	LOS E	61.0	434.4
12	R	34	0.0	0.434	86.6	LOS F	2.5	17.4
Approach		1424	2.0	0.959	76.7	LOS E	61.0	434.4
North: Norseman Ap (N)								
1	L	135	0.0	0.269	10.0	LOS A	1.9	13.5
2	T	176	0.0	0.588	62.5	LOS E	11.7	82.2
3	R	146	0.0	0.942	100.0	LOS F	12.4	86.5
Approach		457	0.0	0.942	59.0	LOS E	12.4	86.5
West: Safety Bay Rd (W)								
4	L	45	0.0	0.047	10.9	LOS B	0.6	4.2
5	T	875	2.0	0.403	19.2	LOS B	17.2	122.6
6	R	409	0.0	0.959	97.6	LOS F	36.4	254.6
Approach		1329	1.3	0.959	43.1	LOS D	36.4	254.6
All Vehicles		3693	1.2	0.959	59.3	LOS E	61.0	434.4

Movement Performance - Pedestrians						
Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m
P1	Across S approach	53	35.2	LOS D	0.2	0.2
P7	Across E approach	53	66.6	LOS F	0.2	0.2
P1	Across N approach	53	18.4	LOS B	0.1	0.1
P3	Across W approach	53	66.6	LOS F	0.2	0.2
All Pedestrians		212	46.7	LOS E		

