Appendix 1

The layout of the proposed development

Ground Floor

WARNBRO SOUND AVENUE

SECRET HARBOUR BOULEVARD

ONEIDA ROAD

OASIS DRIVE

open reserve

refer to traffic engineers report for kerb adjustment

refer to traffic engineers report for kerb and pedestrian path adjustment

title boundary

pad site boundary

EXISTING ENTRY / EXIT

ENTRY / EXIT

existing petrol canopy

existing petrol

existing car wash

existing car parking

existing pedestrian path

new pylon sign

existing car parks

existing loading

existing sub station / fire services

existing hotel

existing amenities

existing commercial

existing carpark and road link

existing residential development

existing lawn

existing kerbing modified refer to traffic engineers report for kerb adjustment

existing site switch board to be relocated / removed

existing brick paving

existing landscaping

existing carparks x 6 + 2 new

existing carparks x 3

existing carpark x 2

existing kerbing modified

new pedestrian path to match existing

new brick paving

pedestrian path

landscaping

line marking

entry 1

entry 2

entry 3

entry 4

town square entry 1

TEMPORARY LANDSCAPING STAGE 1

NEW CAR PARK

21 new car parks

37 new car parks

4 existing car parks

27 new car parks

13 new car parks

existing site switch board to be relocated

activated shopfront facade

proposed expansion 400m2

EX. SUPERMARKET FFL 7.00

MINI MAJOR 659 m² FFL 7.00

1550m² FFL 7.00

3850m2 FFL 7.00 SUPERMARKET

MALL FFL: 7.00

pad site 3 1550m2

specialty boh msb

line of b.o.h

lease line

tenancy loading concrete

trolley store

Acoustic screen wall with angle crown

Planttoom over

take store

screen

canopy

transf

services

airlock

EX. TENANCY

EX. KIOSK

KIOSK

TENANCY

T/B coles

T/B aldi

T/B WOW

TB wow

msb

new woolworths trolley store

pedestrian path

green wall

concrete

specialty loading concrete

R.L 7.53

R.L 7.60

R.L 7.43

R.L 7.48

R.L 7.78

R.L 8.26

R.L 8.13

R.L 7.29

R.L 7.18

R.L 6.94

R.L 6.92

R.L 6.96

R.L 7.04

R.L 8.77

R.L 6.93

R.L 6.37

R.L 6.74

R.L 6.54

R.L 6.13

R.L 6.35

R.L 6.80

R.L 6.99

10.607

69.393

26.526

42.169

15.758

26.311

122.352

20.721

16.535

8.5

8.5

37.515

51.07

27.20

50.114

21.018

20.89

8.559

22.404

18.307

116.198

34.35

102.929

10.5

6.5

22.016

24.184

30.159

8.36

3.928

existing block

existing lawn

existing brick paving

existing commercial

open pad site

community centre open lawned area

Appendix 2

Transport Planning and Traffic Plan

Parks and Recreation

Location Boundary

Distance from Location

Public Facilities

Railway

ROCKINGHAM — Local Government Name

Oasis Drive — Street Name

183 — Total Expected Traffic Generation from Subject Site on the specific section of road - **IN direction**

183 — Total Expected Traffic Generation from Subject Site on the specific section of road - **OUT direction**

330 — Total Expected Traffic Generation from Subject Site on the specific section of road - **IN and OUT direction**

330 — Total Expected Traffic Generation from each facility within Subject Site

1,098 / 1,097 — 215 - Expected Traffic Generation from Subject Site - IN direction

215 - Expected Traffic Generation from Subject Site - OUT direction

2,770 — Existing Number of Vehicles per Day

2,910 — Expected Number of Vehicles per Day

Traffic Flow IN Direction

Traffic Flow OUT Direction

* Existing Road Volumes are increased to 2015 i.e. 2025 (3.6% annual growth)

** The volumes used in this diagram will be minimised by 293 VPD i.e. 25 VPH (generated by the existing retail area to be demolished)

LEGEND

No	DATE	AMENDMENT
G	06-03-2015	PROPOSED LAYOUT AMENDED
F	26-11-2014	TRAFFIC DISTRIBUTION AMENDED
E	18-11-2014	PROPOSED LAYOUT AMENDED
D	12-11-2014	PROPOSED LAYOUT AMENDED

PROJECT: Secret Harbour Shopping Centre Expansion

TITLE: Traffic Flow Diagram 2015

DRAWING NUMBER: KC00258.000_S06a

DRAWN BY: K.P.

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Parks and Recreation

Location Boundary

Distance from Location

Public Facilities

Railway

ROCKINGHAM — Local Government Name

Oasis Drive — Street Name

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Traffic Flow IN Direction

Traffic Flow OUT Direction

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** The volumes used in this diagram will be minimised by 293 VPD i.e. 25 VPH (generated by the existing retail area to be demolished)

LEGEND

No	DATE	AMENDMENT
G	06-03-2015	PROPOSED LAYOUT AMENDED
F	26-11-2014	TRAFFIC DISTRIBUTION AMENDED
E	18-11-2014	PROPOSED LAYOUT AMENDED
D	12-11-2014	PROPOSED LAYOUT AMENDED

PROJECT: Secret Harbour Shopping Centre Expansion

TITLE: Traffic Flow Diagram 2025

DRAWING NUMBER: KC00258.000_S06b

DRAWN BY: K.P.

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Parks and Recreation	Public Facilities	Total Expected Traffic Generation from Subject Site on the specific section of road - **IN direction**
Location Boundary	Railway	Total Expected Traffic Generation from Subject Site on the specific section of road - **OUT direction**
Distance from Location	ROCKINGHAM — Local Government Name	Total Expected Traffic Generation from Subject Site on the specific section of road - **IN and OUT direction**
	Oasis Drive — Street Name	Total Expected Traffic Generation from each facility within Subject Site

1,098 / 1,097 — 215 - Expected Traffic Generation from Subject Site - IN direction
215 - Expected Traffic Generation from Subject Site - OUT direction

2,770 / 2,910 — Existing Number of Vehicles per Day / Expected Number of Vehicles per Day

Traffic Flow IN Direction

Traffic Flow OUT Direction

* Existing Road Volumes are increased to 2015 i.e. 2025 (3.6% annual growth)

** The volumes used in this diagram will be minimised by 293 VPD i.e. 25 VPH (generated by the existing retail area to be demolished)

LEGEND

No	DATE	AMENDMENT
F	06-03-2015	PROPOSED LAYOUT AMENDED
E	26-11-2014	TRAFFIC DISTRIBUTION AMENDED
D	18-11-2014	PROPOSED LAYOUT AMENDED
C	12-11-2014	PROPOSED LAYOUT AMENDED

PROJECT: Secret Harbour Shopping Centre Expansion

TITLE: Traffic Flow Diagram - AM Peak Hour 2015

DRAWING NUMBER: KC00258.000_S07a

DRAWN BY: K.P.

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Parks and Recreation

Location Boundary

Distance from Location

Public Facilities

Railway

ROCKINGHAM — Local Government Name

Oasis Drive — Street Name

183 — Total Expected Traffic Generation from Subject Site on the specific section of road - **IN direction**

183 — Total Expected Traffic Generation from Subject Site on the specific section of road - **OUT direction**

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Traffic Flow IN Direction

Traffic Flow OUT Direction

* Existing Road Volumes are increased to 2015 i.e. 2025 (3.6% annual growth)

** The volumes used in this diagram will be minimised by 293 VPD i.e. 25 VPH (generated by the existing retail area to be demolished)

LEGEND

No	DATE	AMENDMENT
F	06-03-2015	PROPOSED LAYOUT AMENDED
E	26-11-2014	TRAFFIC DISTRIBUTION AMENDED
D	18-11-2014	PROPOSED LAYOUT AMENDED
C	12-11-2014	PROPOSED LAYOUT AMENDED

PROJECT: Secret Harbour Shopping Centre Expansion

TITLE: Traffic Flow Diagram - AM Peak Hour 2025

DRAWING NUMBER: KC00258.000_S07b

DRAWN BY: K.P.

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Parks and Recreation

Public Facilities

Location Boundary

Railway

Distance from Location

ROCKINGHAM — Local Government Name

Oasis Drive — Street Name

183 — Total Expected Traffic Generation from Subject Site on the specific section of road - **IN direction**

183 — Total Expected Traffic Generation from Subject Site on the specific section of road - **OUT direction**

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2,770 — Existing Number of Vehicles per Day

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Traffic Flow IN Direction

Traffic Flow OUT Direction

* Existing Road Volumes are increased to 2015 i.e. 2025 (3.6% annual growth)

** The volumes used in this diagram will be minimised by 293 VPD i.e. 25 VPH (generated by the existing retail area to be demolished)

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D	18-11-2014	PROPOSED LAYOUT AMENDED
C	12-11-2014	PROPOSED LAYOUT AMENDED

PROJECT: Secret Harbour Shopping Centre Expansion

TITLE: Traffic Flow Diagram - PM Peak Hour 2015

DRAWING NUMBER: KC00258.000_S08a

DRAWN BY: K.P.

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Parks and Recreation

Location Boundary

Distance from Location

Public Facilities

Railway

ROCKINGHAM — Local Government Name

Oasis Drive — Street Name

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215 - Expected Traffic Generation from Subject Site - OUT direction

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Traffic Flow IN Direction

Traffic Flow OUT Direction

* Existing Road Volumes are increased to 2015 i.e. 2025 (3.6% annual growth)

** The volumes used in this diagram will be minimised by 293 VPD i.e. 25 VPH (generated by the existing retail area to be demolished)

LEGEND

No	DATE	AMENDMENT
F	06-03-2015	PROPOSED LAYOUT AMENDED
E	26-11-2014	TRAFFIC DISTRIBUTION AMENDED
D	18-11-2014	PROPOSED LAYOUT AMENDED
C	12-11-2014	PROPOSED LAYOUT AMENDED

PROJECT: Secret Harbour Shopping Centre Expansion

TITLE: Traffic Flow Diagram - PM Peak Hour 2025

DRAWING NUMBER: KC00258.000_S08b

DRAWN BY: K.P.

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NO	DATE	AMENDMENT
D	06-03-2015	PROPOSED LAYOUT AMENDED
C	17-11-2014	PROPOSED LAYOUT AMENDED
B	31-10-2014	AMENDED PER COMMENTS RECEIVED ON 23- 10-2014
A	25-08-2014	ISSUED FOR REVIEW

PROJECT:
Secret Harbour Shopping Centre Expansion

TITLE:
Vehicle Turning Circle Plan 02 - Semi-Trailer 19m

DRAWING NUMBER:
KC00258.000_S21

DRAWN BY:
K.P.

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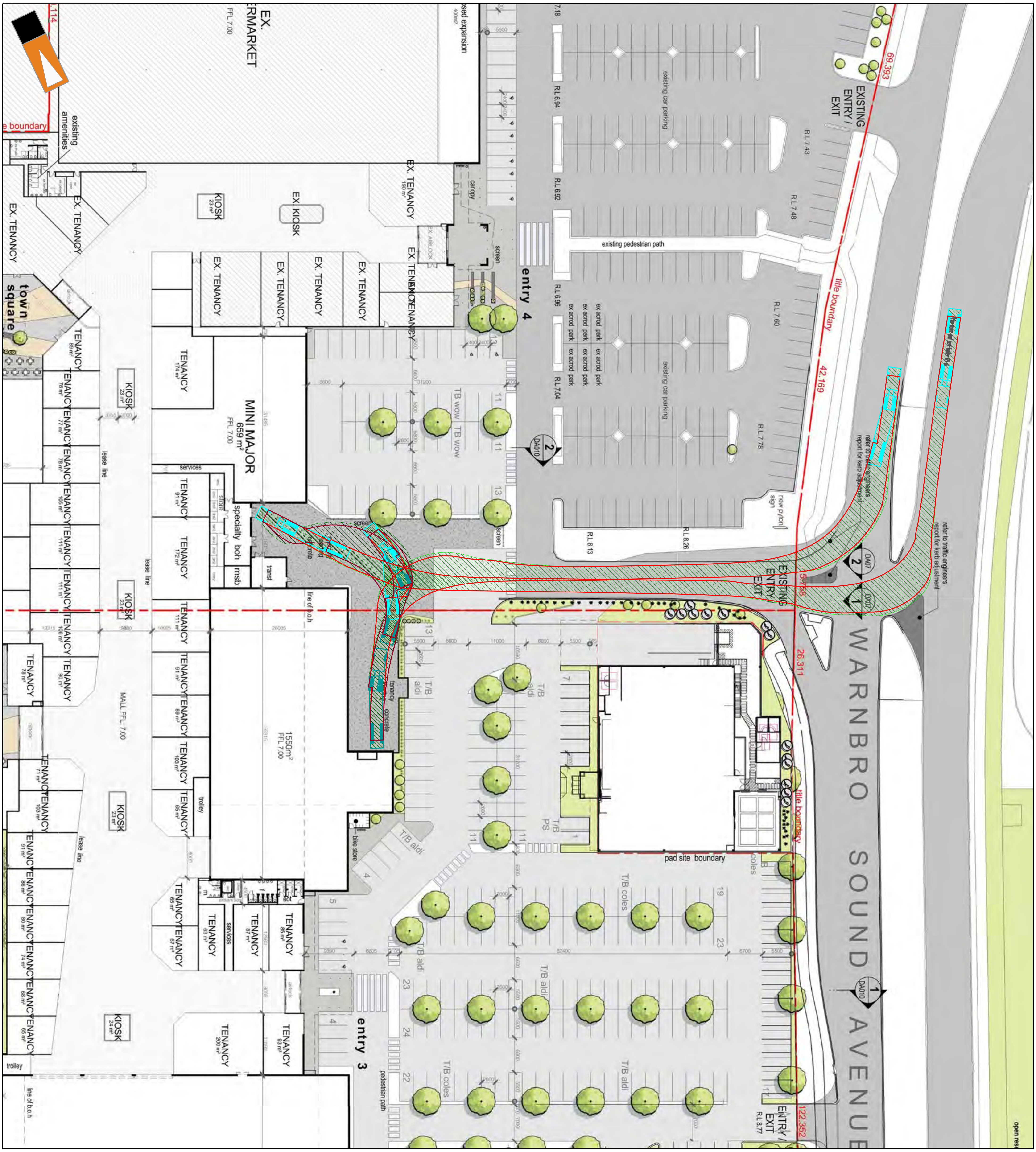

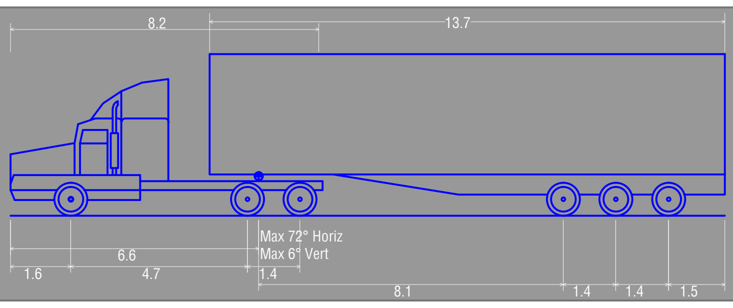

AV - Articulated Vehicle

Overall Length	19.000m
Overall Width	2.500m
Overall Body Height	4.301m
Min Body Ground Clearance	0.418m
Track Width	2.500m
Lock to Lock Time	6.00s
Kerb to Kerb Turning Radius	12.500m

Wheel Path

Body Path

Reverse Path

LEGEND

NO	DATE	AMENDMENT
D	06-03-2015	PROPOSED LAYOUT AMENDED
C	17-11-2014	PROPOSED LAYOUT AMENDED
B	31-10-2014	AMENDED PER COMMENTS RECEIVED ON 23- 10-2014
A	21-08-2014	ISSUED FOR REVIEW

PROJECT: Secret Harbour Shopping Centre Expansion

TITLE: Vehicle Turning Circle Plan 03 - Semi-Trailer 19m

DRAWING NUMBER: KC00258.000_S22

DRAWN BY: K.P.

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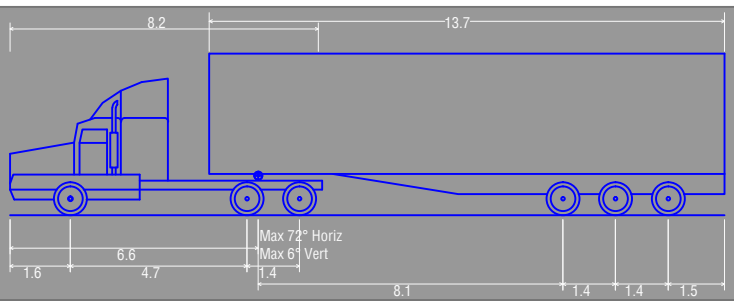

AV - Articulated Vehicle

Overall Length	19.000m
Overall Width	2.500m
Overall Body Height	4.301m
Min Body Ground Clearance	0.418m
Track Width	2.500m
Lock to Lock Time	6.00s
Kerb to Kerb Turning Radius	12.500m

Wheel Path

Body Path

Reverse Path

LEGEND

NO	DATE	AMENDMENT
E	06-03-2015	PROPOSED LAYOUT AMENDED
D	17-11-2014	PROPOSED LAYOUT AMENDED
C	31-10-2014	AMENDED PER COMMENTS RECEIVED ON 23- 10-2014
B	22-08-2014	SWEPT PATH AMENDED

PROJECT:
Secret Harbour Shopping Centre Expansion

TITLE:
Vehicle Turning Circle Plan 04 - Semi-Trailer 19m

DRAWING NUMBER:
KC00258.000_S23

DRAWN BY:
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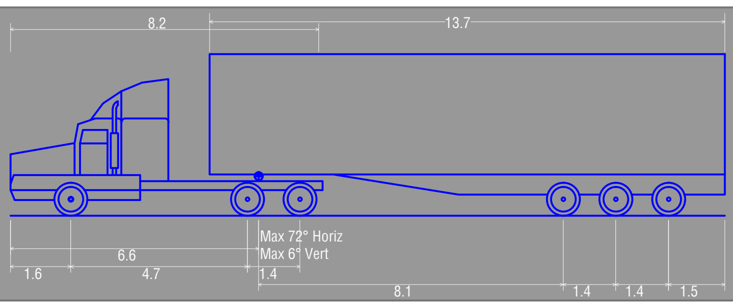

AV - Articulated Vehicle

Overall Length	19.000m
Overall Width	2.500m
Overall Body Height	4.301m
Min Body Ground Clearance	0.418m
Track Width	2.500m
Lock to Lock Time	6.00s
Kerb to Kerb Turning Radius	12.500m

Wheel Path
Body Path
Reverse Path

LEGEND

NO	DATE	AMENDMENT
D	06-03-2015	PROPOSED LAYOUT AMENDED
C	17-11-2014	PROPOSED LAYOUT AMENDED
B	31-10-2014	AMENDED PER COMMENTS RECEIVED ON 23- 10-2014
A	25-08-2014	ISSUED FOR REVIEW

PROJECT: Secret Harbour Shopping Centre Expansion

TITLE: Vehicle Turning Circle Plan 05- Semi-Trailer 19m

DRAWING NUMBER: KC00258.000_S24

DRAWN BY: K.P.

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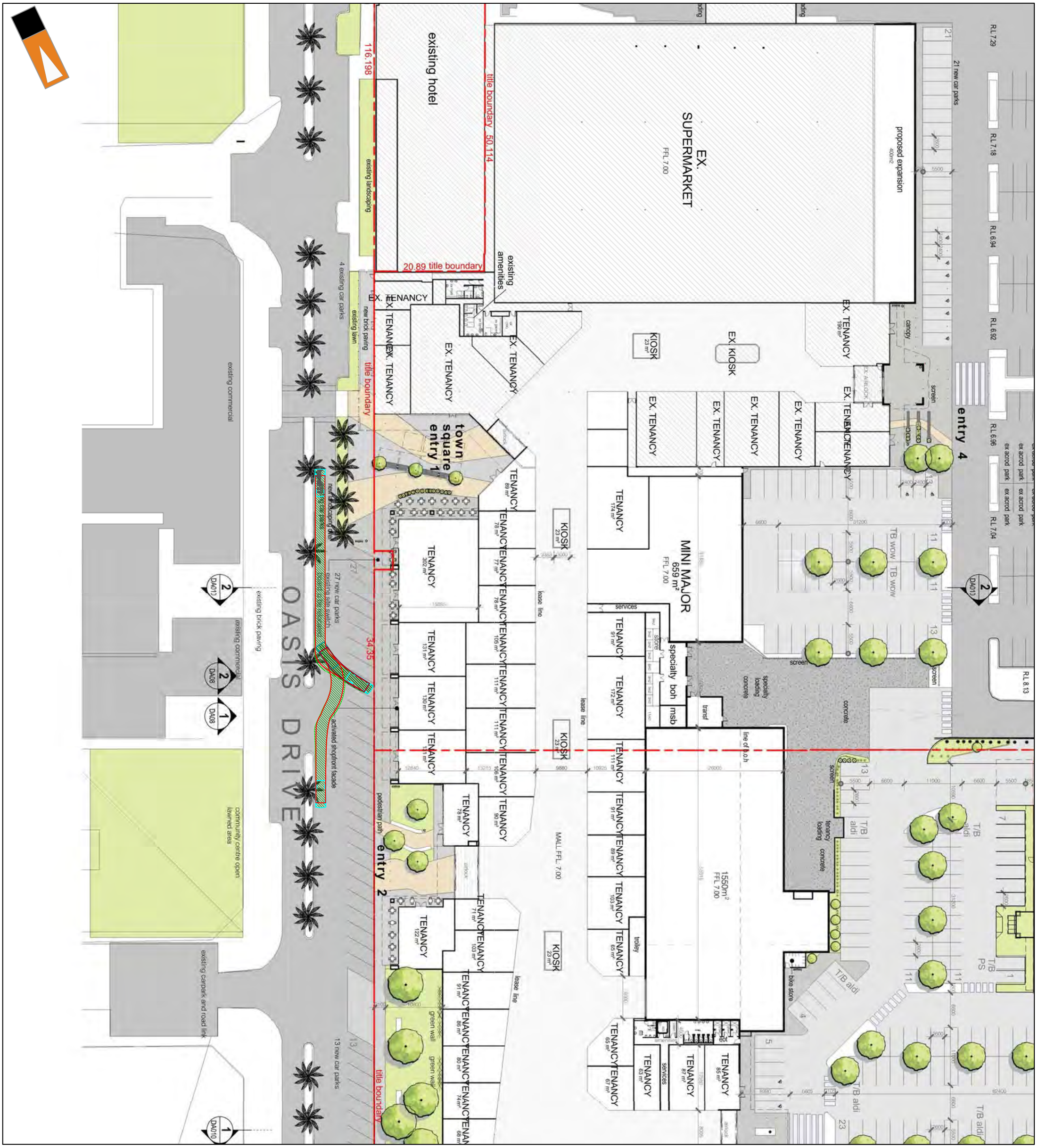

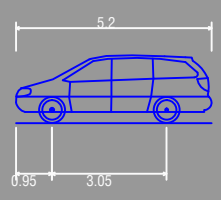

Passenger vehicle (5.2 m)	
Overall Length	5.200m
Overall Width	1.940m
Overall Body Height	1.804m
Min Body Ground Clearance	0.295m
Track Width	1.840m
Lock to Lock Time	4.00s
Kerb to Kerb Turning Radius	6.300m

Wheel Path

Body Path

Reverse Path

LEGEND

NO	DATE	AMENDMENT
D	06-03-2015	PROPOSED LAYOUT AMENDED
C	17-11-2014	PROPOSED LAYOUT AMENDED
B	31-10-2014	AMENDED PER COMMENTS RECEIVED ON 23- 10-2014
A	25-08-2014	ISSUED FOR REVIEW

PROJECT:
Secret Harbour Shopping Centre Expansion

TITLE:
Vehicle Turning Circle Plan 06 Passenger vehicle 5.2m

DRAWING NUMBER:
KC00258.000_S25

DRAWN BY:
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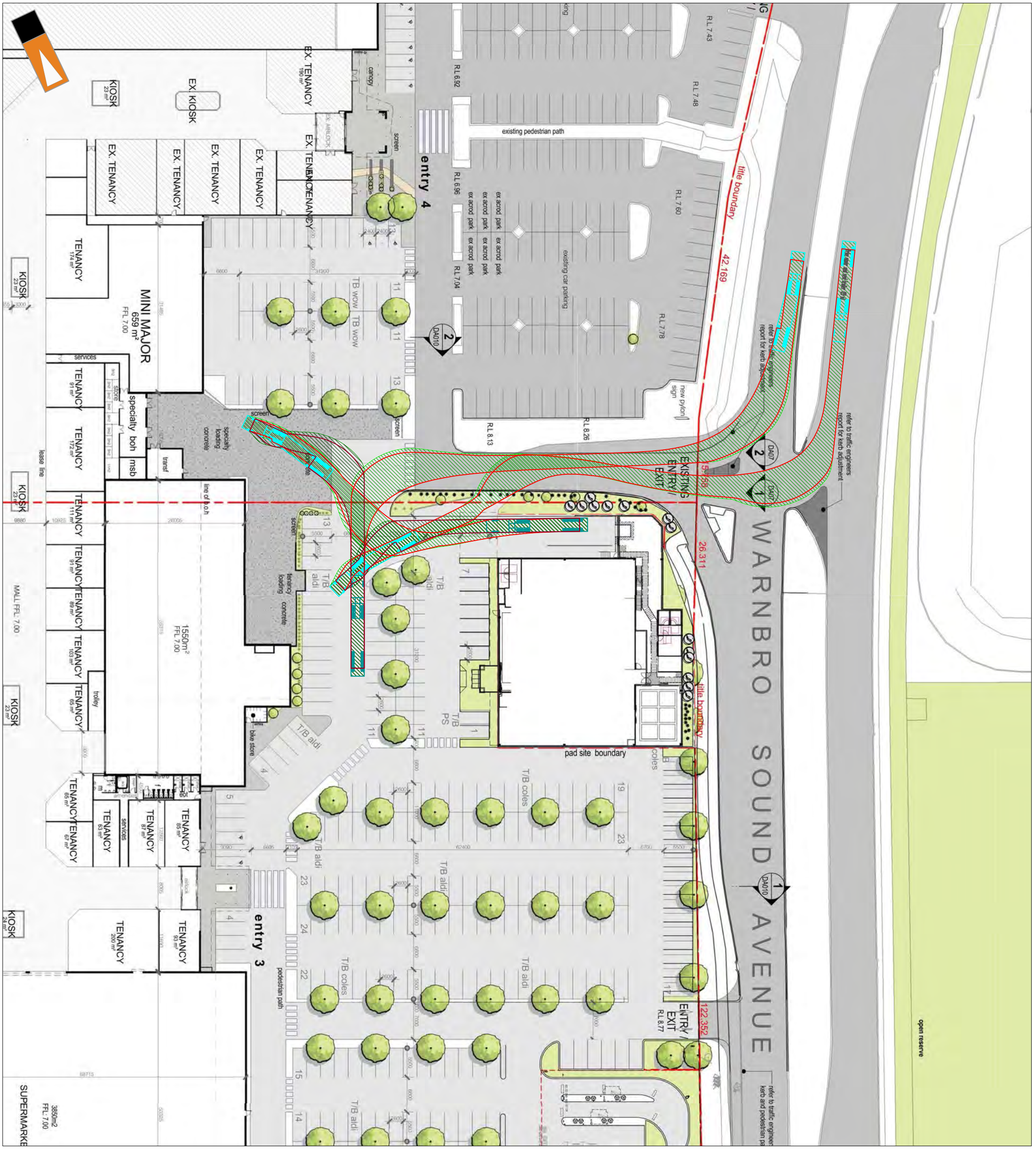

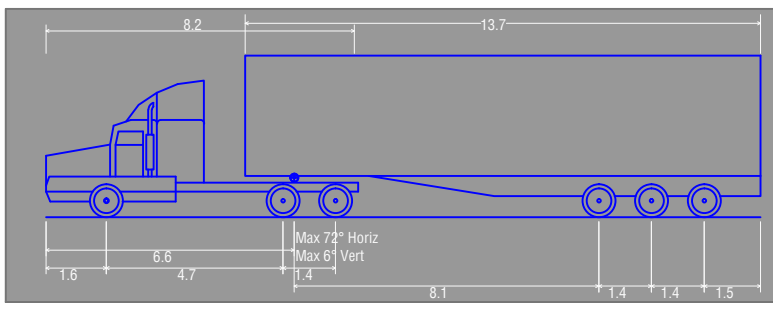

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Overall Body Height	4.301m
Min Body Ground Clearance	0.418m
Track Width	2.500m
Lock to Lock Time	6.00s
Kerb to Kerb Turning Radius	12.500m

Wheel Path
Body Path
Reverse Path

LEGEND

NO	DATE	AMENDMENT
G	06-03-2015	PROPOSED LAYOUT AMENDED
F	17-11-2014	PROPOSED LAYOUT AMENDED
E	03-11-2014	PROPOSED LAYOUT AMENDED
D	29-10-2014	AMENDED PER COMMENTS RECEIVED ON 23-10-2014

PROJECT:
Secret Harbour Shopping Centre Expansion

TITLE:
Vehicle Turning Circle Plan 07a - Semi-Trailer 19m

DRAWING NUMBER:
KC00258.000_S26a

DRAWN BY:
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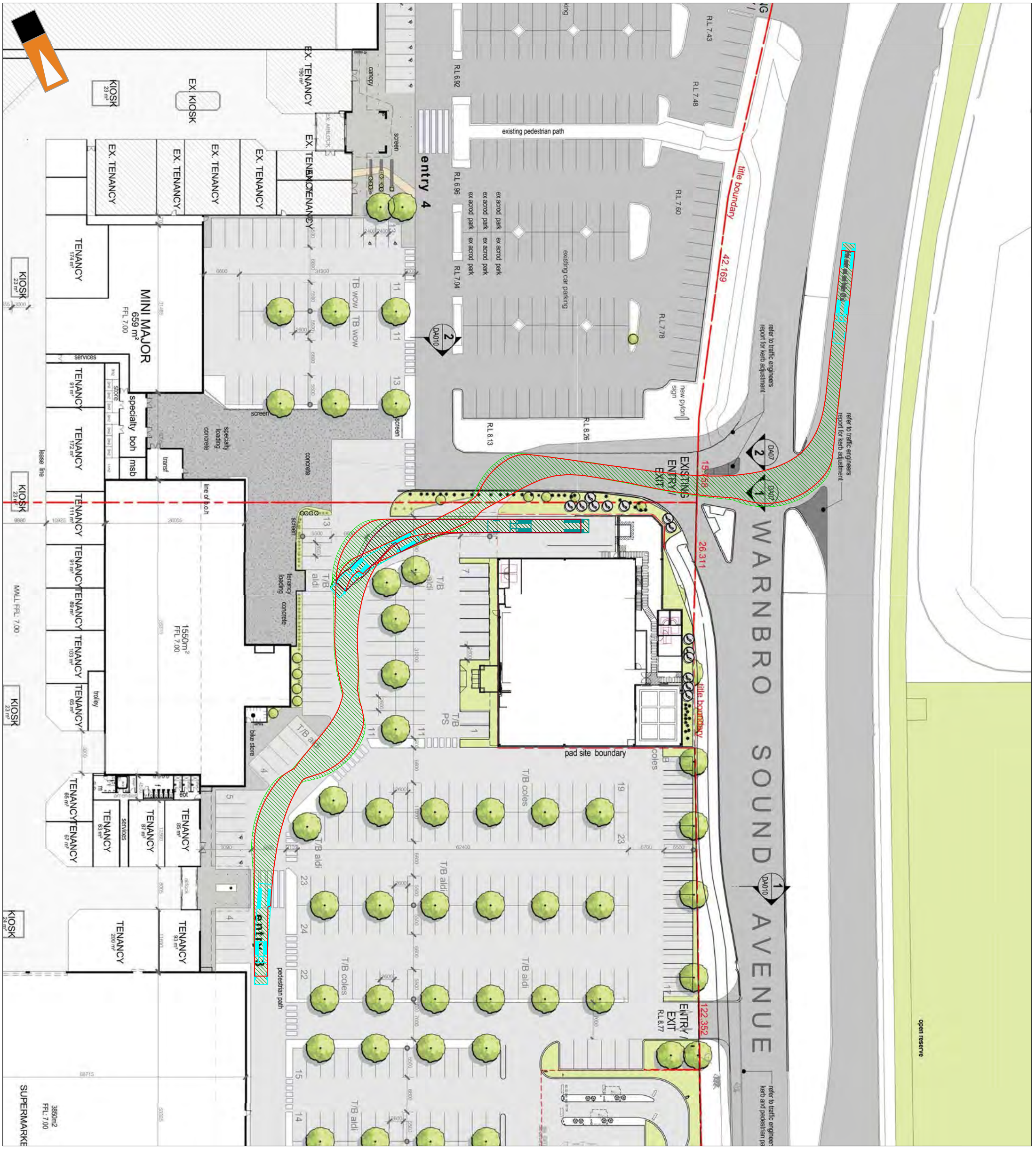

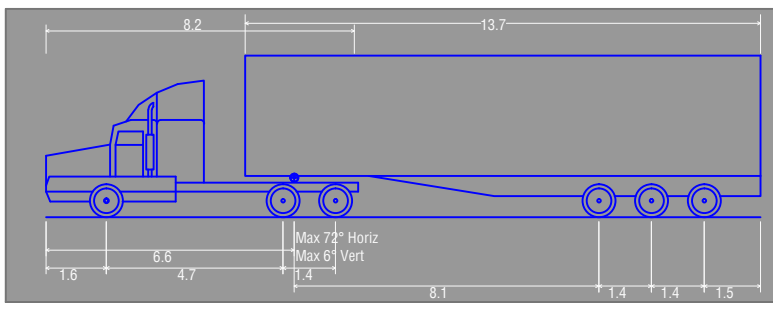

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Overall Length	19.000m
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Track Width	2.500m
Lock to Lock Time	6.00s
Kerb to Kerb Turning Radius	12.500m

Wheel Path

Body Path

Reverse Path

LEGEND

NO	DATE	AMENDMENT
H	06-03-2015	PROPOSED LAYOUT AMENDED
G	17-11-2014	PROPOSED LAYOUT AMENDED
F	03-11-2014	PROPOSED LAYOUT AMENDED
E	29-10-2014	AMENDED PER COMMENTS RECEIVED ON 23-10-2014

PROJECT:
Secret Harbour Shopping Centre Expansion

TITLE:
Vehicle Turning Circle Plan 07b - Semi-Trailer 19m

DRAWING NUMBER:
KC00258.000_S26b

DRAWN BY:
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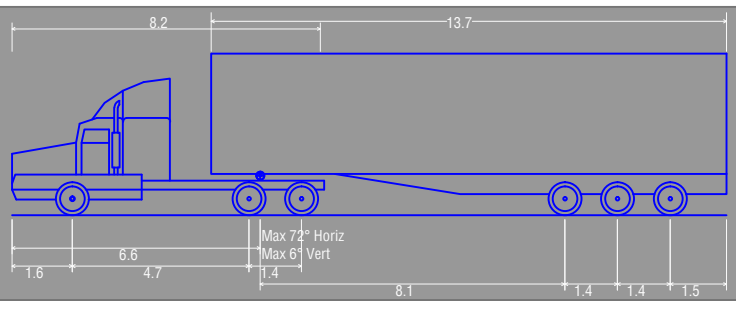

AV - Articulated Vehicle

Overall Length	19.000m
Overall Width	2.500m
Overall Body Height	4.301m
Min Body Ground Clearance	0.418m
Track Width	2.500m
Lock to Lock Time	6.00s
Kerb to Kerb Turning Radius	12.500m

Wheel Path

Body Path

Reverse Path

LEGEND

NO	DATE	AMENDMENT
C	06-03-2015	PROPOSED LAYOUT AMENDED
B	17-11-2014	PROPOSED LAYOUT AMENDED
A	06-11-2014	ISSUED FOR REVIEW

PROJECT:
Secret Harbour Shopping Centre Expansion

TITLE:
Vehicle Turning Circle Plan 09b - Semi-Trailer 19m

DRAWING NUMBER:
KC00258.000_S28b

DRAWN BY:
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Appendix 3

SIDRA Intersection Analysis

Rev H

Table of Contents

List of Figures

1. Introduction

This short report provides details on the SIDRA Analysis conducted to support the findings of the report KC00258.000_R01_Rev E - Transport Impact Assessment for the expansion of the Secret Harbour Shopping Centre. The intersections have been modelled for a theoretical PM peak which is suitable for Thursday evening / Friday evening and Saturday's between 10am and 1pm.

Traffic counts have been obtained from Main Roads WA for Warnbro Sound Avenue, with updated counts collated during a peak hour survey by KCTT staff on Thursday 23rd October 2014 for Warnbro Sound Avenue (south of the roundabout intersection with Secret Harbour Boulevard / Anstey Road) and at Oasis Drive (south of the roundabout intersection with Secret Harbour Boulevard) and on Thursday 6th November 2014 for Oneida Road / Warnbro Sound Avenue. The survey on the 23rd October 2014 was undertaken between 5pm and 7pm, with the peak hour measured between 5pm and 6pm. The survey on the 6th November 2014 was undertaken between 5pm and 6pm. All other counts have been sourced from the City of Rockingham.

The intersections modelled in this report include: -

- Intersection 1 – Secret Harbour Boulevard / Anstey Road / Warnbro Sound Avenue
- Intersection 2 – Warnbro Sound Avenue / Access Road North
- Intersection 3 – Warnbro Sound Avenue / Access Road Middle
- Intersection 4 – Warnbro Sound Avenue / Access Road South
- Intersection 5 – Warnbro Sound Avenue / Oneida Road
- Intersection 6 – Oneida Road / Access Road
- Intersection 7 – Oneida Road / Oasis Drive
- Intersection 8 – Oasis Drive / Access Road
- Intersection 9 – Oasis Drive / Secret Harbour Boulevard
- Intersection 10 – Secret Harbour Boulevard / Access Road

All models have been completed using the traffic flow assumptions for PM peak hour in accordance with the requirements of the WAPC Guidelines for Transport Impact Assessments – Developments.

Intersection of Warnbro Sound Avenue / Access Road Middle (existing Access Road South)

The models for the intersection of Warnbro Sound Avenue / Access Road Middle have been completed using a Left In / Left Out / Right In configuration, due to delays caused for right turn movements from the development into Warnbro Sound Avenue southbound by high growth rates in daily traffic of 3.6% per annum on Warnbro Sound Avenue generally. This strong existing volume in Warnbro Sound Avenue, plus the high general growth rate and the reassignment of traffic from the current 50% / 50% split to a future 60% / 40% split favouring trips attracted to / from the south are arguably the largest factors in the intersections LOS F rating in 2015, and its rapid deterioration in performance to 2025 when the right turn out is maintained. KCTT have therefore recommended that right turn movements out of this access are not allowed due to the high rates of growth in traffic in Warnbro Sound Avenue and the modelled decrease in level of service which would likely lead to an increased rate of incidents in this location.

This right turn traffic has been reallocated in the model to the intersection of Oneida Road / Warnbro Sound Avenue, where the traffic can be constrained at the one location, and therefore an effective engineering solution can be developed and to the north at the roundabout at the intersection of Secret Harbour Boulevard / Warnbro Sound

Avenue. The re-assignment of traffic into the local road network is reviewed in detail in Section 2.6 Traffic Generated by the Development of the Subject Site.

Provision of Access / Egress on Warnbro Sound Avenue

In accordance with the request of the Department of Planning, KCTT have modelled intersections 1, 2, 3, 4, 5, 6 and 10 in two distinct scenarios:

- V1 – Intersection 2 (existing northern access point on Warnbro Sound Avenue) is restricted to left in only intersection. Traffic was distributed in following manner: 50% to Intersection 3; 11% to the Intersection 4; 39% to the Intersection 10.
- V2 – no new access allowed on Warnbro Sound Avenue (Intersection 4 – the proposed southern access – not allowed). Traffic was distributed in following manner: 75% to Intersection 5; 20% to the Intersection 3; and 39% to Intersection 2.

These result are shown in the previous revision of this report (Rev G). Upon review of the previous version of the report Department of Planning, City of Rockingham and the proponent have come to resolution that scenario V1 will be adopted. All models in this report are provided in accordance with abovementioned scenario V1.

Intersection of Warnbro Sound Avenue / Oneida Road

KCTT have completed a model for the existing intersection of Oneida Road and Warnbro Sound Avenue with the intersection currently having delays of 11.5 seconds and an LOS B for the right turn movement from Oneida Road into Warnbro Sound Avenue. The model is based on an observed 5 vehicles turning right per hour in the peak during our traffic survey at the intersection of Oneida Road on Thursday 6th November 2014 between 5pm and 6pm. The survey showed the following vehicle movements: -

- Oneida Road (left out) = 8 VPH
- Oneida Road (right out) = 5 VPH
- Warnbro Sound Avenue (right into Oneida Road) = 10 VPH
- Warnbro Sound Avenue (left into Oneida Road) = 1 VPH

The assessment of the existing intersection layout with the proposed development (model 5A.1p+) in 2015 shows Oneida Road having delays of 35.2 seconds (LOS E) for the scenario V1[1] and 65.8 seconds (LOS F) for the scenario V2[2]. Adding a 60 metre long left turn deceleration lane on Oneida Road in the model 5B.1p+ (2015 PM peak model, with the development generated volumes) will result in smaller delays for the left turn movement and the overall approach on Oneida Road, however the delays for the right turn movement will increase when compared to the model 5A.1p+. This is due to the limitations of SIDRA software being that the Level of Service calculation is tightly connected to the degree of saturation factor. We have provided below an explanation by the SIDRA solution team regarding the differences in output results between short lane models and the full-length lane models (when other parameters are the same): -

[1] Scenario V1 – Restricting the existing northern access/egress on Warnbro Sound Avenue (Intersection 2) to left in only access, providing additional LILO access/egress point on Warnbro Sound Avenue (Intersection 4).
[2] Scenario V2 – No additional access / egress point is allowed on Warnbro Sound Avenue (Intersection 4), the existing northern access / egress point remains LILO (Intersection 2).

