LARSEN ROAD

PROPOSED CROSS-OVER

PEDESTRIAN ENTRY

EXISTING FOOTPATH

EXISTING FOOTPATH

PROPOSED MRS RESERVATION DOTTED BLUE

1.5M WIDE FOOTPATH

PROPOSED 1.8M HIGH COLORBOND FENCING

LANDSCAPING ZONE

17372
103

*NOTE: TREATMENT OF GEORGE STREET VERGE TO BE UNDERTAKEN UNDER THE METRONET PROJECT AND MAY INCLUDE PARALLEL CAR PARKING AND FOOTPATHS

GEORGE STREET*

PEDESTRIAN ENTRY

EXISTING FOOTPATH

EXISTING WATER CORPORATION BUILDING
112
D87097

EXISTING 1.8M HIGH CYCLONE FENCING

PROPOSED 1.8M HIGH COLORBOND FENCING

1.5M WIDE FOOTPATH

PROPOSED FASTFOOD 01
220 m²
NOMINAL FFL: 55.150mm AHD

AWNING OVER

ENTRY

LOADING BAY

ORDER STATION

BIN STORE

DT WINDOW

PROPOSED CONVENIENCE STORE
300 sqm
NOMINAL FFL: 54.950mm AHD

FILL POINT (INDICATIVE ONLY)

PROPOSED MRS RESERVATION SHOWN DASHED TO BE CONFIRMED BY SURVEYOR

PROPOSED FUEL CANOPY
104

PROPOSED SERVICE STATION PYLON SIGN

SERVICE CENTRE
400m²
NOMINAL FFL: 54.150mm AHD

VACUUM BAYS

CAR WASH

AUTO

MANUAL

DOG WASH

PLANT
NOMINAL FFL: 54.050mm AHD

PROPOSED FAST FOOD 02
250 m²
NOMINAL FFL: 54.850mm AHD

O/D SEATING
57 m²

PICK UP WINDOW

PAY WINDOW

PROPOSED TRANSFORMER

EXISTING COMMERCIAL LOT

'NO EXIT' SIGN

'NO RIGHT TURN' SIGN

'NO EXIT' BITUMEN MAKING

EXISTING CROSS OVER

PROPOSED SHARED DEVELOPMENT PYLON SIGN

NO EXIT

SOUTH WESTERN HIGHWAY

1 DA108 PROPOSED SITE PLAN
1 : 300

LOT 104 (SN3) LARSEN RD, (CNR SOUTH WESTERN HIGHWAY) BYFORD

AREA SCHEDULE:	
TOTAL SITE AREA -	11,630 sqm
PROPOSED FAST FOOD 01-	220 sqm
PROPOSED CONVENIENCE STORE -	300 sqm
PROPOSED FAST FOOD 02-	250 sqm
CARWASH -	220 sqm
SERVICE CENTRE -	400 sqm
LANDSCAPE AREA -	1833 sqm (15.8 %)
CAR SPACES PROVIDED -	78

NOTE: ALL AREAS TO BE CONFIRMED BY SURVEY

'NO EXIT' SIGN

'NO RIGHT TURN' SIGN

GRAPHIC SCALE: 1:300

G	ISSUED FOR REVIEW	JK/LM	LM	19.03.2024
F	ISSUED FOR DA - CROSSING NOTES ADDED	JK/LM	LM	23.02.2024
E	ISSUED FOR DA - AMENDED MRS	JK/LM	LM	10.01.2024
D	ISSUED FOR DA	JK/LM	LM	14.12.2023
revision/ issue	description	drawn by	check by	date

project: COMMERCIAL DEVELOPMENT
location: LOT 104 LARSEN RD, BYFORD

drawn: Author
checked: Checker
description: PROPOSED SITE PLAN

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PO Box 743, West Perth, WA 6872
Ph: (08) 9322 5144
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scale: As indicated
date: 19.03.2024
project no: 71.23
dwg no: DA001
rev: G

LARSEN ROAD

IL : 51.85

IL : 51.85

TBM 9002
D/Spike in Conc.
RL 52.33m

TBM 9003
D/Spike in Conc.
RL 55.47m

GEORGE STREET*

SOUTH WESTERN HIGHWAY

17372
103

Water Corporation Building

112

104

10

1.8m High
Cyclone
Mesh Fence

Sea
Container

Sewer
MH
IL : 49.47

WUNGONG
31
SSM

TBM 9001
D/Spike in Bit.
RL 52.34m

TBM 9004
D/Spike in Bit.
RL 55.33m

59.69
95°25'40"
68.04
63.27
90°
60.35
90°01'
115.01
99°56'5"
107.5
127°33'10"
12.25
12.92
175°3'

1 SURVEY
DA109 1 : 300

LOT 104 (SN3) LARSEN RD, (CNR SOUTH WESTERN HIGHWAY) BYFORD

2 LOCATION PLAN
1 : 5000

FEATURE LEVEL SURVEY BY JBA SURVEYS

Notes:
1. Boundary plotted from Landgate SCDB digital data only.
2. True position of Boundary is subject to a re-establishment survey.
3. Heights established from SSM WUN31 via GPS connection.
4. Dimensions, Areas and Offsets subject to re-establishment survey.
5. Sewer & water data plotted from Dial Before You Dig only.

GRAPHIC SCALE: 1:300

B	ISSUED FOR DA	JK/LM	LM	13.12.2023
A	ISSUE FOR INFORMATION	JR	LM	06.11.2023
revision/ issue	description	drawn by	check by	date

project: COMMERCIAL DEVELOPMENT
location: LOT 104 LARSEN RD, BYFORD
drawn: Author
checked: Checker
description: SURVEY
scale: As indicated
date: 13.12.2023
project no: 71.23
dwg no: DA000
rev: B

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Ph: (08) 9322 5144
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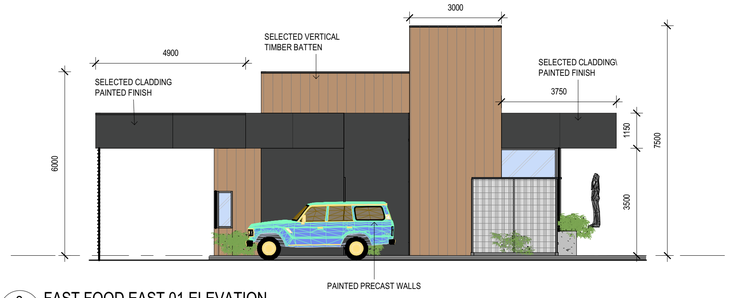
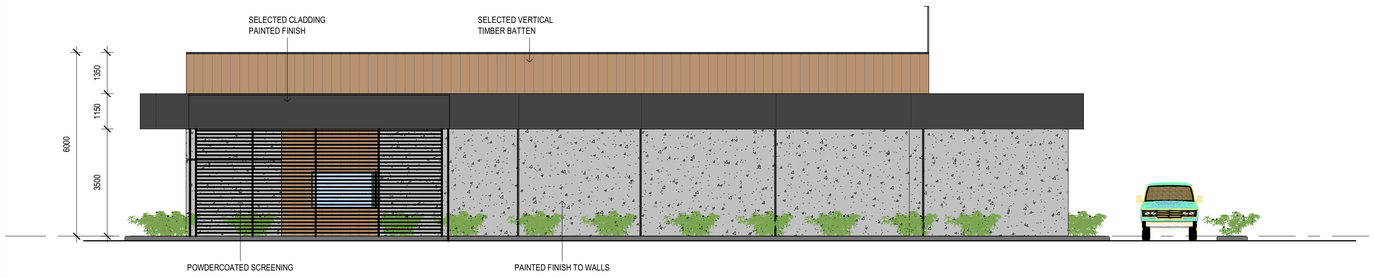
1 DA100 — FAST FOOD 01 NORTH ELEVATION
1 : 100