Safety Bay Road / Baldivis Road roundabout

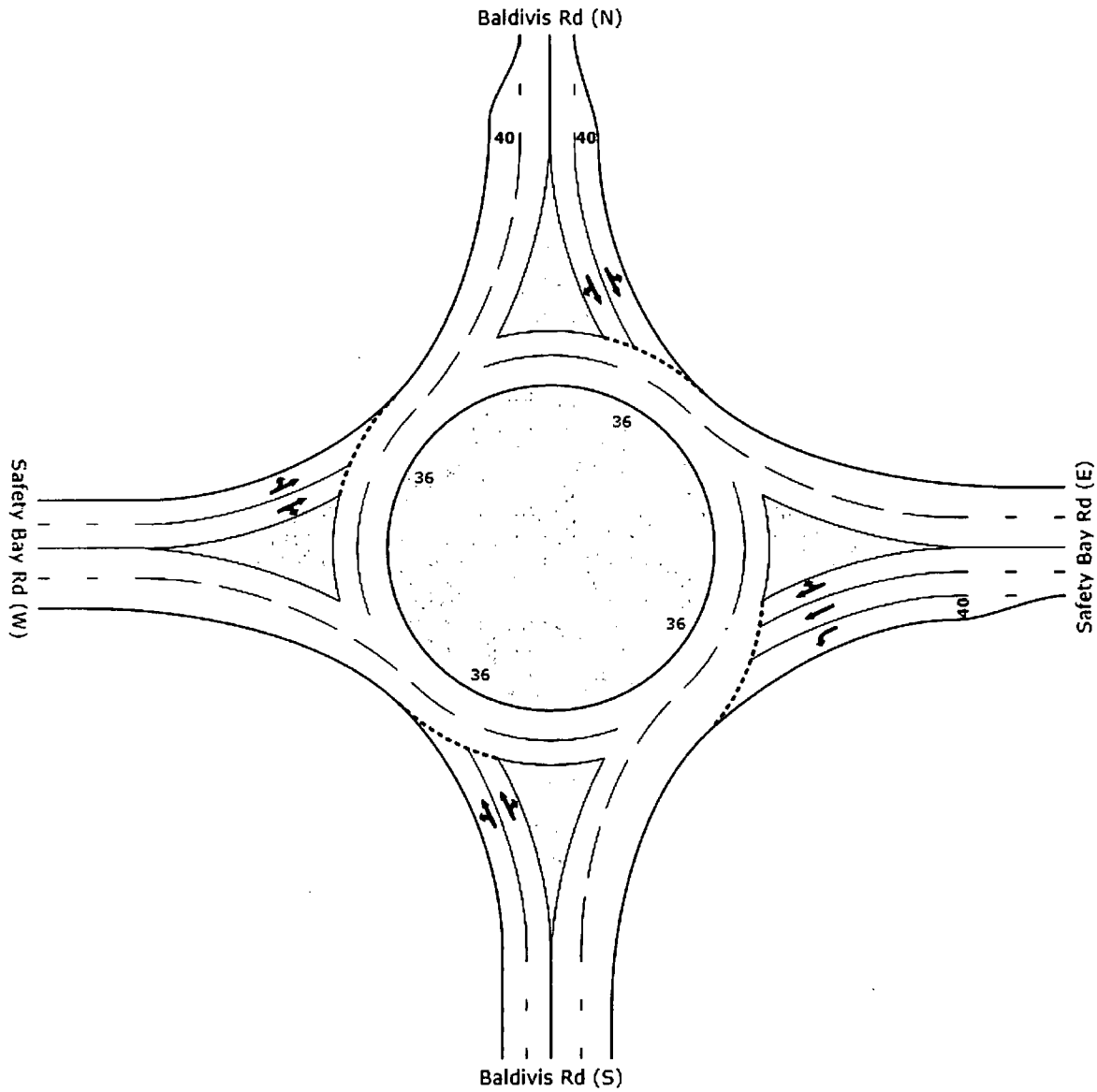


Figure B4. Safety Bay Road / Baldivis Road roundabout layout (widened)

Table B4. SIDRA results – Safety Bay Road / Baldivis Road roundabout (widened) – 2031 weekday PM peak with full development of Baldivis Activity Centre (with Norseman Approach connection south of Safety Bay Rd but no Settlers Ave connection south of Safety Bay Rd)

Movement Performance - Vehicles								
Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m
South: Baldivis Rd (S)								
1	L	102	2.0	0.319	14.4	LOS B	1.8	13.0
2	T	235	2.0	0.681	18.7	LOS B	6.2	44.0
3	R	153	2.0	0.681	26.9	LOS C	6.2	44.0
Approach		489	2.0	0.681	20.4	LOS C	6.2	44.0
East: Safety Bay Rd (E)								
4	L	552	2.0	0.592	12.3	LOS B	5.0	35.5
5	T	1233	2.0	0.716	11.8	LOS B	8.5	60.7
6	R	360	2.0	0.716	21.0	LOS C	7.5	53.2
Approach		2144	2.0	0.716	13.5	LOS B	8.5	60.7
North: Baldivis Rd (N)								
7	L	302	2.0	0.524	10.7	LOS B	3.7	26.1
8	T	317	2.0	0.524	10.4	LOS B	3.7	26.1
9	R	183	2.0	0.524	18.7	LOS B	3.3	23.5
Approach		802	2.0	0.524	12.4	LOS B	3.7	26.1
West: Safety Bay Rd (W)								
10	L	100	2.0	0.583	12.1	LOS B	5.4	38.2
11	T	611	2.0	0.583	11.3	LOS B	5.4	38.2
12	R	338	2.0	0.583	19.9	LOS B	5.0	35.3
Approach		1048	2.0	0.583	14.2	LOS B	5.4	38.2
All Vehicles		4484	2.0	0.716	14.2	LOS B	8.5	60.7