" Non-linear characteristic of the fundamental performance - degree of saturation relationship

Significant differences may result in capacity, degree of saturation, delay, and level of service, queue length, and so on. These are as expected given the short lane model changes, especially when near-capacity conditions apply (degree of saturation, x around 1.0). For example, if the degree of saturation, x is increased slightly from 0.95 to 1.05 (11% increase), delay is likely to increase substantially, e.g. from 60 s to 110 s (83%). When the intersection is operating near capacity, the changes in performance (delay, queue length, etc) are large as a result of small changes in the degree of saturation, i.e. the sensitivity to capacity changes is high, due the non-linear characteristic of the fundamental performance - degree of saturation relationship." (Ref: http://support.sidrasolutions.com/support/solutions/articles/1000119841-short-lane-model)

In summary, SIDRA Software is known to produce optimum modelling results for roundabouts, but provides a level of in-built conservatism for signalised intersections and sign-controlled t-intersections. It is very important that this is recognised by the reader when reviewing SIDRA analyses in this report for considering future intersection geometry design options.

Future traffic flows and volumes include the 3.6% per annum vehicular growth rates which factor into account the expected regional traffic growth. Future traffic volumes have been reassigned so that 60% of the total traffic flow is attracted to / from the south by 2025 in accordance with directions by the City of Rockingham. This model with unimproved intersection geometry 5A.2p+ (2025 PM peak, with the existing geometry, inclusive of the development of volumes) shows the western approach (Oneida Road) having delays in excess of 500 seconds.

We have also modelled options for signalised intersections and a roundabout, with both improvements providing improved levels of service in the future for all movements (inclusive of right turn movements). Given comments by the Department of Planning relating to pedestrian safety, we believe a future roundabout or signalisation of this intersection should be considered. The funding of the intersection should be discussed with the City of Rockingham given the high growth rate of regional traffic.

KCTT acknowledges that traffic signals can be further optimised since the optimisation of traffic signals was not the object of this report. Our findings are outlined below:-

- **Roundabout:** The roundabout offers greater improvement in terms of decreases to theoretical delays and improvements to Levels of Service than signalised intersection. The average delay for the intersection is 3.3 seconds (LOS A) for both scenarios. In this report KCTT have provided results for a 20m-central island diameter with 2-lane-12m-circulating-width roundabout. We have conducted an assessment for a 40m-central-island-diameter with 2-lane-12m-circulating-width roundabout as well (results of this model can be provided upon request). The average speed is approximately 5km/h lower on the 20m-central-island-diameter roundabout while the difference in the average delay is 1.4 seconds. From the intersection performance perspective it can be concluded that the 40m-central-island-diameter roundabout offers negligible improvement.
- **Signals:** In this report KCTT have conducted a sensitivity analysis for optimisation of traffic signals. The analysis showed that a traffic cycle of 70s will provide the highest Level of Service on the intersection average. Given uneven levels of traffic on Oneida Road and Warnbro Sound Avenue actuated traffic signals will give the better outcome intersection wide than fixed traffic signals. The signalised intersection option

offers LOS B with delays of 12.3 seconds for the Scenario V1[3] and 17.1 seconds for the Scenario V2[4]. If the performance of the intersection is modelled in with a 120 seconds traffic cycle (in our experience this is MRWA's preferred traffic cycle length for modelling purposes) delays in the vicinity of 60 seconds can be anticipated in the PM peak from Oneida Road.

[3] Scenario V1 – Restricting the existing northern access/egress on Warnbro Sound Avenue (Intersection 2) to left in only access, providing additional LILO access/egress point on Warnbro Sound Avenue (Intersection 4).

[4] Scenario V2 – No additional access / egress point is allowed on Warnbro Sound Avenue (Intersection 4), the existing northern access / egress point remains LILO (Intersection 2).

2. Intersection Analysis

2.1 Intersection 1 - Secret Harbour Boulevard / Warnbro Sound Avenue

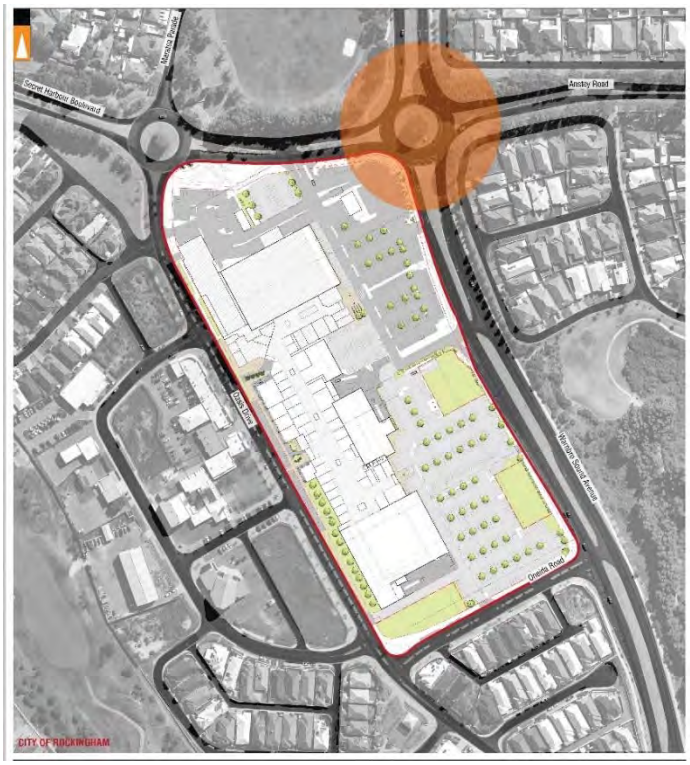


Figure 1 - Location

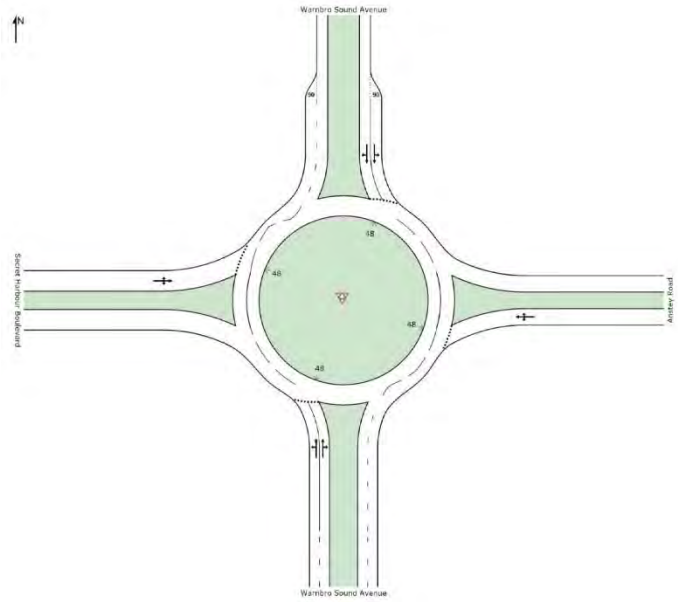


Figure 2 - Schematic Geometry - 1.1p+, 1.2p+

2.1.1 1.1p+ 2015 PM Peak (+ development) – Secret Harbour Boulevard / Warnbro Sound Avenue

Lane Use and Performance

	Demand Flows Total veh/h	HV %	Cap veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	Dist m	Lane Config	Lane Length m	Cap Adj %	Prob. Block. %
South: Warnbro Sound Avenue													
Lane 1	294	3.0	1139	0.258	77[6]	5.8	LOS A	1.6	12.4	Full	154	0.0	0.0
Lane 2[d]	512	3.0	1530	0.335	100	11.0	LOS B	2.4	18.3	Full	154	0.0	0.0
Approach	806	3.0		0.335		9.1	LOS A	2.4	18.3				
East: Anstey Road													
Lane 1[d]	601	3.0	1251	0.480	100	6.6	LOS A	2.1	15.8	Full	232	0.0	0.0
Approach	601	3.0		0.480		6.6	LOS A	2.1	15.8				
North: Warnbro Sound Avenue													
Lane 1[d]	179	3.0	1347	0.133	100	6.1	LOS A	0.9	7.0	Short	90	0.0	0.0
Lane 2	127	3.0	954	0.133	100	11.9	LOS B	0.8	6.2	Full	360	0.0	0.0
Approach	306	3.0		0.133		8.5	LOS A	0.9	7.0				
West: Secret Harbour Boulevard													
Lane 1[d]	265	3.0	945	0.281	100	8.0	LOS A	1.2	9.5	Full	80	0.0	0.0
Approach	265	3.0		0.281		8.0	LOS A	1.2	9.5				
Intersection	1979	3.0		0.480		8.1	LOS A	2.4	18.3				

Figure 3 - LOS Table (Model 1.1p+_V1 Secret Harbour Boulevard / Warnbro Sound Avenue - 2015 - PM Peak - WD)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Warnbro Sound Avenue											
1	L2	95	3.0	0.258	5.8	LOS A	1.6	12.4	0.56	0.54	30.1
2	T1	320	3.0	0.335	5.6	LOS A	2.4	18.3	0.56	0.58	56.3
3	R2	392	3.0	0.335	12.8	LOS B	2.4	18.3	0.56	0.64	51.1
Approach		806	3.0	0.335	9.1	LOS A	2.4	18.3	0.56	0.60	50.9
East: Anstey Road											
4	L2	331	3.0	0.480	4.8	LOS A	2.1	15.8	0.39	0.56	51.9
5	T1	121	3.0	0.480	4.8	LOS A	2.1	15.8	0.39	0.56	38.4
6	R2	149	3.0	0.480	12.2	LOS B	2.1	15.8	0.39	0.56	61.0
Approach		601	3.0	0.480	6.6	LOS A	2.1	15.8	0.39	0.56	51.7
North: Warnbro Sound Avenue											
7	L2	86	3.0	0.133	6.1	LOS A	0.9	7.0	0.65	0.57	55.7
8	T1	135	3.0	0.133	6.3	LOS A	0.9	7.0	0.65	0.61	56.7
9	R2	85	3.0	0.133	14.3	LOS B	0.8	6.2	0.66	0.71	45.7
Approach		306	3.0	0.133	8.5	LOS A	0.9	7.0	0.65	0.62	53.1
West: Secret Harbour Boulevard											
10	L2	51	3.0	0.281	5.0	LOS A	1.2	9.5	0.59	0.73	52.1
11	T1	106	3.0	0.281	5.2	LOS A	1.2	9.5	0.59	0.73	53.3
12	R2	108	3.0	0.281	12.2	LOS B	1.2	9.5	0.59	0.73	41.6
Approach		265	3.0	0.281	8.0	LOS A	1.2	9.5	0.59	0.73	48.5
All Vehicles		1979	3.0	0.480	8.1	LOS A	2.4	18.3	0.53	0.61	51.2

Figure 4 - Movement Summary (Model 1.1p+_V1 Secret Harbour Boulevard / Warnbro Sound Avenue - 2015 - PM Peak WD)

2.1.2 1.2p+ 2025 PM Peak (+ development) - Secret Harbour Boulevard / Warnbro Sound Avenue

Lane Use and Performance

	Demand Flows Total veh/h	HV %	Cap veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	Dist m	Lane Config	Lane Length m	Cap Adj %	Prob Block. %
South: Warnbro Sound Avenue													
Lane 1	374	5.0	1018	0.367	77[6]	6.7	LOS A	2.6	20.7	Full	154	0.0	0.0
Lane 2[d]	662	5.0	1394	0.475	100	11.8	LOS B	4.0	32.0	Full	154	0.0	0.0
Approach	1036	5.0		0.475		10.0	LOS A	4.0	32.0				
East: Anstey Road													
Lane 1[d]	829	3.0	1185	0.700	100	8.1	LOS A	5.1	38.8	Full	232	0.0	0.0
Approach	829	3.0		0.700		8.1	LOS A	5.1	38.8				
North: Warnbro Sound Avenue													
Lane 1[d]	246	5.0	1124	0.219	100	7.5	LOS A	1.8	14.3	Short	90	0.0	0.0
Lane 2	168	5.0	769	0.219	100	13.1	LOS B	1.5	12.0	Full	360	0.0	0.0
Approach	414	5.0		0.219		9.8	LOS A	1.8	14.3				
West: Secret Harbour Boulevard													
Lane 1[d]	345	3.0	755	0.457	100	10.3	LOS B	2.8	21.2	Full	80	0.0	0.0
Approach	345	3.0		0.457		10.3	LOS B	2.8	21.2				
Intersection	2624	4.1		0.700		9.4	LOS A	5.1	38.8				

Figure 5 - LOS Table (Model 1.2p+_V1 Secret Harbour Boulevard / Warnbro Sound Avenue - 2025 - PM Peak - WD)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Warnbro Sound Avenue											
1	L2	124	5.0	0.367	6.7	LOS A	2.6	20.7	0.70	0.62	29.2
2	T1	403	5.0	0.475	6.5	LOS A	4.0	32.0	0.71	0.65	54.4
3	R2	508	5.0	0.475	13.6	LOS B	4.0	32.0	0.73	0.69	49.5
Approach		1036	5.0	0.475	10.0	LOS A	4.0	32.0	0.72	0.67	49.2
East: Anstey Road											
4	L2	468	3.0	0.700	6.2	LOS A	5.1	38.8	0.61	0.73	49.9
5	T1	143	3.0	0.700	6.2	LOS A	5.1	38.8	0.61	0.73	37.1
6	R2	218	3.0	0.700	13.6	LOS B	5.1	38.8	0.61	0.73	59.1
Approach		829	3.0	0.700	8.1	LOS A	5.1	38.8	0.61	0.73	50.3
North: Warnbro Sound Avenue											
7	L2	126	5.0	0.219	7.5	LOS A	1.8	14.3	0.83	0.69	54.0
8	T1	187	5.0	0.219	7.9	LOS A	1.8	14.3	0.82	0.73	54.5
9	R2	100	5.0	0.219	16.2	LOS B	1.5	12.0	0.81	0.81	44.3
Approach		414	5.0	0.219	9.8	LOS A	1.8	14.3	0.82	0.74	51.7
West: Secret Harbour Boulevard											
10	L2	65	3.0	0.457	7.3	LOS A	2.8	21.2	0.78	0.92	49.6
11	T1	138	3.0	0.457	7.5	LOS A	2.8	21.2	0.78	0.92	49.9
12	R2	142	3.0	0.457	14.5	LOS B	2.8	21.2	0.78	0.92	39.0
Approach		345	3.0	0.457	10.3	LOS B	2.8	21.2	0.78	0.92	45.6
All Vehicles		2624	4.1	0.700	9.4	LOS A	5.1	38.8	0.71	0.73	49.6

Figure 6 - Movement Summary (Model 1.2p+_V1 Secret Harbour Boulevard / Warnbro Sound Avenue - 2025 - PM Peak WD)

2.2 Intersection 2 - Warnbro Sound Avenue / Access Road North

Figure 7 - Location

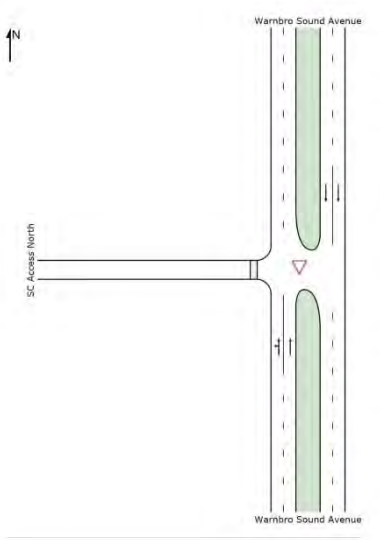


Figure 8 - Schematic Geometry - 2.1p+_V1, 2.2p+_V1

2.2.1 2.1p+ 2015 PM Peak (+ development) – Warnbro Sound Avenue / Access Road North

Lane Use and Performance

	Demand Flows Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	Dist m	Lane Config	Lane Length m	Cap. Adj %	Prob. Block. %
South: Warnbro Sound Avenue													
Lane 1	416	5.6	1886	0.221	100	1.3	LOS A	0.0	0.0	Full	82	0.0	0.0
Lane 2	423	5.0	1918	0.221	100	0.0	LOS A	0.0	0.0	Full	82	0.0	0.0
Approach	839	5.3		0.221		0.6	NA	0.0	0.0				
North: Warnbro Sound Avenue													
Lane 1	316	5.7	1910	0.165	100	0.0	LOS A	0.0	0.0	Full	56	0.0	0.0
Lane 2	317	5.0	1918	0.165	100	0.0	LOS A	0.0	0.0	Full	56	0.0	0.0
Approach	633	5.4		0.165		0.0	NA	0.0	0.0				
Intersection	1472	5.3		0.221		0.4	NA	0.0	0.0				

Figure 9 - LOS Table (Model 2.1p+_V1 Warnbro Sound Avenue / Access Road North - 2015 - PM Peak - WD)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Warnbro Sound Avenue											
1	L2	105	5.0	0.221	5.1	LOS A	0.0	0.0	0.00	0.16	35.0
2	T1	734	5.3	0.221	0.0	LOS A	0.0	0.0	0.00	0.07	65.3
Approach		839	5.3	0.221	0.6	NA	0.0	0.0	0.00	0.08	60.1
North: Warnbro Sound Avenue											
8	T1	633	5.4	0.165	0.0	LOS A	0.0	0.0	0.00	0.00	70.0
Approach		633	5.4	0.165	0.0	NA	0.0	0.0	0.00	0.00	70.0
All Vehicles		1472	5.3	0.221	0.4	NA	0.0	0.0	0.00	0.04	64.1

Figure 10 - Movement Summary (Model 2.1p+_V1 Warnbro Sound Avenue / Access Road North - 2015 - PM Peak - WD)

2.2.2 2.2p+ 2025 PM Peak (+ development) - Warnbro Sound Avenue / Access Road North

Lane Use and Performance

	Demand Flows Total veh/h	HV %	Cap veh/h	Deg Satn v/c	Lane Util %	Average Delay sec	Level of Service	95% Back of Queue Veh	Dist m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Warnbro Sound Avenue													
Lane 1	510	5.6	1890	0.270	100	1.1	LOS A	0.0	0.0	Full	82	0.0	0.0
Lane 2	517	5.0	1918	0.270	100	0.0	LOS A	0.0	0.0	Full	82	0.0	0.0
Approach	1027	5.3		0.270		0.5	NA	0.0	0.0				
North: Warnbro Sound Avenue													
Lane 1	422	5.7	1910	0.221	100	0.0	LOS A	0.0	0.0	Full	56	0.0	0.0
Lane 2	424	5.0	1918	0.221	100	0.0	LOS A	0.0	0.0	Full	56	0.0	0.0
Approach	845	5.4		0.221		0.0	NA	0.0	0.0				
Intersection	1873	5.3		0.270		0.3	NA	0.0	0.0				

Figure 11 - LOS Table (Model 2.2p+_V1 Warnbro Sound Avenue / Access Road North - 2025 - PM Peak - WD)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per Veh	Average Speed km/h
South: Warnbro Sound Avenue											
1	L2	105	5.0	0.270	5.1	LOS A	0.0	0.0	0.00	0.13	35.7
2	T1	922	5.4	0.270	0.0	LOS A	0.0	0.0	0.00	0.06	65.9
Approach		1027	5.3	0.270	0.5	NA	0.0	0.0	0.00	0.06	61.7
North: Warnbro Sound Avenue											
8	T1	845	5.4	0.221	0.0	LOS A	0.0	0.0	0.00	0.00	69.9
Approach		845	5.4	0.221	0.0	NA	0.0	0.0	0.00	0.00	69.9
All Vehicles		1873	5.3	0.270	0.3	NA	0.0	0.0	0.00	0.03	65.2

Figure 12 - Movement Summary (Model 2.2p+_V1 Warnbro Sound Avenue / Access Road North - 2025 - PM Peak - WD)

2.3 Intersection 3 - Warnbro Sound Avenue / Access Road Middle

Figure 13 - Location

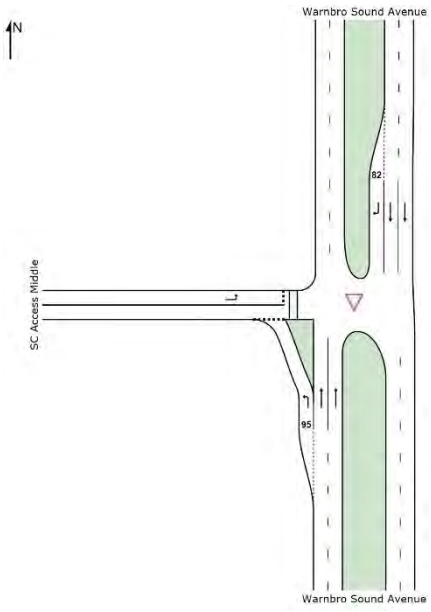


Figure 14 - Schematic Geometry - 3.1p+, 3.2p+

2.3.1 3.1p+ 2015 PM Peak (+ development) – Warnbro Sound Avenue / Access Road Middle

Lane Use and Performance

	Demand Flows Total veh/h	HV %	Cap veh/h	Deg Satn v/c	Lane Util %	Average Delay sec	Level of Service	95% Back of Queue Veh	Dist m	Lane Config	Lane Length m	Cap Adj %	Prob Block %
South: Warnbro Sound Avenue													
Lane 1	206	5.0	929	0.222	100	6.6	LOS A	0.8	6.4	Short	95	0.0	0.0
Lane 2	302	5.7	701	0.432	100	4.1	LOS A	2.9	23.1	Full	115	0.0	0.0
Lane 3	304	5.0	704	0.432	100	4.1	LOS A	2.9	23.0	Full	115	0.0	0.0
Approach	813	5.3		0.432		4.7	LOS A	2.9	23.1				
North: Warnbro Sound Avenue													
Lane 1	296	5.7	1910	0.155	100	0.0	LOS A	0.0	0.0	Full	85	0.0	0.0
Lane 2	297	5.0	1918	0.155	100	0.0	LOS A	0.0	0.0	Full	85	0.0	0.0
Lane 3	39	5.0	436	0.089	100	11.0	LOS B	0.3	2.3	Short	82	0.0	0.0
Approach	633	5.3		0.155		0.7	NA	0.3	2.3				
West: SC Access Middle													
Lane 1	233	2.5	874	0.266	100	4.3	LOS A	1.1	8.0	Full	72	0.0	0.0
Approach	233	2.5		0.266		4.3	LOS A	1.1	8.0				
Intersection	1678	4.9		0.432		3.1	NA	2.9	23.1				

Figure 15 - LOS Table (Model 3.1p+_V1 Warnbro Sound Avenue / Access Road Middle - 2015 - PM Peak - WD)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Warnbro Sound Avenue											
1	L2	206	5.0	0.222	6.6	LOS A	0.8	6.4	0.09	0.56	37.9
2	T1	606	5.3	0.432	4.1	LOS A	2.9	23.0	0.56	0.52	50.8
Approach		813	5.3	0.432	4.7	LOS A	2.9	23.1	0.44	0.53	46.8
North: Warnbro Sound Avenue											
8	T1	594	5.4	0.155	0.0	LOS A	0.0	0.0	0.00	0.00	70.0
9	R2	39	5.0	0.089	11.0	LOS B	0.3	2.3	0.59	0.83	26.3
Approach		633	5.3	0.155	0.7	NA	0.3	2.3	0.04	0.05	64.5
West: SC Access Middle											
10	L2	233	2.5	0.266	4.3	LOS A	1.1	8.0	0.49	0.60	23.7
Approach		233	2.5	0.266	4.3	LOS A	1.1	8.0	0.49	0.60	23.7
All Vehicles		1678	4.9	0.432	3.1	NA	2.9	23.1	0.29	0.36	46.4

Figure 16 - Movement Summary (Model 3.1p+_V1 Warnbro Sound Avenue / Access Road Middle - 2015 - PM Peak - WD)

2.3.2 3.2p+ 2025 PM Peak (+ development) - Warnbro Sound Avenue / Access Road Middle

Lane Use and Performance

	Demand Flows Total veh/h	HV %	Cap veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	Dist m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Warnbro Sound Avenue													
Lane 1	207	5.0	889	0.233	100	6.9	LOS A	0.9	6.7	Short	95	0.0	0.0
Lane 2	410	5.7	701	0.585	100	6.1	LOS A	5.8	45.5	Full	115	0.0	0.0
Lane 3	411	5.0	704	0.585	100	6.1	LOS A	5.8	45.3	Full	115	0.0	0.0
Approach	1028	5.3		0.585		6.3	LOS A	5.8	45.5				
North: Warnbro Sound Avenue													
Lane 1	402	5.7	1910	0.211	100	0.0	LOS A	0.0	0.0	Full	85	0.0	0.0
Lane 2	404	5.0	1918	0.211	100	0.0	LOS A	0.0	0.0	Full	85	0.0	0.0
Lane 3	39	5.0	303	0.129	100	15.2	LOS C	0.4	3.2	Short	82	0.0	0.0
Approach	845	5.3		0.211		0.7	NA	0.4	3.2				
West: SC Access Middle													
Lane 1	233	2.5	737	0.316	100	5.8	LOS A	1.4	10.5	Full	72	0.0	0.0
Approach	233	2.5		0.316		5.8	LOS A	1.4	10.5				
Intersection	2106	5.0		0.585		4.0	NA	5.8	45.5				

Figure 17 - LOS Table (Model 3.2p+_V1 Warnbro Sound Avenue / Access Road Middle - 2025 - PM Peak - WD)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Warnbro Sound Avenue											
1	L2	207	5.0	0.233	6.9	LOS A	0.9	6.7	0.18	0.56	37.2
2	T1	821	5.4	0.585	6.1	LOS A	5.8	45.3	0.65	0.69	44.7
Approach		1028	5.3	0.585	6.3	LOS A	5.8	45.5	0.56	0.66	43.0
North: Warnbro Sound Avenue											
8	T1	806	5.3	0.211	0.0	LOS A	0.0	0.0	0.00	0.00	69.9
9	R2	39	5.0	0.129	15.2	LOS C	0.4	3.2	0.73	0.89	22.3
Approach		845	5.3	0.211	0.7	NA	0.4	3.2	0.03	0.04	64.7
West: SC Access Middle											
10	L2	233	2.5	0.316	5.8	LOS A	1.4	10.5	0.57	0.76	22.4
Approach		233	2.5	0.316	5.8	LOS A	1.4	10.5	0.57	0.76	22.4
All Vehicles		2106	5.0	0.585	4.0	NA	5.8	45.5	0.35	0.42	45.3

Figure 18 - Movement Summary (Model 3.2p+V1 Warnbro Sound Avenue / Access Road Middle - 2025 - PM peak - WD)

2.4 Intersection 4 - Warnbro Sound Avenue / Access Road South

Figure 19 - Location

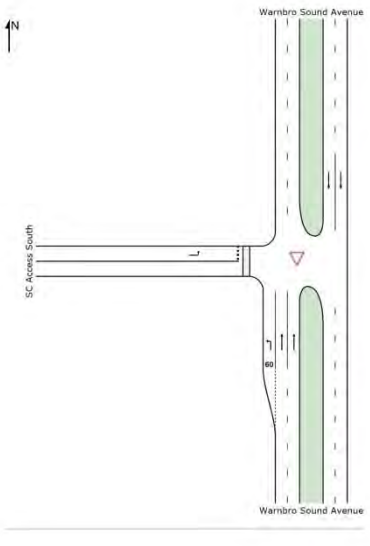


Figure 20 - Schematic Geometry - 4.1p+_V1, 4.2p+_V1

2.4.1 4.1p+ 2015 PM Peak (+ development) – Warnbro Sound Avenue / Access Road South

Lane Use and Performance

	Demand Flows Total veh/h	HV %	Cap veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	Dist m	Lane Config	Lane Length m	Cap Adj %	Prob Block. %
South: Warnbro Sound Avenue													
Lane 1	75	5.0	1146	0.065	100	5.8	LOS A	0.2	1.8	Short	60	0.0	0.0
Lane 2	368	5.6	918	0.401	100	0.8	LOS A	2.5	19.6	Full	100	0.0	0.0
Lane 3	370	5.0	921	0.401	100	0.8	LOS A	2.5	19.5	Full	100	0.0	0.0
Approach	813	5.3		0.401		1.3	NA	2.5	19.6				
North: Warnbro Sound Avenue													
Lane 1	296	5.6	1911	0.155	100	0.0	LOS A	0.0	0.0	Full	100	0.0	0.0
Lane 2	297	5.0	1918	0.155	100	0.0	LOS A	0.0	0.0	Full	100	0.0	0.0
Approach	594	5.3		0.155		0.0	NA	0.0	0.0				
West: SC Access South													
Lane 1	61	3.0	865	0.071	100	3.9	LOS A	0.2	1.8	Full	90	0.0	0.0
Approach	61	3.0		0.071		3.9	LOS A	0.2	1.8				
Intersection	1467	5.2		0.401		0.9	NA	2.5	19.6				

Figure 21 - LOS Table (Model 4.1p+_V1 Warnbro Sound Avenue / Access Road South - 2015 - PM Peak - WD)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Warnbro Sound Avenue											
1	L2	75	5.0	0.065	5.8	LOS A	0.2	1.8	0.08	0.57	34.7
2	T1	738	5.3	0.401	0.8	LOS A	2.5	19.5	0.29	0.14	63.2
Approach		813	5.3	0.401	1.3	NA	2.5	19.6	0.27	0.18	58.9
North: Warnbro Sound Avenue											
8	T1	594	5.3	0.155	0.0	LOS A	0.0	0.0	0.00	0.00	70.0
Approach		594	5.3	0.155	0.0	NA	0.0	0.0	0.00	0.00	70.0
West: SC Access South											
10	L2	61	3.0	0.071	3.9	LOS A	0.2	1.8	0.43	0.52	24.4
Approach		61	3.0	0.071	3.9	LOS A	0.2	1.8	0.43	0.52	24.4
All Vehicles		1467	5.2	0.401	0.9	NA	2.5	19.6	0.17	0.12	59.3

Figure 22 - Movement Summary (Model 4.1p+_V1 Warnbro Sound Avenue / Access Road South - 2015 - PM Peak - WD)

2.4.2 4.2p+ 2025 PM Peak (+ development) - Warnbro Sound Avenue / Access Road South

Lane Use and Performance

	Demand Flows Total veh/h	HV %	Cap veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	Dist m	Lane Config	Lane Length m	Cap. Adj %	Prob. Block. %
South: Warnbro Sound Avenue													
Lane 1	527	5.5	942	0.559	100	1.8	LOS A	4.3	34.1	Full	100	0.0	0.0
Lane 2	513	5.0	918	0.559	100	1.1	LOS A	4.4	34.6	Full	100	0.0	0.0
Approach	1040	5.3		0.559		1.4	NA	4.4	34.6				
North: Warnbro Sound Avenue													
Lane 1	402	5.6	1911	0.211	100	0.0	LOS A	0.0	0.0	Full	100	0.0	0.0
Lane 2	404	5.0	1918	0.211	100	0.0	LOS A	0.0	0.0	Full	100	0.0	0.0
Approach	806	5.3		0.211		0.0	NA	0.0	0.0				
West: SC Access South													
Lane 1	63	3.0	775	0.081	100	4.5	LOS A	0.3	2.1	Full	90	0.0	0.0
Approach	63	3.0		0.081		4.5	LOS A	0.3	2.1				
Intersection	1909	5.2		0.559		0.9	NA	4.4	34.6				

Figure 23 - LOS Table (Model 4.2p_V1+ Warnbro Sound Avenue / Access Road South - 2025 - PM Peak - WD)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Warnbro Sound Avenue											
1	L2	75	5.0	0.559	6.7	LOS A	4.3	34.1	0.29	0.21	42.7
2	T1	965	5.3	0.559	1.0	LOS A	4.4	34.6	0.33	0.20	60.4
Approach		1040	5.3	0.559	1.4	NA	4.4	34.6	0.33	0.20	58.7
North: Warnbro Sound Avenue											
8	T1	806	5.3	0.211	0.0	LOS A	0.0	0.0	0.00	0.00	69.9
Approach		806	5.3	0.211	0.0	NA	0.0	0.0	0.00	0.00	69.9
West: SC Access South											
10	L2	63	3.0	0.081	4.5	LOS A	0.3	2.1	0.48	0.58	23.9
Approach		63	3.0	0.081	4.5	LOS A	0.3	2.1	0.48	0.58	23.9
All Vehicles		1909	5.2	0.559	0.9	NA	4.4	34.6	0.20	0.13	60.0

Figure 24 - Movement Summary (Model 4.2p+_V1 Warnbro Sound Avenue / Access Road South - 2025 - PM Peak - WD)

2.5 Intersection 5 - Warnbro Sound Avenue / Oneida Road

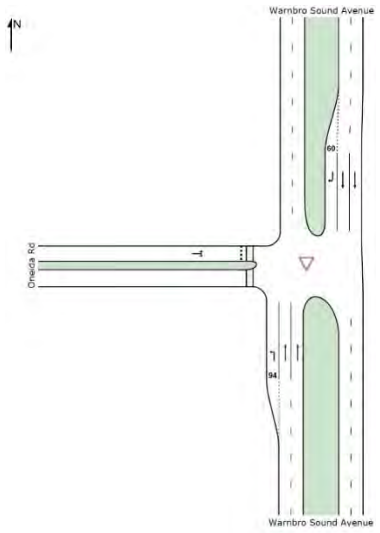


Figure 25 - Schematic Geometry - 5.1p, 5A.1p+_V1, 5A.1p+_V2, 5F.2p, 5A.2p+_V1, 5A.2p+_V1

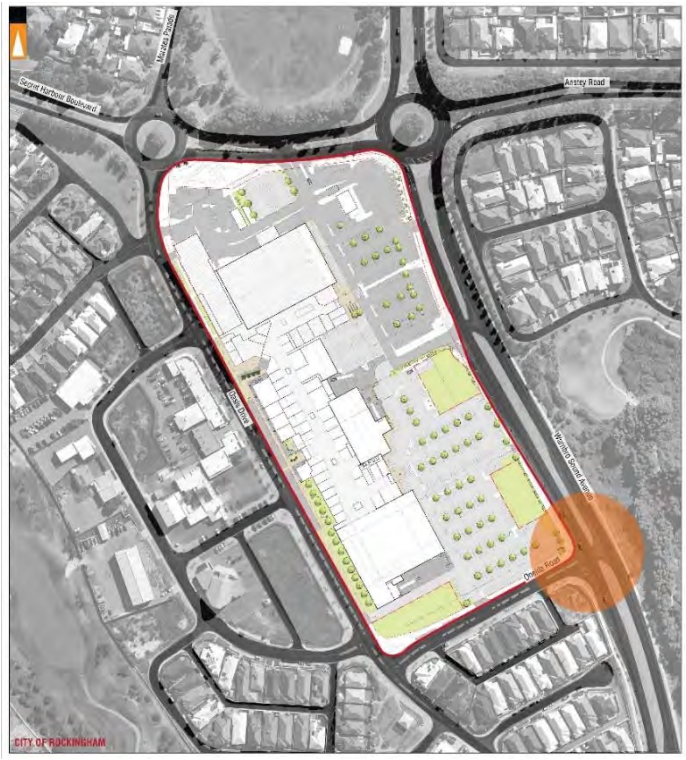


Figure 26 - Location

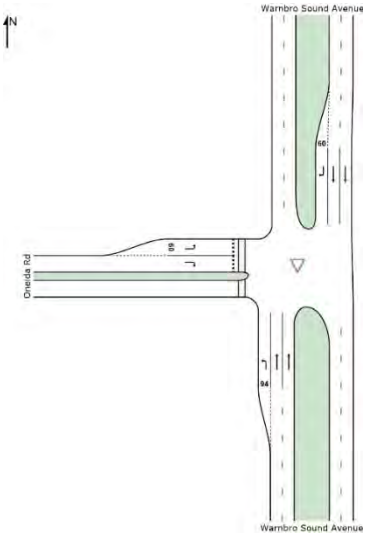


Figure 27 - Schematic Geometry – 5B.1p+, 5B.2p+

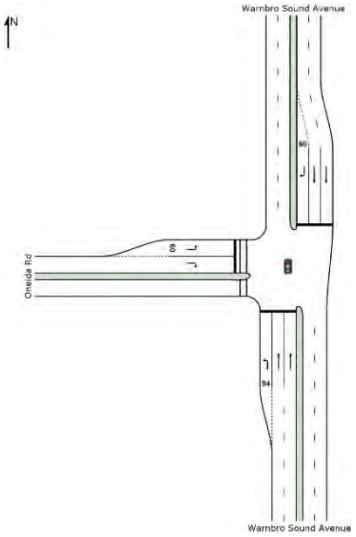


Figure 28 - Schematic Geometry - 5D.2p+

2.5.1 5.1p 2015 PM Peak – Warnbro Sound Avenue / Oneida Road (No Development, Existing Intersection Geometry)

Lane Use and Performance

	Demand Flows Total veh/h	HV %	Cap veh/h	Deg Satn v/c	Lane Util %	Average Delay sec	Level of Service	95% Back of Queue Veh	Dist m	Lane Contig	Lane Length m	Cap Adj %	Prob Block %
South: Warnbro Sound Avenue													
Lane 1	1	5.0	857	0.001	100	4.7	LOS A	0.0	0.0	Short	94	0.0	0.0
Lane 2	194	5.6	989	0.197	100	0.1	LOS A	1.0	7.7	Full	225	0.0	0.0
Lane 3	195	5.0	992	0.197	100	0.1	LOS A	1.0	7.7	Full	225	0.0	0.0
Approach	391	5.3		0.197		0.1	NA	1.0	7.7				
North: Warnbro Sound Avenue													
Lane 1	231	5.6	993	0.233	100	0.1	LOS A	1.2	9.6	Full	108	0.0	0.0
Lane 2	232	5.0	996	0.233	100	0.1	LOS A	1.2	9.5	Full	108	0.0	0.0
Lane 3	11	5.0	601	0.018	100	7.6	LOS A	0.1	0.4	Short	60	0.0	0.0
Approach	474	5.3		0.233		0.2	NA	1.2	9.6				
West: Oneida Rd													
Lane 1	14	3.0	381	0.036	100	11.5	LOS B	0.1	0.9	Full	100	0.0	0.0
Approach	14	3.0		0.036		11.5	LOS B	0.1	0.9				
Intersection	878	5.3		0.233		0.3	NA	1.2	9.6				

Figure 29 - LOS Table (Model 5.1p Warnbro Sound Avenue / Oneida Road - 2015 - PM Peak - no development)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Warnbro Sound Avenue											
4	L2	1	5.0	0.001	4.7	LOS A	0.0	0.0	0.08	0.50	40.4
5	T1	389	5.3	0.197	0.1	LOS A	1.0	7.7	0.07	0.01	49.4
Approach		391	5.3	0.197	0.1	NA	1.0	7.7	0.07	0.02	49.4
North: Warnbro Sound Avenue											
11	T1	463	5.3	0.233	0.1	LOS A	1.2	9.6	0.06	0.01	49.5
12	R2	11	5.0	0.018	7.6	LOS A	0.1	0.4	0.45	0.62	32.9
Approach		474	5.3	0.233	0.2	NA	1.2	9.6	0.06	0.02	49.2
West: Oneida Rd											
1	L2	8	3.0	0.036	11.5	LOS B	0.1	0.9	0.50	0.64	28.4
3	R2	5	3.0	0.036	11.5	LOS B	0.1	0.9	0.50	0.64	33.8
Approach		14	3.0	0.036	11.5	LOS B	0.1	0.9	0.50	0.64	30.8
All Vehicles		878	5.3	0.233	0.3	NA	1.2	9.6	0.07	0.03	48.9

Figure 30 - Movement Summary (Model 5.1p Warnbro Sound Avenue / Oneida Road - 2015 - PM peak - no development)

2.5.2 5D.2p+ 2025 PM Peak (+ development) - Warnbro Sound Avenue / Oneida Road (Signalised Intersection) – assessment conducted for 70s traffic cycle

Lane Use and Performance

	Demand Flows Total veh/h	HV %	Cap veh/h	Deg. Satn v/c	Lane Util %	Average Delay sec	Level of Service	95% Back of Queue Veh	Dist m	Lane Config	Lane Length m	Cap Adj %	Prob Block %
South: Warnbro Sound Avenue													
Lane 1	104	3.0	607	0.172	100	22.8	LOS C	2.6	19.6	Short	94	0.0	0.0
Lane 2	485	3.6	664	0.731	100	23.3	LOS C	15.3	117.7	Full	225	0.0	0.0
Lane 3	487	3.0	666	0.731	100	23.3	LOS C	15.4	117.6	Full	225	0.0	0.0
Approach	1076	3.3		0.731		23.3	LOS C	15.4	117.7				
North: Warnbro Sound Avenue													
Lane 1	368	3.6	995	0.370	100	11.0	LOS B	7.5	58.0	Full	108	0.0	0.0
Lane 2	370	3.0	999	0.370	100	11.0	LOS B	7.6	57.9	Full	108	0.0	0.0
Lane 3	68	3.0	158	0.432	100	39.9	LOS D	2.4	18.3	Short	60	0.0	0.0
Approach	806	3.3		0.432		13.4	LOS B	7.6	58.0				
West: Oneida Rd													
Lane 1	56	3.0	622	0.090	100	22.9	LOS C	1.3	10.3	Short	60	0.0	0.0
Lane 2	84	3.0	622	0.135	100	23.2	LOS C	2.1	15.9	Full	100	0.0	0.0
Approach	140	3.0		0.135		23.1	LOS C	2.1	15.9				
Intersection	2022	3.3		0.731		19.3	LOS B	15.4	117.7				

Figure 31 - LOS Table (Model 5D.2p+_V1 Warnbro Sound Avenue / Oneida Road - 2025 - PM Peak - WD)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop Queued	Effective Stop Rate per veh	Average Speed km/h
South: Warnbro Sound Avenue											
4	L2	104	3.0	0.172	22.8	LOS C	2.6	19.6	0.75	0.73	25.5
5	T1	972	3.3	0.731	23.3	LOS C	15.4	117.6	0.94	0.86	26.0
Approach		1076	3.3	0.731	23.3	LOS C	15.4	117.7	0.92	0.85	26.0
North: Warnbro Sound Avenue											
11	T1	738	3.3	0.370	11.0	LOS B	7.6	57.9	0.64	0.55	34.9
12	R2	68	3.0	0.432	39.9	LOS D	2.4	18.3	0.99	0.75	14.5
Approach		806	3.3	0.432	13.4	LOS B	7.6	58.0	0.67	0.57	32.3
West: Oneida Rd											
1	L2	56	3.0	0.090	22.9	LOS C	1.3	10.3	0.74	0.70	20.2
3	R2	84	3.0	0.135	23.2	LOS C	2.1	15.9	0.75	0.71	25.7
Approach		140	3.0	0.135	23.1	LOS C	2.1	15.9	0.74	0.71	23.7
All Vehicles		2022	3.3	0.731	19.3	LOS B	15.4	117.7	0.81	0.73	28.0