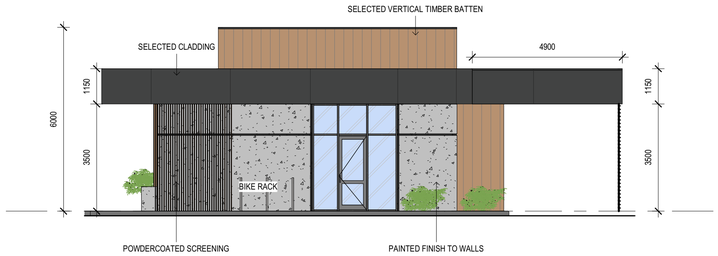
2 DA100 — FAST FOOD EAST 01 ELEVATION
1 : 100

WALL FINISHES LEGEND

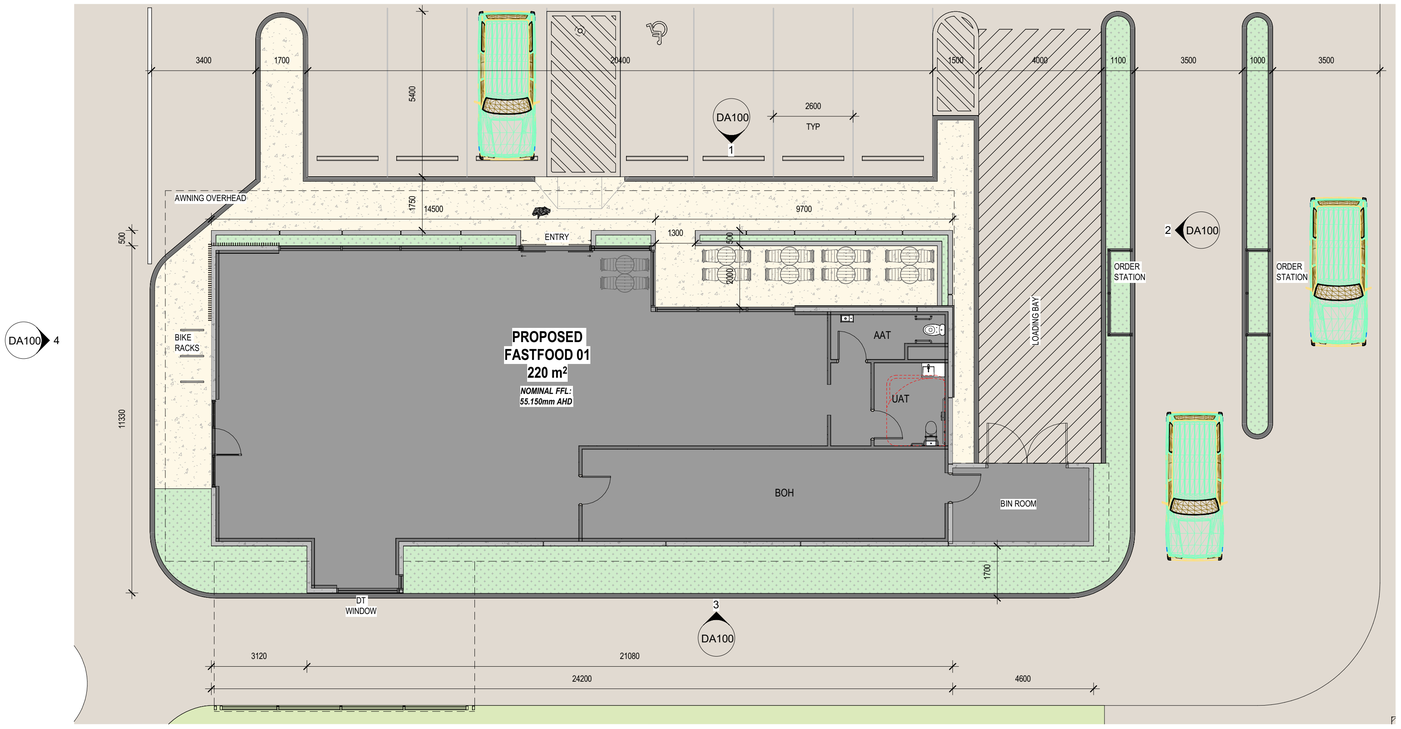
- SELECTED TIMBER LOOK VERTICAL CLADDING
- SELECTED DARK GREY CHARCOAL PAINTED CLADDING
- SELECTED LIGHT GREY PAINTED CLADDING



3 DA100 — FAST FOOD 01 SOUTH ELEVATION
1 : 100



4 DA100 — FAST FOOD 01 WEST ELEVATIONS
1 : 100



5 DA109 — FAST FOOD FLOOR PLAN
1 : 100

6 PERSPECTIVE

GRAPHIC SCALE: 1:100

C	ISSUED FOR DA	JK/LM	LM	13.12.2023
B	ISSUE FOR INFORMATION	JR	LM	06.11.2023
A	ISSUE FOR REVIEW	JS/JK	LM	27.10.2023
revision/ issue	description	drawn by	check by	date

project: COMMERCIAL DEVELOPMENT
location: LOT 104 LARSEN RD, BYFORD
drawn: Author
checked: Checker
description: FAST FOOD 01 PLAN AND ELEVATIONS
scale: 1 : 100
date: 13.12.2023
project no: 71.23
dwg no: DA100
rev: C

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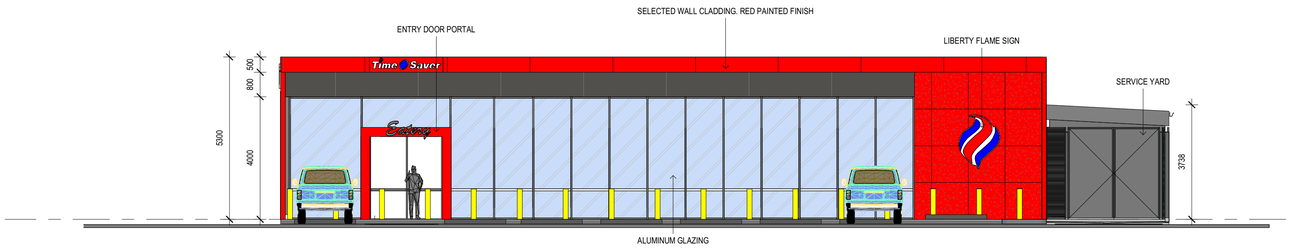
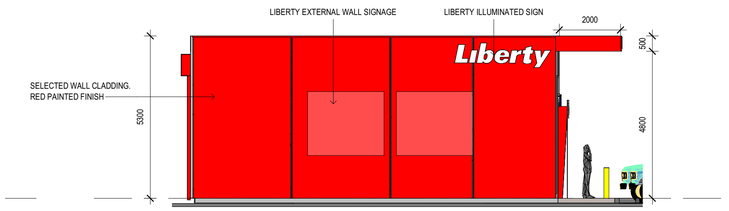
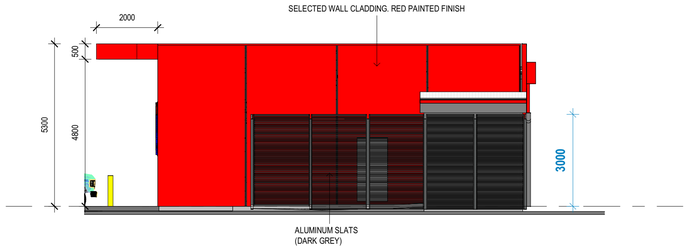