Safety Bay Road / Nairn Drive roundabout

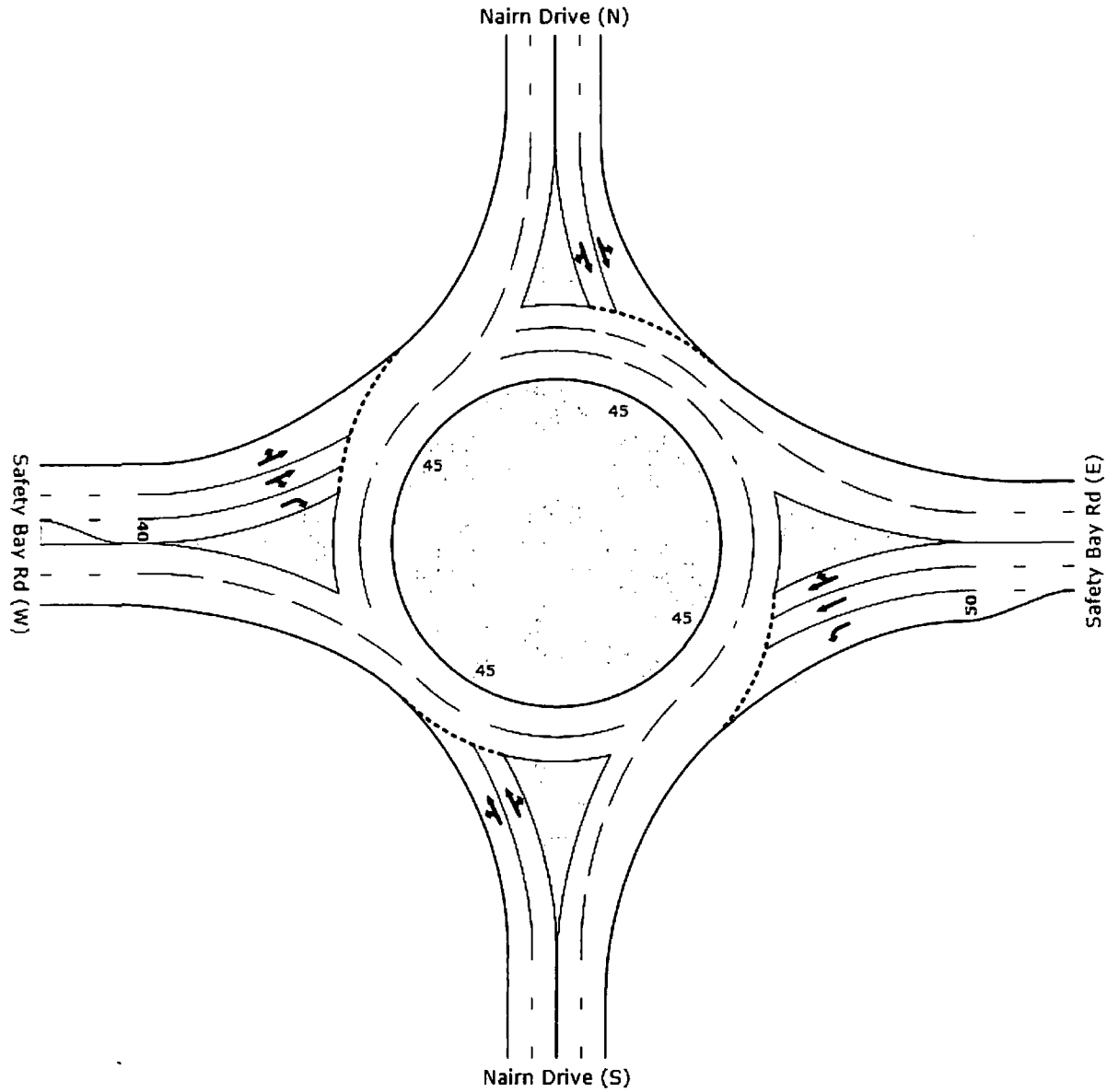
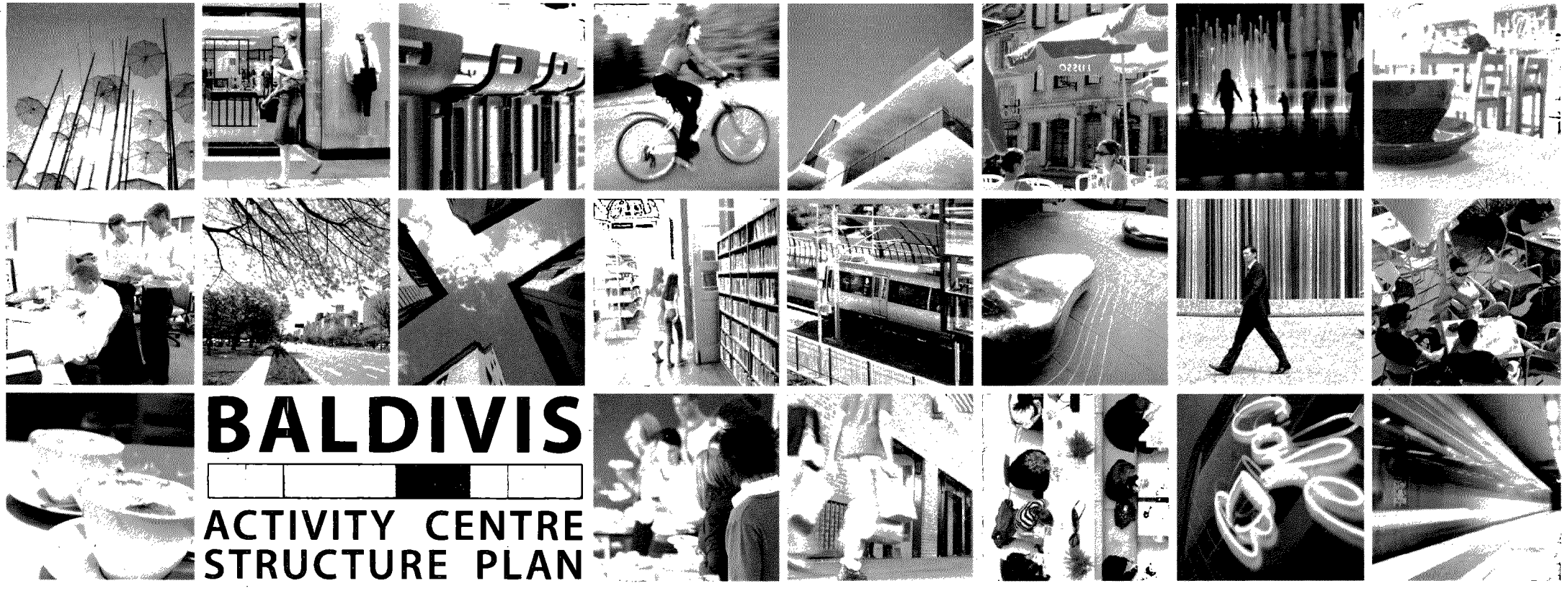