Figure 32 - Movement Summary (Model 5D.2p+_V1 Warnbro Sound Avenue / Oneida Road - 2025 - PM Peak - WD)

5D.2p+ Warnbro Sound Ave - Oneida Rd - 2025 - PM
Signals - Fixed Time Cycle Time = 70 seconds (User-Given Cycle Time)

Phase times determined by the program
Sequence: Sequence2
Movement Class: All Movement Classes
Input Sequence: A, B, C
Output Sequence: A, B, C

Phase Timing Results

Phase	A	B	C
Reference Phase	Yes	No	No
Phase Change Time (sec)	0	30	42
Green Time (sec)	24	6	22
Yellow Time (sec)	4	4	4
All-Red Time (sec)	2	2	2
Phase Time (sec)	30	12	28
Phase Split	43 %	17 %	40 %

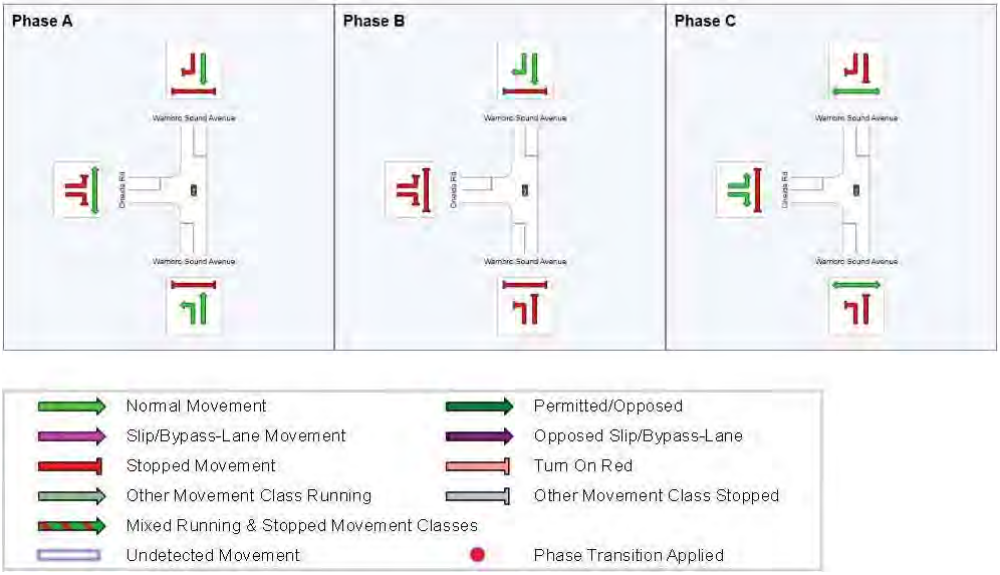


Figure 33 - Phasing summary - (Model 5D.2p+_V1 Warnbro Sound Avenue / Oneida Road - 2025 - PM Peak - WD)

5D.2p+ Warnbro Sound Ave - Oneida Rd - 2025 - PM
Signals - Fixed Time Cycle Time = 70 seconds (User-Given Cycle Time)

Phase times determined by the program
Sequence: Sequence2
Movement Class: All Movement Classes
Input Sequence: A, B, C
Output Sequence: A, B, C

Phase Timing Results

Phase	A	B	C
Reference Phase	Yes	No	No
Phase Change Time (sec)	0	30	42
Green Time (sec)	24	6	22
Yellow Time (sec)	4	4	4
All-Red Time (sec)	2	2	2
Phase Time (sec)	30	12	28
Phase Split	43 %	17 %	40 %

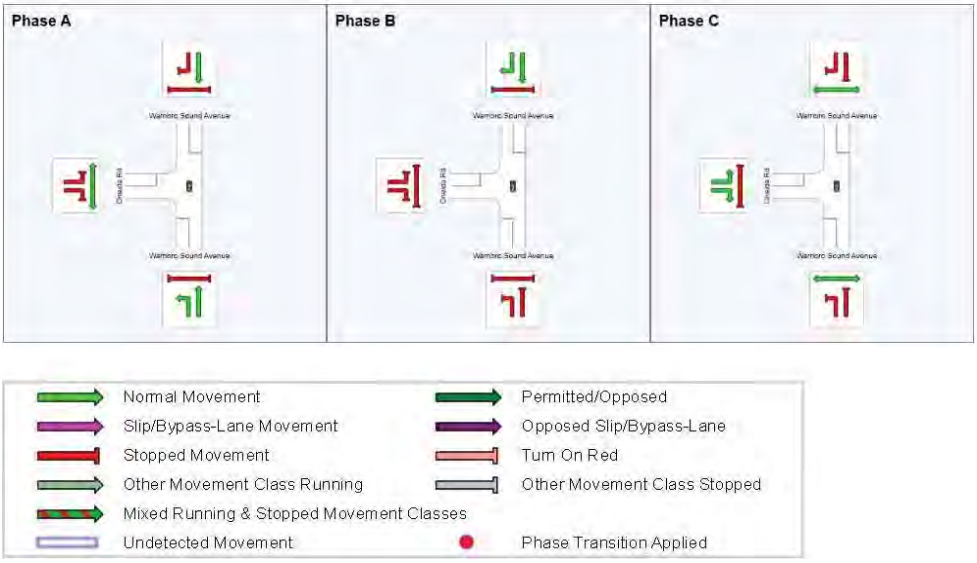


Figure 34 - Phasing summary - (Model 5D.2p+_V1 Warnbro Sound Avenue / Oneida Road - 2025 - PM Peak - WD)

2.5.3 5F.2p 2025 PM Peak – Warnbro Sound Avenue / Oneida Road (no development)

Lane Use and Performance

	Demand Flows Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	Dist m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Warnbro Sound Avenue													
Lane 1	2	5.0	857	0.002	100	4.7	LOS A	0.0	0.1	Short	94	0.0	0.0
Lane 2	284	5.6	983	0.289	100	0.1	LOS A	1.6	12.6	Full	225	0.0	0.0
Lane 3	285	5.0	986	0.289	100	0.1	LOS A	1.6	12.6	Full	225	0.0	0.0
Approach	571	5.3		0.289		0.2	NA	1.6	12.6				
North: Warnbro Sound Avenue													
Lane 1	337	5.6	990	0.341	100	0.1	LOS A	2.0	16.0	Full	108	0.0	0.0
Lane 2	338	5.0	993	0.341	100	0.1	LOS A	2.0	16.0	Full	108	0.0	0.0
Lane 3	16	5.0	462	0.034	100	9.7	LOS A	0.1	0.9	Short	60	0.0	0.0
Approach	692	5.3		0.341		0.3	NA	2.0	16.0				
West: Oneida Rd													
Lane 1	20	3.0	190	0.105	100	21.2	LOS C	0.3	2.3	Full	100	0.0	0.0
Approach	20	3.0		0.105		21.2	LOS C	0.3	2.3				
Intersection	1282	5.3		0.341		0.6	NA	2.0	16.0				

Figure 35 - LOS Table (Model 5F.2p Warnbro Sound Avenue / Oneida Road - 2025 - PM peak – no development)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Warnbro Sound Avenue											
4	L2	2	5.0	0.002	4.7	LOS A	0.0	0.1	0.08	0.50	40.4
5	T1	568	5.3	0.289	0.1	LOS A	1.6	12.6	0.10	0.03	49.1
Approach		571	5.3	0.289	0.2	NA	1.6	12.6	0.10	0.03	49.1
North: Warnbro Sound Avenue											
11	T1	676	5.3	0.341	0.1	LOS A	2.0	16.0	0.08	0.02	49.3
12	R2	16	5.0	0.034	9.7	LOS A	0.1	0.9	0.55	0.73	30.3
Approach		692	5.3	0.341	0.3	NA	2.0	16.0	0.09	0.03	48.9
West: Oneida Rd											
1	L2	13	3.0	0.105	21.2	LOS C	0.3	2.3	0.70	0.75	21.2
3	R2	7	3.0	0.105	21.2	LOS C	0.3	2.3	0.70	0.75	26.7
Approach		20	3.0	0.105	21.2	LOS C	0.3	2.3	0.70	0.75	23.5
All Vehicles		1282	5.3	0.341	0.6	NA	2.0	16.0	0.10	0.04	48.3

Figure 36 - Movement Summary (Model 5F.2p Warnbro Sound Avenue / Oneida Road - 2025 - PM peak - no development)

2.6 Intersection 6 - Oneida Road / Access Road

Figure 37 - Location

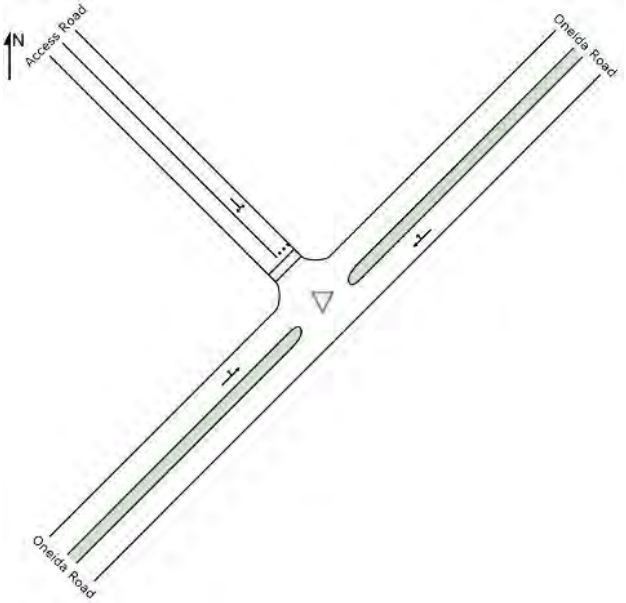


Figure 38 - Schematic Geometry - 6.1p+_V1, 6.2p+

2.6.1 6.1p+ 2015 PM Peak (+ development)

Lane Use and Performance

	Demand Flows Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util %	Average Delay sec	Level of Service	95% Back of Queue Veh	Dist m	Lane Config	Lane Length m	Cap. Adj %	Prob. Block. %
NorthEast: Oneida Road													
Lane 1	140	3.0	1204	0.116	100	2.2	LOS A	0.5	4.0	Full	100	0.0	0.0
Approach	140	3.0		0.116		2.2	NA	0.5	4.0				
NorthWest: Access Road													
Lane 1	78	3.0	1393	0.056	100	2.3	LOS A	0.2	1.6	Full	100	0.0	0.0
Approach	78	3.0		0.056		2.3	LOS A	0.2	1.6				
SouthWest: Oneida Road													
Lane 1	68	3.0	1007	0.068	100	1.5	LOS A	0.3	2.2	Full	100	0.0	0.0
Approach	68	3.0		0.068		1.5	NA	0.3	2.2				
Intersection	286	3.0		0.116		2.1	NA	0.5	4.0				

Figure 39 - LOS Table (Model 6.1p+_V1 Oneida Road / Access Road - 2015 - PM Peak - WD)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
NorthEast: Oneida Road											
25	T1	78	3.0	0.116	0.2	LOS A	0.5	4.0	0.09	0.25	43.2
26	R2	62	3.0	0.116	4.8	LOS A	0.5	4.0	0.09	0.25	35.8
Approach		140	3.0	0.116	2.2	NA	0.5	4.0	0.09	0.25	39.6
NorthWest: Access Road											
27	L2	62	3.0	0.056	2.3	LOS A	0.2	1.6	0.15	0.34	31.6
12	R2	16	3.0	0.056	2.4	LOS A	0.2	1.6	0.15	0.34	31.3
Approach		78	3.0	0.056	2.3	LOS A	0.2	1.6	0.15	0.34	31.6
SouthWest: Oneida Road											
1	L2	16	3.0	0.068	5.0	LOS A	0.3	2.2	0.12	0.16	37.9
31	T1	53	3.0	0.068	0.4	LOS A	0.3	2.2	0.12	0.16	45.3
Approach		68	3.0	0.068	1.5	NA	0.3	2.2	0.12	0.16	43.4
All Vehicles		286	3.0	0.116	2.1	NA	0.5	4.0	0.12	0.25	37.7

Figure 40 - Movement Summary (Model 6.1p+_V1 Oneida Road / Access Road - 2015 - PM Peak - WD)

2.6.2 6.2p+ 2025 PM Peak (+ development)

Lane Use and Performance

	Demand Flows Total veh/h	HV %	Cap veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue veh	Dist m	Lane Config	Lane Length m	Cap. Adj %	Prob. Block. %
NorthEast: Oneida Road													
Lane 1	164	3.0	1134	0.145	100	1.7	LOS A	0.7	5.2	Full	100	0.0	0.0
Approach	164	3.0		0.145		1.7	NA	0.7	5.2				
NorthWest: Access Road													
Lane 1	78	3.0	1354	0.058	100	2.4	LOS A	0.2	1.7	Full	100	0.0	0.0
Approach	78	3.0		0.058		2.4	LOS A	0.2	1.7				
SouthWest: Oneida Road													
Lane 1	93	3.0	985	0.094	100	1.2	LOS A	0.4	3.1	Full	100	0.0	0.0
Approach	93	3.0		0.094		1.2	NA	0.4	3.1				
Intersection	335	3.0		0.145		1.7	NA	0.7	5.2				

Figure 41 - LOS Table (Model 6.2p+_V1 Oneida Road / Access Road - 2025 - PM Peak - WD)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
NorthEast: Oneida Road											
25	T1	111	3.0	0.145	0.2	LOS A	0.7	5.2	0.09	0.19	44.6
26	R2	54	3.0	0.145	4.8	LOS A	0.7	5.2	0.09	0.19	36.8
Approach		164	3.0	0.145	1.7	NA	0.7	5.2	0.09	0.19	41.7
NorthWest: Access Road											
27	L2	62	3.0	0.058	2.4	LOS A	0.2	1.7	0.19	0.35	31.4
12	R2	16	3.0	0.058	2.5	LOS A	0.2	1.7	0.19	0.35	31.1
Approach		78	3.0	0.058	2.4	LOS A	0.2	1.7	0.19	0.35	31.4
SouthWest: Oneida Road											
1	L2	16	3.0	0.094	5.0	LOS A	0.4	3.1	0.14	0.13	38.3
31	T1	77	3.0	0.094	0.4	LOS A	0.4	3.1	0.14	0.13	45.9
Approach		93	3.0	0.094	1.2	NA	0.4	3.1	0.14	0.13	44.4
All Vehicles		335	3.0	0.145	1.7	NA	0.7	5.2	0.13	0.21	39.3

Figure 42 - Movement Summary (Model 6.2p+_V1 - Oneida Road / Access Road 2025 PM Peak - WD)

2.7 Intersection 7 - Oneida Road / Oasis Drive

Figure 43 - Location

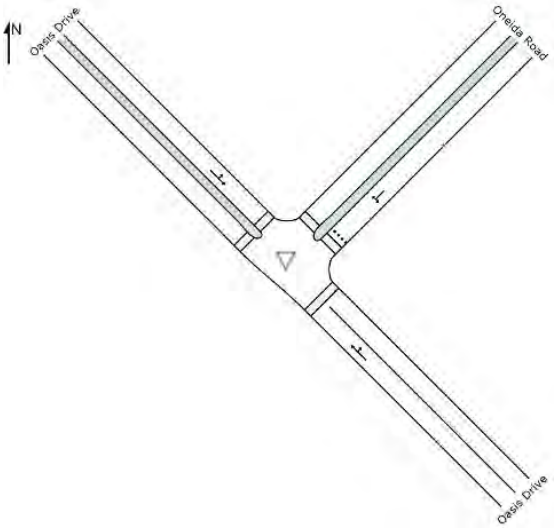


Figure 44 - Schematic Geometry - 7A.1p+, 7A.2p+

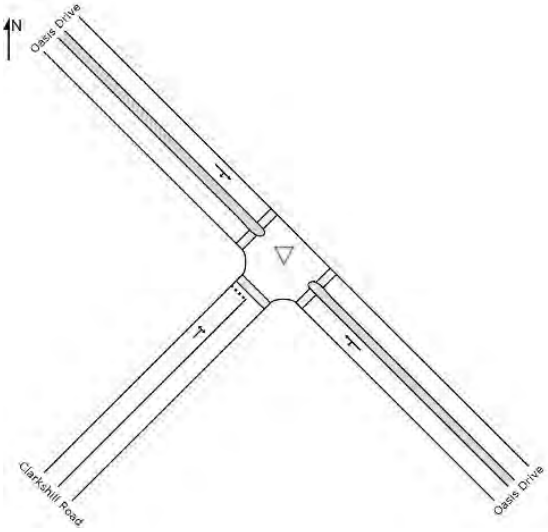


Figure 45 - Schematic Geometry - 7B.1p+, 7B.2p+

2.7.1 7.1Ap+ 2015 PM Peak (+ development) – Oneida Road / Oasis Drive

Lane Use and Performance

	Demand Flows Total veh/h	HV %	Cap veh/h	Deg Satn v/c	Lane Util %	Average Delay sec	Level of Service	95% Back of Queue Veh	Dist m	Lane Config	Lane Length m	Cap Adj %	Prob. Block %
SouthEast: Oasis Drive													
Lane 1	57	2.0	1162	0.049	100	3.3	LOS A	0.2	1.6	Full	300	0.0	0.0
Approach	57	2.0		0.049		3.3	NA	0.2	1.6				
NorthEast: Oneida Road													
Lane 1	112	2.0	1244	0.090	100	5.0	LOS A	0.3	2.4	Full	110	0.0	0.0
Approach	112	2.0		0.090		5.0	LOS A	0.3	2.4				
NorthWest: Oasis Drive													
Lane 1	93	2.0	1162	0.080	100	1.6	LOS A	0.3	2.5	Full	15	0.0	0.0
Approach	93	2.0		0.080		1.6	NA	0.3	2.5				
Intersection	261	2.0		0.090		3.4	NA	0.3	2.5				

Figure 46 - LOS Table (Model 7.1Ap+ Oneida Road / Oasis Drive 2015 - PM Peak - WD)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
SouthEast: Oasis Drive											
2	T1	24	2.0	0.049	0.7	LOS A	0.2	1.6	0.27	0.36	43.2
3	R2	33	2.0	0.049	5.3	LOS A	0.2	1.6	0.27	0.36	43.3
Approach		57	2.0	0.049	3.3	NA	0.2	1.6	0.27	0.36	43.3
NorthEast: Oneida Road											
4	L2	36	2.0	0.090	5.0	LOS A	0.3	2.4	0.16	0.52	41.8
6	R2	76	2.0	0.090	5.0	LOS A	0.3	2.4	0.16	0.52	18.9
Approach		112	2.0	0.090	5.0	LOS A	0.3	2.4	0.16	0.52	27.9
NorthWest: Oasis Drive											
7	L2	54	2.0	0.080	2.6	LOS A	0.3	2.5	0.10	0.29	40.3
8	T1	39	2.0	0.080	0.2	LOS A	0.3	2.5	0.10	0.29	46.9
Approach		93	2.0	0.080	1.6	NA	0.3	2.5	0.10	0.29	44.2
All Vehicles		261	2.0	0.090	3.4	NA	0.3	2.5	0.16	0.40	36.0

Figure 47 – Movement Summary (Model 7.1Ap+ Oneida Road / Oasis Drive - 2015 - PM Peak - WD)

2.7.2 7.2Ap+ 2025 PM Peak (+ development) – Oneida Road / Oasis Drive

Lane Use and Performance

	Demand Flows Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	Dist m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
SouthEast: Oasis Drive													
Lane 1	79	2.0	1085	0.073	100	3.6	LOS A	0.3	2.4	Full	300	0.0	0.0
Approach	79	2.0		0.073		3.6	NA	0.3	2.4				
NorthEast: Oneida Road													
Lane 1	164	2.0	1196	0.137	100	5.1	LOS A	0.5	3.8	Full	110	0.0	0.0
Approach	164	2.0		0.137		5.1	LOS A	0.5	3.8				
NorthWest: Oasis Drive													
Lane 1	127	2.0	1145	0.111	100	1.6	LOS A	0.5	3.6	Full	15	0.0	0.0
Approach	127	2.0		0.111		1.6	NA	0.5	3.6				
Intersection	371	2.0		0.137		3.6	NA	0.5	3.8				

Figure 48 - LOS Table (Model 7.2Ap+ Oneida Road / Oasis Drive - 2025 - PM Peak - WD)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
SouthEast: Oasis Drive											
2	T1	35	2.0	0.073	1.0	LOS A	0.3	2.4	0.33	0.39	42.9
3	R2	44	2.0	0.073	5.6	LOS A	0.3	2.4	0.33	0.39	43.1
Approach		79	2.0	0.073	3.6	NA	0.3	2.4	0.33	0.39	43.0
NorthEast: Oneida Road											
4	L2	51	2.0	0.137	5.1	LOS A	0.5	3.8	0.20	0.53	41.7
6	R2	114	2.0	0.137	5.2	LOS A	0.5	3.8	0.20	0.53	18.8
Approach		164	2.0	0.137	5.1	LOS A	0.5	3.8	0.20	0.53	27.4
NorthWest: Oasis Drive											
7	L2	73	2.0	0.111	2.6	LOS A	0.5	3.6	0.10	0.29	40.1
8	T1	55	2.0	0.111	0.3	LOS A	0.5	3.6	0.10	0.29	46.8
Approach		127	2.0	0.111	1.6	NA	0.5	3.6	0.10	0.29	44.1
All Vehicles		371	2.0	0.137	3.6	NA	0.5	3.8	0.19	0.42	35.4

Figure 49 - Movement Summary (Model 7.2Ap Oneida Road / Oasis Drive - 2025 - PM Peak - WD)

2.7.3 7.1Bp+ 2015 PM Peak (+ development) – Oasis Drive / Clarkshill Road

Lane Use and Performance

	Demand Flows Total veh/h	HV %	Cap veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	Dist m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
SouthEast: Oasis Drive													
Lane 1	104	2.0	1072	0.097	100	1.0	LOS A	0.4	3.2	Full	15	0.0	0.0
Approach	104	2.0		0.097		1.0	NA	0.4	3.2				
NorthWest: Oasis Drive													
Lane 1	92	2.0	1100	0.083	100	2.0	LOS A	0.4	2.7	Full	130	0.0	0.0
Approach	92	2.0		0.083		2.0	NA	0.4	2.7				
SouthWest: Clarkshill Road													
Lane 1	52	2.0	1196	0.043	100	5.1	LOS A	0.1	1.1	Full	147	0.0	0.0
Approach	52	2.0		0.043		5.1	LOS A	0.1	1.1				
Intersection	247	2.0		0.097		2.2	NA	0.4	3.2				

Figure 50 - LOS Table (Model 7.1Bp+ Oasis Drive / Clarkshill Road - 2015 - PM Peak - WD)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
SouthEast: Oasis Drive											
7	L2	34	2.0	0.097	2.6	LOS A	0.4	3.2	0.12	0.18	43.5
8	T1	71	2.0	0.097	0.2	LOS A	0.4	3.2	0.12	0.18	45.9
Approach		104	2.0	0.097	1.0	NA	0.4	3.2	0.12	0.18	45.0
NorthWest: Oasis Drive											
2	T1	60	2.0	0.083	0.4	LOS A	0.4	2.7	0.19	0.23	41.4
3	R2	32	2.0	0.083	5.0	LOS A	0.4	2.7	0.19	0.23	42.9
Approach		92	2.0	0.083	2.0	NA	0.4	2.7	0.19	0.23	42.1
SouthWest: Clarkshill Road											
4	L2	19	2.0	0.043	5.1	LOS A	0.1	1.1	0.21	0.53	38.5
6	R2	33	2.0	0.043	5.1	LOS A	0.1	1.1	0.21	0.53	26.1
Approach		52	2.0	0.043	5.1	LOS A	0.1	1.1	0.21	0.53	31.0
All Vehicles		247	2.0	0.097	2.2	NA	0.4	3.2	0.17	0.27	39.6

Figure 51 - Movement Summary (Model 7.1Bp+ Oasis Drive / Clarkshill Road - 2015 - PM Peak - WD)

2.7.4 7.2Bp+ 2025 PM Peak (+ development) Oasis Drive – Clarkshill Road

Lane Use and Performance

	Demand Flows Total veh/h	HV %	Cap veh/h	Deg Satn v/c	Lane Util %	Average Delay sec	Level of Service	95% Back of Queue Veh	Dist m	Lane Config	Lane Length m	Cap Adj %	Prob Block %
SouthEast: Oasis Drive													
Lane 1	142	2.0	1061	0.134	100	1.0	LOS A	0.6	4.5	Full	15	0.0	0.0
Approach	142	2.0		0.134		1.0	NA	0.6	4.5				
NorthWest: Oasis Drive													
Lane 1	127	2.0	1072	0.119	100	2.1	LOS A	0.5	4.0	Full	130	0.0	0.0
Approach	127	2.0		0.119		2.1	NA	0.5	4.0				
SouthWest: Clarkshill Road													
Lane 1	67	2.0	1131	0.060	100	5.4	LOS A	0.2	1.6	Full	147	0.0	0.0
Approach	67	2.0		0.060		5.4	LOS A	0.2	1.6				
Intersection	337	2.0		0.134		2.3	NA	0.6	4.5				

Figure 52 - LOS Table (Model 7.2Bp+ Oasis Drive/ Clarkshill Road - 2025 - PM Peak - WD)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop Queued	Effective Stop Rate per veh	Average Speed km/h
SouthEast: Oasis Drive											
7	L2	44	2.0	0.134	2.6	LOS A	0.6	4.5	0.13	0.18	43.4
8	T1	98	2.0	0.134	0.3	LOS A	0.6	4.5	0.13	0.18	45.9
Approach		142	2.0	0.134	1.0	NA	0.6	4.5	0.13	0.18	45.0
NorthWest: Oasis Drive											
2	T1	85	2.0	0.119	0.6	LOS A	0.5	4.0	0.22	0.24	41.2
3	R2	42	2.0	0.119	5.1	LOS A	0.5	4.0	0.22	0.24	42.8
Approach		127	2.0	0.119	2.1	NA	0.5	4.0	0.22	0.24	41.9
SouthWest: Clarkshill Road											
4	L2	24	2.0	0.060	5.4	LOS A	0.2	1.6	0.25	0.54	38.3
6	R2	43	2.0	0.060	5.4	LOS A	0.2	1.6	0.25	0.54	25.9
Approach		67	2.0	0.060	5.4	LOS A	0.2	1.6	0.25	0.54	30.6
All Vehicles		337	2.0	0.134	2.3	NA	0.6	4.5	0.19	0.28	39.6

Figure 53 - Movement Summary (Model 7.2Bp+ Oasis Drive / Clarkshill Road - 2025 - PM Peak - WD)

2.8 Intersection 8 - Oasis Drive / Access Road

Figure 54 - Location

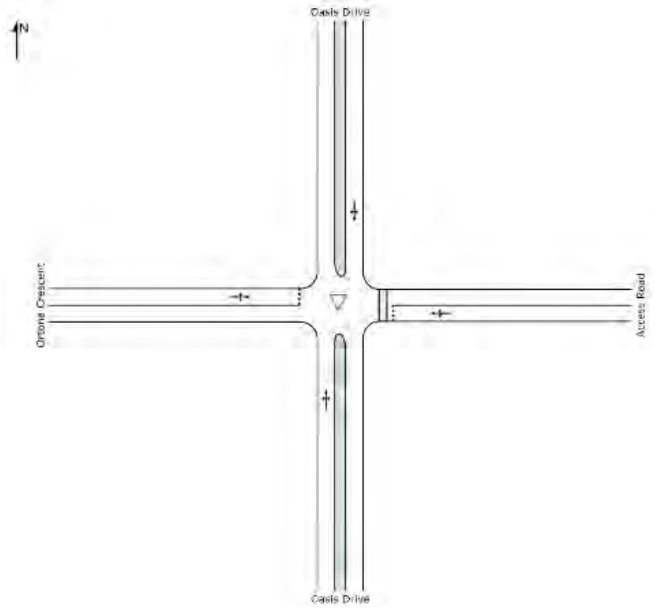


Figure 55 - Schematic Geometry - 8.1p+, 8.2p+

2.8.1 8.1p+ 2015 PM Peak (+ development)

Lane Use and Performance													
	Demand Flows Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	Dist m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Oasis Drive													
Lane 1	126	1.0	968	0.130	100	2.1	LOS A	0.6	4.3	Full	63	0.0	0.0
Approach	126	1.0		0.130		2.1	NA	0.6	4.3				
East: Access Road													
Lane 1	54	1.0	991	0.054	100	4.8	LOS A	0.2	1.4	Full	30	0.0	0.0
Approach	54	1.0		0.054		4.8	LOS A	0.2	1.4				
North: Oasis Drive													
Lane 1	174	1.0	1002	0.173	100	2.4	LOS A	0.8	5.9	Full	63	0.0	0.0
Approach	174	1.0		0.173		2.4	NA	0.8	5.9				
West: Ortona Crescent													
Lane 1	56	1.0	1089	0.051	100	7.2	LOS A	0.2	1.3	Full	200	0.0	0.0
Approach	56	1.0		0.051		7.2	LOS A	0.2	1.3				
Intersection	409	1.0		0.173		3.3	NA	0.8	5.9				

Figure 56 - LOS Table (Model 8.1p+ Oasis Drive / Access Road - 2015 - PM Peak - WD)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop Queued	Effective Stop Rate per veh	Average Speed km/h
South: Oasis Drive											
1	L2	6	1.0	0.130	7.3	LOS A	0.6	4.3	0.09	0.21	39.9
2	T1	99	1.0	0.130	0.8	LOS A	0.6	4.3	0.09	0.21	39.9
3	R2	21	1.0	0.130	6.6	LOS A	0.6	4.3	0.09	0.21	39.9
Approach		126	1.0	0.130	2.1	NA	0.6	4.3	0.09	0.21	39.9
East: Access Road											
4	L2	21	1.0	0.054	4.8	LOS A	0.2	1.4	0.27	0.52	25.7
5	T1	2	1.0	0.054	3.4	LOS A	0.2	1.4	0.27	0.52	25.7
6	R2	31	1.0	0.054	5.0	LOS A	0.2	1.4	0.27	0.52	25.7
Approach		54	1.0	0.054	4.8	LOS A	0.2	1.4	0.27	0.52	25.7
North: Oasis Drive											
7	L2	31	1.0	0.173	6.3	LOS A	0.8	5.9	0.06	0.24	39.1
8	T1	124	1.0	0.173	0.7	LOS A	0.8	5.9	0.06	0.24	39.1
9	R2	19	1.0	0.173	7.3	LOS A	0.8	5.9	0.06	0.24	39.1
Approach		174	1.0	0.173	2.4	NA	0.8	5.9	0.06	0.24	39.1
West: Ortona Crescent											
10	L2	28	1.0	0.051	7.3	LOS A	0.2	1.3	0.22	0.59	36.5
11	T1	4	1.0	0.051	5.3	LOS A	0.2	1.3	0.22	0.59	36.5
12	R2	23	1.0	0.051	7.4	LOS A	0.2	1.3	0.22	0.59	36.5
Approach		56	1.0	0.051	7.2	LOS A	0.2	1.3	0.22	0.59	36.5
All Vehicles		409	1.0	0.173	3.3	NA	0.8	5.9	0.12	0.32	36.8

Figure 57 - Movement Summary (Model 8.1p+ Oasis Drive / Access Road - 2015 - PM Peak - WD)

2.8.2 8.2p+ 2025 PM Peak (+ development)

Lane Use and Performance													
	Demand Flows Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	Dist m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Oasis Drive													
Lane 1	176	1.0	904	0.194	100	2.6	LOS A	0.9	6.7	Full	63	0.0	0.0
Approach	176	1.0		0.194		2.6	NA	0.9	6.7				
East: Access Road													
Lane 1	72	1.0	873	0.082	100	5.5	LOS A	0.3	2.1	Full	30	0.0	0.0
Approach	72	1.0		0.082		5.5	LOS A	0.3	2.1				
North: Oasis Drive													
Lane 1	246	1.0	952	0.259	100	2.8	LOS A	1.3	9.5	Full	63	0.0	0.0
Approach	246	1.0		0.259		2.8	NA	1.3	9.5				
West: Ortona Crescent													
Lane 1	81	1.0	987	0.082	100	7.6	LOS A	0.3	2.2	Full	200	0.0	0.0
Approach	81	1.0		0.082		7.6	LOS A	0.3	2.2				
Intersection	575	1.0		0.259		3.7	NA	1.3	9.5				

Figure 58 - LOS Table (Model 8.2p+ Oasis Drive / Access Road - 2025 - PM Peak - WD)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Oasis Drive											
1	L2	9	1.0	0.194	7.8	LOS A	0.9	6.7	0.14	0.24	38.0
2	T1	139	1.0	0.194	1.3	LOS A	0.9	6.7	0.14	0.24	38.0
3	R2	27	1.0	0.194	7.1	LOS A	0.9	6.7	0.14	0.24	38.0
Approach		176	1.0	0.194	2.6	NA	0.9	6.7	0.14	0.24	38.0
East: Access Road											
4	L2	27	1.0	0.082	5.5	LOS A	0.3	2.1	0.35	0.57	24.6
5	T1	4	1.0	0.082	4.1	LOS A	0.3	2.1	0.35	0.57	24.6
6	R2	40	1.0	0.082	5.7	LOS A	0.3	2.1	0.35	0.57	24.6
Approach		72	1.0	0.082	5.5	LOS A	0.3	2.1	0.35	0.57	24.6
North: Oasis Drive											
7	L2	40	1.0	0.259	6.7	LOS A	1.3	9.5	0.12	0.26	37.7
8	T1	179	1.0	0.259	1.2	LOS A	1.3	9.5	0.12	0.26	37.7
9	R2	27	1.0	0.259	7.7	LOS A	1.3	9.5	0.12	0.26	37.7
Approach		246	1.0	0.259	2.8	NA	1.3	9.5	0.12	0.26	37.7
West: Ortona Crescent											
10	L2	41	1.0	0.082	7.8	LOS A	0.3	2.2	0.29	0.62	35.9
11	T1	8	1.0	0.082	5.8	LOS A	0.3	2.2	0.29	0.62	35.9
12	R2	32	1.0	0.082	7.9	LOS A	0.3	2.2	0.29	0.62	35.9
Approach		81	1.0	0.082	7.6	LOS A	0.3	2.2	0.29	0.62	35.9
All Vehicles		575	1.0	0.259	3.7	NA	1.3	9.5	0.18	0.34	35.6

Figure 59 - Movement Summary (Model 8.2p+ Oasis Drive / Access Road - 2025 - PM Peak - WD)

2.9 Intersection 9 - Oasis Drive / Secret Harbour Boulevard

Figure 60 - Location

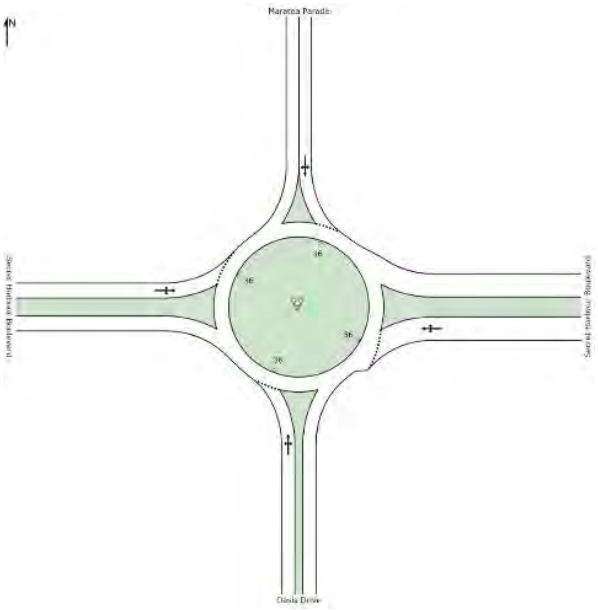


Figure 61 - Schematic Geometry - 9.1p+, 9.2p+

2.9.1 9.1p+ 2015 PM Peak (+ development)

Lane Use and Performance

	Demand Flows Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	Dist m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Oasis Drive													
Lane 1[d]	175	2.0	1480	0.118	100	5.3	LOS A	0.6	4.0	Full	70	0.0	0.0
Approach	175	2.0		0.118		5.3	LOS A	0.6	4.0				
East: Secret Harbour Boulevard													
Lane 1[d]	96	2.0	1454	0.066	100	4.7	LOS A	0.2	1.5	Full	74	0.0	0.0
Approach	96	2.0		0.066		4.7	LOS A	0.2	1.5				
North: Maratea Parade													
Lane 1[d]	160	2.0	1386	0.115	100	5.2	LOS A	0.6	4.1	Full	110	0.0	0.0
Approach	160	2.0		0.115		5.2	LOS A	0.6	4.1				
West: Secret Harbour Boulevard													
Lane 1[d]	114	2.0	1431	0.079	100	7.1	LOS A	0.3	2.3	Full	385	0.0	0.0
Approach	114	2.0		0.079		7.1	LOS A	0.3	2.3				
Intersection	544	2.0		0.118		5.5	LOS A	0.6	4.1				

Figure 62 - LOS Table (Model 9.1p+ Oasis Drive / Secret Harbour Boulevard - 2015 - PM Peak - WD)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Oasis Drive											
10	L2	47	2.0	0.118	2.9	LOS A	0.6	4.0	0.22	0.49	50.8
11	T1	59	2.0	0.118	3.0	LOS A	0.6	4.0	0.22	0.49	41.8
12	R2	68	2.0	0.118	8.9	LOS A	0.6	4.0	0.22	0.49	36.8
Approach		175	2.0	0.118	5.3	LOS A	0.6	4.0	0.22	0.49	43.8
East: Secret Harbour Boulevard											
1	L2	33	2.0	0.066	3.1	LOS A	0.2	1.5	0.20	0.47	27.9
2	T1	38	2.0	0.066	3.1	LOS A	0.2	1.5	0.20	0.47	55.4
3	R2	25	2.0	0.066	9.1	LOS A	0.2	1.5	0.20	0.47	30.0
Approach		96	2.0	0.066	4.7	LOS A	0.2	1.5	0.20	0.47	40.8
North: Maratea Parade											
4	L2	37	2.0	0.115	3.8	LOS A	0.6	4.1	0.31	0.46	29.9
5	T1	87	2.0	0.115	3.8	LOS A	0.6	4.1	0.31	0.46	30.1
6	R2	36	2.0	0.115	10.0	LOS B	0.6	4.1	0.31	0.46	55.3
Approach		160	2.0	0.115	5.2	LOS A	0.6	4.1	0.31	0.46	36.8
West: Secret Harbour Boulevard											
7	L2	15	2.0	0.079	3.6	LOS A	0.3	2.3	0.24	0.53	49.1
8	T1	36	2.0	0.079	3.6	LOS A	0.3	2.3	0.24	0.53	45.6
9	R2	63	2.0	0.079	9.8	LOS A	0.3	2.3	0.24	0.53	44.3
Approach		114	2.0	0.079	7.1	LOS A	0.3	2.3	0.24	0.53	45.3
All Vehicles		544	2.0	0.118	5.5	LOS A	0.6	4.1	0.25	0.49	41.7

Figure 63 - Movement Summary (Model 9.1p+ - Secret Harbour Boulevard / Oasis Drive 2015 PM Peak - WD)

2.9.2 9.2p+ 2025 PM Peak (+ development)

Lane Use and Performance

	Demand Flows Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	Dist m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
South: Oasis Drive													
Lane 1[d]	245	2.0	1426	0.172	100	5.5	LOS A	0.9	6.2	Full	70	0.0	0.0
Approach	245	2.0		0.172		5.5	LOS A	0.9	6.2				
East: Secret Harbour Boulevard													
Lane 1[d]	142	2.0	1405	0.101	100	4.9	LOS A	0.3	2.5	Full	74	0.0	0.0
Approach	142	2.0		0.101		4.9	LOS A	0.3	2.5				
North: Maratea Parade													
Lane 1[d]	225	2.0	1322	0.170	100	5.6	LOS A	0.9	6.4	Full	110	0.0	0.0
Approach	225	2.0		0.170		5.6	LOS A	0.9	6.4				
West: Secret Harbour Boulevard													
Lane 1[d]	160	2.0	1377	0.116	100	7.3	LOS A	0.5	3.6	Full	385	0.0	0.0
Approach	160	2.0		0.116		7.3	LOS A	0.5	3.6				
Intersection	773	2.0		0.172		5.8	LOS A	0.9	6.4				

Figure 64 - LOS Table (Model 9.2p+ Oasis Drive / Secret Harbour Boulevard - 2025 - PM Peak - WD)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Oasis Drive											
10	L2	66	2.0	0.172	3.1	LOS A	0.9	6.2	0.29	0.51	50.4
11	T1	81	2.0	0.172	3.2	LOS A	0.9	6.2	0.29	0.51	41.2
12	R2	98	2.0	0.172	9.1	LOS A	0.9	6.2	0.29	0.51	36.2
Approach		245	2.0	0.172	5.5	LOS A	0.9	6.2	0.29	0.51	43.2
East: Secret Harbour Boulevard											
1	L2	46	2.0	0.101	3.3	LOS A	0.3	2.5	0.27	0.49	27.6
2	T1	56	2.0	0.101	3.3	LOS A	0.3	2.5	0.27	0.49	54.8
3	R2	40	2.0	0.101	9.2	LOS A	0.3	2.5	0.27	0.49	29.6
Approach		142	2.0	0.101	4.9	LOS A	0.3	2.5	0.27	0.49	40.2
North: Maratea Parade											
4	L2	48	2.0	0.170	4.1	LOS A	0.9	6.4	0.39	0.49	29.5
5	T1	124	2.0	0.170	4.2	LOS A	0.9	6.4	0.39	0.49	29.6
6	R2	53	2.0	0.170	10.3	LOS B	0.9	6.4	0.39	0.49	54.5
Approach		225	2.0	0.170	5.6	LOS A	0.9	6.4	0.39	0.49	36.5
West: Secret Harbour Boulevard											
7	L2	21	2.0	0.116	3.8	LOS A	0.5	3.6	0.31	0.55	48.7
8	T1	49	2.0	0.116	3.8	LOS A	0.5	3.6	0.31	0.55	45.3
9	R2	89	2.0	0.116	10.0	LOS B	0.5	3.6	0.31	0.55	43.9
Approach		160	2.0	0.116	7.3	LOS A	0.5	3.6	0.31	0.55	44.9
All Vehicles		773	2.0	0.172	5.8	LOS A	0.9	6.4	0.32	0.51	41.3