1 DA101 **LIBERTY SOUTH ELEVATION**
1 : 100



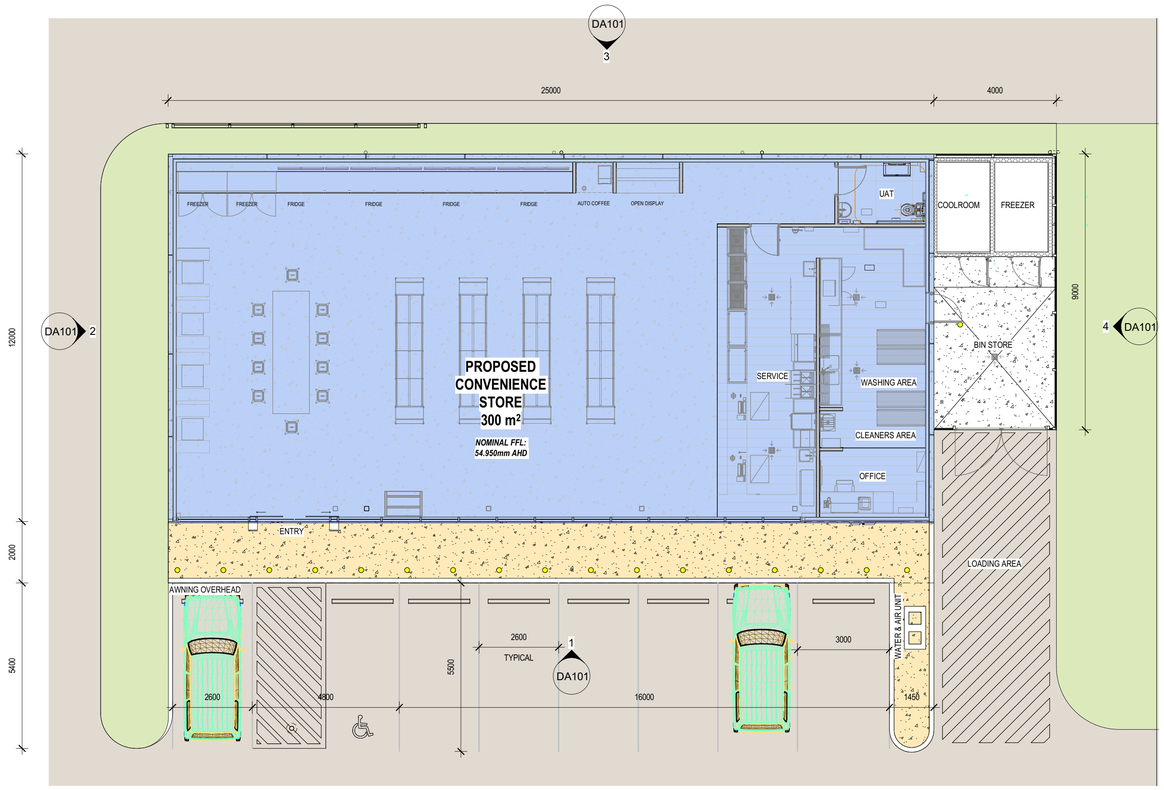
2 DA101 **LIBERTY WEST ELEVATION**
1 : 100

3 DA101 **LIBERTY NORTH ELEVATION**
1 : 100



4 DA101 **LIBERTY EAST ELEVATION**
1 : 100

WALL FINISHES LEGEND
SELECTED CLADDING RED FINISH



5 DA109 **LIBERTY FLOOR PLAN**
1 : 100

6 **LIBERTY 3D**

GRAPHIC SCALE: 1:100

revision/ issue	description	drawn by	check by	date
C	ISSUED FOR DA	JK/LM	LM	13.12.2023
B	ISSUE FOR INFORMATION	JR	LM	06.11.2023
A	ISSUE FOR REVIEW	JS/JK	LM	27.10.2023

project
COMMERCIAL DEVELOPMENT
location
LOT 104 LARSEN RD, BYFORD

drawn: Author
checked: Checker

description
LIBERTY PLAN AND ELEVATIONS

scale: 1 : 100

date: 13.12.2023

project no: 71.23

dwg no: DA101

rev: C

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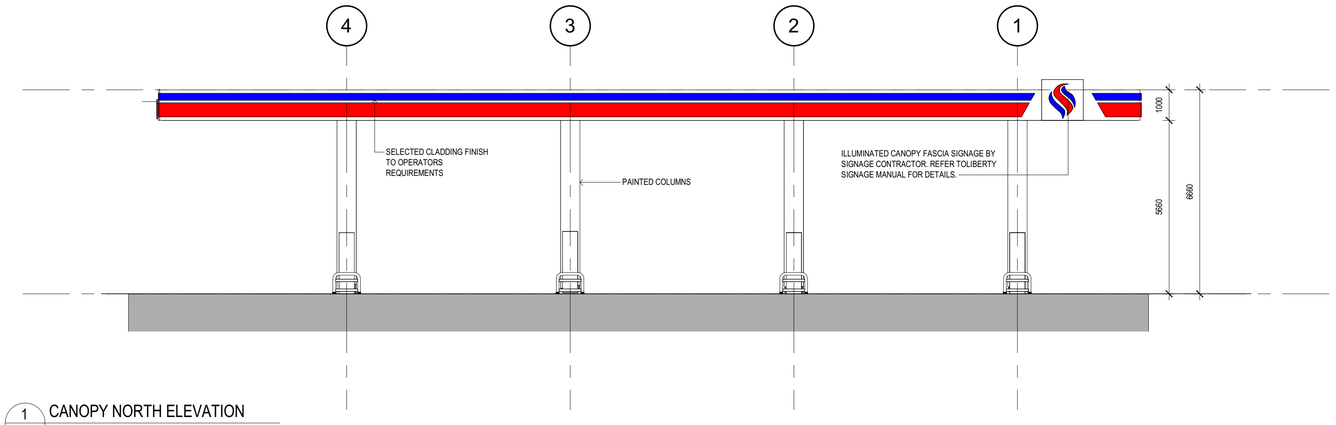
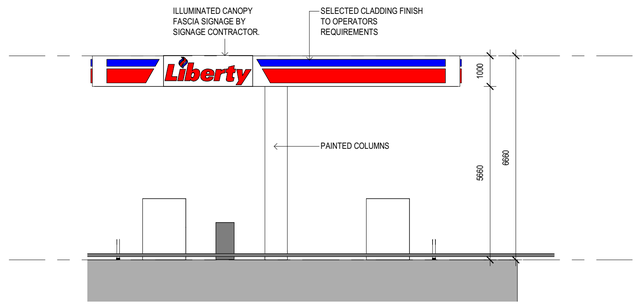
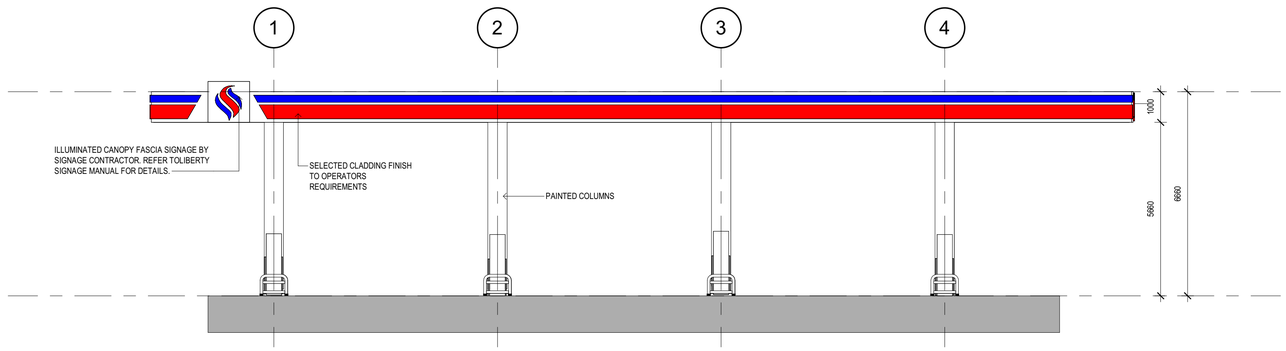