Figure B5. Safety Bay Road / Nairn Drive roundabout layout (widened)

Table B5. SIDRA results – Safety Bay Road / Nairn Drive roundabout (widened) – 2031 weekday PM peak with full development of Baldivis Activity Centre (with Norseman Approach connection south of Safety Bay Rd but no Settlers Ave connection south of Safety Bay Rd)

Movement Performance - Vehicles								
Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m
South: Nairn Drive (S)								
1	L	297	2.0	0.865	21.4	LOS C	11.5	82.0
2	T	361	2.0	0.865	20.4	LOS C	11.5	82.0
3	R	499	2.0	0.948	46.5	LOS D	14.7	105.0
Approach		1157	2.0	0.948	31.9	LOS C	14.7	105.0
East: Safety Bay Rd (E)								
4	L	546	2.0	0.653	13.3	LOS B	5.2	37.1
5	T	1254	2.0	0.612	11.2	LOS B	6.3	44.9
6	R	2	2.0	0.612	19.7	LOS B	4.6	33.0
Approach		1802	2.0	0.653	11.8	LOS B	6.3	44.9
North: Nairn Drive (N)								
7	L	1	2.0	0.680	48.7	LOS D	11.3	80.6
8	T	514	2.0	0.680	48.6	LOS D	11.3	80.6
9	R	132	2.0	0.680	58.7	LOS E	8.7	61.9
Approach		646	2.0	0.680	50.7	LOS D	11.3	80.6
West: Safety Bay Rd (W)								
10	L	126	2.0	0.546	9.2	LOS A	3.7	26.6
11	T	976	2.0	0.546	7.6	LOS A	4.5	31.8
12	R	711	2.0	0.546	16.2	LOS B	4.5	31.8
Approach		1813	2.0	0.546	11.0	LOS B	4.5	31.8
All Vehicles		5418	2.0	0.948	20.5	LOS C	14.7	105.0



BALDIVIS

ACTIVITY CENTRE STRUCTURE PLAN

Sydney

Level 21, 321 Kent Street
Sydney, NSW 2000
Tel: +61 2 8233 9900
Fax: +61 2 8233 9966

Brisbane

Level 12, 120 Edward Street
Brisbane, QLD 4000
Tel: +61 7 3007 3800
Fax: +61 7 3007 3811

Melbourne

Level 12, 120 Collins Street
Melbourne, VIC 3000
Tel: +61 3 8663 4888
Fax: +61 3 8663 4999

Perth

Level 1, 55 St Georges Terrace
Perth, WA 6000
Tel: +61 8 9346 0500
Fax: +61 8 9221 1779

Australia · Asia · Middle East
www.urbis.com.au
info@urbis.com.au

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