Figure 65 - Movement Summary (Model 9.2p+ Oasis Drive / Secret Harbour Boulevard - 2025 - PM Peak, WD)

2.10 Intersection 10 - Secret Harbour Boulevard / Access Road

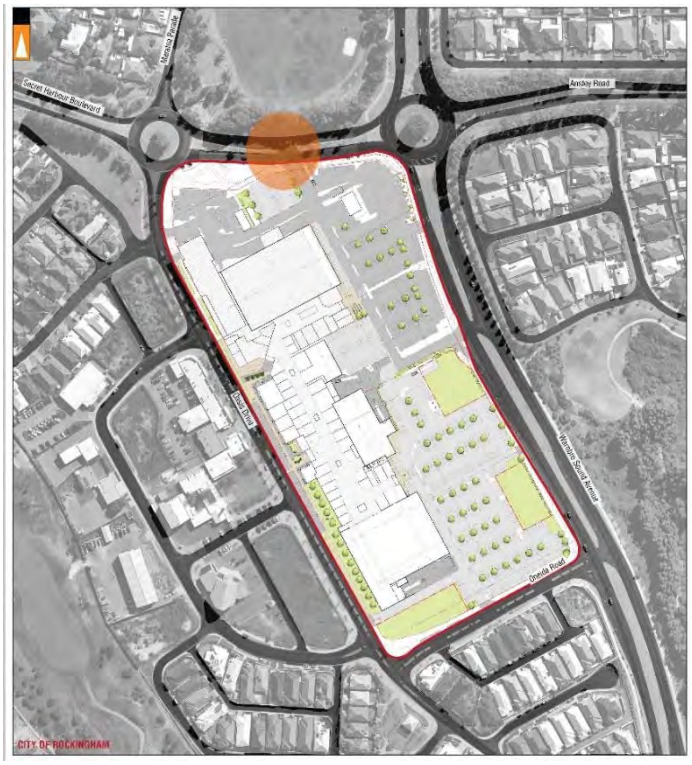


Figure 66 - Location

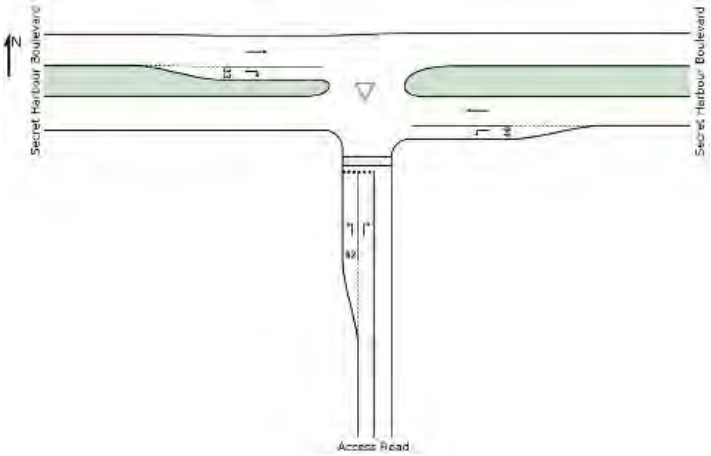


Figure 67 - Schematic Geometry - 10.1p+_V1, 10.1p+_V2, 10.2p+

2.10.1 10.1p+ 2015 PM Peak (+ development) – Secret Harbour Boulevard / Access Road

Lane Use and Performance

	Demand Flows Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util %	Average Delay sec	Level of Service	95% Back of Queue Veh	Dist m	Lane Config	Lane Length m	Cap. Adj %	Prob. Block. %
South: Access Road													
Lane 1	54	3.0	1174	0.046	100	2.4	LOS A	0.2	1.3	Short	42	0.0	0.0
Lane 2	247	3.0	652	0.379	100	6.3	LOS A	2.1	16.1	Full	45	0.0	0.0
Approach	301	3.0		0.379		5.6	LOS A	2.1	16.1				
East: Secret Harbour Boulevard													
Lane 1	247	3.0	1158	0.214	100	5.5	LOS A	0.9	7.0	Short	40	0.0	0.0
Lane 2	98	3.0	940	0.104	100	0.5	LOS A	0.5	3.5	Full	90	0.0	0.0
Approach	345	3.0		0.214		4.1	NA	0.9	7.0				
West: Secret Harbour Boulevard													
Lane 1	107	3.0	695	0.154	100	2.6	LOS A	0.7	5.1	Full	80	0.0	0.0
Lane 2	38	3.0	742	0.051	100	8.3	LOS A	0.2	1.5	Short	33	0.0	0.0
Approach	145	3.0		0.154		4.1	NA	0.7	5.1				
Intersection	792	3.0		0.379		4.7	NA	2.1	16.1				

Figure 68 - LOS Table (Model 10.1p+_V1 Secret Harbour Boulevard / Access Road - 2015 - PM Peak - WD)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Access Road											
1	L2	54	3.0	0.046	2.4	LOS A	0.2	1.3	0.21	0.35	28.8
3	R2	247	3.0	0.379	6.3	LOS A	2.1	16.1	0.59	0.76	25.5
Approach		301	3.0	0.379	5.6	LOS A	2.1	16.1	0.52	0.69	26.0
East: Secret Harbour Boulevard											
4	L2	247	3.0	0.214	5.5	LOS A	0.9	7.0	0.10	0.57	36.0
5	T1	98	3.0	0.104	0.5	LOS A	0.5	3.5	0.19	0.08	65.0
Approach		345	3.0	0.214	4.1	NA	0.9	7.0	0.12	0.43	42.2
West: Secret Harbour Boulevard											
11	T1	107	3.0	0.154	2.6	LOS A	0.7	5.1	0.46	0.36	54.8
12	R2	38	3.0	0.051	8.3	LOS A	0.2	1.5	0.53	0.72	31.6
Approach		145	3.0	0.154	4.1	NA	0.7	5.1	0.48	0.45	47.3
All Vehicles		792	3.0	0.379	4.7	NA	2.1	16.1	0.34	0.53	35.0

Figure 69 - Movement Summary (Model 10.1p+_V1 Secret Harbour Boulevard / Access Road - 2015 - PM Peak – WD

2.10.2 10.2p+ 2025 PM Peak (+ development) - Secret Harbour Boulevard / Access Road

Lane Use and Performance

	Demand Flows Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util %	Average Delay sec	Level of Service	95% Back of Queue Veh	Dist m	Lane Config	Lane Length m	Cap Adj %	Prob Block %
South: Access Road													
Lane 1	54	3.0	1129	0.048	100	2.1	LOS A	0.2	1.3	Short	42	0.0	0.0
Lane 2	247	3.0	600	0.412	100	7.6	LOS A	2.4	18.2	Full	45	0.0	0.0
Approach	301	3.0		0.412		6.6	LOS A	2.4	18.2				
East: Secret Harbour Boulevard													
Lane 1	225	3.0	1158	0.195	100	5.5	LOS A	0.8	6.3	Short	40	0.0	0.0
Lane 2	137	3.0	940	0.146	100	0.5	LOS A	0.7	5.1	Full	90	0.0	0.0
Approach	362	3.0		0.195		3.6	NA	0.8	6.3				
West: Secret Harbour Boulevard													
Lane 1	139	3.0	695	0.200	100	2.7	LOS A	0.9	6.8	Full	80	0.0	0.0
Lane 2	38	3.0	729	0.052	100	8.4	LOS A	0.2	1.5	Short	33	0.0	0.0
Approach	177	3.0		0.200		4.0	NA	0.9	6.8				
Intersection	840	3.0		0.412		4.7	NA	2.4	18.2				

Figure 70 - LOS Table (Model 10.2p+_V1 Secret Harbour Boulevard / Access Road - 2025 - PM Peak - WD)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop Queued	Effective Stop Rate per veh	Average Speed km/h
South: Access Road											
1	L2	54	3.0	0.048	2.1	LOS A	0.2	1.3	0.25	0.31	29.9
3	R2	247	3.0	0.412	7.6	LOS A	2.4	18.2	0.63	0.86	24.1
Approach		301	3.0	0.412	6.6	LOS A	2.4	18.2	0.56	0.76	25.0
East: Secret Harbour Boulevard											
4	L2	225	3.0	0.195	5.5	LOS A	0.8	6.3	0.09	0.57	36.1
5	T1	137	3.0	0.146	0.5	LOS A	0.7	5.1	0.20	0.08	64.8
Approach		362	3.0	0.195	3.6	NA	0.8	6.3	0.13	0.38	44.5
West: Secret Harbour Boulevard											
11	T1	139	3.0	0.200	2.7	LOS A	0.9	6.8	0.47	0.38	54.3
12	R2	38	3.0	0.052	8.4	LOS A	0.2	1.5	0.54	0.72	31.4
Approach		177	3.0	0.200	4.0	NA	0.9	6.8	0.49	0.45	48.1
All Vehicles		840	3.0	0.412	4.7	NA	2.4	18.2	0.36	0.53	35.6

Figure 71 - Movement Summary (Model 10.2p+_V1 Secret Harbour Boulevard / Access Road - 2025 - PM peak WD)

Appendix 4

Riley Consulting's Parking Assessment for McDonald's Pad Site

EXECUTIVE SUMMARY

This technical note has been prepared on behalf of McDonalds to consider the actual parking demands anticipated to be required for the proposed Secret Harbour store. The McDonalds store will be located on a pad site within the Secret Harbour shopping centre expansion. This parking assessment does not consider the parking impacts of a Dan Murphy's liquor store proposed for the adjacent pad site. A separate report is to be submitted to cover that development. The findings of this assessment are as follows:

- Reference to the City of Rockingham's planning report for the proposed shopping centre expansion concludes that 767 bays are required under the Scheme. In total 757 bays are provided within the shopping centre site and 59 bays are provided to adjacent streets. The parking providing for the shopping centre is 816 bays and is deemed to comply.
- Separate car parking requirements are provided for fast food restaurants under the Scheme of 1 bay per 11m^2 of NLA. However, if the restaurant were to be internal to the shopping centre, a parking requirement of 1 bay per 25m^2 would apply. Under the Scheme an additional 34 bays would be required for the proposed McDonalds restaurant (at 1 bay per 25m^2 21 bays would be required).
- The development of the pad site for the proposed McDonalds will result in the loss of 10 bays to the current parking provision.

PURPOSE

The purpose of this assessment is to consider the actual parking demands expected as a result of constructing a McDonalds restaurant as part of the Secret Harbour shopping centre expansion. The proposed McDonalds restaurant will occupy a pad site fronting Warnbro Sound Avenue, but will share the same car park as the shopping centre.

The car parking required under the Town Planning Scheme No 2 (TPS) is considered to over-estimate the actual car parking demands of the proposed land uses. SPP4.2 has been introduced to recognise cross visitation and reciprocal use of shopping centre car parks. However, SPP4.2 does not cover fast food restaurants.

This technical note assesses the level of parking for the proposed McDonalds based on the TPS and the actual expectations of parking demands.

Figure 1 shows the two pad sites and the proposed shopping centre expansion.

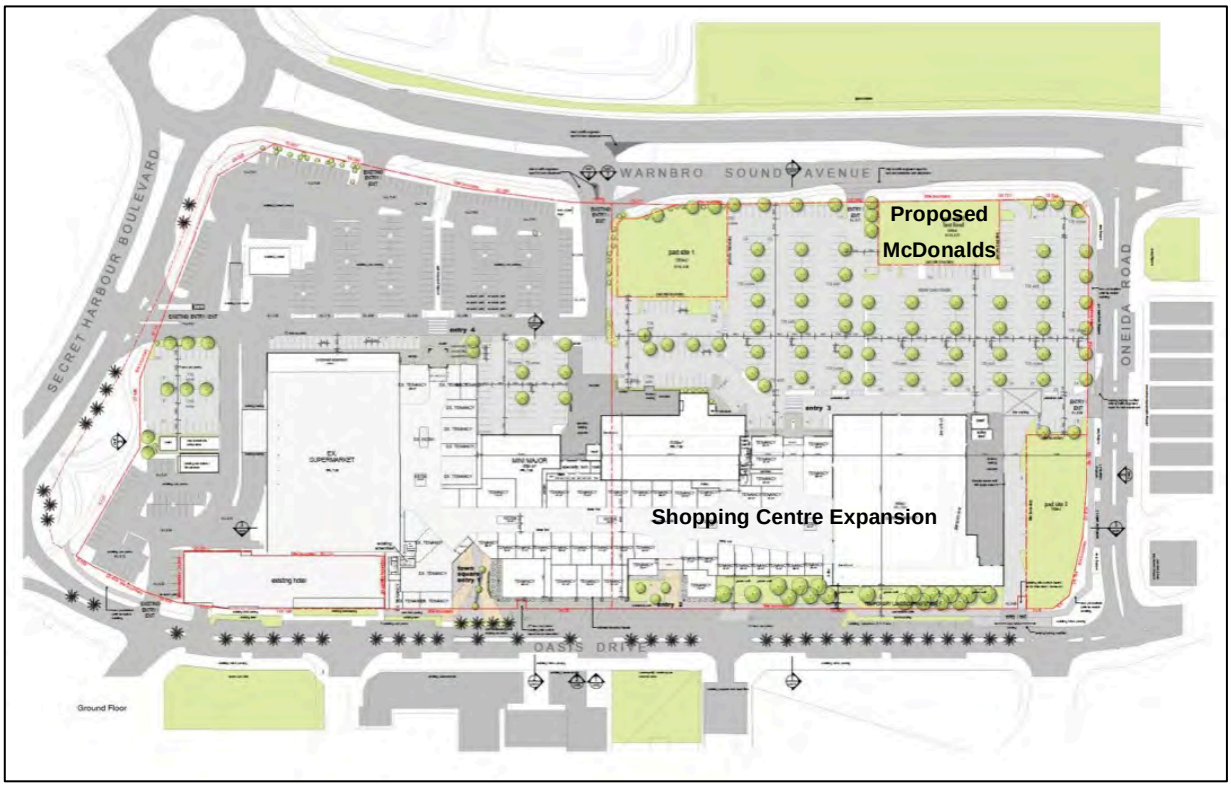


Figure 1 Secret Harbour Shopping Centre

TPS CAR PARKING ASSESSMENT

A development application for the shopping centre expansion has been lodged and is due before JDAP. The planning report prepared by the City has assessed the level of parking deemed to be required for the shopping centre expansion based on Table 2 of TPS2. Table 1 shows a reproduction of the parking requirements shown in the City's planning report (table 6 of that report). The parking requirements are cognisant of current policies applied to the whole shopping centre (existing plus proposed). The car parking shown in Table 1 is cognisant of SPP4.2.

From Table 1 it can be seen that the development requires 767 bays. The planning report further identifies that the development will provide 757 on-site parking bays and 59 on-street parking bays, or a total of 816 bays.

The shopping Centre DA shows 816 bays - a surplus of 49 bays.

Table 1 City Planning Report – TPS Car parking Requirement

Based on the revised parking calculations from SPP4.2 as outlined Tables 2 and 5, the overall shopping centre would require the following car parking:

Table 6: Revised Overall Parking Calculations

Development	Parking Requirement		
	Spaces	Spaces for People with a Disability	Total
Stage 1 (existing shopping Centre)	343(372)	7*	343
Tavern (included in Stage 1)			
Caltex	16	1	17
Stage 2 (proposed development)	407	9*	407
Total	**766 (795)**	**17**	**767**

Notes:
* Parking spaces for people with a disability have been calculated on Building Code of Australia Requirements (i.e. 1/50 overall spaces for Class 6).

Although a surplus of parking is demonstrated, the City's report makes the following comment:

> *Of concern, however, is the intent to develop the remaining three pad sites. Each of these pad sites would be required to be self-sufficient in terms of parking provision, as there is minimal surplus parking available for their use.*

NON-SHOPPING CENTRE USES

A tavern of 587m^2 was developed within Stage 1 of the shopping centre and had a parking requirement of 118 bays. It is understood from the planning report that this land use need not be considered in regard to the car parking demands of the pad site (s) and shopping centre expansion.

ADDITIONAL PARKING REQUIRED BY THE TPS FOR MCDONALDS

Planning Policy 3.3.9 requires that fast food restaurants provide parking as per Table 3 of TPS2 as follows:

> 1 bay per 14m^2 of NLA (including outdoor eating areas) max 1 bay per 11m^2

Although not indicated in TPS2 Table 3, the previous TPS stated that where a drive-through facility is provided the drive-through access way shall accommodate 10 cars and can provide up to 50% of the total TPS parking requirement. It is assumed that this still applies.

Based on a restaurant floor area of 600m^2 a total of 43 bays would be required. The architect's plan shows the drive-through access way can accommodate 14 cars before any interference to internal access roads would occur. Thus it can be derived that the TPS parking requirement would be (43 – 14) 29 additional bays.

Under the TPS requirements the McDonalds store requires 29 additional bays.

NEW DEVELOPMENT PARKING PROVISION

As a result of the proposed development of a McDonalds store to the Warnbro Sound Avenue frontage, 10 parking bays will be lost. Thus the overall parking provision for the shopping centre will be (816 – 10) 806 bays.

The proposed McDonalds store will reduce the shopping centre parking to 806 bays.

It has been shown that the proposed expansion of the shopping centre will require 767 bays and the proposed McDonalds store would require an additional 29 bays. In total the two developments would require (767 + 29) 796 bays.

The shopping centre expansion and McDonalds requires 796 to meet the requirements of the TPS.

With a total of 806 bays provided by the expansion of the shopping centre, the overall requirements for parking are met.

Current parking can accommodate the TPS requirement of the proposed McDonald Store.

TPS PARKING REQUIREMENT REDUCED AS SPP4.2

The car parking requirement for the shopping centre has been reduced under SPP4.2 to better reflect the expectations of cross visitation and reciprocal use. Applying the SPP4.2 parking requirement[1] of 1 bay per 25m^2 to the proposed McDonalds store (as if it were internal to the shopping centre) there would be a parking requirement of (600 / 25) 24 bays. With 14 bays provided within the drive-through facility, the additional bays required would be (24 – 14) 10 bays. However, the drive-through is capped at 50% and 12 bays would be required.

[1] Table 5 of the City's JDAP report (PDS-008/15) identifies the parking rate for shops as 1 bay per 25m^2

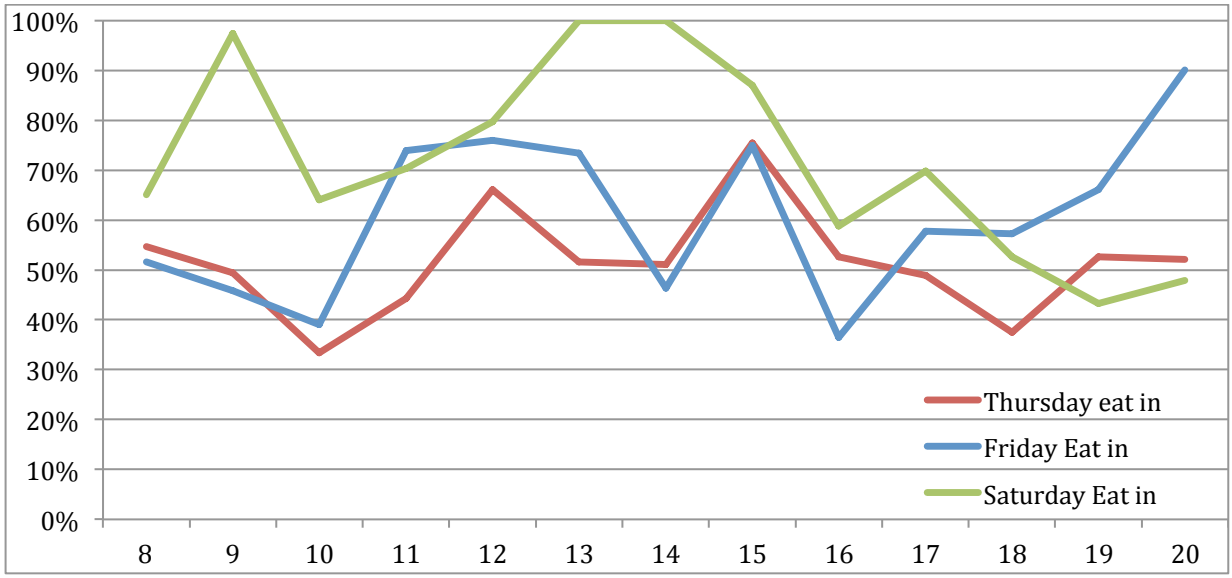
It is relevant to note that the RTA *Guide to Traffic Generating Developments* makes the following comment in regard to shopping centre traffic generation:

> *Specialty shops, secondary retail GLFA - includes specialty shops and take-away stores such as McDonalds. These stores are grouped, as they tend to not be primary attractors to the centre.*

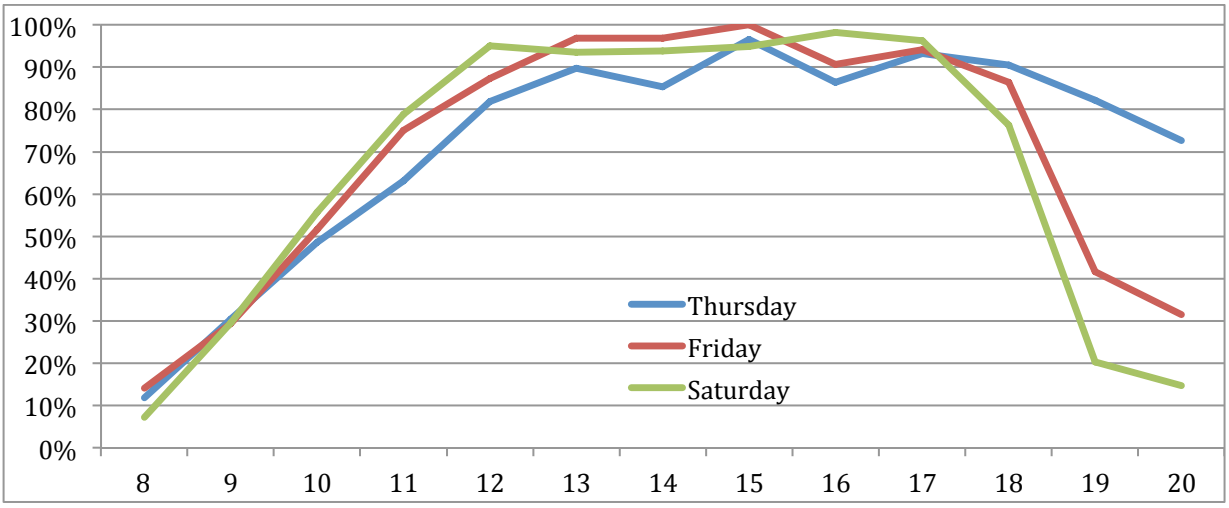
PEAK PERIODS OF ATTRACTION APPLIED TO THE TPS PARKING REQUIREMENTS

The TPS parking requirement is based upon the full occupancy of individual land uses. However, different uses can attract customers at different times.

Graph 1 shows the typical dine-in customer attraction to McDonalds proportionally to the peak Saturday lunchtime trading period, between 12pm and 1pm. Graph 2 shows the traffic profile taken from the average traffic arrivals and departures at Bull Creek, Garden City and the Park Centre, Victoria Park. Surprisingly the traffic attraction on a Friday is shown to have the highest peak.



Graph 1 McDonalds Typical Demand Profile (based on % of peak attraction)



Graph 2 Typical Shopping Centre Demand Profile (based on % of peak attraction)

Tables 2, 3 and 4 show the parking demands for Thursday, Friday and Saturday based on the TPS parking requirement (+29 bays) and the derived SPP4.2 parking requirement (+10 bays) applied to the proposed McDonalds store. The parking requirements are factored by the typical hourly demands.

Table 2 Thursday Parking Demands

Time	Total Required TPS (767 + 29)	Vacant bays TPS	Total Required SPP4.2 (767 + 12)	Vacant Bays SPP4.2
8	106	700	97	709
9	248	558	240	566
10	382	424	377	429
11	497	309	489	317
12	648	158	636	170
13	703	103	694	112
14	670	136	661	145
15	762	44	750	56
16	678	128	669	137
17	***729***	***77***	***721***	***85***
18	***705***	***101***	***699***	***107***
19	645	161	636	170
20	573	233	564	242

Indicates peak hour of attraction to McDonalds
Indicates peak hour of attraction to shopping centre

Table 3 Friday Parking Demands

Time	Total Required TPS (767 + 29)	Vacant bays TPS	Total Required SPP4.2 (767 + 12)	Vacant Bays SPP4.2
8	123	683	114	692
9	239	567	231	575
10	408	398	401	405
11	597	209	584	222
12	692	114	679	127
13	764	42	751	55
14	756	50	748	58
15	**789**	**17**	**776**	**30**
16	706	100	700	106
17	739	67	729	77
18	***680***	***126***	***670***	***136***
19	339	467	328	478
20	268	538	252	554

Indicates peak hour of attraction to McDonalds
Indicates peak hour of attraction to shopping centre

Table 4 Saturday Parking Demands

Time	Total Required TPS (767 + 29)	Vacant bays TPS	Total Required SPP4.2 (767 + 12)	Vacant Bays SPP4.2
8	74	732	63	743
9	254	552	238	568
10	446	360	435	371
11	***625***	***181***	***613***	***193***
12	752	54	738	68
13	***746***	***60***	***729***	***77***
14	749	57	732	74
15	753	53	738	68
16	770	36	760	46
17	759	47	747	59
18	600	206	591	215
19	169	637	161	645
20	74	732	118	688

Indicates peak hour of attraction to McDonalds
Indicates peak hour of attraction to shopping centre

Based on Tables 2, 3 and 4 it can be seen that at the peak period of parking demand, there would be 17 vacant bays applying the TPS parking requirement, or 30 vacant bays applying the requirements derived from SPP4.2.

Assessment of the peak periods of parking activity shows surplus bays in regard to the TPS parking requirements can be expected.

MCDONALD'S CROSS VISITATION

McDonald's and other fast food retailers prefer co-location of their stores with shopping centres due to the high level of reciprocal use between the retail and food activities. A survey of McDonalds dine-in customers at the Innaloo shopping centre showed that just 30.9% of customers during the Saturday lunchtime peak period arrived specifically by car. The other 69% of customers were reciprocal to the shopping centre.

If the percentage of reciprocal use is applied to the peak McDonalds demand, the TPS parking requirement could be (29 bays x 31%) 9 bays. Based on SPP4.2 the number of required bays could be (12 x 31%) 4 bays.

Thus the overall parking requirements could be (767 + 9) 776 bays under the TPS or (767 + 4) 771 bays under SPP4.2. This suggests a possible surplus of (806 – 771) 35 bays.

CONCLUSIONS

The City of Rockingham's TPS parking requirements show that the proposed expansion to the Secret Harbour shopping centre will require 767 bays to be provided. In total 816 bays are provided.

The development of a pad site for McDonalds will remove up to 10 bays, thereby reducing the parking supply to 806 bays.

The TPS parking requirement for fast food indicates the proposed McDonalds should provide 43 bays, of which 50% can be provided in the drive-through. 14 bays are provided in the drive-through. In total 29 additional bays would be considered to be required. However, if the McDonalds were internal to the shopping centre, SPP4.2 could apply and 24 bays would be required, of which 50%, or 12 are provided in the drive-through.

The shopping centre car park with 806 bays can accommodate the parking requirements of the shopping centre and McDonalds under either the TPS or SPP4.2. However, additional development of other pad sites would be constrained in regard to accessible parking.

Assessing the TPS / SPP4.2 parking requirements to the peak period of use for the shopping centre and McDonalds (Tables 2 – 4), it is derived that at least 17 / 32 bays could be considered surplus to the TPS / SPP4.2 requirements. The surplus bays would provide the opportunity for parking associated with other pad sites.

It is known that McDonalds will attract 69% of their dine-in customers from the shopping centre during peak periods of activity. On this basis the TPS / SPP4.2 parking requirements could be reduced to 9 bays and 4 bays respectively. The possible peak period surplus (identified between 3pm and 4pm of Friday) could be up to 35 bays (806 – 771 under SPP4.2). This possible surplus would be available for the use of other pad sites.

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20th APRIL 2015

Kristie Spagnolo
Senior Project Manager
APP Corporation Pty Ltd
Level 4, 181 Adelaide Terrace
EAST PERTH
WA 6004

Dan Murphy's - Secret Harbour Shopping Centre
Operational Noise Emissions Assessment

Dear Kristie,

Further to our acoustic assessment works regarding the proposed Dan Murphy's liquor retail outlet, Secret Harbour, in Western Australia, Sealhurst have prepared the following report to address potential impacts from noise sources identified as part of the development. The primary noise sources considered include several roof mounted mechanical and refrigeration units, and also noise emissions from delivery trucks and loading dock operations.

PROJECT APPRECIATION

We understand a Dan Murphy's liquor retail outlet is proposed to be constructed as part of the ongoing redevelopment of the Secret Harbour Shopping Centre. The Dan Murphy's site is situated adjacent to Warnbro Sound Avenue, with the nearest residential premises located approximately 60 metres to the east.

The project is currently working towards DA submission, and an acoustic assessment is required in order to demonstrate that noise emissions from the finished development will comply with the *Environmental Protection (Noise) Regulations 1997 (as amended).*

The scope of works for this assessment includes the following:

- Identify acoustic issues for consideration and highlight areas for investigation;
- Establish environmental design criteria with reference to relevant legislation, standards and guidelines
- Estimate noise levels from the development with potential for impact at nearby noise-sensitive receivers – e.g. loading docks, roof mounted plant equipment and the like;
- Assess compliance with the applicable noise limits and suggest measures to minimise potential impact at noise-sensitive receiver locations
- Investigate the implications of 24-hour operation with respect to noise emissions compliance

CONCLUSIONS

Our findings are as follows:

1. In terms of noise emissions, the *Environmental Protection (Noise) Regulations 1997 (as amended)* represent the applicable statutory legislation, and the Assigned Noise Level (ANL) limits the objective gauge with which the proposed development must be shown to comply.

2. ANL limits have been calculated based on an Influencing Factor (IF) of **+4** at the nearest Noise Sensitive Receiver (NSR), identified as single storey residence at 12 Lorne Bend, located approximately 60 metres east of the proposed development site. Full details of the calculation and limits are included in Technical Appendices of this report.
3. Noise emission sources from Dan Murphy's liquor retail outlet have been identified as follows:
    - Roof mounted mechanical air handling units (condenser deck)
    - Roof mounted refrigeration plant equipment
    - Delivery trucks and operations within loading dock
4. Site surveys were conducted at the nearest NSR to assess the local acoustic climate and detailed observations are presented herein. Overall, the site is exposed to moderate levels of noise, with the primary contribution from road traffic passing on Warnbro Sound Avenue. Incidental aircraft flyovers were also observed throughout site measurements.

    Daytime (0700 – 2200 hours) measured noise levels were typically between L_{A10} 55-65 dB, with night time (2200 – 0700 hours) noise levels typically between L_{A10} 45-55 dB.
5. Sound power level (SWL) data of roof mounted mechanical and refrigeration plant equipment is taken from existing Dan Murphy's outlets of similar size, and is deemed to provide a suitable representation of the eventual selections for the proposed development.

    To investigate the potential noise impact of 24-hour operation, all roof mounted sources were modelled to be switched on at all times. Our assessment demonstrates a predicted cumulative noise level from roof mounted sources ONLY of L_{A10} 38 dB during night time operations at the nearest NSR.

    This result therefore predicts compliance with the most stringent calculated ANL limit of L_{A10} 39 dB, applicable during the following times:
    - Monday to Saturday (2200-0700 hours)
    - Sunday and Public Holidays (2200-0900 hours)
6. Deliveries and loading dock operations have been modelled using noise source contributions from the following:
    - Truck engine noise idling in loading dock
    - Truck-mounted refrigeration equipment
    - Unloading pallet noise
    - Safety reversing alarms
    - All roof mounted mechanical and refrigeration plant switched on

    Our modelled assessment indicates that loading dock operations result in a predicted cumulative noise level of L_{A10} 43 dB at the nearest NSR, which complies with *Regulatory* limits during the following time periods:

    - 0700 – 2200 Monday to Saturday
    - 0900 – 2200 Sundays and Public Holidays

    Alternative models were constructed with noise contributions coming only from unloading activities and roof mounted mechanical and refrigeration plant equipment.

    Our predicted results indicated that lower noise emissions than the predicted L_{A10} 43 dB could achieved, using the following assumptions and process as follows:

    - Truck engine sound power levels as outlined in this report

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- Truck engine turned off once in position
- Reverse beepers NOT operational – use of alternative safety strategy instead (e.g. Broadband alarm OR physical spotters)
- Strict adherence to quiet unloading operations – responsibility upon delivery staff (i.e. careful placing of pallets, no dropped items, quiet driving techniques etc.

It must be noted that whilst compliance of operations is possible based on adherence to the above, operations are unlikely to be "inaudible" at the nearest NSR. To further reduce noise emissions, consideration could be given to enclosing the loading dock, however trucks arriving /departing during night time hours are still have the potential to generate incidental noise that exceeds the Regulatory ANL limits.

The following pages present our site assessment(s), ANL calculation, predicted noise impacts and compliance statements regarding noise emissions from mechanical and refrigeration equipment, and loading dock operations associated with the proposed Dan Murphy's liquor retail outlet.

If you have any queries, please feel free to contact me direct,

Kind Regards,

Daryl Thompson
Director
Sealhurst Pty Ltd

AMBIENT NOISE ASSESSMENT

Reliable sound level data for the surrounding area is crucial information for any noise sensitive assessment project, as it allows an objective view of the real world external environment. In this way, noise survey data offers a unique relevance and justification to noise emissions, and can serve as a fixed baseline against which operations (and any exceedance) can be assessed, alongside or in sympathy with the calculated Regulatory requirements.

Sealhurst presented engineering staff to site at various times during day, evening and night time periods during the week of 10th-17th April 2015 to undertake a detailed baseline noise survey analysis of the existing acoustic climate in the immediate vicinity of the nearest NSR, identified as 12 Lorne Bend, approximately 60m east of the proposed development site.

A noise measurement position was established on the western side of Lorne Bend. Resultant sound levels were recorded as *.wav files for analysis of key events during day and night time periods, to determine the typical noise climate into which the new development will be created.

Measurement Equipment Details

Attended measurements were recorded using a Norsonic type Nor140 model Sound Level Meter. The meter complies with all relevant specification standards for Type 1 integrating sound measurement equipment and was within a valid laboratory-calibration period at the time of survey. The meter satisfies all relevant and applicable Australian Standards for acoustic measurement devices, including Schedule 4 clauses contained within *Environmental Protection (Noise) Regulations 1997.*

The meter was field-calibrated before and after the measurement series, which consisted of attended noise measurements conducted during a representative weekday period. Consecutive five minute uninterrupted sample periods were recorded over several hours, during both day and night time intervals. All measurements were taken in accordance with the relevant guidance in *AS1055.1-1997: Acoustics – Description and Measurement of Environmental Noise, Part 1: General Procedures*.

Details of the measurement equipment are presented below:

Equipment Type/Model	Serial No.	Calibration Cert. No.	Last Calibration Date
Nor140 SLM	1406036	473692023	14 AUG 2014
Nor 1209 Preamp	20076	473692023	14 AUG 2014
Nor 1225 Microphone	208154	473692023	14 AUG 2014
Nor 1251 Calibrator	34172	CAL 022-2014-4735	13 AUG 2014

Calibration certificates for this equipment are included in Technical Appendices attached to this report.

Meteorological Conditions

Meteorological conditions were calm and clear throughout the measurement periods, with light winds recorded at various time throughout day, evening and night time measurements.

Measurement Protocol

The Nor140 sound level meter was positioned on the western side of Lorne Bend at 1.5m above ground level. All measurements were set to record consecutive five minute intervals, with recordings stored to an audio recording device attached to the system.

Parallel measurements were taken using the "Fast" and "Slow" time-weighting, to record linear spectral measurements. A-weighted broadband and statistical indices were also recorded simultaneously. The system was calibrated before and after to ensure no significant drift was observed during the survey period.

Results were post processed observing appropriate logarithmic (energetic) averaging to generate ten minute data intervals over day and night time periods, during 10th-17th April 2015 to form a baseline set of noise levels.

Noise Survey – Measurement Locations and Observations

Noise survey measurements were taken at a location close to the nearest noise sensitive receiver (NSR) at 12 Lorne Bend, shown in orange in the image below. The proposed Dan Murphy's site is indicated with a red dashed outline.

Day Time Sources (0700 – 2200 hours)

Passing vehicular traffic on Warnbro Sound Avenue is the primary contributor to the overall noise environment at the nearest NSR located at 12 Lorne Bend. Passing buses were observed several times per hour, and were typically responsible for the maximum recorded levels of between 65-70 dB L_{AMAX}. Incidental vehicle pass bys on Lorne Bend also resulted in similar noise level maximums.

Several light aircraft per hour were observed flying overhead during day time measurements, though did not significantly contribute to the overall noise environment.

Night Time Sources (2200 - 0700)

During night time hours, road traffic activity subsided, leading to a corresponding decrease in overall noise levels when compared to day time measurements.

Summary of Measured Noise Data

A summary of the broadband sound level data recorded during attended site measurements is presented below:

Equivalent (L_{Aeq}), Maximum (L_{Amax}) and Minimum (L_{Amin}), and statistical noise indices L_{A1}, L_{A10} and L_{A90} sound level data is presented below and represents an overview of the local acoustic environment:

Measurement Location	Period	$L_{Aeq,T}$ (dB)	L_{A1} (dB)	L_{A10} (dB)	L_{A90} (dB)	L_{AFmin} (dB)	L_{AFmax} (dB)
12 Lorne Bend (Nearest NSR)	Day time (0700-2200hrs)	59.7	64.2	60.3	50.1	43.1	68.4
	Night time (2200-0700hrs)	50.3	56.1	52.0	44.2	41.4	60.8

NOTES:

$L_{Aeq,T}$ (dB) is the equivalent noise level which is summation of noise events and integrated over the measurement period (T).
L_{AF1} (dB) is the statistical index which describes the sound pressure level which was exceeded for 1% of the overall measurement period, in this case 10 min during day, evening and night time periods.
L_{AF10} (dB) is the statistical index which describes the sound pressure level which was exceeded for 10% of the overall measurement period, in this case 10 min during, evening and night time periods.
L_{AF90} (dB) is the statistical index which describes the sound pressure level which was exceeded for 90% of the overall measurement period, in this case 10 min during day, evening and night time periods. L_{A90} is also referred to as background or residual noise.
L_{AFmin} (dB) is the minimum sound pressure level measured during the measurement period.
L_{AFmax} (dB) is the maximum sound pressure level measured during the measurement period.

UNDERSTANDING THE APPLICABLE CRITERIA

Environmental Protection (Noise) Regulations 1997 (as amended)

All environmental noise emissions must demonstrate compliance with Regulation 7 of the *Environmental Protection (Noise) Regulations 1997 (as amended)* represents the applicable legislation governing environmental noise emissions which may be introduced when a new building or development is constructed. The legislation seeks to regulate noise emission by the prescription of noise limits deemed "allowable" and applied at an identified nearest Noise Sensitive Receiver (NSR).

To calculate the applicable limits, two concentric circles with radii of 100m and 450m are superimposed around an identified NSR and the type of land use contained within the circles is identified. Annual Average Weekday Traffic (AAWT) volume is also accounted for to arrive at a set of Assigned Noise Level (ANL) limits applicable to the receiver, when subject to noise emissions.

Noise Source Character

In addition to the ANL limits, particular noise sources attract additional punitive dB levies based upon the noise source characteristics. *Regulation 7* prescribes that the noise character must be "free" of annoying characteristics - specifically:

(i) tonality (e.g. whining, droning)
(ii) modulation (e.g. cyclical change in character, such as a siren)
(iii) impulsiveness (e.g. banging, thumping)

Penalties apply up to a maximum of +15dB, for tonality (+5dB), modulation (+5dB) and impulsiveness (+10dB), where the noise source is NOT music.

Identification of the Nearest Noise Sensitive Receiver (NSR)

To assess likely noise impacts, the nearest NSR must be identified - *Schedule 1 Part C,* of the *Regulations* prescribes the applicable definitions of noise sensitive premises. Demonstrating compliance with the *Regulations* at these locations implies the logic that any receiver(s) further away from the source will also comply.

The nearest NSR has been identified as an existing residential property at 12 Lorne Bend, located approximately 60 metres east of the proposed Dan Murphy's development site.

Application of Assigned Noise Level Limits

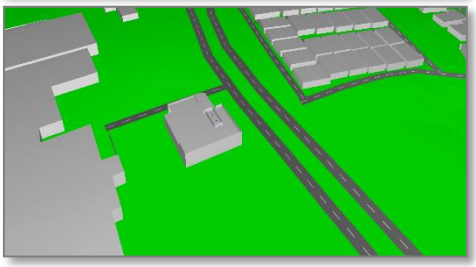
Under the prescribed calculation methodology, the Influencing Factor (IF) has been calculated at **+4**, determined by the presence of commercial land and the proximity of a "Secondary" road with 100m of the NSR, Warnbro Sound Avenue, with a traffic flow of 8,500 vehicles per day (AAWT). The limits presented below represent the objective noise target which must not be exceeded in order to comply with the applicable *Regulations*.

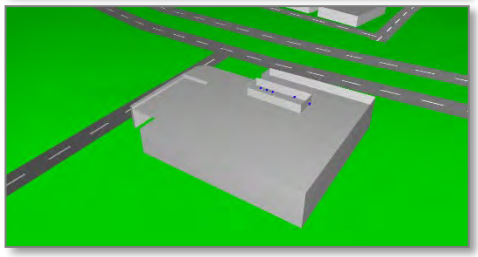
Land Use has been calculated using a combination of site observation, geospatial data recognition and planning mapping to determine land area(s) of particular defined uses. Land use mapping, percentage area details and all calculation inputs are presented in Technical Appendices accompanying this report.