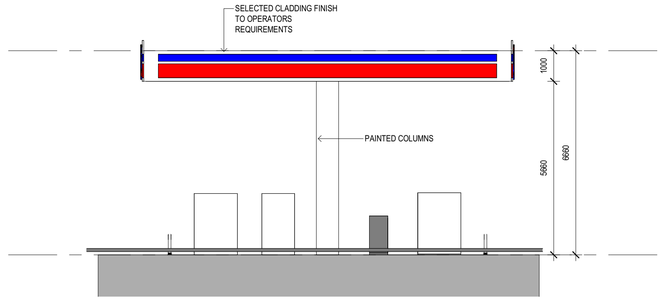
1 DA102 CANOPY NORTH ELEVATION
1 : 100



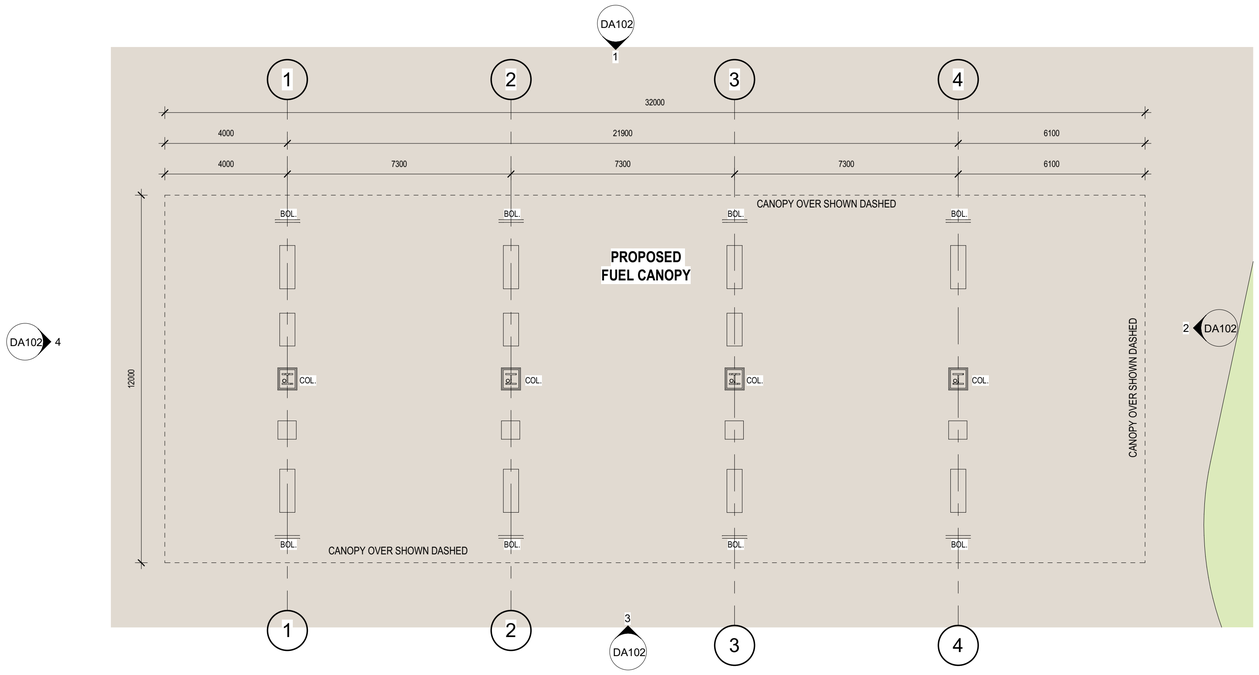
2 DA102 CANOPY EAST ELEVATION
1 : 100



3 DA102 CANOPY SOUTH ELEVATION
1 : 100



4 DA102 CANOPY WEST ELEVATION
1 : 100



5 DA109 CANOPY FLOOR PLAN
1 : 100

6 CANOPY 3D

0 1 2 3 4 5 10
GRAPHIC SCALE: 1:100

N

revision/ issue	description	drawn by	check by	date
B	ISSUED FOR DA	JK/LM	LM	13.12.2023
A	ISSUE FOR REVIEW	JS/JK	LM	27.10.2023

project
COMMERCIAL DEVELOPMENT
location
LOT 104 LARSEN RD, BYFORD

drawn: Author
checked: Checker
description: CANOPY PLAN AND ELEVATIONS
scale: 1 : 100
date: 13.12.2023
project no: 71.23
dwg no: DA102
rev: B

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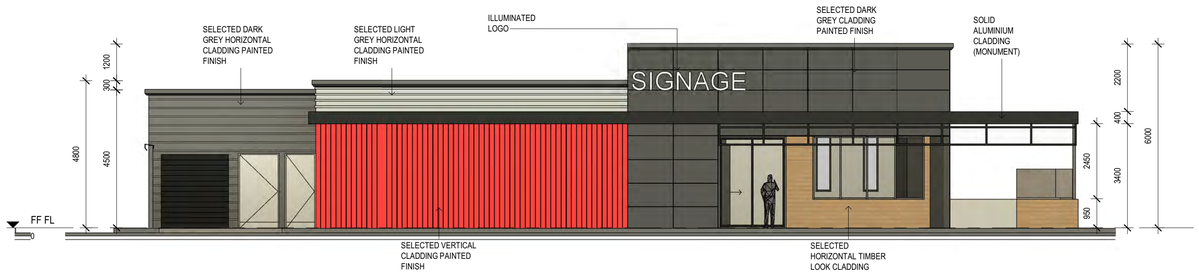
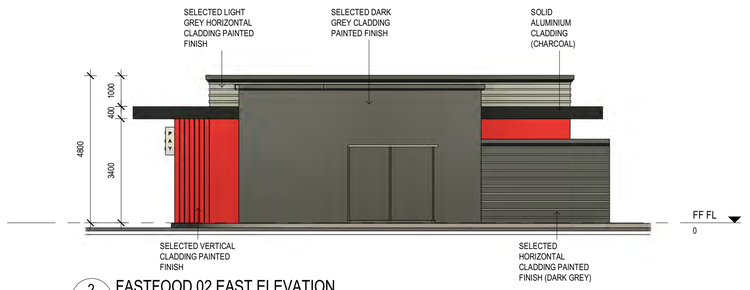
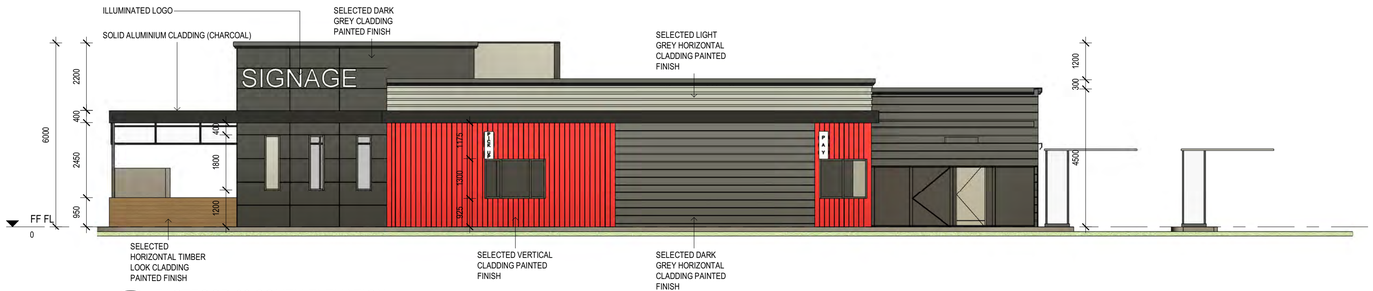


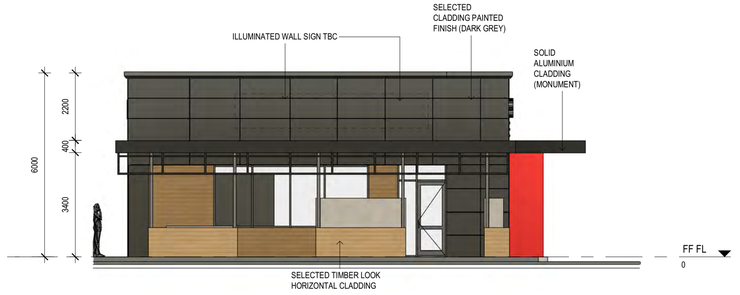
1 DA103 FASTFOOD 02 NORTH ELEVATION
1 : 100



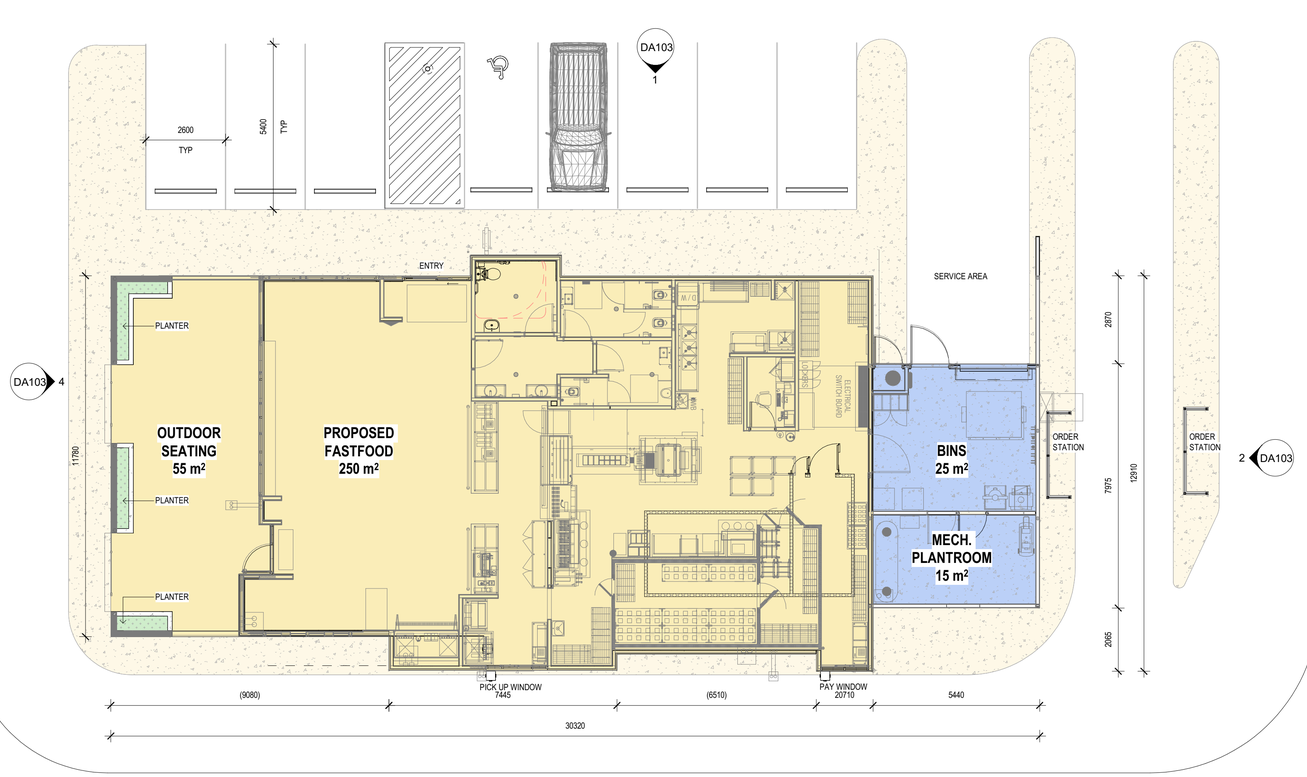
2 DA103 FASTFOOD 02 EAST ELEVATION
1 : 100



3 DA103 FASTFOOD 02 SOUTH ELEVATION
1 : 100



4 DA103 FASTFOOD 02 WEST ELEVATION
1 : 100



5 DA109 FAST FOOD 02 FLOOR PLAN
1 : 100

3 DA103

6 PERSPECTIVE

0 1 2 3 4 5 10
GRAPHIC SCALE: 1:100

N

C	ISSUED FOR DA	JK/LM	LM	13.12.2023
B	ISSUE FOR INFORMATION	JR	LM	06.11.2023
A	ISSUE FOR REVIEW	JS/JK	LM	27.10.2023
revision/ issue	description	drawn by	check by	date

project: COMMERCIAL DEVELOPMENT
location: LOT 104 LARSEN RD, BYFORD
drawn: Author
checked: Checker
description: FAST FOOD 02 PLAN AND ELEVATIONS
scale: 1 : 100
date: 13.12.2023
project no: 71.23
dwg no: DA103
rev: C

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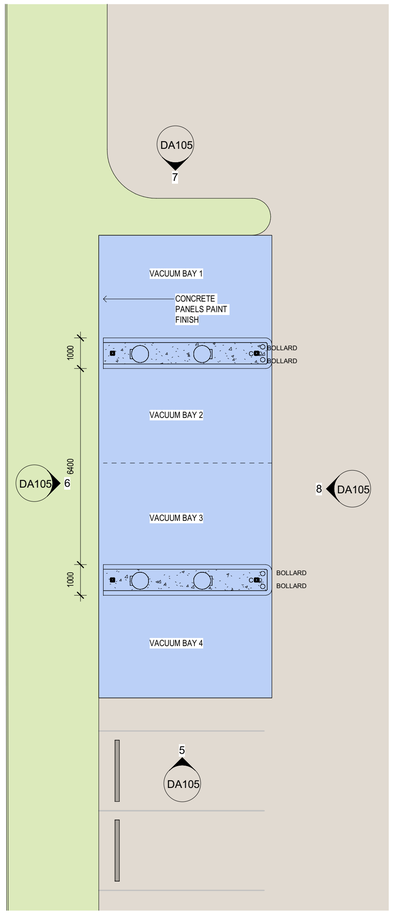

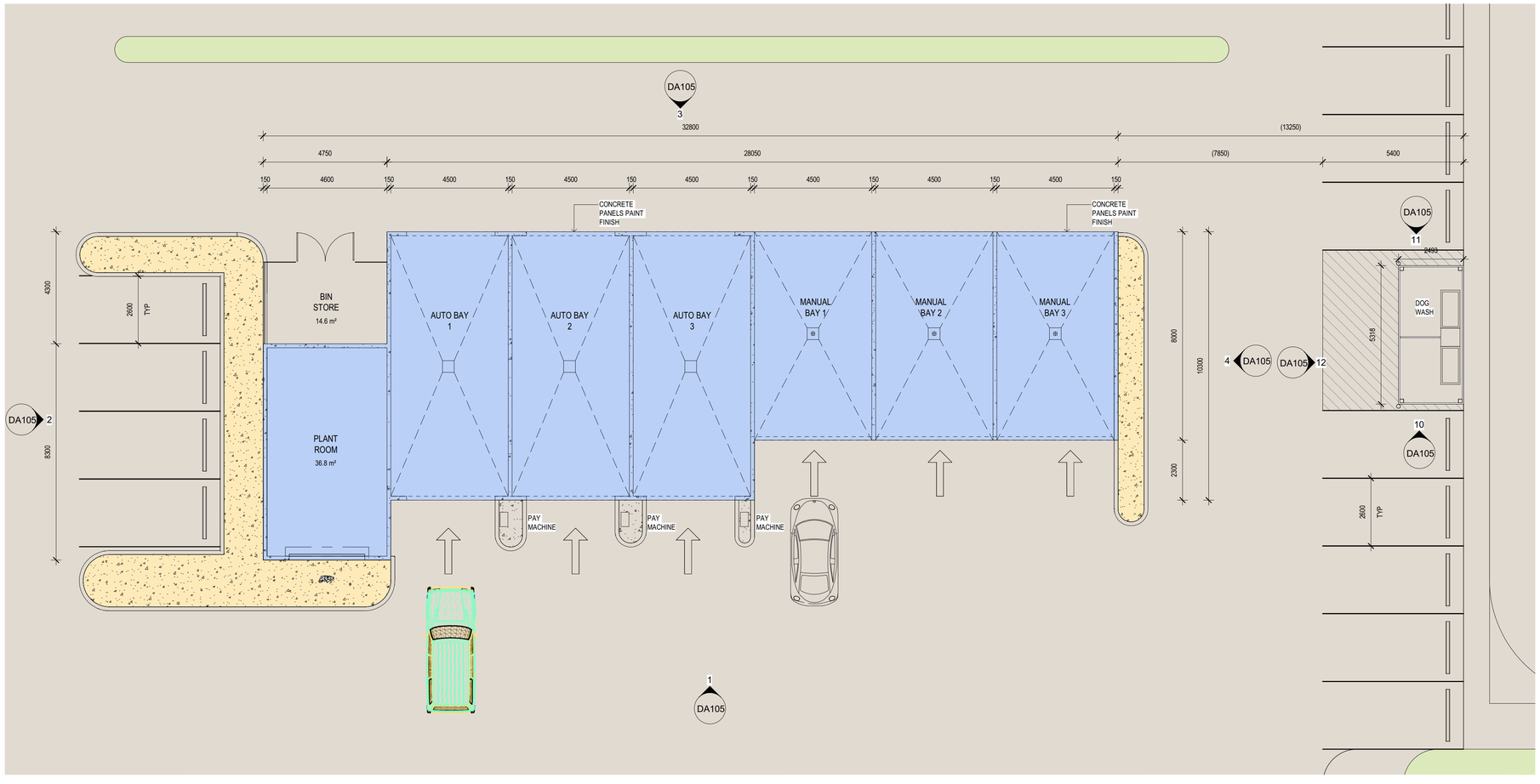

2 DA105 VACUUM BAYS PLAN
1 : 100

1 DA105 CARWASH PLAN
1 : 100

0 1 2 3 4 5 10
GRAPHIC SCALE: 1:100

N

B	ISSUED FOR DA	JK/LM	LM	13.12.2023
A	ISSUE FOR INFORMATION	JR	LM	06.11.2023
revision/ issue	description	drawn by	check by	date