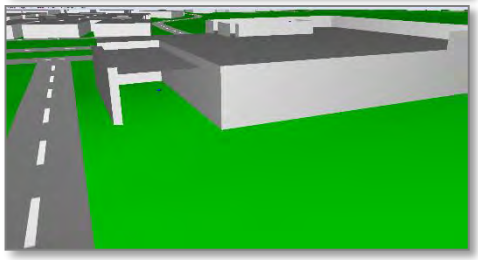
The Table below presents the ANL limits for noise emissions, applicable to the nearest NSR identified as 12 Lorne Bend approximately 60m east of the proposed Dan Murphy's liquor retail outlet.

Part of Premises Receiving Noise	Time of Day	Assigned Level (dB)		
		L_{A10}	L_{A1}	L_{AMAX}
Noise sensitive premises at locations within 15m of a building directly associated with a noise sensitive use	0700 to 1900 hours Monday to Saturday	**49**	**59**	**69**
	0900 to 1900 hours Sundays and public holidays	**44**	**54**	**69**
	1900 to 2200 hours all days	**44**	**54**	**59**
	2200 hours on any day to 0700 hours Monday to Saturday and 0900 hours Sunday and public holidays	**39**	**49**	**59**
Noise sensitive premises at locations further than 15m of a building directly associated with a noise sensitive use	All hours	**60**	**75**	**80**
Commercial premises	All hours	**60**	**75**	**80**
Industrial and Utility premises	All hours	**65**	**80**	**90**

PREDICTED NOISE MODELLING







Notwithstanding recorded noise levels, all noise emission sources anticipated as part of the development must be demonstrated to comply with the calculated Assigned Noise Level (ANL) limits as prescribed under the *Regulations* for individual and cumulative noise source(s).

Observations and environmental noise measurements provide an objective image of the overall site, though measurements alone are inevitably influenced by local noise factors, (particularly during the daytime and evening periods), hence noise emissions predictions have been matched to the local environment to demonstrate full compliance with the *Regulations*.

A detailed 3D noise model was constructed using the industry-leading Cadna A® noise modelling platform, allowing a robust assessment of noise emissions from the identified noise sources, consisting of mechanical and refrigeration plant items, and loading dock operations only, **WITHOUT** road traffic or extraneous noise source contributions. The modelled environment is constructed using the following elements:

- Geospatial landform data,
- Acoustically-relevant barriers, louvers and buildings which will affect noise at the nearest NSR location; And,
- The location and representative sound power level data for each anticipated noise source

The imagery right shows sequential steps in the creation of the modelled environment. The resultant scenario allows a comparison of real world noise levels with predicted noise emissions from the development, and a communicative visual output demonstrating the output results. The approach also offers a unique opportunity to identify the primary contributor(s) and focus noise attenuation treatment if and where required.

- Acoustically-relevant barriers, louvers and buildings which will affect noise at the nearest NSR locations; And,
- The locations of noise sources, reference sound power level data for each item;

The imagery right shows sequential steps in the creation of the modelled environment. The resultant scenario offers a comparison of real world noise levels with predicted noise emissions from the development, and a communicative visual output demonstrating the output results. The approach also offers a unique opportunity to identify the primary contributor(s) and focus noise attenuation treatment if and where required.

Cumulative Building Services Noise Emission

The constructed noise model contains all identified noise sources in operation, providing a cumulative calculation for predicted noise levels at the nearest NSR location.

The output below depicts noise emissions as colour contours – the effects of building shadowing, screening and subsequent noise barrier effects of local buildings can also be clearly observed.

The result is the predicted noise level at the nearest NSR location from the identified noise sources only. A comparison against the ANL limits will demonstrate compliance (or otherwise) with the *Regulations.*

ANTICIPATED SOURCES OF NOISE EMISSIONS

Anticipated sources of noise emission from the expansion project are as follows:

- Delivery trucks / loading dock operations
- Roof mounted mechanical air handling units (condenser banks)
- Refrigeration plant equipment

At this stage of development design, details regarding proposed mechanical and refrigeration plant are not yet available. We have used known equipment selection and roof layouts from a previous project where a similar sized Dan Murphy's liquor retail outlet was assessed. These details are assumed to be representative of the likely proposed selections at Dan Murphy's Secret Harbour:

- Temperzone OPA 960 Packaged AHU
- 3 x Kirby Titan PPH 153 MH A1-2 Refrigeration Units

REGULATORY LIMITS AND COMPLIANCE ADVICE

ROOF MOUNTED MECHANICAL & REFRIGERATION EQUIPMENT

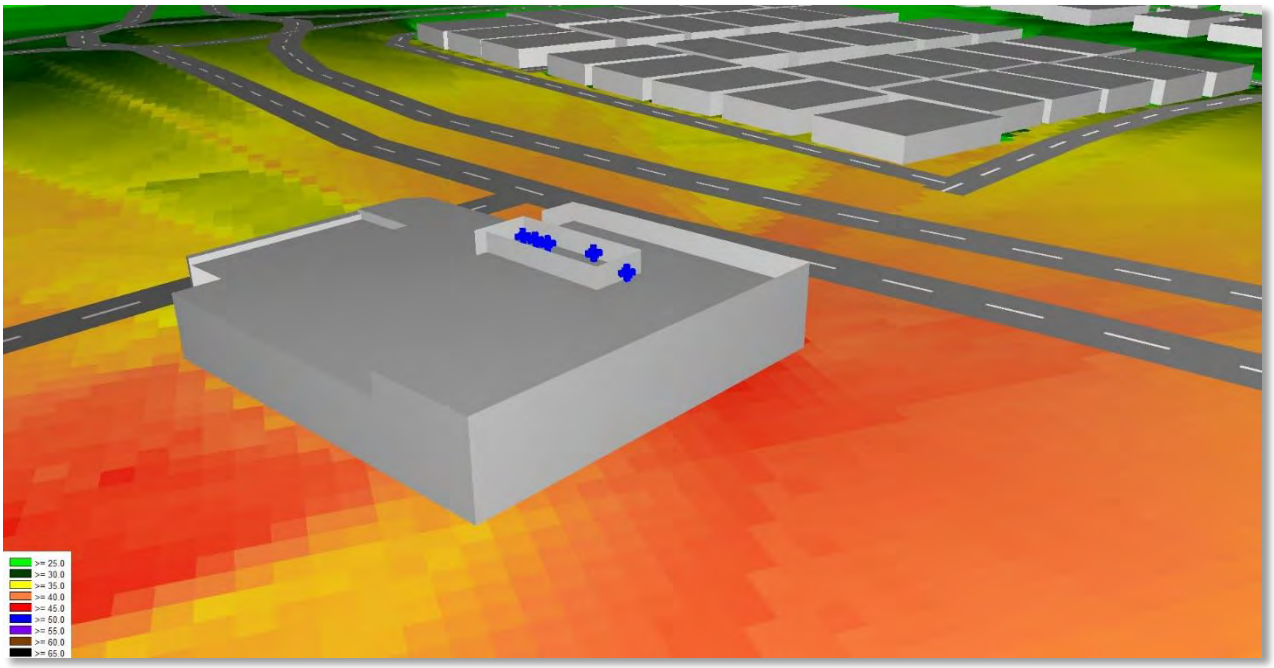
Mechanical air handling units and refrigeration plant equipment are shown on DA drawings to be located on the roof, and surrounded by a two metre high enclosure (assumed open top). The following octave band sound power level (SWL) data has been used in our assessment:

Equipment Details	Octave Band Centre Frequency (Hz)								SWL (dB(A))
Roof mounted noise sources	**63**	**125**	**250**	**500**	**1kHz**	**2kHz**	**4kHz**	**8kHz**	
Temperzone OPA 960 Packaged AHU – Supply Air Outlet	88.5	83.0	71.5	68.0	65.5	63.0	58.0	53.5	73.0
Temperzone OPA 960 Packaged AHU – Radiated	78.0	78.0	77.0	80.0	81.0	79.0	77.0	75.0	86.0
Kirby Titan PPH 153 MH A1-2 Refrigeration Units	85.0	83.0	83.0	75.0	73.0	72.0	70.0	67.0	80.0

Noise modelling has been undertaken without any contribution from delivery trucks and loading dock operations to ascertain the impact of mechanical plant items in isolation. The resultant model (see Figure 02 in Technical Appendices) shown below indicates a predicted noise level at the nearest NSR of L_{A10} 38 dB, which is compliant with the ANL limits at all times, including the most stringent night time ANL limits, calculated at L_{A10} 39 dB. These limits apply during the following periods:

- 2200 – 0700 hours Monday to Saturday
- 2200 – 0900 hours Sundays & Public Holidays

The existing measured ambient L_{A10} noise levels during these periods, statistically averaged at 52.0 dB, implies that emissions from roof mounted mechanical and refrigeration plant equipment will barely contribute to the overall noise level at the nearest NSR.



LOADING DOCK OPERATIONS

Due to the potential for incidental high sound power (SWL) level activities to occur during deliveries, from trucks and associated equipment, loading dock operations have the potential to exceed the prescribed ANL limits at the nearest NSR. Noise emission contributions are anticipated from delivery truck engines, reversing safety alarms, refrigeration equipment, engine idling whilst unloading, and unloading noise from pallets etc.

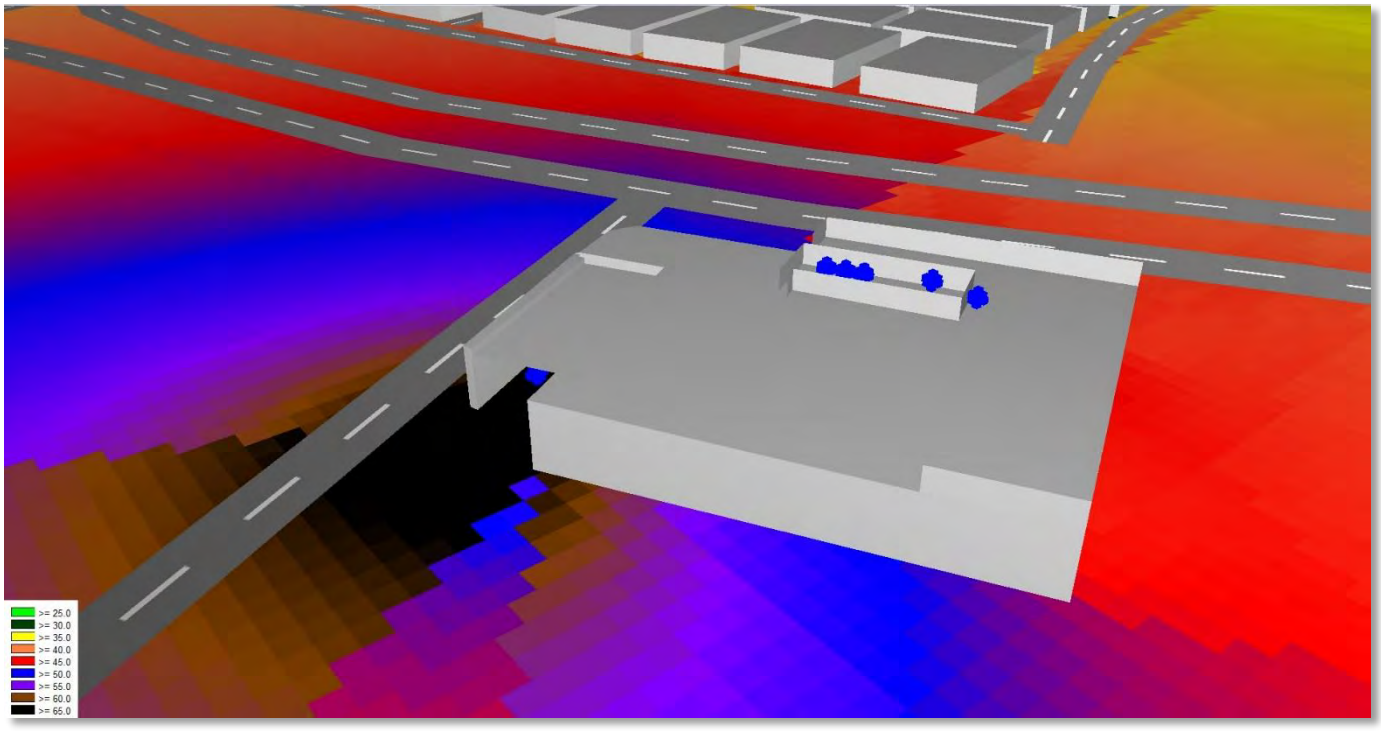
Representative sound power levels (SWL) (expressed here as A-weighted values) and associated noise spectra were attributed to each activity and summed cumulatively to develop a worst case assessment of unloading dock activity.

Time periods for each activity were also ascertained from similar projects, in terms of a single unloading operation, taken to be 30 minutes for one operation. Timings have been considered as part of our compliance assessment, as follows:

Activity	SWL (dB(A))	Anticipated Time Period
Truck engine noise idling/low revs	98	30 minutes (ON)
Safety reversing alarms (80dB(A) @2m)	94	1 min (ON)
Truck-mounted refrigeration equipment	95	30 minutes (ON)
Unloading pallet noise	95	25 minutes (ACTIVE)

Our modelling of loading dock operations at the proposed development has been based on the following:

- A single delivery truck stationary in loading dock
- All delivery truck/operations sources specified in the table above switched on
- Absorptive lining applied to loading dock barrier wall and roof
- All roof mounted mechanical and refrigeration plant associated with the operation of Dan Murphy's is also switched on



The resultant model (see Figure 01 in Technical Appendices) shown above indicates a predicted noise level at the nearest NSR of L_{A10} 43 dB.

The model does not account for the noise emissions resulting from delivery truck manoeuvring in and out of the loading dock. Consequently, actual noise levels may temporarily be higher than modelled results indicate. It should be noted that whilst on connecting public roads, noise emissions are attributable to road traffic noise and hence are not assessable under ANL limits.

These results indicate that based on the assumptions made in the current model, deliveries and associated loading dock operations are predicted to be compliant with the relevant ANL limits during the following periods:

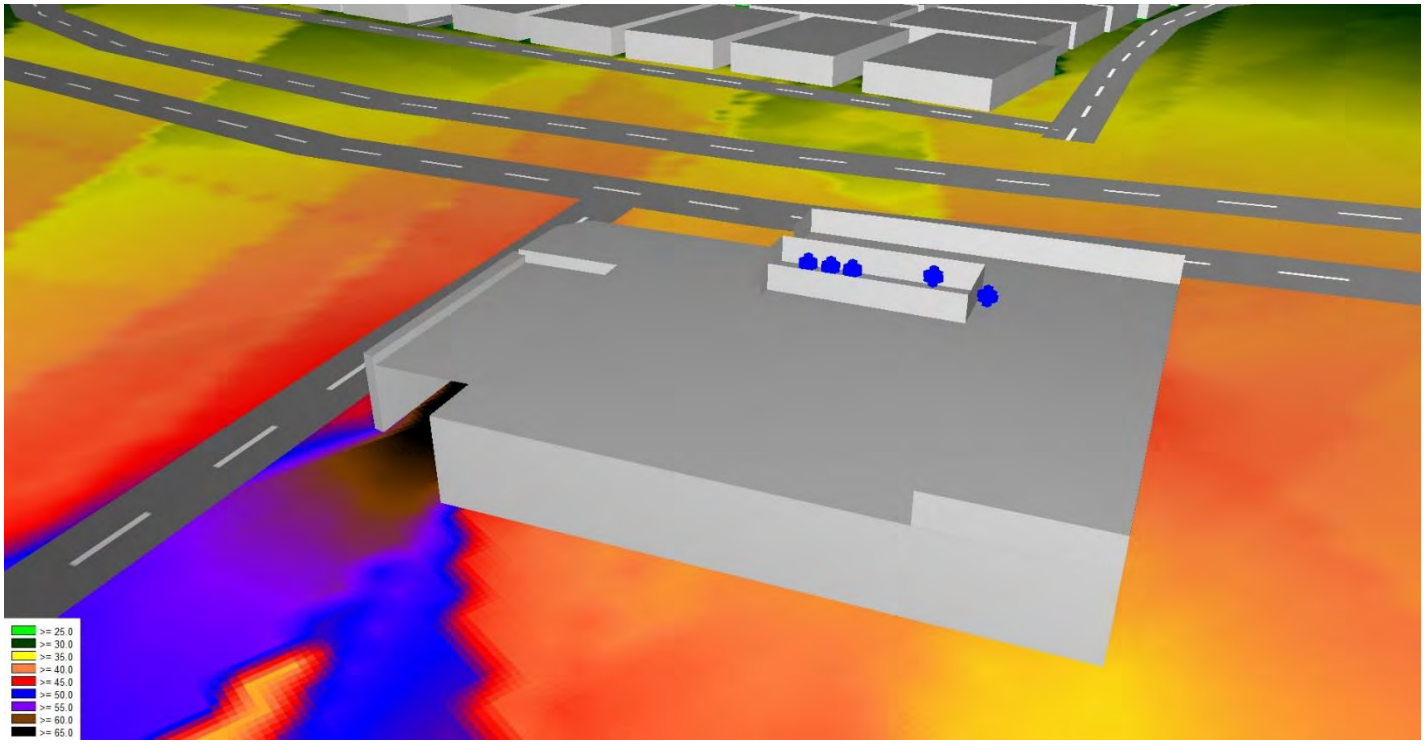
- 0700 – 2200 hours Monday to Saturday
- 0900 – 2200 hours Sundays & Public Holidays

Lower noise emissions are able to be demonstrated using alternative models, which investigate the following parameters, and their effect of noise emissions levels at the nearest NSR:

- Delivery truck sources (engine idle and refrigeration unit) switched off on arrival
- SWL data used for delivery truck sources and unloading operations
- Extension of loading dock screening wall

An example model is presented below, which considers noise from the following sources:

- Roof mounted mechanical and refrigeration plant
- Unloading delivery truck (all other associated truck sources switched off)



The resultant model (see Figure 03 in Technical Appendices) indicates a predicted noise level at the nearest NSR of L_{A10} 38 dB, which complies with the most stringent night time ANL limits, calculated at L_{A10} 39 dB. The model does not account for the noise emissions resulting from delivery truck manoeuvring in and out of the loading dock, and consequently actual noise levels may be slightly higher than modelled results indicate.

Sealhurst recommend further assessment once more details are confirmed regarding delivery truck specifications and anticipated loading dock procedures.

DELIVERIES AND WASTE COLLECTION

Notwithstanding predicted compliance of loading dock operations outside of time periods associated with the most stringent ANL limits, on the basis of the existing acoustic climate profile documented herein, Sealhurst recommend that deliveries/waste collection be scheduled to occur during daytime hours (0700 – 1900) to coincide with periods where the Regulatory ANL limits of L_{A10} 49dB are at their least stringent. Measured ambient noise levels during day time hours of L_{A10} 55-65 dB will also assist in limiting potential perception of "intrusiveness" to local residents.

Sealhurst understand that waste (typically cardboard products) is generally removed by the same trucks responsible for deliveries, directly following unloading activities. Refuse collection is exempt from Regulatory compliance, however scheduling to run with existing domestic waste removal may assist in minimising "intrusiveness" of additional noise sources outside of existing routines.

Deliveries and waste collection scheduling may be included in any future operational Noise Management Plan which may be required as the development matures to completion.

SAFETY WARNING DEVICES - REVERSING ALARMS

Heavy goods delivery vehicles are required to produce safety warning signals when reversing in commercial applications as a strategy to minimise human injury and increase vehicle movement safety, particularly in confined spaces.

Traditional "reverse beepers" add an unnecessary additional noise source, which is more likely to cause annoyance and potential complaint, particularly at more noise-sensitive times i.e. evening and night time periods.

Operationally, delivery trucks will not be screened by the barrier wall during reverse manoeuvres, and the cost, operational impact and limited acoustic efficacy of constructing an additional noise barrier to address this source is not recommended as a primary noise control strategy.

Sealhurst recommend reverse beepers be replaced with an alternative broadband sound alarm – the broadband sound is an effective alarm when close to the vehicle, and is subjectively less intrusive when received at a distance, at equivalent alarm loudness levels. The broadband sound has a bland and characterless sound quality, and if set at an appropriate level (relevant to loading dock activity noise and surrounding existing acoustic climate) should be effectively masked so as not to cause an intrusive noise problem.

ALTERNATIVES TO BROADBAND ALARMS

A growing body of literature[1] regards alternative safety devices and management principles exists which can be employed to avoid tonal reverse beeper alarm sound issues - as the issue is one of safety (with an acoustical annoyance outcome), by removing the reverse beeper alarm source in place of an alternative visual safety strategy, the problem can be removed.

Such strategies are employed in existing high noise scenarios, where audio warnings have limited value - for example high noise plant rooms, offshore installations etc. where noise levels of warning sirens/signals may not be overheard and/or could approach levels which would otherwise induce hearing damage in order to be heard.

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1 SAFE WORK AUSTRALIA - Draft guide Traffic Management: Construction Work;

ROADING NEW ZEALAND - Guideline for Controlling Reversing Vehicles DEC 2009;

Typically staff in such areas may already be wearing ear defenders, therefore the principle is able to be implemented where certain constraints apply.

The use of reversing cameras, visual alarms signals (e.g. specific vehicle reverse lights) and safety management techniques such as the use of spotters should be considered as part of the noise management strategy for the new development, if broadband alarms are not preferred.

24-HOUR OPERATIONS ASSESSMENT

24-hour operation requires all sources of noise emissions to be compliant with the most stringent ANL limits, which are applied to the following periods

- 2200 – 0700 hours Monday to Saturday
- 2200 – 0900 hours Sundays & Public Holidays

As shown in the modelled outputs, anticipated noise emissions from the proposed development (excluding delivery and unloading operations) have been shown to comply with the most stringent ANL limit of L_{A10} 39 dB during night time hours.

Equipment selections and associated sound power levels (SWL) used in our assessment produce noise emissions that are approaching non-compliance. If proposed selections have higher sound power levels than those specified here, alterations to the location and surrounding enclosure will likely be required to maintain compliance. Sealhurst recommend further assessment once final selections are made to ensure compliance with the Regulatory limits, and to assess selections for noise characteristics that may attract additional penalties.

Alternative models indicate that noise emissions from deliveries and loading dock operations can that theoretically meet night time ANL limits, providing that certain conditions of operations are met.

In the event that 24-hour trade is approved, Sealhurst recommend a more detailed assessment be undertaken to confirm specific operational requirements of the loading dock. Noise models more closely resembling the eventual procedures can then be constructed. A noise survey of loading dock operations at an existing Dan Murphy's liquor retail outlet may also assist in identifying representative noise levels, and associated sound power levels (SWL) that can be utilised as modelling inputs.

TECHNICAL APPENDICES

CALCULATION OF NOISE EMISSIONS LIMITS

Schedule 3 of the *Regulations* prescribes a specific calculation methodology to determine the applicable limits, referred to as the Assigned Noise Level (ANL) limits. An Assigned Noise Level is calculated for each identified noise sensitive receiver using a combination of environmental factors local to the receiver. A standard set of ANL's exist to provide a base level of acoustic amenity, as shown in the Table below. These levels are modified by an Influencing Factor (IF) to reflect noise sensitivity in the specific environment relative to the subject development.

The Influencing Factor (IF) accounts for site-specific circumstances surrounding the NSR(s), identified as part of the calculation process, and is formulated via a detailed appraisal of the percentage Commercial "C" and Industrial "I" land. To calculate the additional Influencing Factor (IF), two concentric circles are drawn around the nearest noise-sensitive reception point; one at 450m radius and one at 100m radius. Percentages are calculated for the amount of land area within the circles used for noise emitting purposes (e.g. industrial or commercial uses) and compared to the total area encompassed by the concentric circles.

A Transport Factor (TF) is also calculated to account for volume of road traffic in (AAWT) within these two zones. The combined calculation attempts to provide a site-specific and practical relevance to noise emissions for each new development, allowing for existing noise sources.

Part of Premises Receiving Noise	Time of Day	Assigned Level (dB)		
		L_{A10}	L_{A1}	L_{AMAX}
Noise sensitive premises at locations within 15m of a building directly associated with a noise sensitive use	0700 to 1900 hours Monday to Saturday	45 + influencing factor	55 + influencing factor	65 + influencing factor
	0900 to 1900 hours Sundays and public holidays	40 + influencing factor	50 + influencing factor	65 + influencing factor
	1900 to 2200 hours all days	40 + influencing factor	50 + influencing factor	55 + influencing factor
	2200 hours on any day to 0700 hours Monday to Saturday and 0900 hours Sunday and public holidays	35 + influencing factor	45 + influencing factor	55 + influencing factor
Noise sensitive premises at locations further than 15m of a building directly associated with a noise sensitive use	All hours	60	75	80
Commercial premises	All hours	60	75	80
Industrial and Utility premises	All hours	65	80	90

CALCULATION OF INFLUENCING FACTOR (IF)

The Influencing Factor (IF) is calculated using the following equation:

$$\text{Influencing factor (IF)} = I + C + TF$$

Where;

I = (% of industrial land usage within 100m + % of industrial land usage within 450m) x 1 / 10

C = (% of commercial land usage within 100m + % of commercial land usage within 450m) x 1 / 20

TF = +6 if there is a "Major" road within 100m of the development
+2 if there is a "Major" road within 450 m of the development
+ 2 if there is a "Secondary" road within 100m of the development

The maximum value the transport factor (TF) can reach is 6;

A "Major" road is defined as having Annual Average Weekday Traffic (AAWT) flows in excess of 15,000 vehicle movements per day. A "Secondary" road is defined as having Annual Average Weekday Traffic (AAWT) flows in excess of 6,000 vehicle movements per day.

SURROUNDING LAND USE

Land use surrounding the nearest noise sensitive receiver (NSR) is primarily residential with the Secret Harbour Shopping Centre comprising most of the commercial area. Warnbro Sound Avenue passes through the INNER circle (100m radius), carrying 8,500 Annual Average Weekday Traffic (AAWT) movements, as defined by the most recent available figures from Main Roads WA Traffic Digest 2003-2009, which classifies it as a “Secondary” Road for the purposes of the calculation.

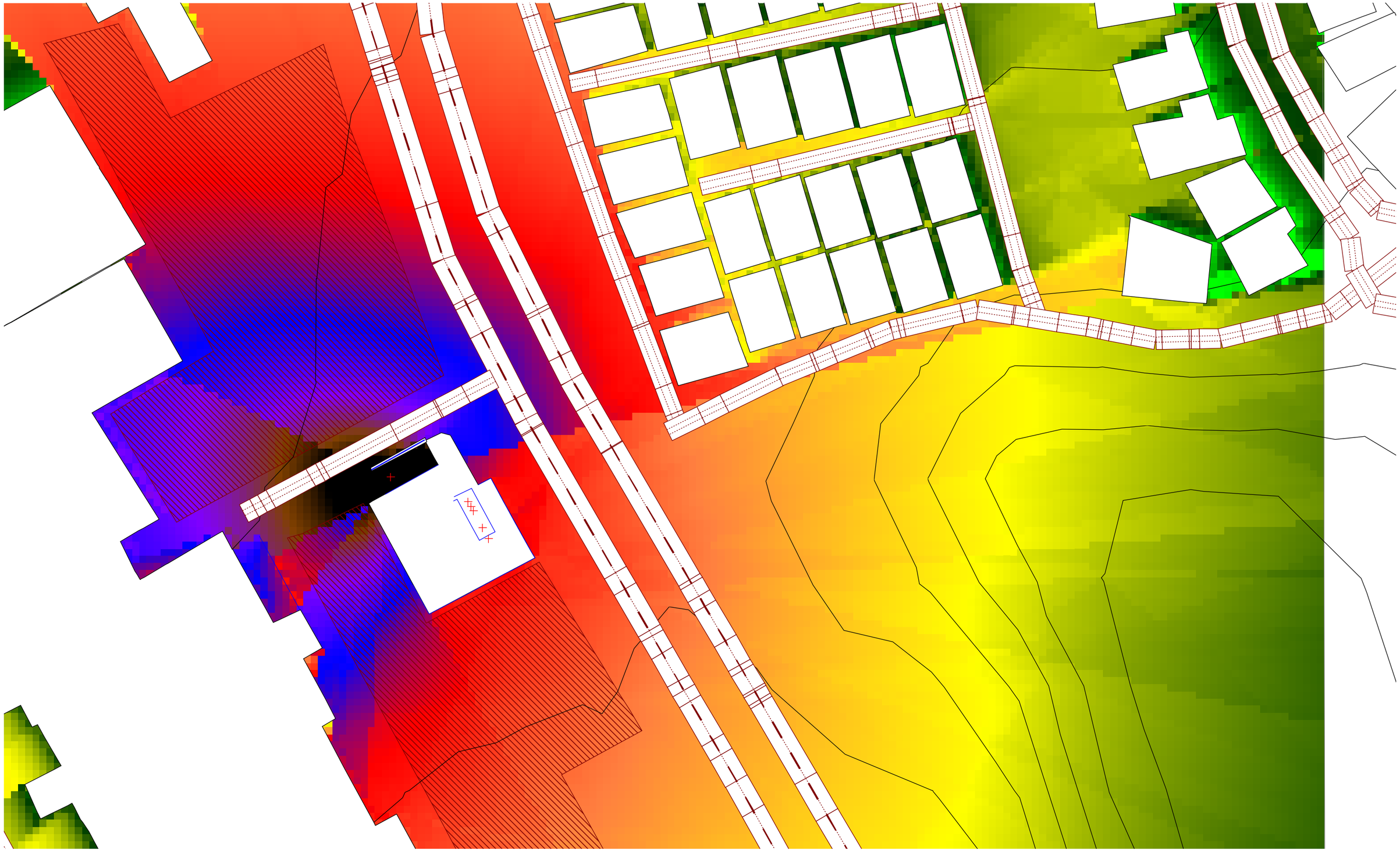
IDENTIFICATION OF LAND USE

CALCULATION VALUES

Land Use Type & IF Calculation					
Industrial Land Use					"I"
% Area in Inner Circle	0%				+0.00
% Area in Outer Circle	0%				
Commercial Land Use					"C"
% Area in Inner Circle	23%				+1.89
% Area in Outer Circle	15%				
Roads	**Location**	**Estimated vehicle Movements per day**	**Classification**	**Result**	"TF"
Warnbro Sound Avenue	Inner Circle	8,500	Secondary	+2	2
Source – Main Roads Traffic Digest 2003/2009					
INFLUENCING FACTOR					+3.89

The resultant IF therefore equals **4**, determining the applicable Assigned Noise Level limits at all times.

PREDICTED EMISSION NOISE MAPS



Noise Level dB (LA10)

- >= 25.0
- >= 30.0
- >= 35.0
- >= 40.0
- >= 45.0
- >= 50.0
- >= 55.0
- >= 60.0
- >= 65.0

- Point Source
- Road
- Parking Lot
- Building
- Barrier
- Contour Line
- Calculation Area

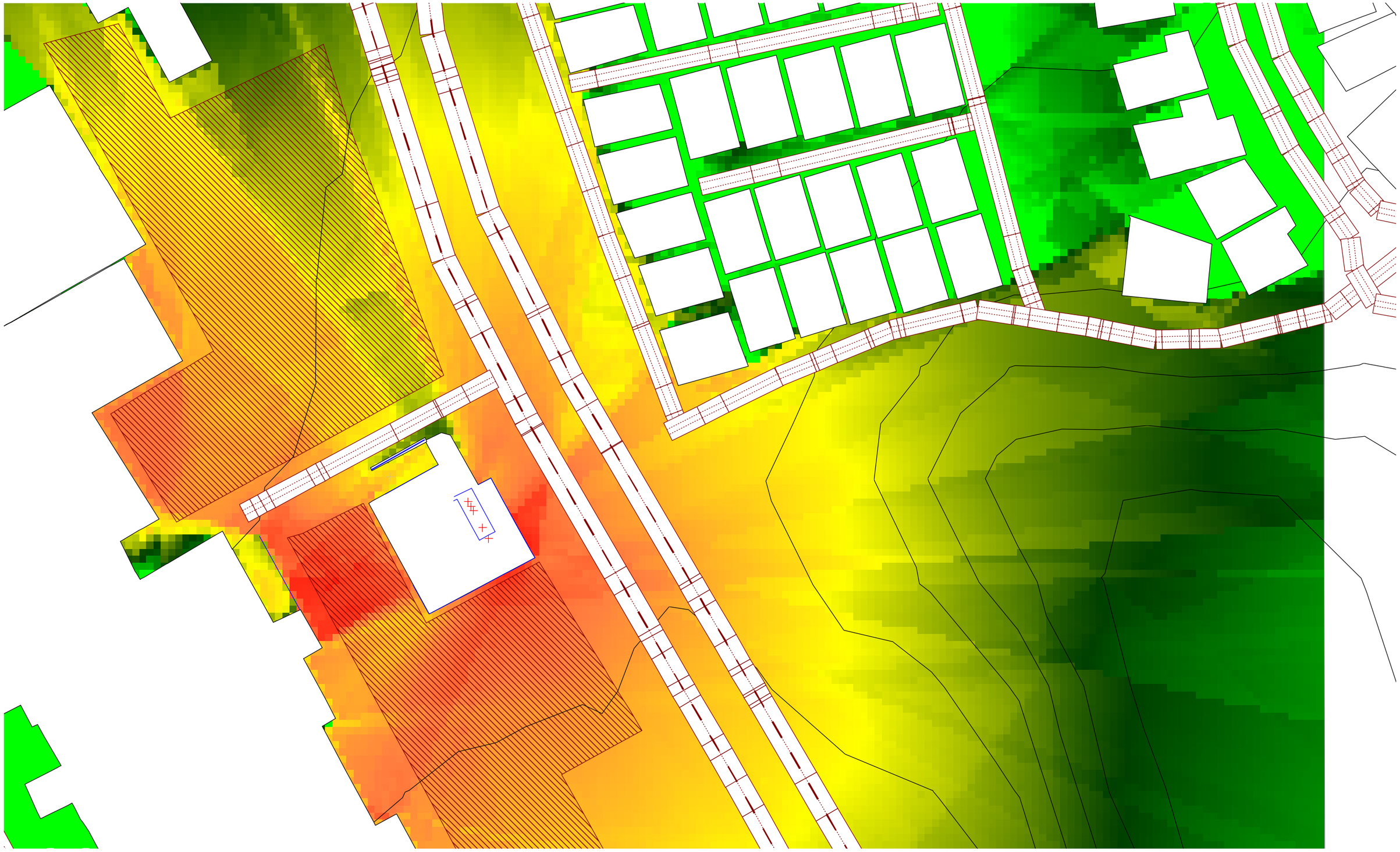
SCALE 1:1000

SEA-2014-041 : Dan Murphy's Liquor Retail Outlet - Secret Harbour
Noise Contour Plot - Cumulative Noise Emissions from Roof Mounted Mechanical/Refrigeration Plant and All Loading Dock Noise Souces

PROJECT ID: Dan Murphy's Liquor Retail Outlet - Secret Harbour
DRAWN BY: DM
LAST MODIFIED: 20.04.15

Rev. 0

Figure: 01



Noise Level dB (LA10)

>= 25.0
>= 30.0
>= 35.0
>= 40.0
>= 45.0
>= 50.0
>= 55.0
>= 60.0
>= 65.0

Point Source
Road
Parking Lot
Building
Barrier
Contour Line
Calculation Area

SCALE 1:1000

SEA-2014-041 : Dan Murphy's Liquor Retail Outlet - Secret Harbour
Noise Contour Plot - Cumulative Noise Emissions from Roof Mounted Mechanical/Refrigeration Plant ONLY

PROJECT ID: Dan Murphy's Liquor Retail Outlet - Secret Harbour
DRAWN BY: DM
LAST MODIFIED: 20.04.15

Rev. 0

Figure: 02

SCALE 1:1000

Noise Level dB (LA10)

- >= 25.0
- >= 30.0
- >= 35.0
- >= 40.0
- >= 45.0
- >= 50.0
- >= 55.0
- >= 60.0
- >= 65.0

- Point Source
- Road
- Parking Lot
- Building
- Barrier
- Contour Line
- Calculation Area

SEA-2014-041 : Dan Murphy's Liquor Retail Outlet - Secret Harbour
Noise Contour Plot - Cumulative Noise Emissions from Roof Mounted Mechanical/Refrigeration Plant and Unloading Noise ONLY

PROJECT ID: Dan Murphy's Liquor Retail Outlet - Secret Harbour
DRAWN BY: DM
LAST MODIFIED: 20.04.15

Rev. 0

Figure: 03

EQUIPMENT CALIBRATION CERTIFCATES

Certificate of Calibration

Certificate No.: 473692023

Object:	Sound Analyser Nor140
Supplier:	Norsonic AS
Type:	Nor140
Serial number:	1406036
Client:	Sealhurst Pty Ltd , Perth ,WEST AUSTRALIA

Calibration complies with the following standard(s)

IEC 61672-1:2002 class 1
IEC 60651 type 1
IEC 60804 type 1
IEC 61260 class 1
ANSI S1.4-1983 (R2001) with amd. S1.4A-1985 class 1
ANSI S1.43-1997 (R2002) class 1
ANSI S1.11-2004 class 1
DIN 45 657, Applicable parts
Norsonic production standard set for the Nor140

Instrumentation used for calibration traceable to:

Electrical Parameters: MT, Norway
Acoustical Parameters: PTB, Germany
Environmental Parameters: IKM, Norway. Justervesenet. Norway

Adjustments: None

Comments: None

Date of calibration:	**Calibration interval recommended**
2014-08-14	2 years

The environmental parameters applicable to this calibration are kept well within limits ensuring negligible deviation on obtained measurement results.

Calibrated by:

Sign.

Norsonic
P... 24, N-3420 LIERSKOGEN, NORWAY
TEL: +47 32 85 89 00

Norsonic AS, P.B 24, 3421 Lierskogen. Visitor address: Gunnersbråtan 2, Tranby, Norway.
Phone +47 32858900 Fax.: +47 32852208. email: info@norsonic.com

Norsonic

Certificate of Calibration

Certificate No.: CAL 022-2014-4735

NORWEGIAN ACCREDITATION CAL 022

Test object:	Sound Calibrator
Manufacturer:	Norsonic
Type:	1251
Serial no:	34172

Customer:

	Level	Level Stability	Frequency	Frequency Stability	Distortion
Measurement Results:	114,00 dB	0,05 dB	1000,34 Hz	0,00 %	0,41 %
Expanded Uncertainty:	0.11 dB	0.02 dB	1.0 Hz	0.1 %	0.2 %

The stated level is relative to 20µPa.
The stated level is valid at reference conditions.The following correction factors have been applied during the measurement:
Pressure: 0,0005 dB/kPa Temperature: 0,000 dB/°C Relative humidity: 0,000 dB/%RH Load volume : 0,0003 dB/mm3
The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k, which for a t-distribution with the reported effective degree of freedom corresponds to coverage probability of approximately 95%. The standard uncertainty of measurement has been determined in accordance with EA publication EA-4/02.

Records: L:\PROJECTS\CALLAB\PROGRAM\Cal\2014\NOR1251_34172_M1.nmf

Environmental conditions:	Pressure:	Temperature:	Relative humidity:
Reference conditions:	101,325 kPa	23,0 °C	50 %RH
Measurement conditions:	97,030 ± 0,010 kPa	23,8 ± 0,2 °C	48,1 ± 1,0 %RH

Date received for calibration:
Date of calibration: 2014-08-13
Date of issue: 2014-08-13
Engineer Terje Hansen
Supervisor

Terje Hansen

Preconditioning
The equipment was preconditioned for more than 12 hours at the specified calibration temperature and humidity.

Calibration and verification performed
The performed tests refer to the sections 5.2, 5.3 and 5.5 in IEC 60942 (1997-11): Electro-acoustics - Sound Calibrators. The calibrator has been tested as described in Annex B of the same standard described in the sections B.3.3 for the sound level, B.3.4 for Sound pressure level stability - short-term fluctuations, B.3.5 for frequency and in B.3.6 for total distortion.

Method of Calibration
A detailed description of the calibration procedure is available separately from the calibration laboratory.

Instruments and Program
A complete list of instruments, hardware and software, that has been used for this calibration is separately available from the calibration laboratory.

Traceability
The measured values are traceable to the following laboratories:
Sound Pressure Level: PTB, Germany
Voltage: IKM Laboratorium Norway
Frequency: IKM Laboratorium Norway
Ambient Pressure: Justervesenet, Norway
Temperature: Justervesenet, Norway
Relative Humidity: Justervesenet, Norway

Statement of Conformity
The tested Sound Calibrator has shown to conform with the requirements for periodic tests as described in IEC 60942 (1997-11) Annex B. All required tests have been performed and have demonstrated measurement values, extended by the uncertainty of the measurements, to be within the required range for a Class 1 sound calibrator.

Street address: Gunnersbråtan 2, N-3421 Tranby, Norway
Tel.: +47 32858900 Fax.: +47 32852208 email: ncl@norsonic.com

ROWEGROUP

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Northbridge 6003
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p: 08 9221 1991
f: 08 9221 1919
info@rowegroup.com.au
rowegroup.com.au

Job Ref: 8289
26 June 2015

Chief Executive Officer
City of Rockingham
PO Box 2142
ROCKINGHAM DC WA 6967

Attention: Mr Greg Delahunty – Senior Planning Officer

Dear Sir

Proposed Shop (Dan Murphy's Liquor Store)
Lot 2010 (No. 19) Oasis Drive, Lot 2003 (No. 420) Secret Harbour Boulevard and Lot 2013 (No. 2) Oneida Road, Secret Harbour

Rowe Group acts on behalf of Perpetual Ltd, the landowner of Lot 2010 (No. 19) Oasis Drive, Lot 2003 (No. 420) Secret Harbour Boulevard and Lot 2013 (No. 2) Oneida Road, Secret Harbour ('the subject site'). We write in relation to the Development Application for a proposed 'Shop' (Dan Murphy's Liquor Store) at the subject site and the City's letter dated 15 May 2015 which request additional information pursuant to Regulation 11A of the *Planning and Development (Development Assessment Panels) Regulations 2011*.

As requested in the 15 May 2015 letter, we provide the following:

1. A floor plan showing the Net Lettable Area ('NLA') of the proposed development;
2. Information pertaining to a two week long parking survey carried out by KCTT; and
3. Further justification relating to City of Rockingham Local Planning Policy No. 3.3.19 – Licensed Premises.