project
COMMERCIAL DEVELOPMENT
location
LOT 104 LARSEN RD, BYFORD

drawn: Author
checked: Checker
description: CARWASH PLAN LAYOUT

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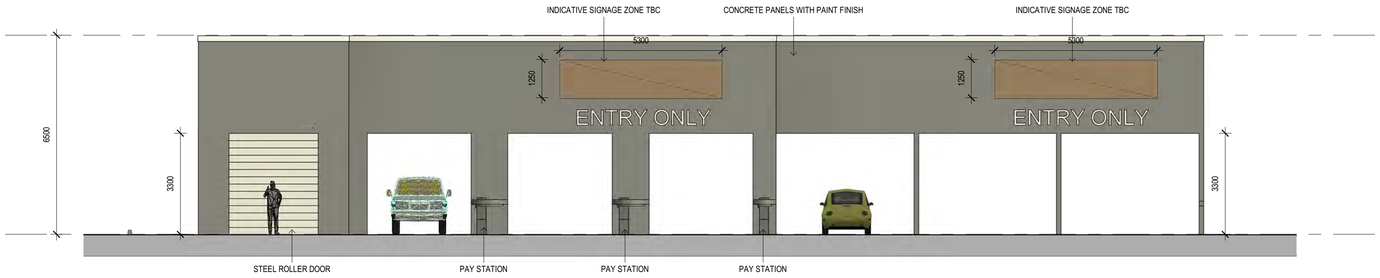
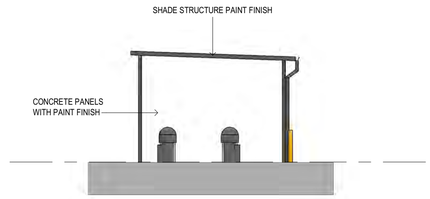
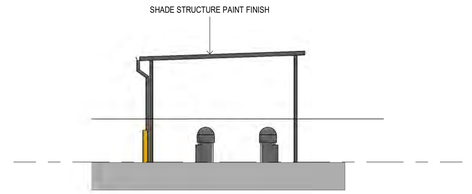
scale: 1 : 100
date: 13.12.2023
project no: 71.23
dwg no: DA104
rev: B



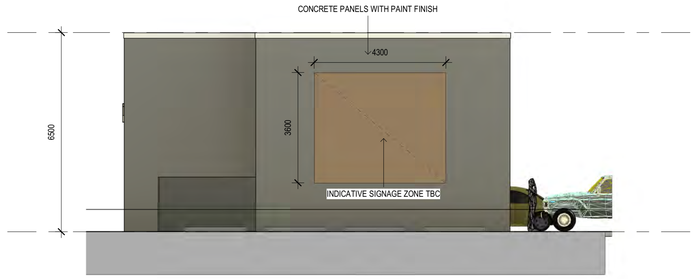
1 CAR WASH ELEVATION
DA104 1 : 100



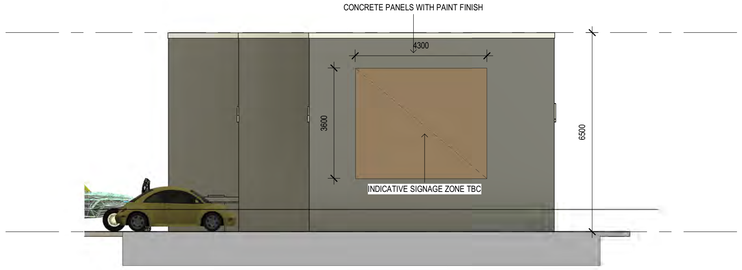
5 VACUUM BAY ELEVATION
DA104 1 : 100



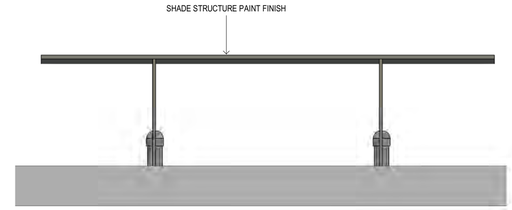
7 VACUUM BAY ELEVATION
DA104 1 : 100



2 CAR WASH ELEVATION
DA104 1 : 100

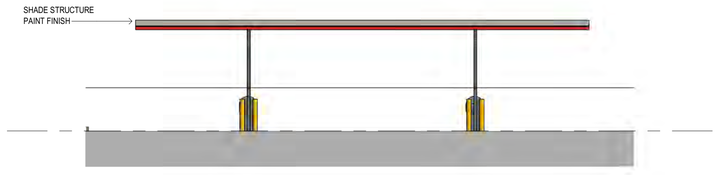


4 CAR WASH ELEVATION
DA104 1 : 100

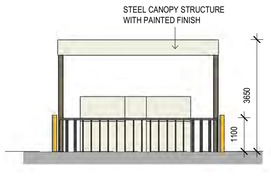


6 VACUUM BAY ELEVATION
DA104 1 : 100

3 CAR WASH ELEVATION
DA104 1 : 100

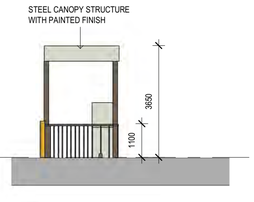


8 VACUUM BAY ELEVATION
DA104 1 : 100



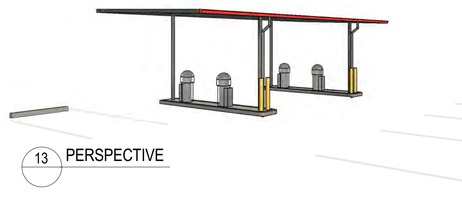
9 DOG WASH ELEVATION
SK.05 1 : 100

12 DOG WASH ELEVATION
DA104 1 : 100

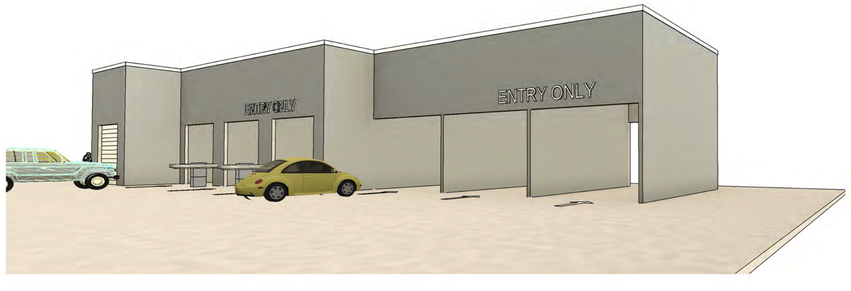


10 DOG WASH ELEVATION
DA104 1 : 100

11 DOG WASH ELEVATION
DA104 1 : 100



13 PERSPECTIVE



14 PERSPECTIVE

0 1 2 3 4 5 10
GRAPHIC SCALE: 1:100

N

C	ISSUED FOR DA	JK/LM	LM	13.12.2023
B	ISSUE FOR INFORMATION	JR	LM	06.11.2023
A	ISSUE FOR REVIEW	JS/JK	LM	27.10.2023
revision/ issue	description	drawn by	check by	date

project
COMMERCIAL DEVELOPMENT
location
LOT 104 LARSEN RD, BYFORD

drawn: Author
checked: Checker
description: CARWASH, VACUUM BAYS, DOG WASH

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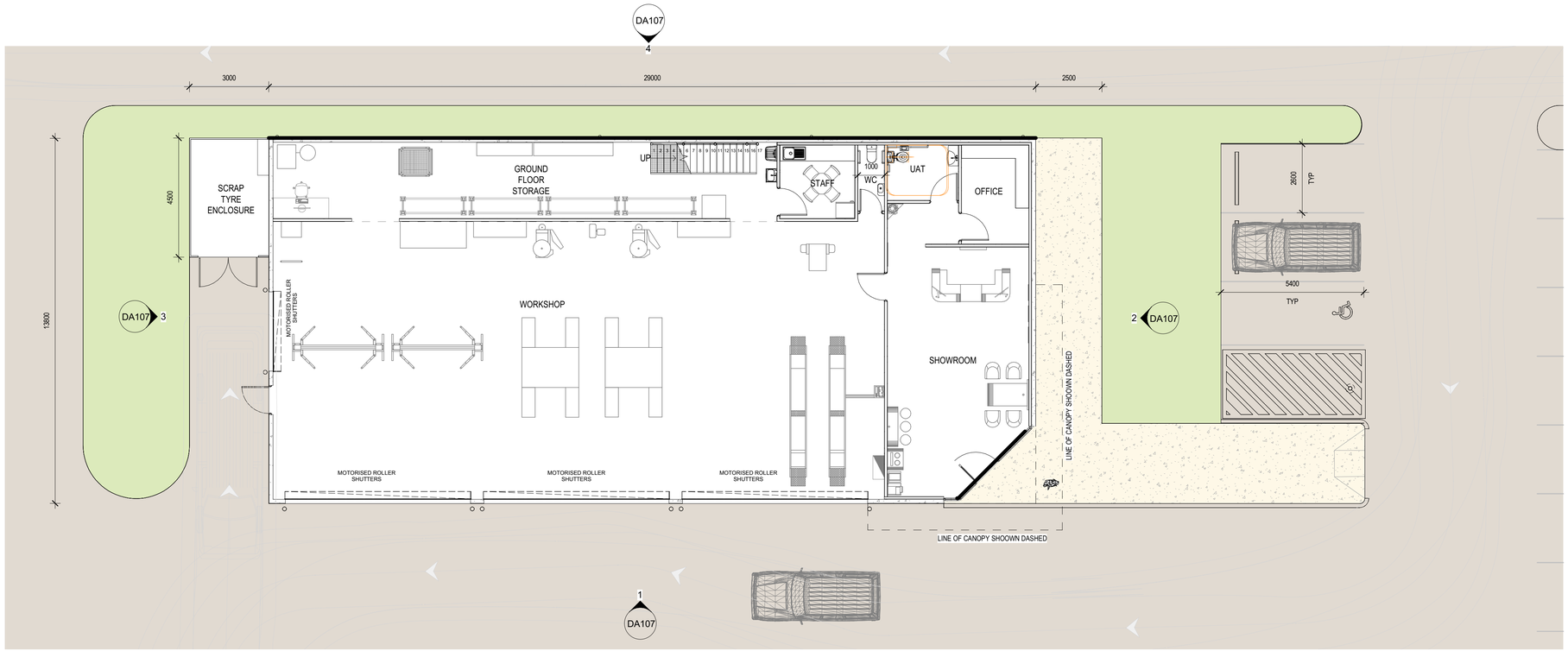
scale: 1 : 100
date: 13.12.2023
project no: 71.23
dwg no: DA105
rev: C



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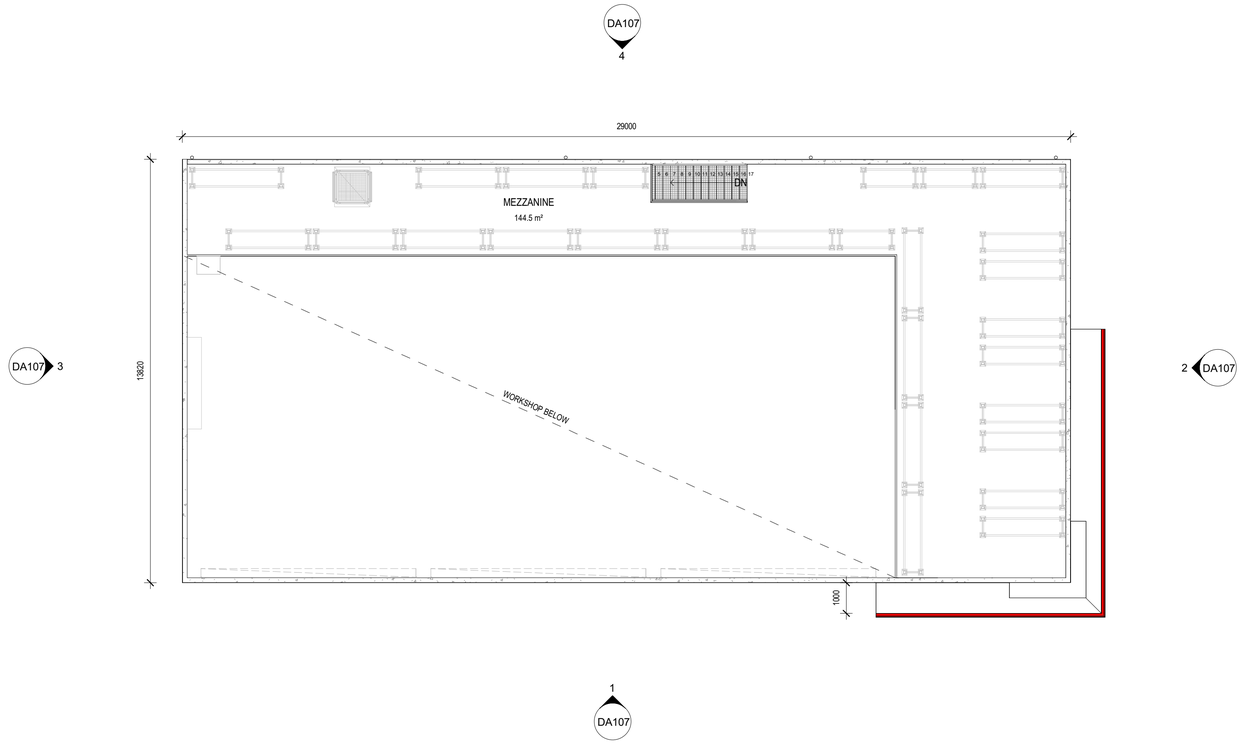

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revision/ issue	description	drawn by	check by	date
C	ISSUED FOR DA	JK/LM	LM	13.12.2023
B	ISSUE FOR INFORMATION	JR	LM	06.11.2023
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project: COMMERCIAL DEVELOPMENT
location: LOT 104 LARSEN RD, BYFORD

drawn: Author
checked: Checker

description: SERVICE CENTRE LAYOUT PLAN

scale: 1 : 100
date: 13.12.2023
project no: 71.23
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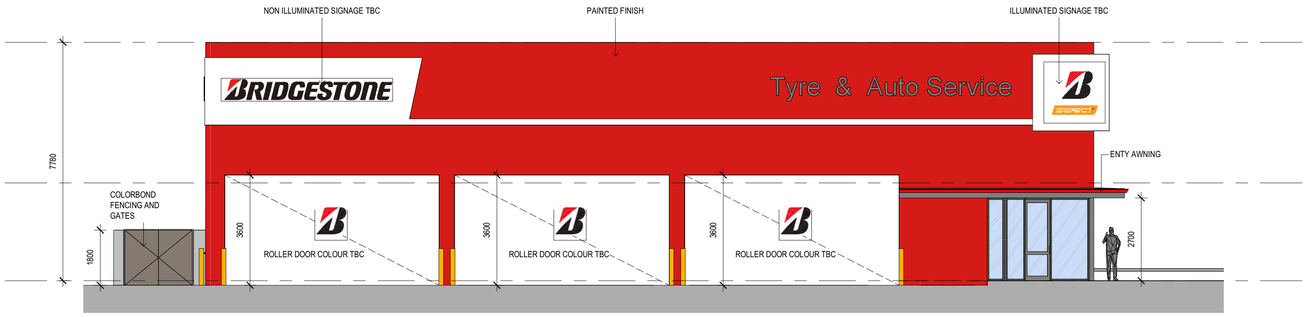