Net Lettable Area

The floor plan has been amended to reflect the following definition of NLA floorspace under the City of Rockingham Town Planning Scheme No. 2 ('TPS 2'):

> *means the area of all floors within the internal finished surfaces of permanent walls but excludes the following areas:*

a) *all stairs, toilets, cleaners cupboards, lift shafts and motor rooms, escalators, tea rooms and plant rooms, and other service areas;*

b) *lobbies between lifts facing other lifts serving the same floor;*

c) *areas set aside as public space or thoroughfares and not for the exclusive use of occupiers of the floor or building;*

d) *areas set aside for the provision of facilities or services to the floor or building where such facilities are not for the exclusive use of occupiers of the floor or building.*

The floor plan shows a total NLA floorspace of 1,054m^2. Please refer Attachment One – Floor Plan.

Car Parking

As requested by the City in the 15 May letter, KCTT has undertaken a two week parking survey of the Kwinana Marketplace Dan Murphy's Liquor Store.

Please refer Attachment Two – Traffic Engineering Report.

A series of parking surveys were conducted by KCTT to ascertain the current usage of the parking spaces available on the site for the Kwinana Marketplace Dan Murphy's Liquor Store.

The survey was conducted by KCTT, who were stationed near the access / egress points of the shopping centre, and recorded the following information:

- Vehicle Movements through the Dan Murphy's Car park (in 10-minute blocks);
- Carpark Utilisation Ratio (expressed as a percentage of bays used / unused);
- Number of Vehicles Parked (at 10-minute Intervals);
- Number of Pedestrians Witnessed Walking To / From Dan Murphy's Car park; and
- Average Vehicle Dwell Time.

Based on the Traffic Engineering Report the Kwinana Marketplace Dan Murphy's Liquor Store has an average utilisation rate of 50.9%. When the average utilisation rate is applied to the proposed Dan Murphy's Liquor Store at the subject site, the development requires the provision of approximately 25 bays, which is generally in accordance with the number of parking bays proposed.

City of Rockingham Local Planning Policy No. 3.3.19 – Licensed Premises

The City of Rockingham Local Planning Policy No. 3.3.19 – Licensed Premises ('LPP 3.3.19') applies to all applications for planning approval for a land use associated with the sale of liquor. Therefore the provisions of LPP 3.3.19 apply in this instance. We provide the following assessment of the proposed development against the assessment criteria contained under Clause 4.1.3 of LPP 3.3.19. The following section provides sufficient justification below each relevant provision of Clause 4.1.3 of LPP 3.3.19.

a) *Location: Applications will generally not be supported if the proposal is likely to have a significant potential impact upon the amenity of an area or affected neighbouring properties. A significant potential impact includes circumstances in which if the application were granted:*

   i. *undue offence, annoyance, disturbance or inconvenience to persons who reside or work in the vicinity, or to persons in or travelling to or from an existing or proposed place of public worship, hospital, child care premises or school, would be likely to occur; or*

   ii. *the amenity, quiet or good order of the locality in which the premises or the proposed premises are, or are to be, situated would in some other manner be lessened.*

   iii. *licensed premises should generally have an active street front.*

The proposed liquor store falls under the definition of 'Shop' under TPS 2. A' Shop' use is classified as a 'D' (discretionary) use within the 'District Town Centre' zone under TPS 2. Furthermore, Section 6.3 of the Secret Harbour Town Centre Policy nominates 'Retail' uses as a preferred use at the subject site. A liquor store is clearly a 'Retail' use and should be supported.

It is important to note that there will be no consumption of alcohol on-site. The proposed Dan Murphy's will sell packaged alcohol by retail, therefore according with the definition of 'Shop' as contained in TPS 2.

In addition, a liquor store is a use that is commonly found within District Centres throughout the Perth Metropolitan Region. Therefore the proposed location of a liquor store as part of the Secret Harbour Shopping Centre (a District Centre under State Planning Policy No. 4.2 – Activity Centres for Perth and Peel) in appropriate in this instance.

It should also be noted that the proposed development forms part of a designated District Centre, there will be minimal impacts on the amenity of the locality.

b) *Number of Patrons: Premises are restricted to maximum patron numbers under the Health (Public Building) Regulations 1992, and those numbers are to be complied with at all times.*

As the proposed development will offer the sale of packaged alcohol to be consumed off-site, a limit on the number of patrons is not necessary in this instance. Clause 4.1.3(b) of LPP 3.3.19 is more appropriate for uses which allow for the consumption of alcohol on-site (such as tavern, restaurant, small bar, etc.). Therefore Clause 4.1.3(b) of LPP 3.3.19 is not applicable to this application.

d) *Noise: To address noise impacts from a proposed licensed premises, the City may require that an applicant submit a noise report, prepared by a suitably qualified acoustic consultant (as determined by the City), in order to ensure that the noise emanating from the licensed premises is not excessive and indicating the likely noise nuisance and what sound attenuation measures are needed.*

Clause 4.1.3(d) of LPP 3.3.19 was addressed as part of a detailed Operational Noise Emissions Assessment was provided as part of the Development Application accepted by the City on 14 May 2015. Based on the information contained within the Operational Noise Emissions Assessment the proposed development is consistent with the acceptable noise levels.

Notwithstanding the above, noise (in the context of LPP 3.3.19) is more of an issue associated with those uses which allow for the consumption of alcohol on-site (such as tavern, restaurant, small bar, etc.) rather than a liquor store.

e) *Harm Minimisation: The applicant will be required to demonstrate that the principles of harm minimisation have been addressed by the lodgement of a House Management Policy, Code of Conduct and Management Plan in accordance with the Director of Liquor Licensing Guidelines.*

The operation of the proposed liquor store will be consistent with the Department of Racing, Gaming & Liquor Harm Minimisation Policy ('Harm Minimisation Policy'). The requirements of the Harm Minimisation Policy will be addressed when applying for a liquor license under the *Liquor Control Act 1988.*

f) *Consultation: Where the Manager, Statutory Planning considers that an Application for Planning Approval for a 'Licensed Premises' is likely to have a significant potential impact upon the amenity of an area or affected neighbouring properties, the application will be the subject of a process of community consultation in accordance with clause 6.3.3 of TPS2 and Planning Procedure No. 1.3 - Community Consultation.*

The proposed development is supported by an Operational Noise Emissions Assessment which states that the proposed development is consistent with the acceptable noise levels. Furthermore and as previously stated, the proposed development of a liquor store ('Shop') is a use that is commonly found within District Centres throughout the Perth Metropolitan Region and is listed as a 'D' use in the District Town Centre' zone. Therefore the use is appropriate for the subject site. On this basis the proposed development will result in minimal impacts on the amenity of the locality. For these reasons we believe that public consultation is not required in this instance.

On the basis of the above, the proposed development is consistent with the provisions of LPP 3.3.19.

Summary

In summary of the above, we have provided the following:

1. Amended architectural drawings showing the Net Lettable Area ('NLA') of the proposed development as 1,054m^2;

2. A Traffic Engineering Report has been prepared by KCTT which demonstrates that the proposed development has a parking demand of 25 bays. Therefore the proposed development should be supported; and
3. The proposed development is consistent with the relevant provisions of LPP 3.3.19 as detailed above.

Should you require any further information or clarification in relation to this matter, please contact Paul Cunningham or the undersigned on 9221 1991.

Yours faithfully,

Nathan Stewart
Rowe Group

WARNBRO SOUND AVENUE

council pedestrian path

landscaping plantings to be consistent with the selection propsed for the shopping centre development

title boundary

331° 36' 15"
15.75 m

151° 36' 15"
26.30 m

60° 11' 14"
163.07 m

149° 18' 47"
122.32 m

title boundary

existing entry / exit

Uni sex access

Uni sex access

tea room & amenities 39m²

plant room 13m²

coolroom 101m²

storage 163m²

secure storage / service 16m²

RL 8.100

RL 6.835

selling floor
913m²

RL 8.100

NLA - 1054m²

landscaping plan not part of this application. Previously submitted as part of overall centre.

RL 6.995

pad site boundary

general office 40m²

safe store

office

ice cabinet

RL 7.595

feature timber columns

canopy above shown dashed

RL 8.100

RL 7.950

DAN MURPHY'S TROLLEY BAY

3x bike racks

5810 | 2800 ice cabinet | 2785 | 7640 shofront glazing | 16285

2280 boundary offset | 8200 loading dock | 9255 admin. & misc. | 25975 selling floor

8190 loading dock | 1600 fall | 1600 fall (loading) 1:100 | 400 drain | 2985 admin & misc | 6000 ramp | 2100 ramp | 1750 | 500 | 4900 car space | 6600 aisle

1100 ramp | 1650 | 5500 car space | 6600 aisle | 8590 coolroom | 2220 boundary offset | 25695 selling floor

Site Analysis

NLA excludes the following areas:
(a) all stairs, toilets, cleaners cupboards, lift shafts and motor rooms, escalators, tea rooms and plant rooms, and other service areas;
(b) lobbies between lifts facing other lifts serving the same floor;
(c) areas set aside as public space or thoroughfares and not for the exclusive use of occupiers of the floor or building;
(d) areas set aside for the provision of facilities or services to the floor or building where such facilities are not for the exclusive use of occupiers of the floor or building.

Areas excluded : 191m2
(Tea room, amenities, services areas and plant room)

GLA : 1245m2
Selling Floor : 913m2
NLA includes Selling floor, cool room & general office only: 1054m2

D.A. ISSUE

no.	date	ISSUE / revision	by
A	19.02.15	REVISED DA SUBMISSION	RM
B	24.04.15	REVISED DA SUBMISSION	TC
C	19.05.15	REVISED DA SUBMISSION	RM

client: Charter Hall

project - address: Dan Murphys Secret Harbour
420 Secret Harbour Blvd,
Secret Harbour, W.A 6173

drawing title: **PROPOSED GROUND FLOOR PLAN**

job no.: 2013-074

drawing no.: **DA03**

issue: C

scale @ A2: 1:200

drawn: RN / AF

MELBOURNE
SYDNEY
PERTH

1800 422 533

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21/05/2015 9:50:02 AM

ROWEGROUP

Attachment One

Floor Plan

WARNBRO SOUND AVENUE

331° 36' 15"
15.75 m
existing
entry /
exit

60° 11' 14"
163.07 m

151° 36' 15"
26.30 m

149° 18' 47"
122.32 m

DM004 4

DM004 5

DM004 1

DM004 2

DM004 3

PROPOSED
DAN MURPHY'S

RL 8.100

NLA - 1054m²

1:100
fall

1:10
ramp

DAN MURPHY'S
TROLLEY BAY

tb

tb

tb

BOH

legend

subject to this
applicaton

D.A. ISSUE

no.	date	ISSUE / revision	by
A	18.05.15	REVISED DA SUBMISSION	RM
B	23.06.15	REVISED DA - Car allocation	TC

client: Charter Hall

project - address:
Dan Murphys Secret Harbour
420 Secret Harbour Boulevard,
Secret Harbour, W.A 6173

drawing title:
PROPOSED CAR PARK ALLOCATION

job no. 2013-074

drawing no. **DA10**

issue B

scale @ A2

drawn RM

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PERTH

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23/06/2015 12:13:09 PM

ROWEGROUP

Attachment Two

Traffic Engineering Report

TRAFFIC ENGINEERING REPORT

Dan Murphy's Carpark Survey,

Kwinana Marketplace

June 2015

Rev D

kctt

HISTORY AND STATUS OF THE DOCUMENT

Revision	Date issued	Reviewed by	Approved by	Date approved	Revision type
Rev A	10.06.2015	C Kleyweg	C Kleyweg	10.06.2015	Issued for Draft Review
Rev B	15.06.2015	C Kleyweg	C Kleyweg	15.06.2015	Issued for Discussion
Rev C	18.06.2015	C Kleyweg	C Kleyweg	18.06.2015	Issued for Discussion with City of Rockingham
Rev D	21.06.2015	C Kleyweg	C Kleyweg	21.06.2015	Issued for Discussion with City of Rockingham

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Revision	Date of issue	Quantity	Issued to
Rev A	10.06.2015	1 (PDF)	Kristie Spagnolo (APP Projects), Claire Lynch (APP Projects), Sean Fairfoul (Rowe Group), Paul Cunningham (Rowe Group)
Rev B	15.06.2015	1 (PDF)	Kristie Spagnolo (APP Projects), Claire Lynch (APP Projects), Sean Fairfoul (Rowe Group), Paul Cunningham (Rowe Group)
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File Name	M:\0 - KCTT (Aust)\Jobs\KC00258.000 Secret Harbour Shopping Centre TIA\Outgoing\Reports\150610 Traffic Survey Rev A\150621 Rev D\KC00258.000 R01 Dan Murphys Kwinana Parking Survey Rev D.docx
Author	Colin Kleyweg / Chris Clay
Project Manager	Colin Kleyweg
Name of the Project	Dan Murphy's Kwinana Parking Survey
Name of the Document	Dan Murphy's Kwinana Parking Survey Report Rev D
Document Version	KC00258.070_R01_Rev D

Prepared By: **KCTT (Trading as KC Traffic and Transport PTY LTD)**
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Website: www.kctt.com.au |

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Appendix 1 – Noise Diagram

KC00258.000_S40 Carparking Noise Diagram – Survey Thursday 28th May 2015
KC00258.000_S41 Carparking Noise Diagram – Survey Friday 29th May 2015
KC00258.000_S42 Carparking Noise Diagram – Survey Saturday 30th May 2015

1. Executive Summary

KCTT have completed detailed parking, vehicle movement and pedestrian movement surveys at the Dan Murphy's Kwinana Marketplace site. KCTT have confirmed the Selling Floor and Loading Space yields for the Kwinana Marketplace Store with Woolworths. The following points summarise our findings: -

- Under the City of Rockingham's Parking Requirements, the Dan Murphy's Kwinana Marketplace requires 56 dedicated bays.
- The average utilisation rate for parking varied between: -
    - 38.3% over the 3 surveyed hours on Thursday 28th of May 2015
    - 65.0% over the 3 surveyed hours on Friday 29th of May
    - 59.6% over the 3 surveyed hours on Saturday 30th of May 2015
    - 35.4% over the 3 surveyed hours on Thursday 4th of June 2015
    - 55.3% over the 3 surveyed hours on Friday 5th of June 2015
    - 51.7% over the 3 surveyed hours on Saturday 13th of June 2015
    - Or an average utilisation rate across the 18 surveyed hours of 50.9%
- Therefore, we believe generally the store requires 50.9% of the parking allocated, with the Friday 29th of May 2015 survey a good example of a "peak-peak" survey given it was the Friday before a long weekend.
- Each of the survey results from Thursday 28th of May 2015 to Saturday 30th of May 2015 were between 10% to 18% higher than results prior to, or on standard weekends.
- The highest volume of vehicles parked during the 18 hours of survey was 42, or a utilisation rate of 77.8% of the dedicated spaces on Friday 29th of May 2015.
- Pedestrian movement from external areas was sparse during all survey periods where less than 50% of the carpark was utilised. During this period we witnessed some vehicles moving through the parking area to park directly in front of the Dan Murphy's store as the distance between the entrance of the Dan Murphy's store and nearest entrance to the Kwinana Marketplace building is approximately 95 metres in a direct line, or approximately 150 metres via dedicated footpaths and pedestrian crossings.
- As carpark utilisation increased, the volume of pedestrians attracted from external to the parking spaces dedicated to Dan Murphy's increased with a commensurate decrease in vehicles being attracted from other locations within the carpark. Therefore we believe it is reasonable to allow for parking reciprocity.
- KCTT measured average dwell times over the six survey periods to gauge the behaviour of customers. The results showed: -
    - 5:33 average dwell time from a sample size of 32 vehicles on Thursday 28th of May 2015
    - 7:50 average dwell time from a sample size of 26 vehicles on Friday 29th of May 2015
    - 6:18 average dwell time from a sample size of 36 vehicles on Saturday 30th of May 2015
    - 5:17 average dwell time from a sample size of 39 vehicles on Thursday 4th of June 2015
    - 6:01 average dwell time from a sample size of 32 vehicles on Friday 5th of June 2015
    - 6:39 average dwell time from a sample size of 27 vehicle on Saturday 13th of June 2015

- Longer vehicle dwell times generally correlate with increased parking volumes. As shown however on Friday 29th of May 2015 the dwell times decreased during the peak utilisation rates, suggesting extra cashier positions were opened to deal with peak flows and generate faster throughput – therefore longer dwell times are not always correlated with higher volumes of parking.
- The parking utilisation rate varied between a low of 14.3% of all spaces utilised on Thursday 28th of May after 7:30pm to a high of 75.0% on two occasions on Friday 29th of May 2015 at 3:40pm and 4:10pm. During the peak periods noted this involved the highest volume of pedestrians walking between the Kwinana Marketplace and the Dan Murphy's Liquor Store, confirming our approach that 50% of reciprocity of parking is reasonable.
- The peak parking requirement for the Dan Murphy's did not coincide with late morning / early afternoon peaks for the wider Kwinana Marketplace on Saturday's.
- The peak parking requirement at Dan Murphy's Liquor Store was observed to be later on Saturday afternoons, generally between 3pm and 4pm, with peak parking requirements observed on Friday evenings between 3pm and 5pm. We therefore believe that because the peak attraction periods do not overlap exactly, there is also reasonable argument for reciprocity of parking between the shopping centre retail uses and the Dan Murphy's liquor store.
- Thursday evening peaks were smaller than those on Friday evening and Saturday afternoon.

In summary, we believe the surveys show that it is reasonable that KCTT have allowed for reciprocity of parking for the calculation of parking at the Secret Harbour Shopping Centre using a rate of 50% based on: -

i. The average parking utilisation across the 18 surveyed hours was 50.9% of the bays calculated as required.
ii. The survey included a peak period prior to a holiday long weekend which was greater than the peak exhibited on the following weekend, meaning the results are robust.
iii. The survey period is robust. 18 hours provides a substantial sample.
iv. The peak periods noted were short with no extension of dwell times. This is likely due to Dan Murphy's Liquor Store having sufficient staffing to counter for peak periods by opening additional cashiers. These staff can then go back to other tasks as the store customer numbers decrease.
v. During the peak periods, more customers were observed walking between Dan Murphy's and the Kwinana Marketplace entrance / i.e. trip blending.
vi. The peak periods for the Dan Murphy's Liquor Store and general peak attraction for retail shopping do not coincide. The general retail shopping peak on Saturday afternoon is earlier than the peaks for the Dan Murphy's store.

2. Introduction

2.1 Traffic Engineering Report Layout

KCTT have been requested to review the parking usage patterns at the existing Dan Murphy's store at the Kwinana Marketplace to determine the overall parking requirements for the proposed expansion of the existing Secret Harbour Shopping Centre.

Our agreed scope of work is as follows: -

- Review the number of parking bays available at the existing facility.
- Conduct a series of site surveys to determine the peak usage of the facility, including three 3 hour site surveys on:
    - Thursday 28th of May – 5pm to 8pm;
    - Friday 29th of May – 2pm to 5pm;
    - Saturday 30th of May – 2pm to 5pm;
    - Thursday 4th of June – 4pm to 7pm;
    - Friday 5th of June – 1pm to 4pm;
    - Saturday 13th of June – 1pm to 4pm.
- Provide graphics which highlight the usage of parking bays and the volumes of traffic utilising the site during the survey periods.
- Provide a report which examines the parking requirements of the site and comments on the reciprocity of parking based on the various land-uses.

2.2 Notes Pertaining To This Report

This report has been provided to review the existing parking requirements for the Dan Murphy's at Kwinana Marketplace, to confirm whether the parking rates proposed by KCTT in our report KC00258.000 Secret Harbour Shopping Centre TIA Rev E, dated 9th March 2015 are reasonable.

The following key points are relevant to the collection of data which has been undertaken for this project: -

- Parking surveys conducted at Kwinana Marketplace during the periods noted above in Section 1.1.
- Aerial imagery as available through commercial arrangements with Nearmaps.

The above information has been provided as a basis to substantiate our findings in this report.

3. Parking Analysis

3.1 Comparative Analysis of the Development Proposal vs Dan Murphy's Kwinana

This analysis looks at the parking requirements for the Secret Harbour Shopping Centre with the proposed provision of a Dan Murphy's Liquor Store.

The proposal seeks to add approximately 913m^2 of selling floor area and 372m^2 of storage / loading / back of house facilities to the existing development. The total floorspace of the development, including all existing uses is 19,445m^2.

Table 1 - Secret Harbour Shopping Centre Dan Murphy's Pad Site Proposal

Location	Area	Parking Requirements	Total Number of Bays
Pad Site 1 (Dan Murphy's Liquor Store) Secret Harbour Shopping Centre	1,014m^2 (Selling Floor and Coolroom and 40m^2 Office)	1 parking bay per 22m^2 NLA	48
Dan Murphy's Liquor – Kwinana Marketplace	1,122m^2 (Selling Floor and Coolroom) and 48m^2 (Office) *	1 parking bay per 22m^2 NLA	54

Note: *Dan Murphy's Liquor – Kwinana Marketplace areas have been provided by Dan Murphy's on request. Refer Appendix 1.

The Dan Murphy's Kwinana outlet is located on the south-western corner of the Kwinana Marketplace. The entrance to the Dan Murphy's store is approximately 90 metres directly southwest from the pedestrian access / egress to the Big W located in the main shopping centre building.

Based on our assessment that the Dan Murphy's store has an average utilisation rate of 50.9% through the 18 hours of peak surveys conducted, we believe the proposed Secret Harbour Dan Murphy's store should have a provision of 25 bays.

4. Parking Survey

A series of parking surveys was conducted by KCTT at Kwinana Marketplace to ascertain the current usage of the parking spaces available on the site for the Dan Murphy's Liquor Store. This survey was conducted over three days during peak periods on Thursday 28th May, Friday 29th May, Saturday 30th May, Thursday 4th June, Friday 5th June and Saturday 13th June 2015.

The survey was conducted by members of the KCTT team, who were stationed near the access / egress points of the shopping centre, and recorded the following information: -

- Vehicle Movements through the Dan Murphy's Carpark (in 10-minute blocks)
- Carpark Utilisation Ratio (expressed as a percentage of bays used / unused)
- Number of Vehicles Parked (at 10-minute Intervals)
- Number of Pedestrians Witnessed Walking To / From Dan Murphy's Carpark
- Average Vehicle Dwell Time

The team also made general observations about how long vehicles stayed within the shopping centre carpark. The 3-hour survey period provided sufficient time for all customers to enter and exit the premises. This information has also been recorded on our "Parking Noise Diagrams" KC00258.070_S40 to KC00258.070_S45. The purpose of this information is to highlight the fast turnover of vehicles that occurs in shopping centre carparks and to show how often each bay was utilised during the survey period. The use of the bays can also be cross-referenced against the histograms and tabular data provided in the following pages.

The total number of vehicle spaces available immediately adjacent to the Dan Murphy's site is 83.

4.1 Survey – Thursday 28th of May 2015

The following survey information has been collated for Thursday 28th of May 2015.

4.1.1 Vehicle Movements Through the Dan Murphy's Carpark

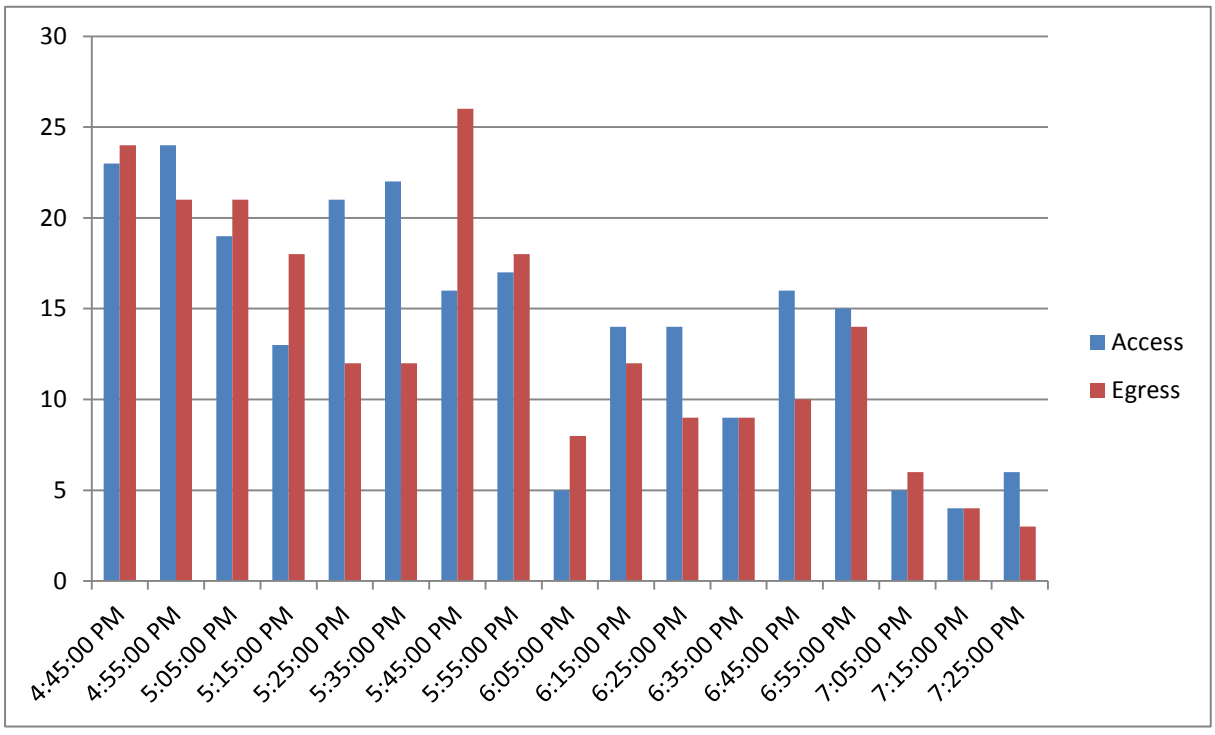
The KCTT team conducted a field survey counting the number of vehicles utilising the car park during the time of 5:00pm to 8:00pm on Thursday the 28th of May 2015. In total 243 vehicles entered the car park and 227 vehicles exited during the survey period.

Table 2 - Vehicle movements through the Dan Murphy's Carpark, Kwinana Marketplace between 17:00 and 20:00, Thursday 28th May 2015

Time	16:45-16:55	16:55-17:05	17:05-17:15	17:15-17:25	17:25-17:35	17:35-17:45	17:45-17:55	17:55-18:05	18:05-18:15	18:15-18:25	18:25-18:35	18:35-18:45	18:45 – 18:55	18:55 – 19:05	19:05 – 19:15	19:15 – 19:25	19:25 – 19:35
Cars Entering	23	24	19	13	21	22	16	17	5	14	14	9	16	15	5	4	6
Cars Leaving	24	21	21	18	12	12	26	18	8	12	9	9	10	14	6	4	3

The figure below illustrates vehicular traffic at the entries to the subject site during the Thursday evening peak.

Figure 1 – Car Park Usage, Thursday 28th of May 2015



4.1.2 Carpark Utilisation Ratio and Number of Vehicles Parked (10 Minute Intervals)

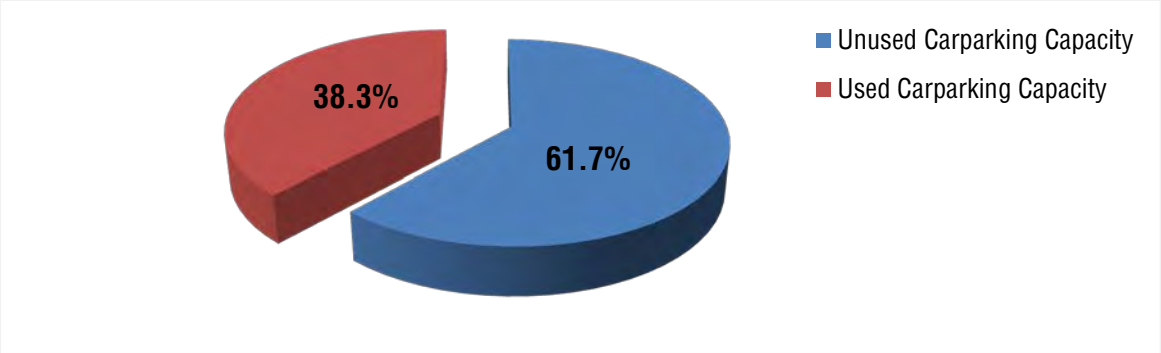
The results of the survey from Thursday the 28th of May indicate that on average there were 20.7 vehicles parked with 33.3 vehicle spaces available. This equates to an average percentage utilisation of 38.3% during this 3 hour survey period.

Table 3 – Number of Vehicles Parked During the Parking Survey, Thursday 28th May 2015

Time	Cars Parked	Vehicle Spaces Available	Percentage Utilisation
16:45 – 16:55	32	22	59.3%
16:55 – 17:05	30	24	55.6%
17:05 – 17:15	35	19	64.8%
17:15 – 17:25	31	23	57.4%
17:25 – 17:35	25	29	46.3%
17:35 – 17:45	28	26	51.9%
17:45 – 17:55	33	21	61.1%
17:55 – 18:05	26	28	48.2%
18:05 – 18:15	20	34	37.1%
18:15 – 18:25	15	39	27.8%
18:25 – 18:35	9	45	16.7%
18:35 – 18:45	11	43	20.4%
18:45 – 18:55	11	43	20.4%
18:55 – 19:05	17	37	31.5%
19:05 – 19:15	9	45	16.7%
19:15 – 19:25	8	46	14.8%
19:25 – 19:35	12	42	22.2%
Total	**352**	**556**	**n.a.**
Average	**20.7**	**33.3**	**38.3%**

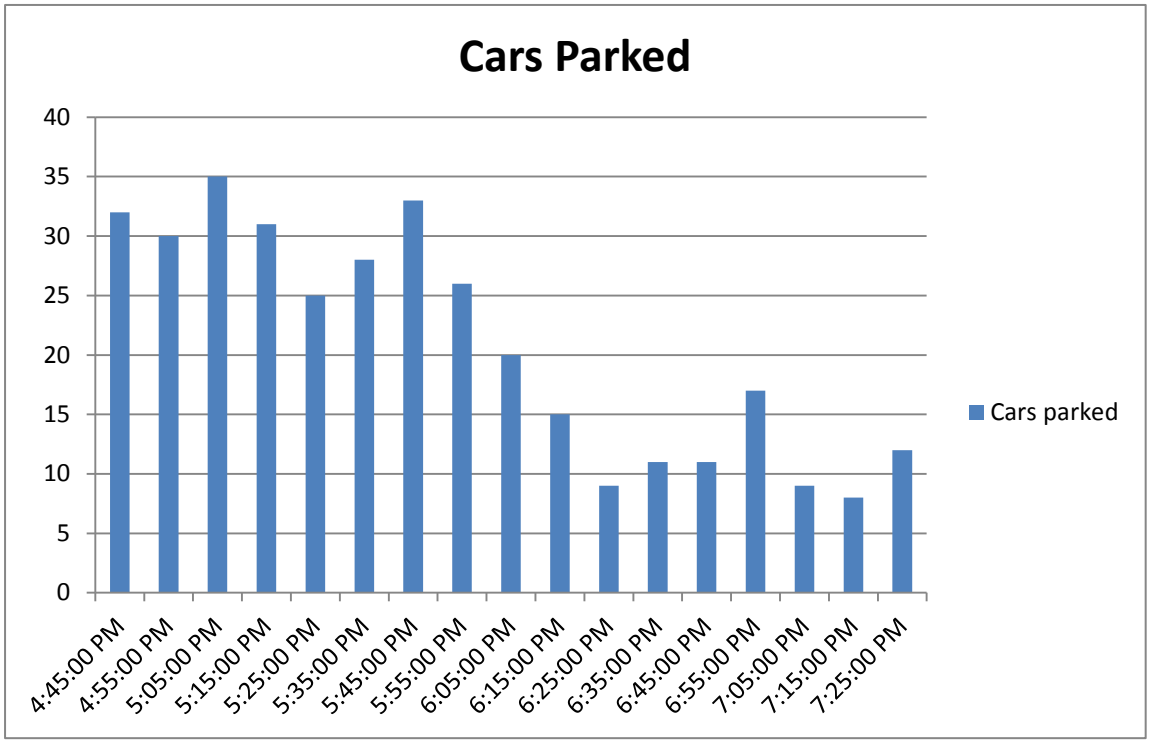
This information is shown pictorially in Figures 2 and 3 below.

Figure 2 - Average Percentages of utilised Car Parking Capacity during the Survey on Thursday the 28th May 2015



KCTT have completed a series of noise diagrams that highlights the occupancy of vehicle parking spaces throughout the survey period.

Figure 3 - Number of Vehicles Found Parked During Each 10-Minute Survey Period



4.1.3 Number of Pedestrians Witnessed Accessing / Egressing Dan Murphy's Carpark

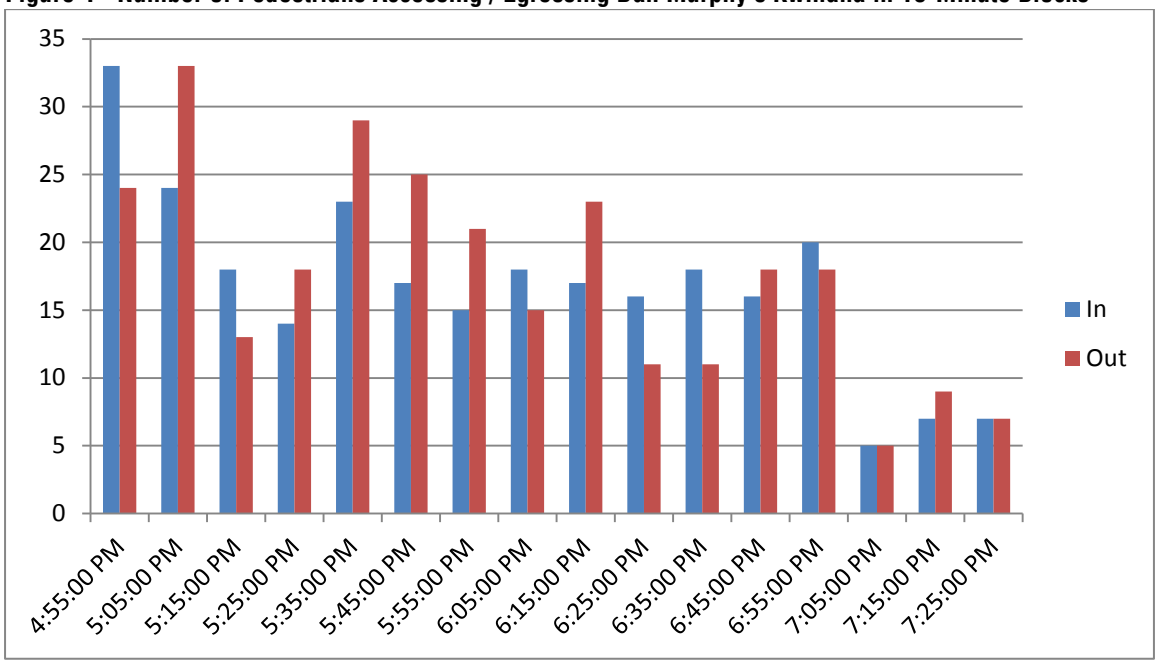
KCTT completed surveys counting the number of pedestrians accessing / egressing the Dan Murphy's store from the carpark and also collated any pedestrian movement into / out of the store which did not involve a vehicle.

Table 4 - Number of Pedestrians Witnessed Accessing / Egressing Dan Murphy's Kwinana

Time	16:45 – 16:55	16:55 – 17:05	17:05 – 17:15	17:15 – 17:25	17:25 – 17:35	17:35 – 17:45	17:45 – 17:55	17:55 – 18:05	18:05 – 18:15	18:15 – 18:25	18:25 – 18:35	18:35 – 18:45	18:45 – 18:55	18:55 – 19:05	19:05 – 19:15	19:15 – 19:25	19:25 – 19:35
Pedestrians (in)		33	24	18	14	23	17	15	18	17	16	18	16	20	5	7	7
Pedestrians (out)		24	33	13	18	29	25	21	15	23	11	11	18	18	5	9	7
Pedestrians (from external areas)								2				1	1				1

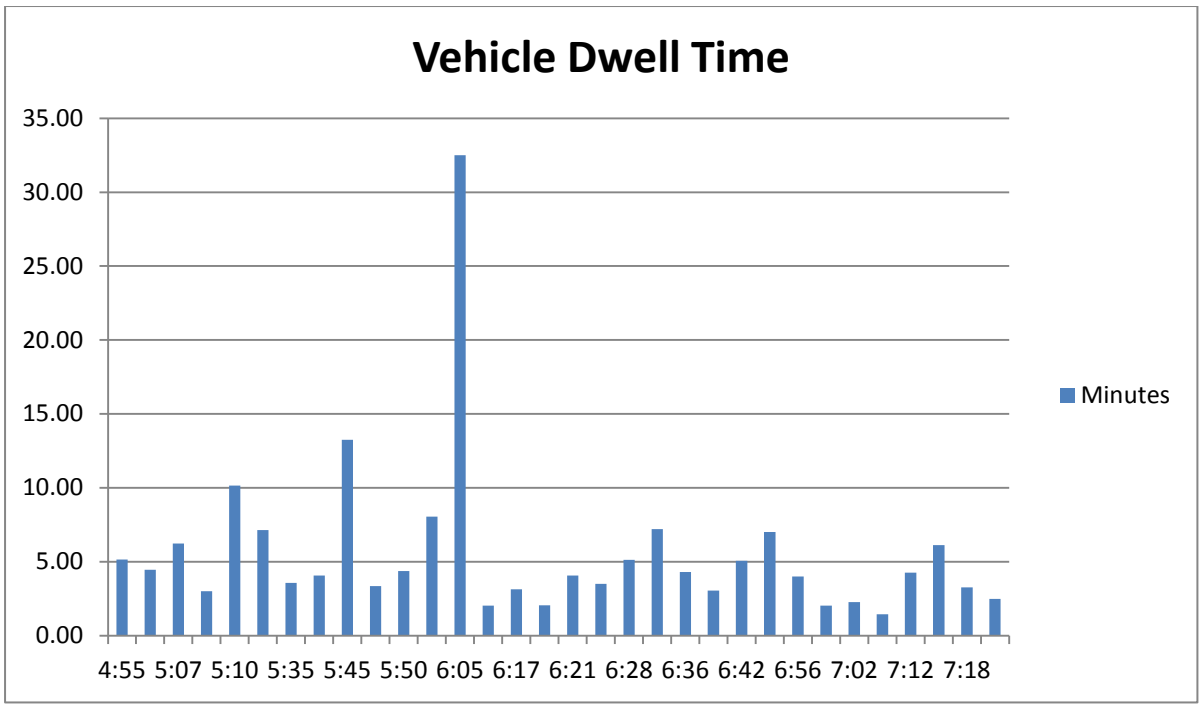
The majority of pedestrians utilised a vehicle parked in close proximity to the store due to the constant availability of bays parked in close proximity.

Figure 4 - Number of Pedestrians Accessing / Egressing Dan Murphy's Kwinana in 10-Minute Blocks



4.1.4 Average Vehicle Dwell Time

KCTT believe the dwell time is also an important consideration. KCTT randomly measured a number of vehicles for the time they stayed parked in the study area. The following figure shows the general split of times.



The majority of dwell times are less than 5 minutes, with the occasional longer dwell time. The average dwell time measured on Thursday 28th of May 2015 for all vehicles surveyed was 5 minutes 33 seconds from a sample size of 32 vehicles.

4.2 Survey – Friday 29th of May 2015

The following survey information has been collated for Friday 29th of May 2015.

4.2.1 Vehicle Movements Through the Dan Murphy's Carpark

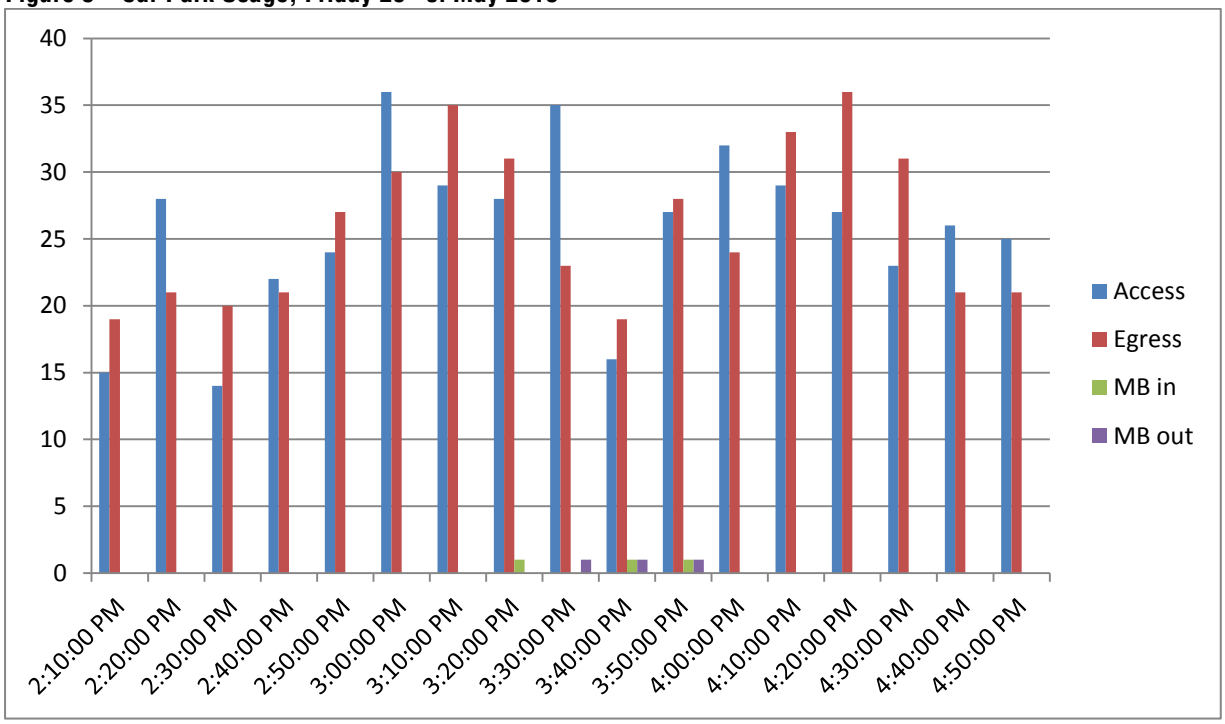
The KCTT team conducted a field survey counting the number of vehicles utilising the car park during the time of 2:10pm to 5:10pm on Friday the 29th of May 2015. In total 436 vehicles entered the car park and 440 vehicles exited during the survey period, with 3 motorcycles entering and exiting during the survey period.

Table 5 - Vehicle movements through the Dan Murphy's Carpark, Kwinana Marketplace between 14:10 and 17:00, Friday 29th May 2015

Time	14:10 – 14:20	14:20 – 14:30	14:30 – 14:40	14:40 – 14:50	14:50 – 15:00	15:00 – 15:10	15:10 – 15:20	15:20 – 15:30	15:30 – 15:40	15:40 – 15:50	15:50 – 16:00	16:00 – 16:10	16:10 – 16:20	16:20 – 16:30	16:30 – 16:40	16:40 – 16:50	16:50 – 17:00
Cars Entering	15	28	14	22	24	36	29	28	35	16	27	32	29	27	23	26	25
Cars Leaving	19	21	20	21	27	30	35	31	23	19	28	24	33	36	31	21	21
Motorcycles Entering								1		1	1						
Motorcycles Exiting									1	1	1						

The figure below illustrates vehicular traffic at the entries to the subject site during the Friday afternoon peak.

Figure 5 – Car Park Usage, Friday 29th of May 2015



4.2.2 Carpark Utilisation Ratio and Number of Vehicles Parked (10 Minute Intervals)

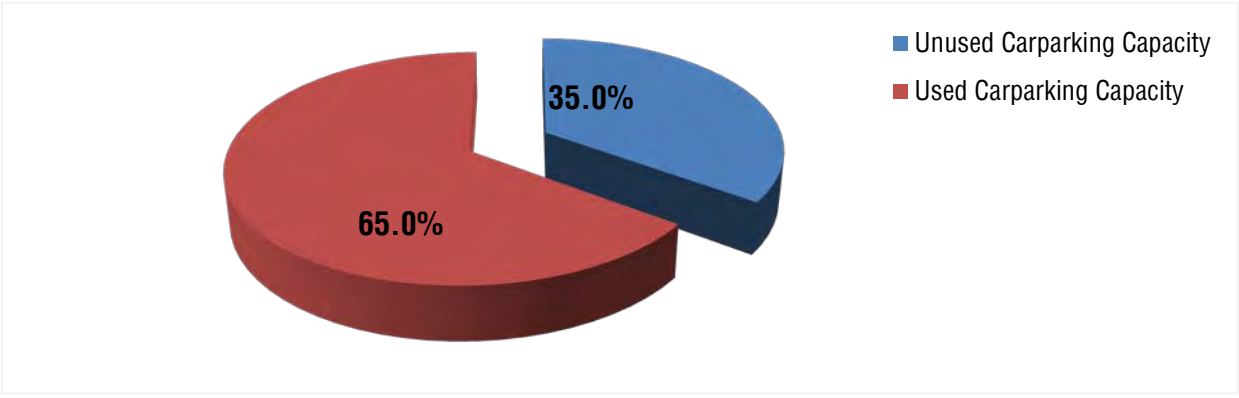
The results of the survey from Friday the 29th of May indicate that there was an average utilisation rate of 65.0% for the dedicated parking area for Dan Murphy's.

Table 6 - Number of Vehicles Parked During the Parking Survey, Friday 29th May 2015

Time	Cars Parked	Vehicle Spaces Available	Percentage Utilisation
14:10 – 14:20	32	22	59.3%
14:20 – 14:30	25	29	46.3%
14:30 – 14:40	28	26	51.9%
14:40 – 14:50	31	23	57.4%
14:50 – 15:00	39	15	72.2%
15:00 – 15:10	31	23	57.4%
15:10 – 15:20	39	15	72.2%
15:20 – 15:30	38	16	70.4%
15:30 – 15:40	41	13	75.9%
15:40 – 15:50	42	12	77.8%
15:50 – 16:00	37	17	68.5%
16:00 – 16:10	39	15	72.2%
16:10 – 16:20	42	12	77.8%
16:20 – 16:30	38	16	70.4%
16:30 – 16:40	34	20	62.9%
16:40 – 16:50	27	27	50.0%
16:50 – 17:00	30	24	55.6%
17:00 – 17:10	39	15	72.2%
Total	**632**	**340**	
Average	**35.1**	**18.9**	**65.0%**

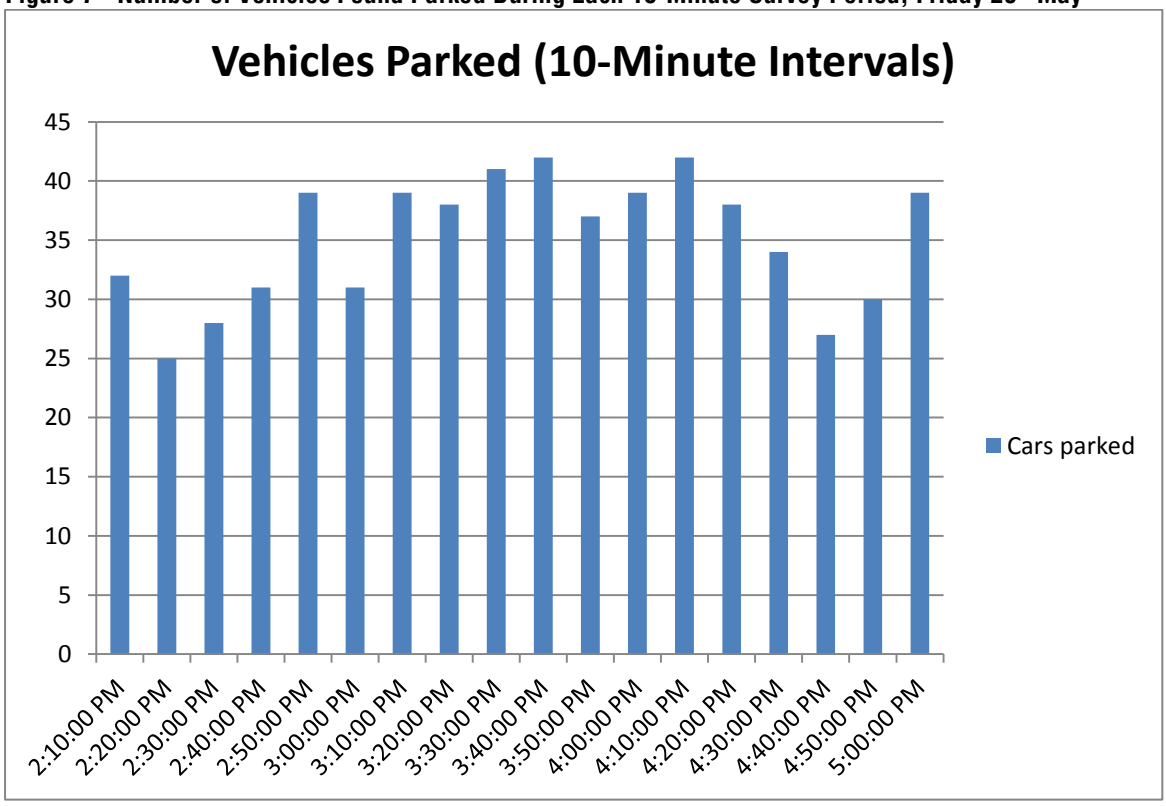
This information is shown pictorially in Figures 6 and 7 below.

Figure 6 - Overall Percentages of utilised Car Parking Capacity during the Survey on Friday the 29th May 2015



KCTT have completed a series of noise diagrams that highlights the occupancy of vehicle parking spaces throughout the survey period.

Figure 7 - Number of Vehicles Found Parked During Each 10-Minute Survey Period, Friday 29th May



4.2.3 Number of Pedestrians Witnessed Accessing / Egressing Dan Murphy's Carpark

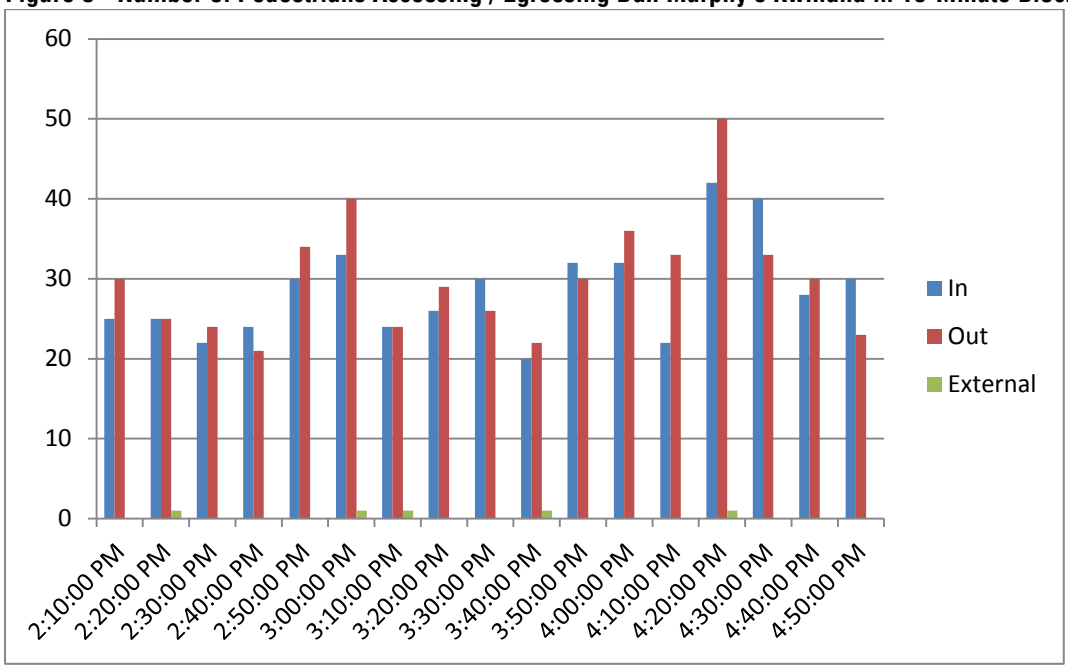
KCTT completed surveys counting the number of pedestrians accessing / egressing the Dan Murphy's store from the carpark and also collated any pedestrian movement into / out of the store which did not involve a vehicle.

Table 7 - Number of Pedestrians Witnessed Accessing / Egressing Dan Murphy's Kwinana, Friday 29th May

Time	14:10 – 14:20	14:20 – 14:30	14:30 – 14:40	14:40 – 14:50	14:50 – 15:00	15:00 – 15:10	15:10 – 15:20	15:20 – 15:30	15:30 – 15:40	15:40 – 15:50	15:50 – 16:00	16:00 – 16:10	16:10 – 16:20	16:20 – 16:30	16:30 – 16:40	16:40 – 16:50	16:50 – 17:00
Pedestrians (in)	25	25	22	24	30	33	24	26	30	20	32	32	22	42	40	28	30
Pedestrians (out)	30	25	24	21	34	40	24	29	26	22	30	36	33	50	33	30	23
Pedestrians (from external areas)		1				1	1			1				1			

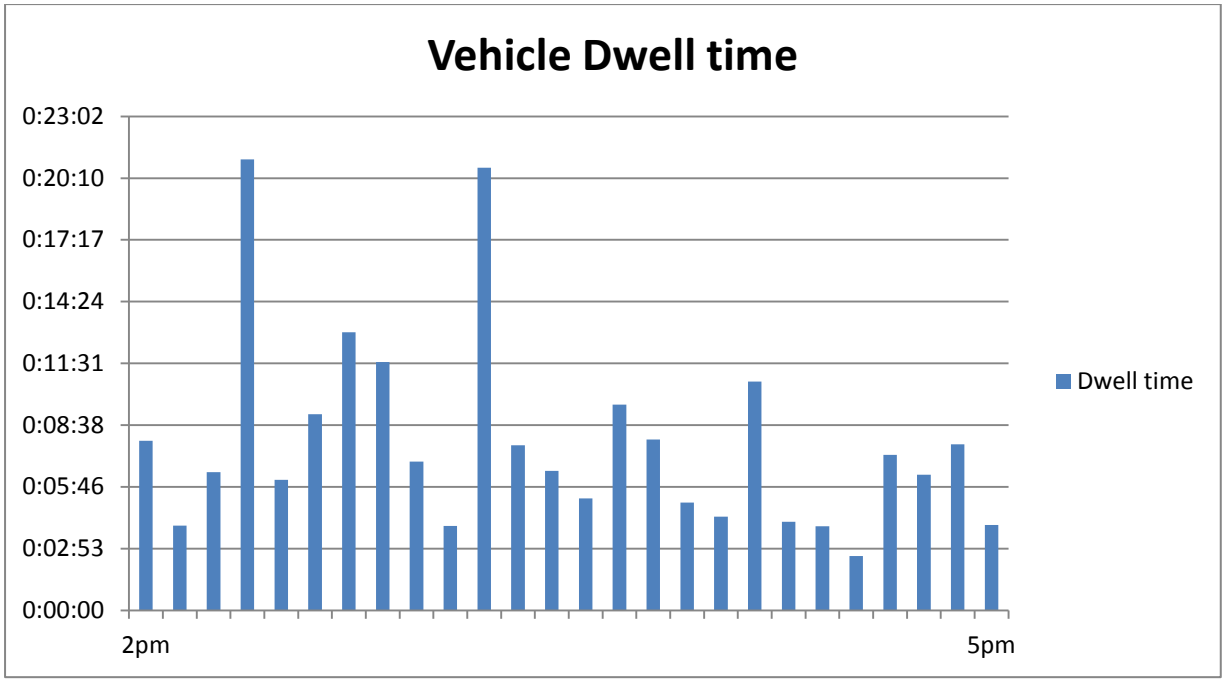
The majority of pedestrians utilised a vehicle parked in close proximity to the store due to the constant availability of bays parked in close proximity.

Figure 8 - Number of Pedestrians Accessing / Egressing Dan Murphy's Kwinana in 10-Minute Blocks



4.2.4 Average Vehicle Dwell Time

KCTT believe the dwell time is also an important consideration. KCTT randomly measured a number of vehicles for the time they stayed parked in the study area. The following figure shows the general split of times.



The majority of dwell times are less than 8 minutes, with the occasional longer dwell time. The average dwell time measured on Friday 29th of May 2015 for all vehicles surveyed was 7 minutes 50 seconds from a sample size of 26 vehicles.

4.3 Survey – Saturday 30th of May 2015

The following survey information has been collated for Saturday 30th of May 2015.

4.3.1 Vehicle Movements through the Dan Murphy's Carpark

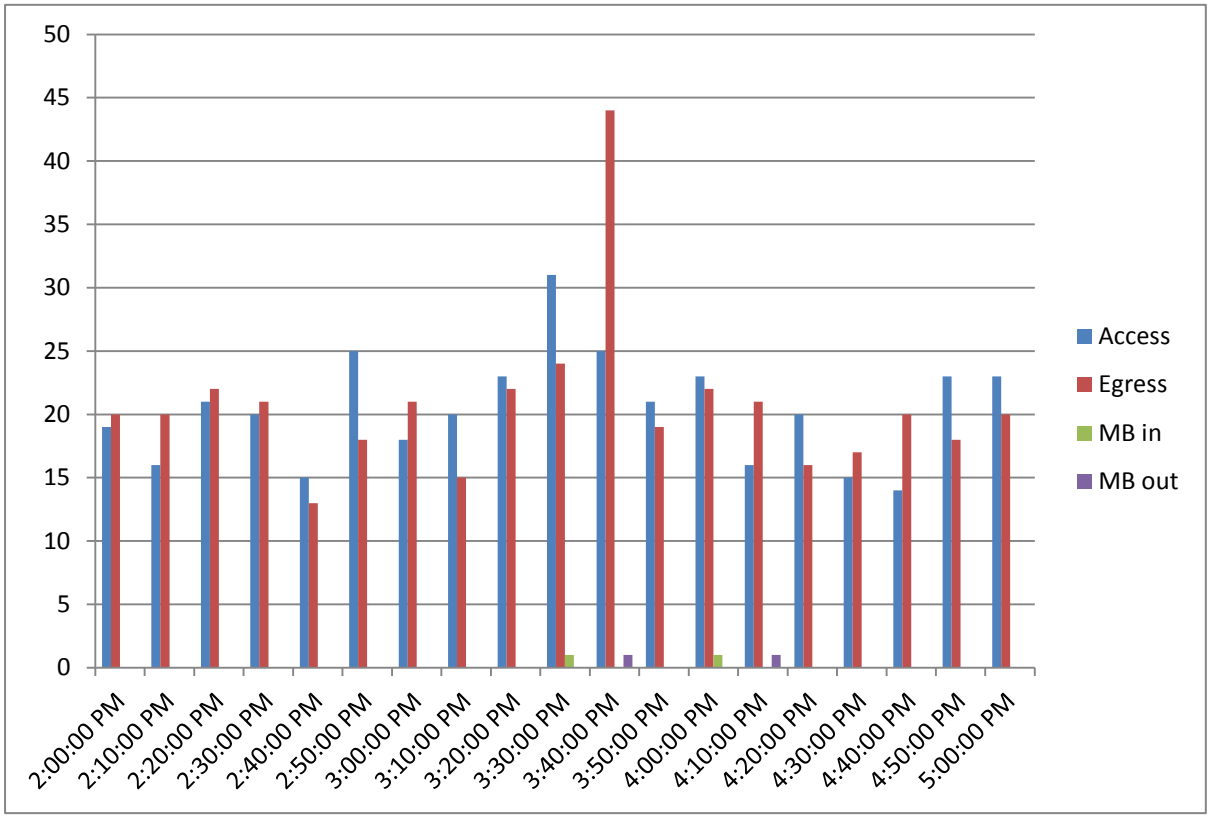
The KCTT team conducted a field survey counting the number of vehicles utilising the car park during the time of 2:00pm to 5:00pm on Saturday the 30th of May 2015. In total 388 vehicles entered the car park and 393 vehicles exited during the survey period, with 2 motorcycles accessing and egressing the parking area during the study period.

Table 8 - Vehicle movements through the Dan Murphy's Carpark, Kwinana Marketplace between 14:00 and 17:00, Saturday 30th May 2015

Time	14:00 – 14:10	14:10 – 14:20	14:20 – 14:30	14:30 – 14:40	14:40 – 14:50	14:50 – 15:00	15:00 – 15:10	15:10 – 15:20	15:20 – 15:30	15:30 – 15:40	15:40 – 15:50	15:50 – 16:00	16:00 – 16:10	16:10 – 16:20	16:20 – 16:30	16:30 – 16:40	16:40 – 16:50	16:50 – 17:00	17:00 – 17:10
Cars Entering	19	16	21	20	15	25	18	20	23	31	25	21	23	16	20	15	24	23	23
Cars Leaving	20	20	22	21	13	18	21	15	22	24	44	19	22	21	16	17	30	18	20
Motorcycles Entering										1			1						
Motorcycles Leaving											1			1					

The figure below illustrates vehicular traffic at the entries to the subject site during the Saturday afternoon peak.

Figure 9 – Car Park Usage, Saturday 30th of May 2015



4.3.2 Carpark Utilisation Ratio and Number of Vehicles Parked (10 Minute Intervals)

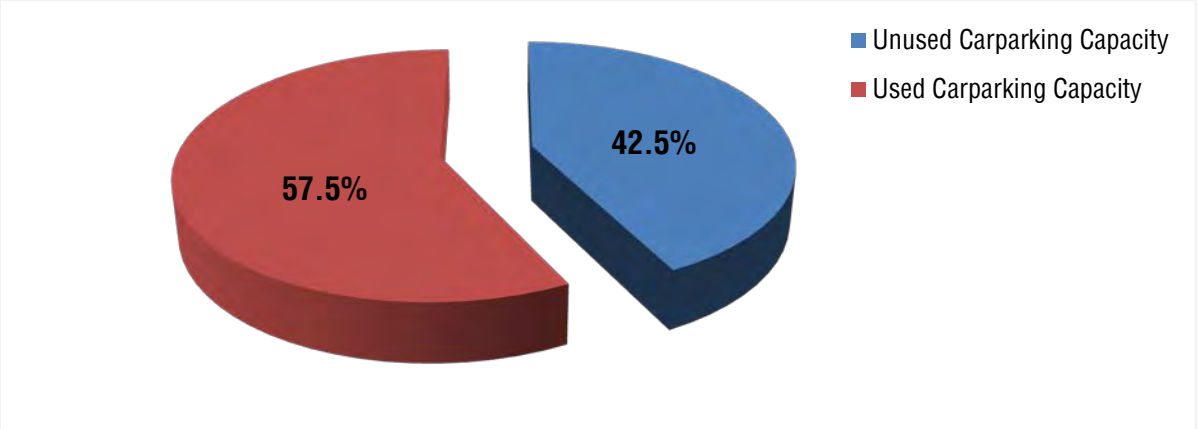
The results of the survey from Saturday the 30th of May indicate that there was an average utilisation rate of parking of 57.5%.

Table 9 - Number of Vehicles Parked During the Parking Survey, Saturday 30th of May 2015

Time	Cars Parked	Vehicle Spaces Available	Percentage Utilisation
14:00 – 14:10	37	17	68.5%
14:10 – 14:20	36	18	66.7%
14:20 – 14:30	34	20	62.9%
14:30 – 14:40	33	21	61.1%
14:40 – 14:50	29	25	53.7%
14:50 – 15:00	30	24	55.6%
15:00 – 15:10	37	17	68.5%
15:10 – 15:20	31	23	57.4%
15:20 – 15:30	35	19	64.8%
15:30 – 15:40	37	17	68.5%
15:40 – 15:50	38	16	70.4%
15:50 – 16:00	30	24	55.6%
16:00 – 16:10	31	23	57.4%
16:10 – 16:20	25	29	46.3%
16:20 – 16:30	34	20	62.9%
16:30 – 16:40	34	20	62.9%
16:40 – 16:50	30	24	55.6%
16:50 – 17:00	26	28	48.1%
17:00 – 17:10	25	29	46.3%
Total	**612**	**414**	
Average	**32.2**	**21.8**	**59.6%**

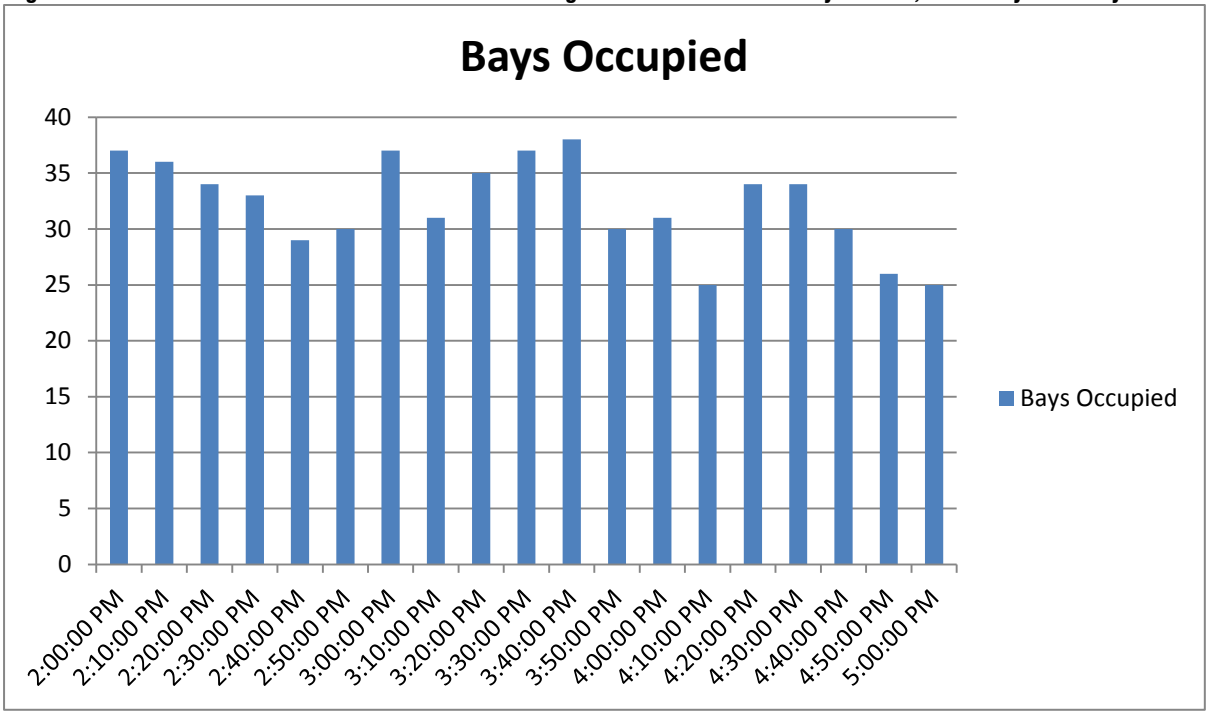
This information is shown pictorially in Figures 10 and 11 below.

Figure 10 - Overall Percentages of utilised Car Parking Capacity during the Survey on Saturday the 30th of May 2015



KCTT have completed a series of noise diagrams that highlights the occupancy of vehicle parking spaces throughout the survey period.

Figure 11 - Number of Vehicles Found Parked During Each 10-Minute Survey Period, Saturday 30th May



4.3.3 Number of Pedestrians Witnessed Accessing / Egressing Dan Murphy's Carpark

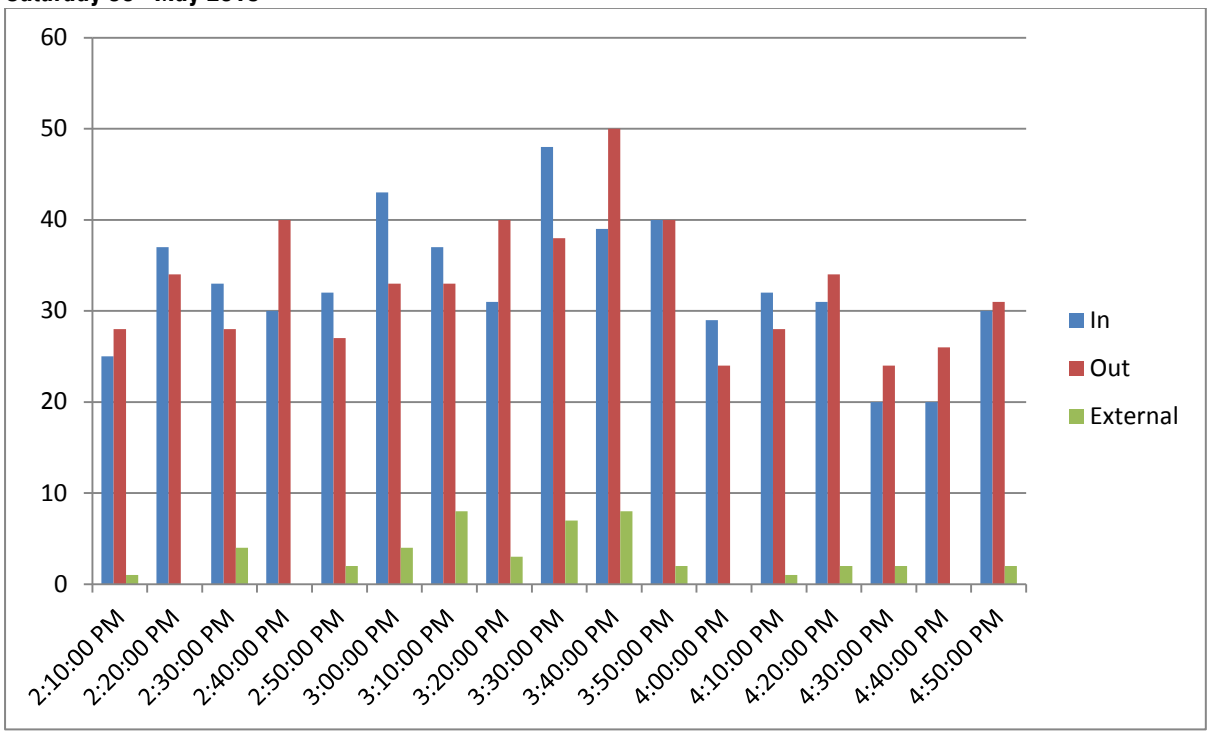
KCTT completed surveys counting the number of pedestrians accessing / egressing the Dan Murphy's store from the carpark and also collated any pedestrian movement into / out of the store which did not involve a vehicle.

Table 10 - Number of Pedestrians Witnessed Accessing / Egressing Dan Murphy's Kwinana, Saturday 30th of May 2015

Time	14:10 – 14:20	14:20 – 14:30	14:30 – 14:40	14:40 – 14:50	14:50 – 15:00	15:00 – 15:10	15:10 – 15:20	15:20 – 15:30	15:30 – 15:40	15:40 – 15:50	15:50 – 16:00	16:00 – 16:10	16:10 – 16:20	16:20 – 16:30	16:30 – 16:40	16:40 – 16:50	16:50 – 17:00
Pedestrians (in)	25	37	33	30	32	43	37	31	48	39	40	29	32	31	20	20	30
Pedestrians (out)	28	34	28	40	27	33	33	40	38	50	40	24	28	34	24	26	31
Pedestrians (from external areas)	1		4		2	4	8	3	7	8	2		1	2	2		2

The majority of pedestrians utilised a vehicle parked in close proximity to the store due to the constant availability of bays parked in close proximity, however there was a larger volume of pedestrians witnessed between 3:00pm and 4:00pm who "trip-blended". i.e. combined trips to the Kwinana Marketplace for general shopping, plus the Dan Murphy's Liquor Stores without bringing their vehicle into the study area.

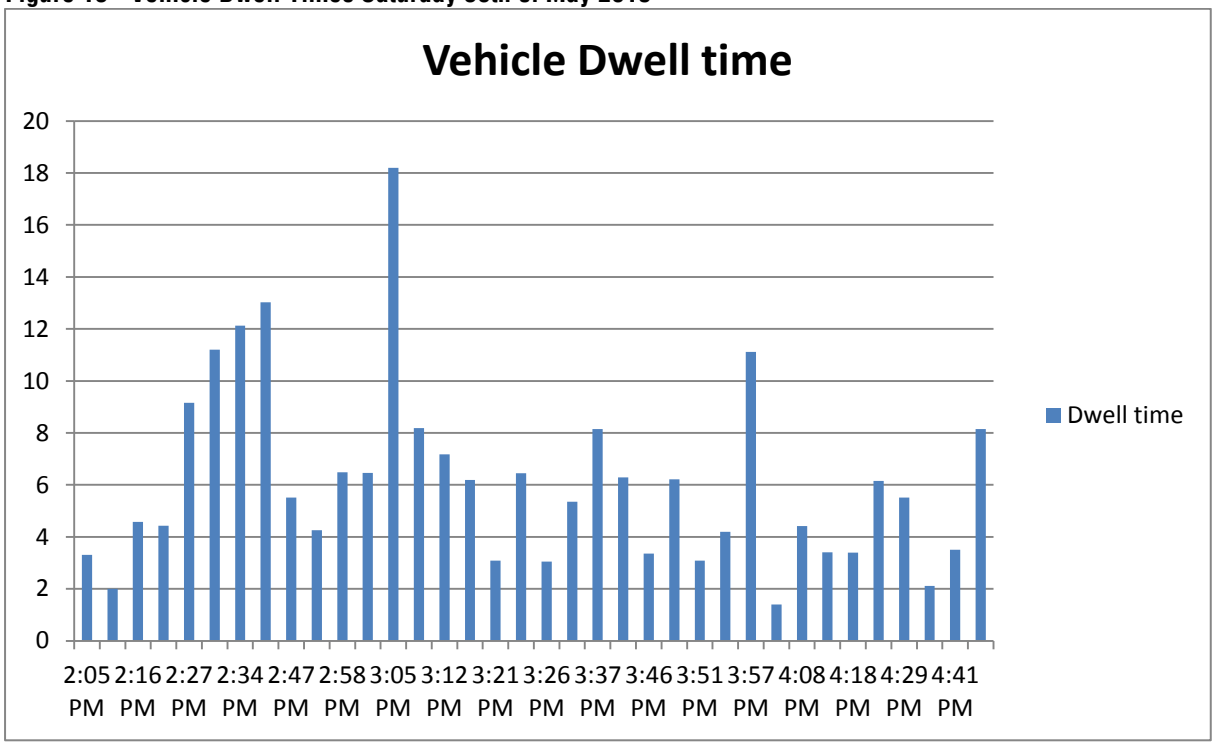
Figure 12 - Number of Pedestrians Accessing / Egressing Dan Murphy's Kwinana in 10-Minute Blocks, Saturday 30th May 2015



4.3.4 Average Vehicle Dwell Time

KCTT believe the dwell time is also an important consideration. KCTT randomly measured a number of vehicles for the time they stayed parked in the study area. The following figure shows the general split of times.

Figure 13 - Vehicle Dwell Times Saturday 30th of May 2015



The majority of dwell times are less than 6 minutes, with the occasional longer dwell time. The average dwell time measured on Saturday 30th of May 2015 for all vehicles surveyed was 6 minutes 18 seconds from a sample size of 36 vehicles.

4.4 Survey – Thursday 4th of June 2015

The following survey information has been collated for Thursday 4th of June 2015.

4.4.1 Vehicle Movements Through the Dan Murphy's Carpark

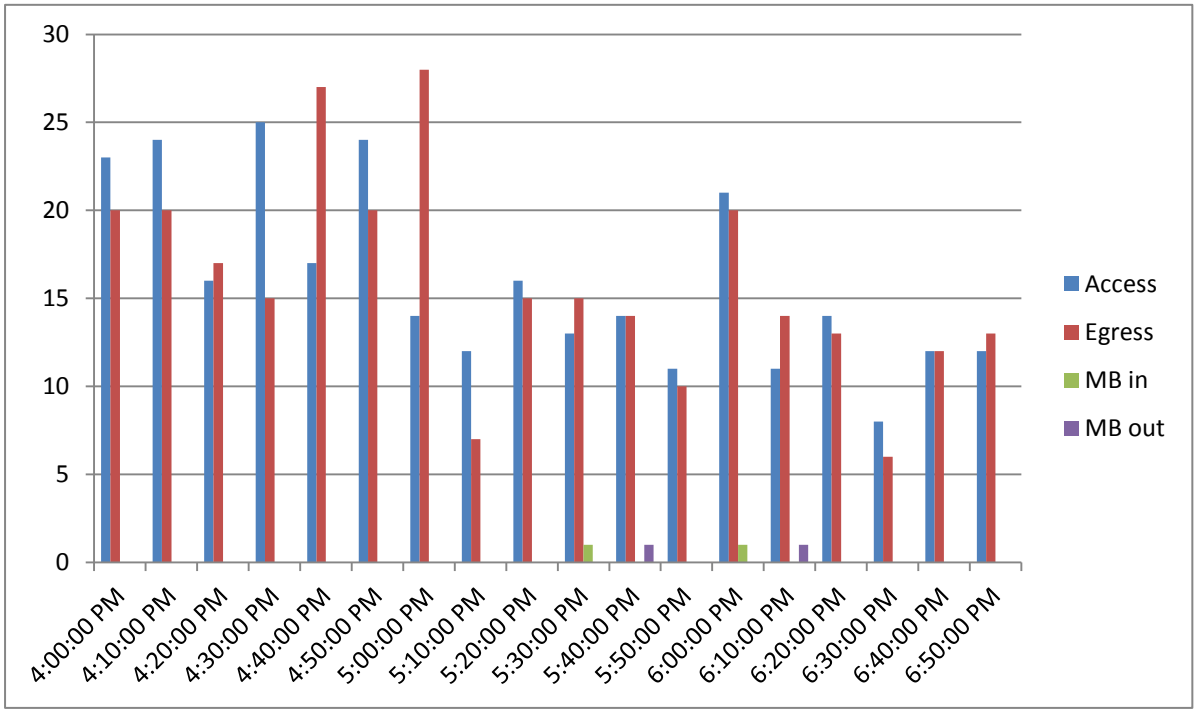
The KCTT team conducted a field survey counting the number of vehicles utilising the car park during the time of 4:00pm to 7:00pm on Thursday the 4th of June 2015. In total 287 vehicles entered the car park and 286 vehicles exited during the survey period, plus 2 motorcycles accessing and egressing the subject site during the survey period.

Table 11 - Vehicle movements through the Dan Murphy's Carpark, Kwinana Marketplace between 16:00 and 19:00, Thursday 4th of June 2015

Time	16:00 – 16:10	16:10 – 16:20	16:20 – 16:30	16:30 – 16:40	16:40 – 16:50	16:50 – 17:00	17:00 – 17:10	17:10 – 17:20	17:20 – 17:30	17:30 – 17:40	17:40 – 17:50	17:50 – 18:00	18:00 – 18:10	18:10 – 18:20	18:20 – 18:30	18:30 – 18:40	18:40 – 18:50	18:50 – 19:00
Cars Entering	23	24	16	25	17	24	14	12	16	13	14	11	21	11	14	8	12	12
Cars Leaving	20	20	17	15	27	20	28	7	15	15	14	10	20	14	13	6	12	13
Motorcycles Entering										1			1					
Motorcycles Leaving											1			1				

The figure below illustrates vehicular traffic at the entries to the subject site during the Thursday evening peak.

Figure 14 – Car Park Usage, Thursday 4th of June 2015



4.4.2 Carpark Utilisation Ratio and Number of Vehicles Parked (10 Minute Intervals)

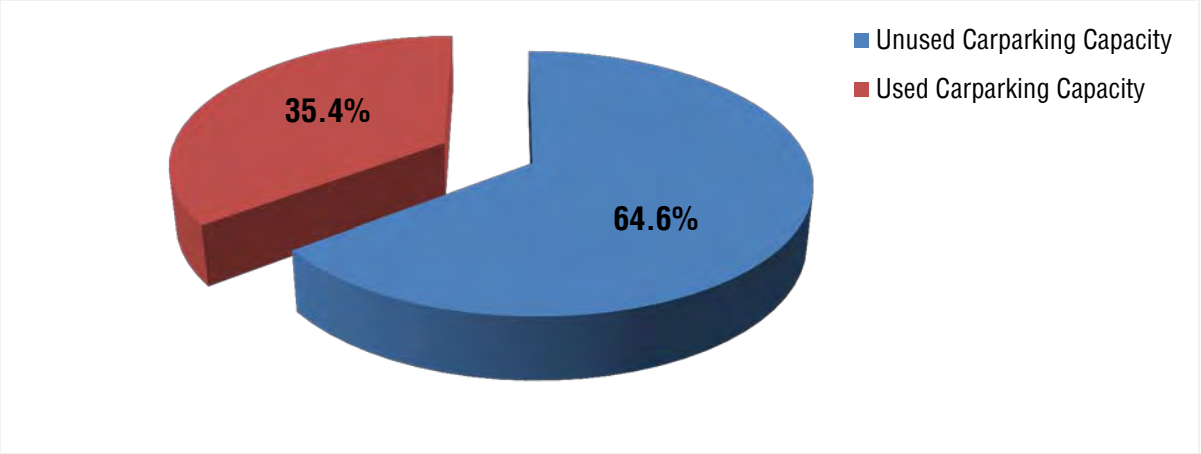
The results of the survey from Thursday the 4th of June indicate that there was an average parking utilisation rate of 34.1%.

Table 12 - Number of Vehicles Parked During the Parking Survey, Thursday 4th of June 2015

Time	Cars Parked	Vehicle Spaces Available	Percentage Utilisation
16:00 – 16:10	23	31	42.6%
16:10 – 16:20	22	32	40.7%
16:20 – 16:30	21	33	38.9%
16:30 – 16:40	18	36	33.3%
16:40 – 16:50	26	28	48.1%
16:50 – 17:00	26	28	48.1%
17:00 – 17:10	24	30	44.4%
17:10 – 17:20	16	38	29.6%
17:20 – 17:30	19	35	35.1%
17:30 – 17:40	20	34	37.0%
17:40 – 17:50	16	38	29.6%
17:50 – 18:00	17	37	31.5%
18:00 – 18:10	16	38	29.6%
18:10 – 18:20	23	31	42.6%
18:20 – 18:30	17	37	31.5%
18:30 – 18:40	15	39	27.7%
18:40 – 18:50	16	38	29.6%
18:50 – 19:00	17	37	31.5%
19:00 – 19:10	11	43	20.4%
Total	**363**	**663**	
Average	**19.1**	**32.9**	**35.4%**

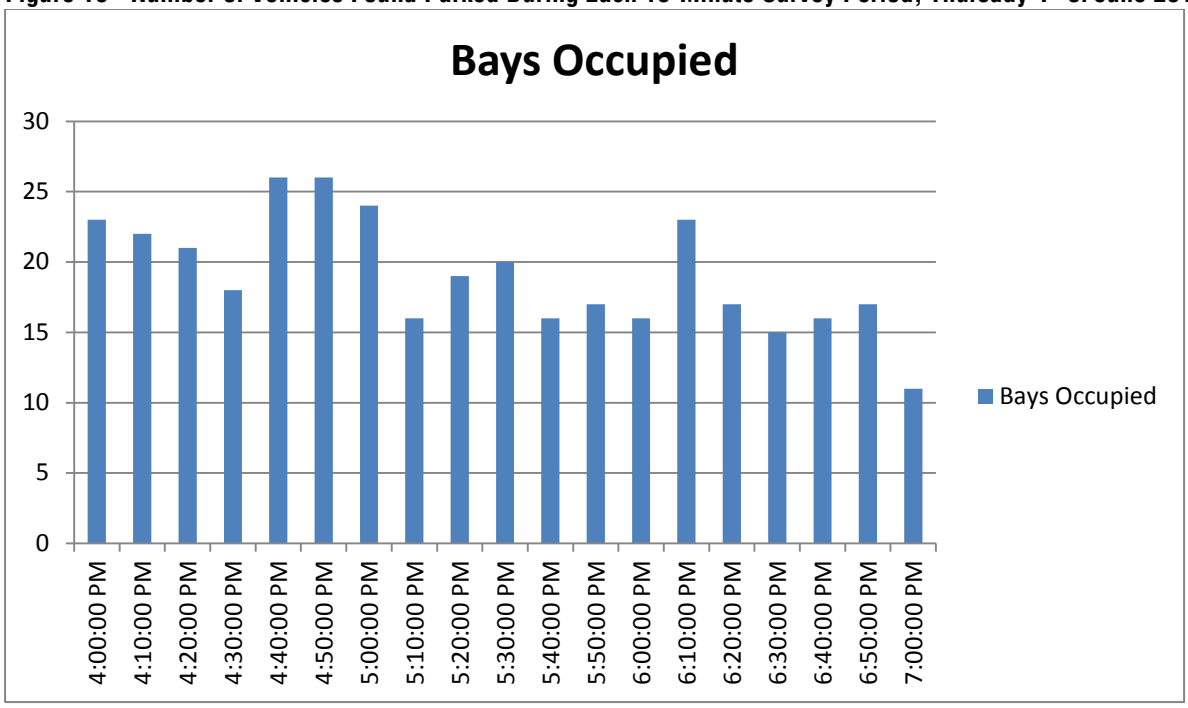
This information is shown pictorially in Figures 15 and 16 below.

Figure 15 - Average Percentages of utilised Car Parking Capacity during the Survey on Thursday the 4th of June 2015



KCTT have completed a series of noise diagrams that highlights the occupancy of vehicle parking spaces throughout the survey period.

Figure 16 - Number of Vehicles Found Parked During Each 10-Minute Survey Period, Thursday 4th of June 2015



4.4.3 Number of Pedestrians Witnessed Accessing / Egressing Dan Murphy's Carpark

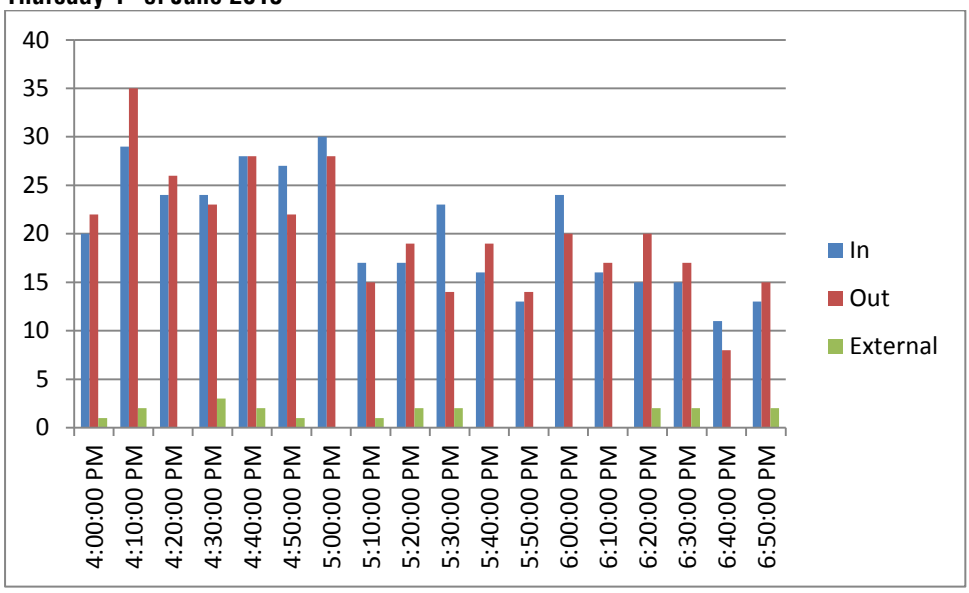
KCTT completed surveys counting the number of pedestrians accessing / egressing the Dan Murphy's store from the carpark and also collated any pedestrian movement into / out of the store which did not involve a vehicle.

Table 13 - Number of Pedestrians Witnessed Accessing / Egressing Dan Murphy's Kwinana, Thursday 4th of June 2015

Time	16:00 – 16:10	16:10 – 16:20	16:20 – 16:30	16:30 – 16:40	16:40 – 16:50	16:50 – 17:00	17:00 – 17:10	17:10 – 17:20	17:20 – 17:30	17:30 – 17:40	17:40 – 17:50	17:50 – 18:00	18:00 – 18:10	18:10 – 18:20	18:20 – 18:30	18:30 – 18:40	18:40 – 18:50	18:50 – 19:00
Pedestrians (in)	20	29	24	24	28	27	30	17	17	23	16	13	24	16	15	15	11	13
Pedestrians (out)	22	35	26	23	28	22	28	15	19	14	19	14	20	17	20	17	8	15
Pedestrians (from external areas)	1	2		3	2	1		1	2	2					2	2		2

The majority of pedestrians utilised a vehicle parked in close proximity to the store due to the constant availability of bays parked in close proximity.

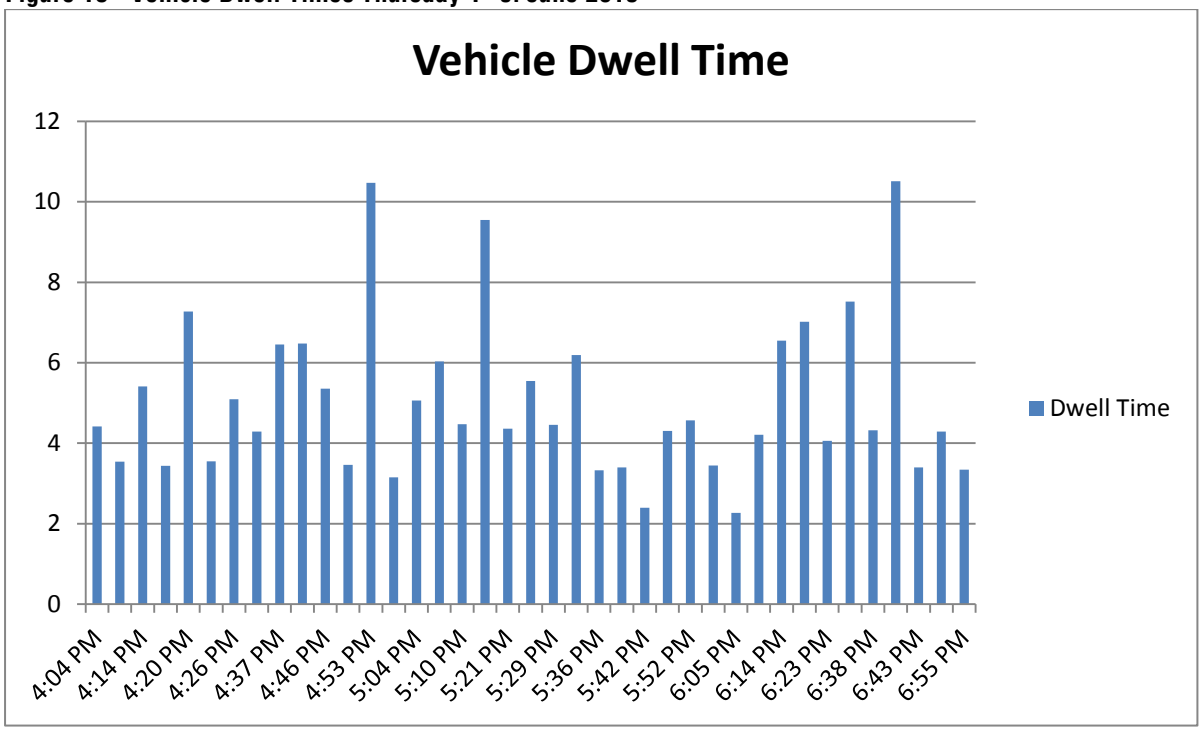
Figure 17 - Number of Pedestrians Accessing / Egressing Dan Murphy's Kwinana in 10-Minute Blocks, Thursday 4th of June 2015



4.4.4 Average Vehicle Dwell Time

KCTT believe the dwell time is also an important consideration. KCTT randomly measured a number of vehicles for the time they stayed parked in the study area. The following figure shows the general split of times.

Figure 18 - Vehicle Dwell Times Thursday 4th of June 2015



The majority of dwell times are less than 5 minutes, with the occasional longer dwell time. The average dwell time measured on Thursday 4th of June 2015 for all vehicles surveyed was 5 minutes 17 seconds from a sample size of 39 vehicles.

4.5 Survey – Friday 5th of June 2015

The following survey information has been collated for Friday 5th of June 2015.

4.5.1 Vehicle Movements Through the Dan Murphy's Carpark

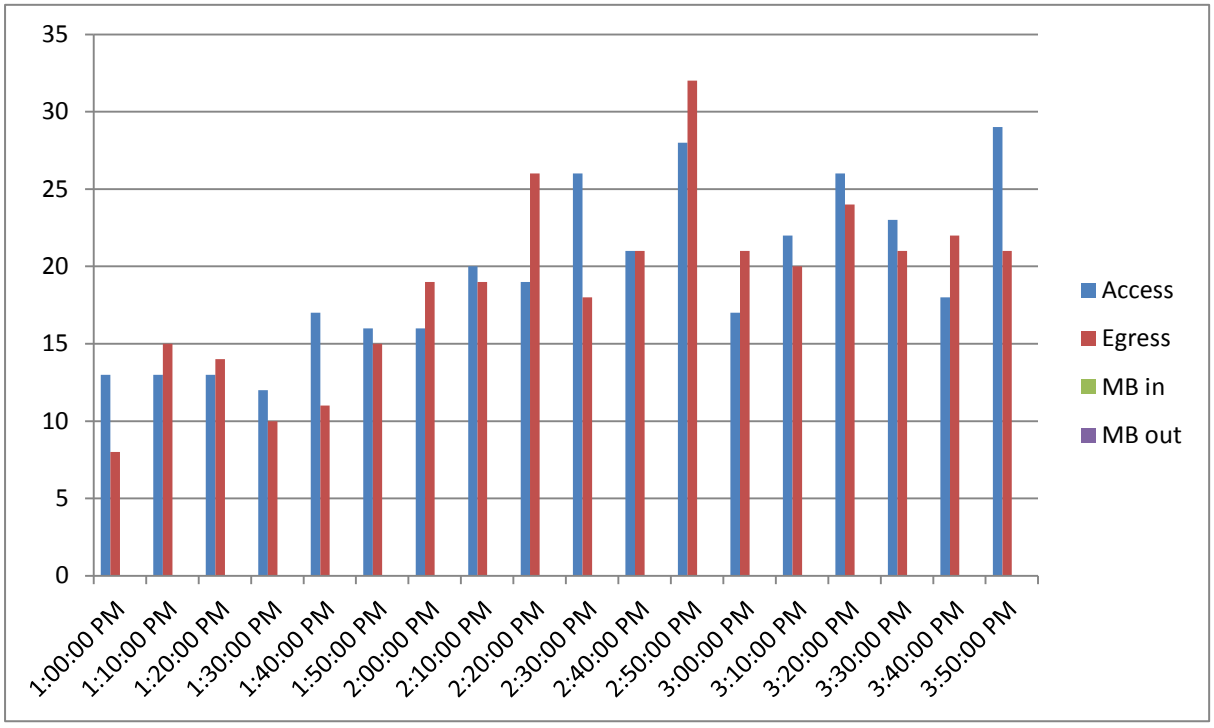
The KCTT team conducted a field survey counting the number of vehicles utilising the car park during the time of 1:00pm to 4:00pm on Friday the 5th of June 2015. In total 349 vehicles entered the car park and 337 vehicles exited during the survey period.

Table 14 - Vehicle movements through the Dan Murphy's Carpark, Kwinana Marketplace between 13:00 and 16:00, Friday 5th of June 2015

Time	13:00 – 13:10	13:10 – 13:20	13:20 – 13:30	13:30 – 13:40	13:40 – 13:50	13:50 – 14:00	14:00 – 14:10	14:10 – 14:20	14:20 – 14:30	14:30 – 14:40	14;40 – 14:50	14:50 – 15:00	15:00 – 15:10	15:10 – 15:20	15:20 – 15:30	15:30 – 15:40	15:40 – 15:50	15:50 – 16:00
Cars Entering	13	13	13	12	17	16	16	20	19	26	21	28	17	22	26	23	18	29
Cars Leaving	8	15	14	10	11	15	19	19	26	18	21	32	21	20	24	21	22	21

The figure below illustrates vehicular traffic at the entries to the subject site during the Friday afternoon peak.

Figure 19 – Car Park Usage, Friday 5th of June 2015



4.5.2 Carpark Utilisation Ratio and Number of Vehicles Parked (10 Minute Intervals)

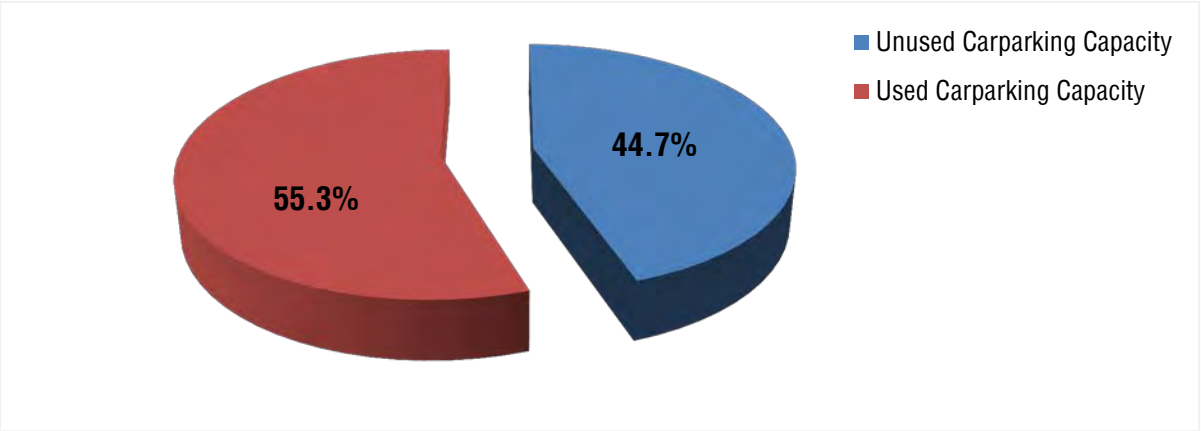
The results of the survey from Friday the 5th of June indicate that there was an average utilisation rate of 53.3%.

Table 15 - Number of Vehicles Parked During the Parking Survey, Friday 5th of June 2015

Time	Cars Parked	Vehicle Spaces Available	Percentage Utilisation
13:10 – 13:20	28	26	51.9%
13:20 – 13:30	25	29	46.3%
13:30 – 13:40	24	30	44.4%
13:40 – 13:50	26	28	48.2%
13:50 – 14:00	21	33	38.9%
14:00 – 14:10	32	22	59.3%
14:10 – 14:20	27	27	50.0%
14:20 – 14:30	31	23	57.4%
14:30 – 14:40	37	17	68.5%
14:40 – 14:50	40	14	74.1%
14:50 – 15:00	36	18	66.7%
15:00 – 15:10	30	14	55.6%
15:10 – 15:20	20	34	37.0%
15:20 – 15:30	36	18	66.7%
15:30 – 15:40	31	23	57.4%
15:40 – 15:50	31	23	57.4%
15:50 – 16:00	33	21	61.1%
Total	**508**	**400**	
Average	**29.9**	**24.1**	**55.3%**

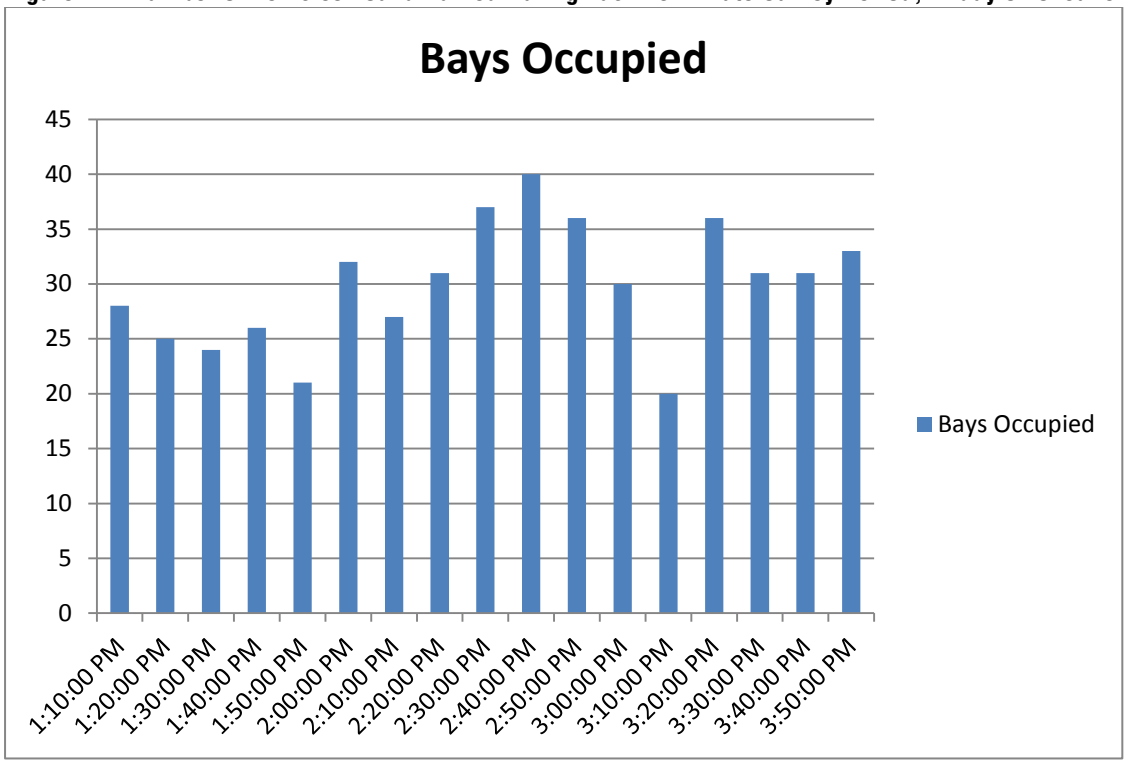
This information is shown pictorially in Figures 20 and 21 below.

Figure 20 - Overall Percentages of utilised Car Parking Capacity during the Survey on Thursday the 28th May 2015



KCTT have completed a series of noise diagrams that highlights the occupancy of vehicle parking spaces throughout the survey period.

Figure 21 - Number of Vehicles Found Parked During Each 10-Minute Survey Period, Friday 5th of June 2015



4.5.3 Number of Pedestrians Witnessed Accessing / Egressing Dan Murphy's Carpark

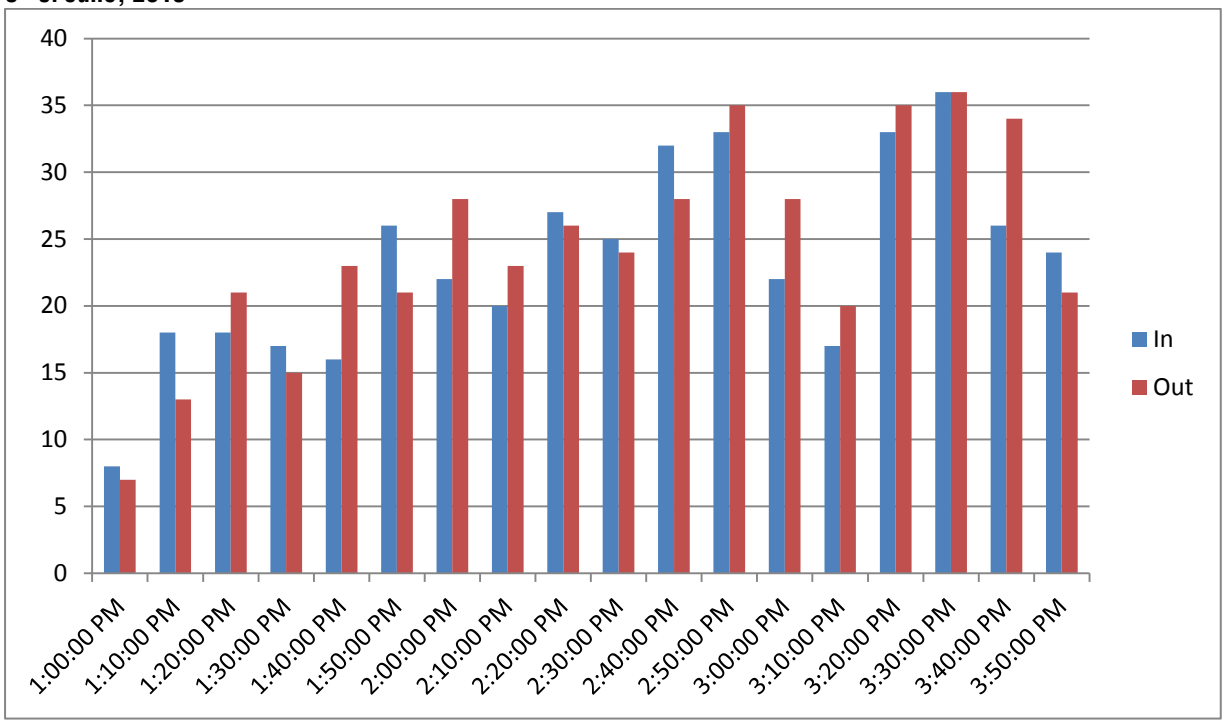
KCTT completed surveys counting the number of pedestrians accessing / egressing the Dan Murphy's store from the carpark and also collated any pedestrian movement into / out of the store which did not involve a vehicle.

Table 16 - Number of Pedestrians Witnessed Accessing / Egressing Dan Murphy's Kwinana

Time	13:00 – 13:10	13:10 – 13:20	13:20 – 13:30	13:30 – 13:40	13:40 – 13:50	13:50 – 14:00	14:00 – 14:10	14:10 – 14:20	14:20 – 14:30	14:30 – 14:40	14;40 – 14:50	14:50 – 15:00	15:00 – 15:10	15:10 – 15:20	15:20 – 15:30	15:30 – 15:40	15:40 – 15:50	15:50 – 16:00
Pedestrians (in)	8	18	18	17	16	26	22	20	27	25	32	33	22	17	33	36	26	24
Pedestrians (out)	7	13	21	15	23	21	28	23	26	24	28	35	28	20	35	36	34	21

The majority of pedestrians utilised a vehicle parked in close proximity to the store due to the constant availability of bays parked in close proximity.

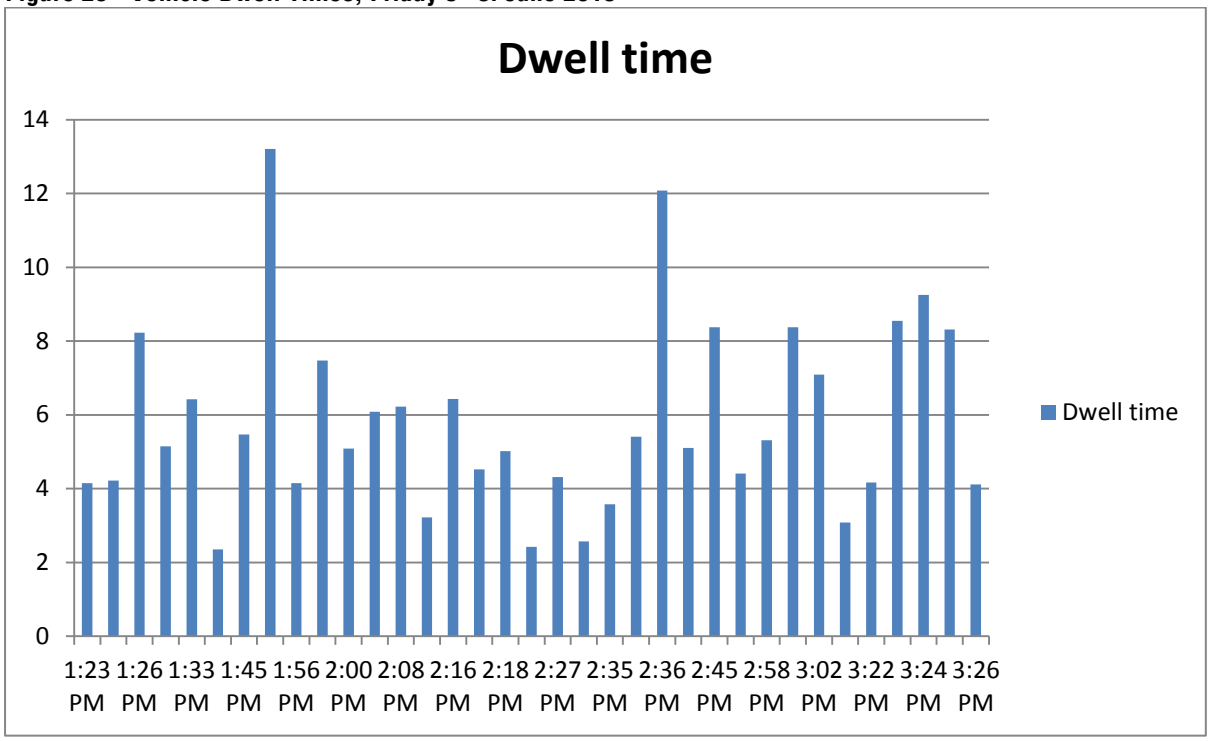
Figure 22 - Number of Pedestrians Accessing / Egressing Dan Murphy's Kwinana in 10-Minute Blocks, Friday 5th of June, 2015



4.5.4 Average Vehicle Dwell Time

KCTT believe the dwell time is also an important consideration. KCTT randomly measured a number of vehicles for the time they stayed parked in the study area. The following figure shows the general split of times.

Figure 23 - Vehicle Dwell Times, Friday 5th of June 2015



The majority of dwell times are less than 5 minutes, with the occasional longer dwell time. The average dwell time measured on Friday 5th of June 2015 for all vehicles surveyed was 6 minutes 01 seconds from a sample size of 32 vehicles.

4.6 Survey – Saturday 13th of June 2015

The following survey information has been collated for Saturday 13th of June 2015.

4.6.1 Vehicle Movements Through the Dan Murphy's Carpark

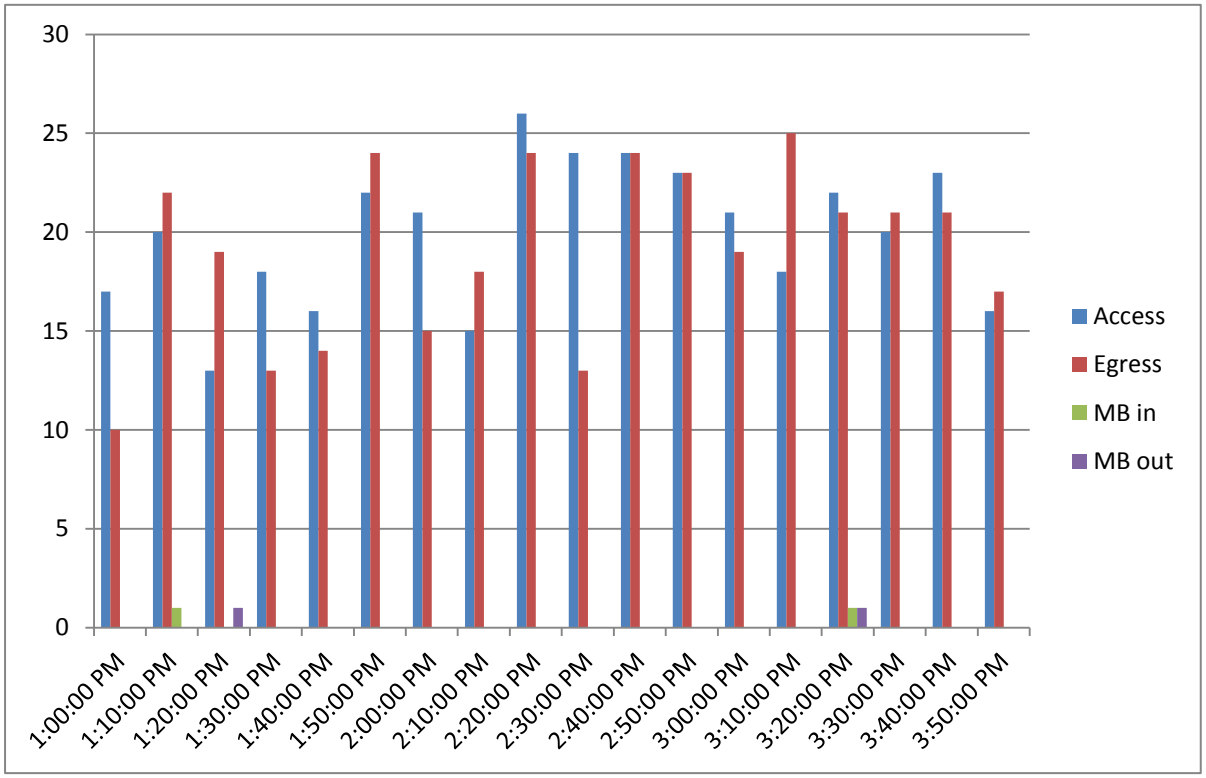
The KCTT team conducted a field survey counting the number of vehicles utilising the car park during the time of 1:00pm to 4:00pm on Saturday the 13th of June 2015. In total 359 vehicles entered the car park and 343 vehicles exited during the survey period.

Table 17 – Vehicle movements through the Dan Murphy's Carpark, Kwinana Marketplace between 17:00 and 20:00, Friday 13th of June 2015

Time	13:00 – 13:10	13:10 – 13:20	13:20 – 13:30	13:30 – 13:40	13:40 – 13:50	13:50 – 14:00	14:00 – 14:10	14:10 – 14:20	14:20 – 14:30	14:30 – 14:40	14:40 – 14:50	14:50 – 15:00	15:00 – 15:10	15:10 – 15:20	15:20 – 15:30	15:30 – 15:40	15:40 – 15:50	15:50 – 16:00
Cars Entering	17	20	13	18	16	22	21	15	26	24	24	23	21	18	20	20	23	16
Cars Leaving	10	22	19	13	14	24	15	18	24	13	24	23	19	25	21	21	21	17
Motorbikes Entering		1													1			
Motorbikes Leaving			1												1			

The figure below illustrates vehicular traffic at the entries to the subject site during the Saturday afternoon peak.

Figure 24 – Car Park Usage, Saturday 13th of June 2015



4.6.2 Carpark Utilisation Ratio and Number of Vehicles Parked (10 Minute Intervals)

The results of the survey from Friday the 13th of June indicate that there was an average utilisation rate of 50.0%.

Table 18 – Number of Vehicles Parked During the Parking Survey, Saturday 13th of June 2015

Time	Cars Parked	Vehicle Spaces Available	Percentage Utilisation
13:00 – 13:10	28	26	51.8%
13:10 – 13:20	30	24	55.6%
13:20 – 13:30	26	28	48.1%
13:30 – 13:40	22	32	40.7%
13:40 – 13:50	30	24	55.6%
13:50 – 14:00	29	25	53.7%
14:00 – 14:10	28	26	51.9%
14:10 – 14:20	25	29	46.3%
14:20 – 14:30	28	26	51.8%
14:30 – 14:40	34	20	63.0%
14:40 – 14:50	34	20	63.0%
14:50 – 15:00	26	28	48.1%
15:00 – 15:10	36	18	66.7%
15:10 – 15:20	26	28	48.1%
15:20 – 15:30	29	25	53.7%
15:30 – 15:40	27	27	50.0%
15:40 – 15:50	24	30	44.4%
15:50 – 16:00	23	31	42.6%
Total	**503**	**467**	
Average	**27.9**	**25.9**	**51.7%**

This information is shown pictorially in Figures 25 and 26 below.

Figure 25 - Overall Percentage of utilised Car Parking Capacity during the Survey on Friday the 13th June 2015

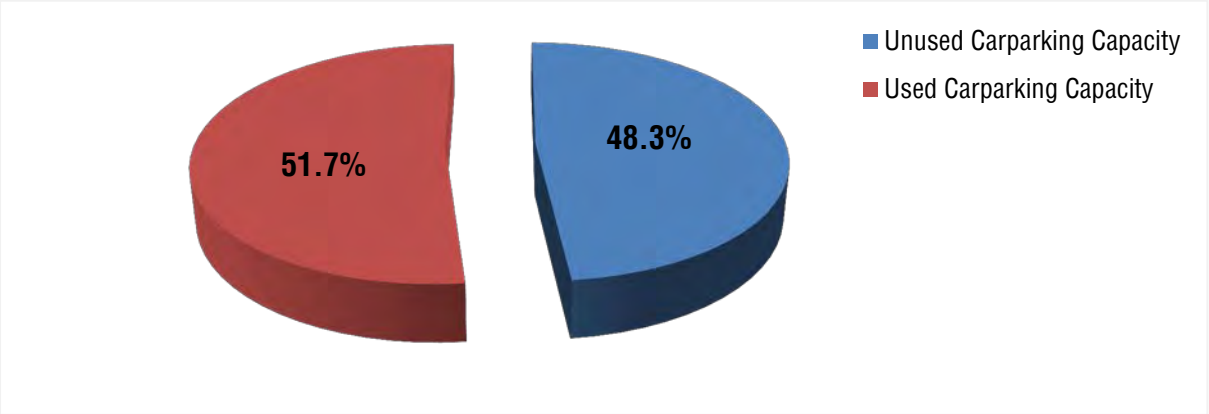
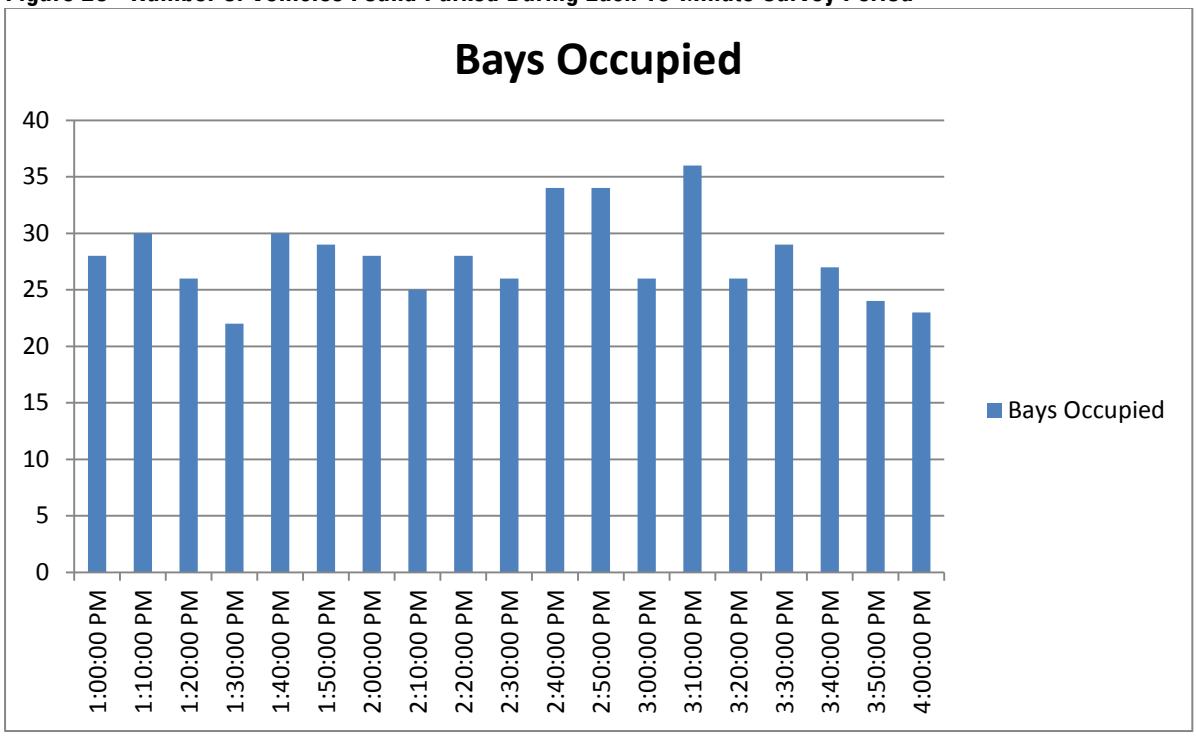


Figure 26 - Number of Vehicles Found Parked During Each 10-Minute Survey Period



4.6.3 Number of Pedestrians Witnessed Accessing / Egressing Dan Murphy's Carpark

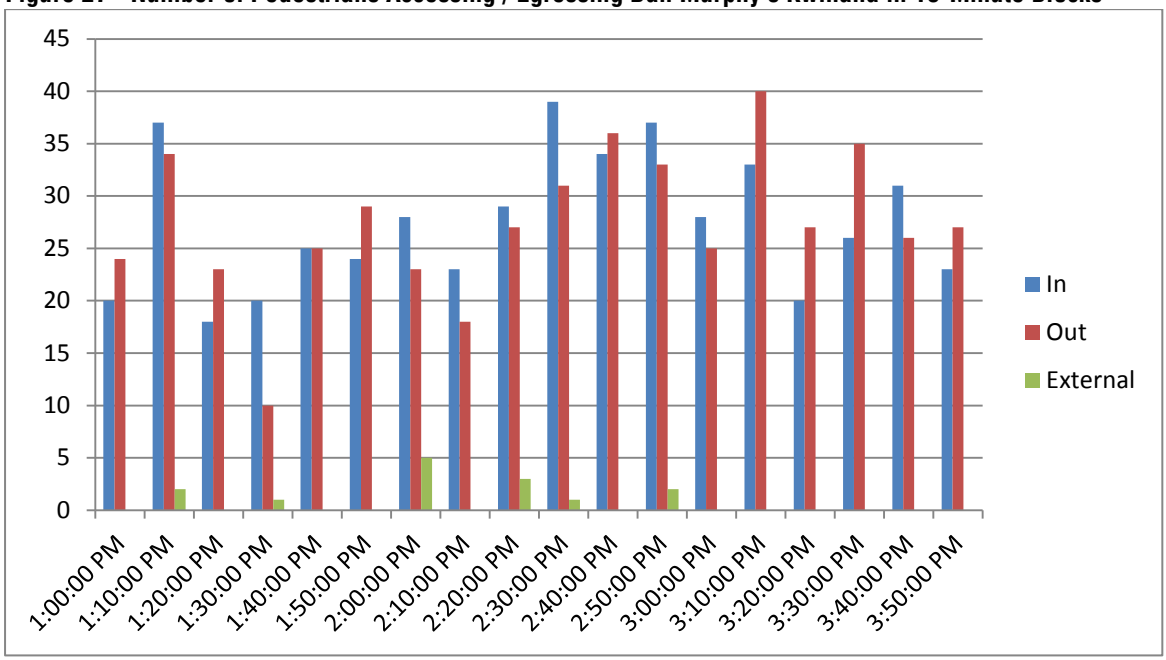
KCTT completed surveys counting the number of pedestrians accessing / egressing the Dan Murphy's store from the carpark and also collated any pedestrian movement into / out of the store which did not involve a vehicle.

Table 19 - Number of Pedestrians Witnessed Accessing / Egressing Dan Murphy's Kwinana

Time	13:00 – 13:10	13:10 – 13:20	13:20 – 13:30	13:30 – 13:40	13:40 – 13:50	13:50 – 14:00	14:00 – 14:10	14:10 – 14:20	14:20 – 14:30	14:30 – 14:40	14:40 – 14:50	14:50 – 15:00	15:00 – 15:10	15:10 – 15:20	15:20 – 15:30	15:30 – 15:40	15:40 – 15:50	15:50 – 16:00
Pedestrians (in)	20	37	18	20	25	24	28	23	29	39	34	37	28	33	20	26	31	23
Pedestrians (out)	24	34	23	10	25	29	23	18	27	31	36	33	25	40	27	35	26	27
Pedestrians (from external areas)		2		1			5		3	1		2						

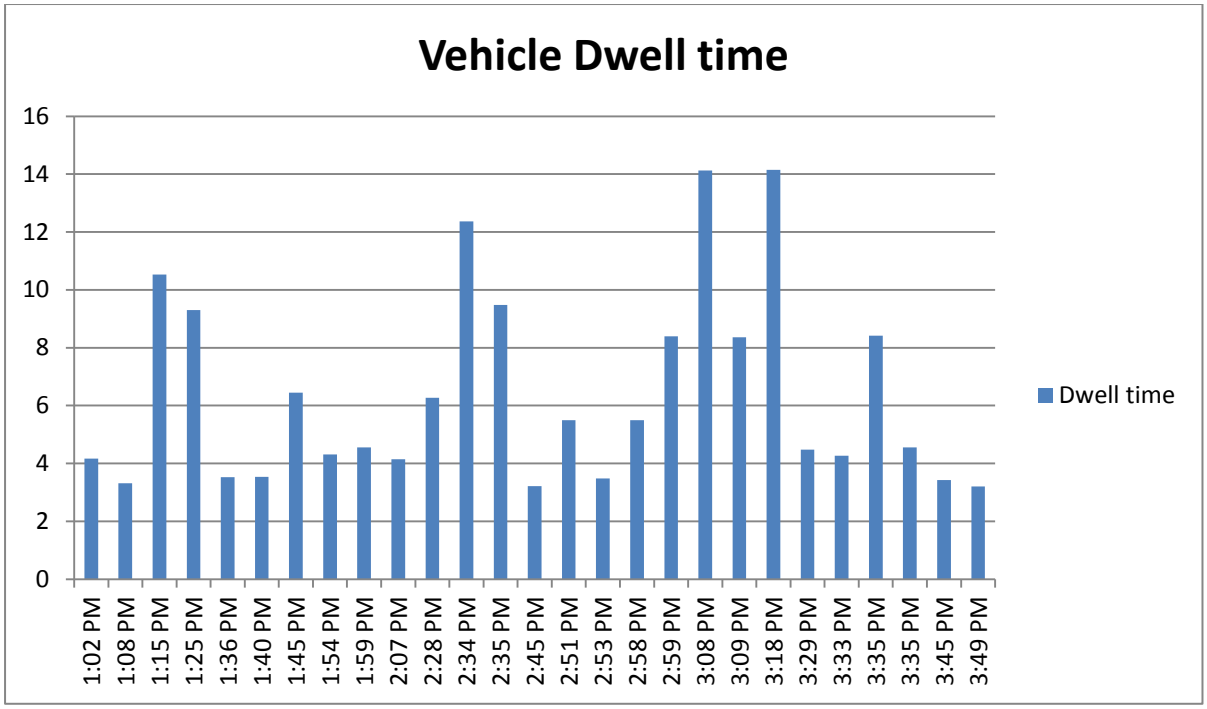
The majority of pedestrians utilised a vehicle parked in close proximity to the store due to the constant availability of bays parked in close proximity.

Figure 27 - Number of Pedestrians Accessing / Egressing Dan Murphy's Kwinana in 10-Minute Blocks



4.6.4 Average Vehicle Dwell Time

KCTT believe the dwell time is also an important consideration. KCTT randomly measured a number of vehicles for the time they stayed parked in the study area. The following figure shows the general split of times.



The majority of dwell times are less than 5 minutes, with the occasional longer dwell time. The average dwell time measured on Saturday 13th of June 2015 for all vehicles surveyed was 6 minutes 39 seconds from a sample size of 27 vehicles.