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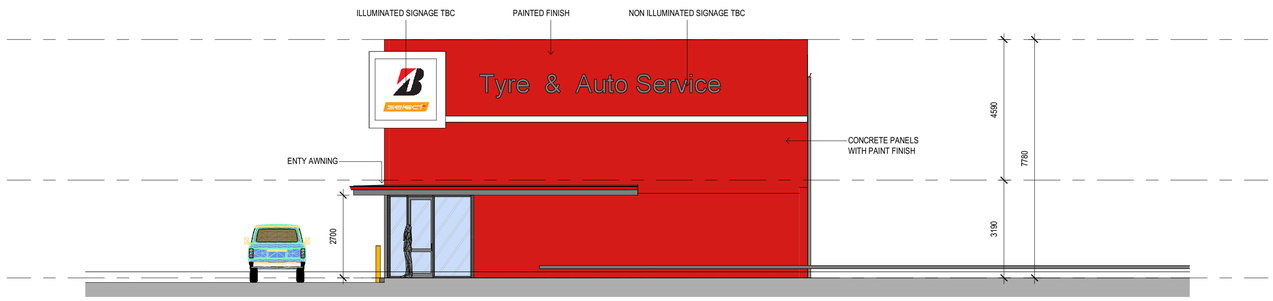

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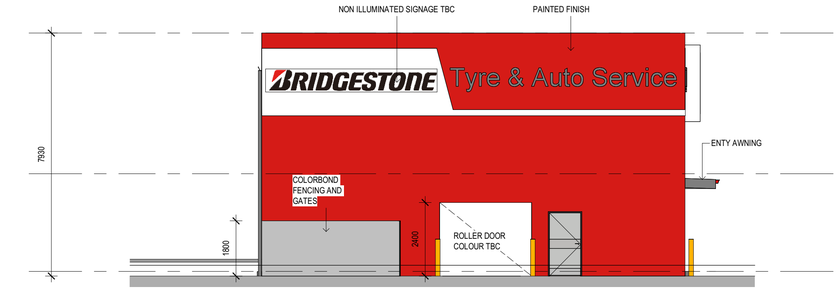

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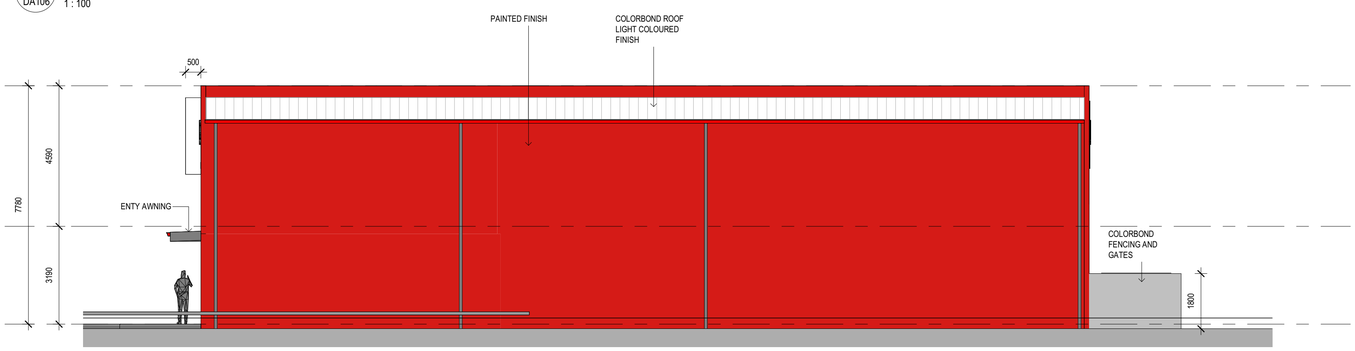

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5 SERVICE CENTRE 3D VIEW

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revision/ issue	description	drawn by	check by	date

project
COMMERCIAL DEVELOPMENT
location
LOT 104 LARSEN RD, BYFORD

drawn: Author
checked: Checker
description: SERVICE CENTRE ELEVATIONS

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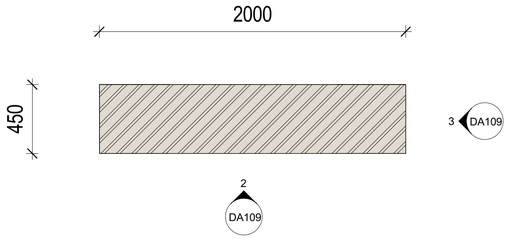

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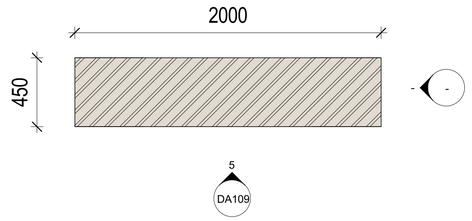

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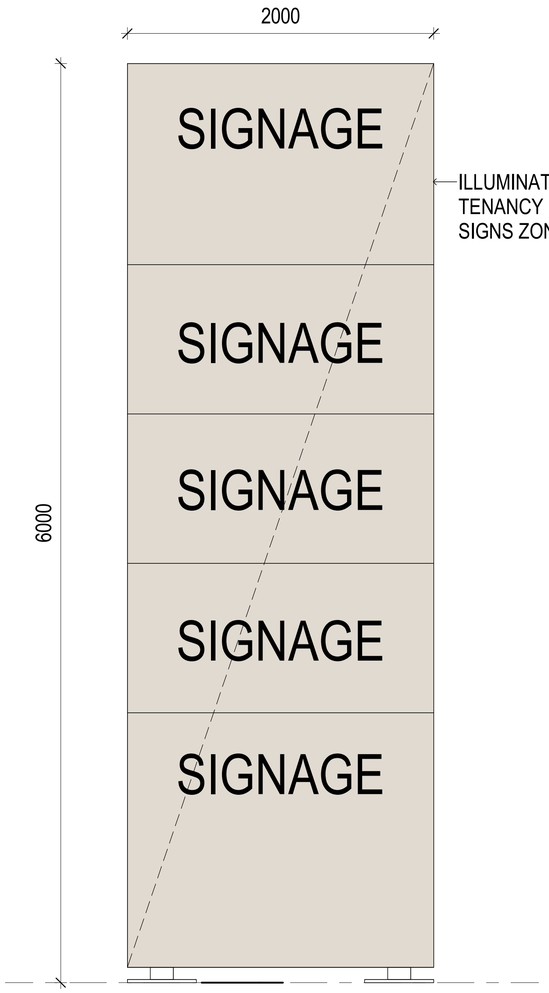

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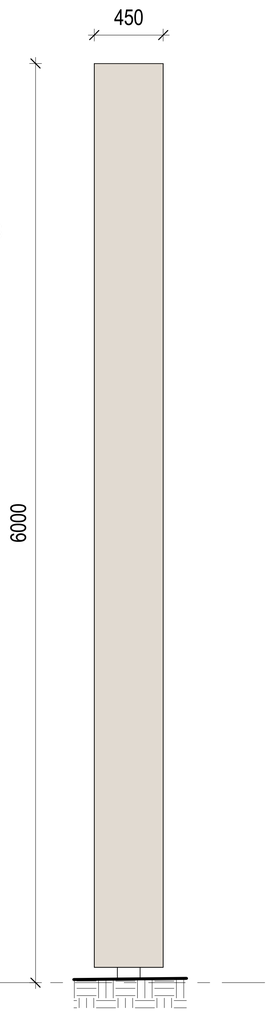

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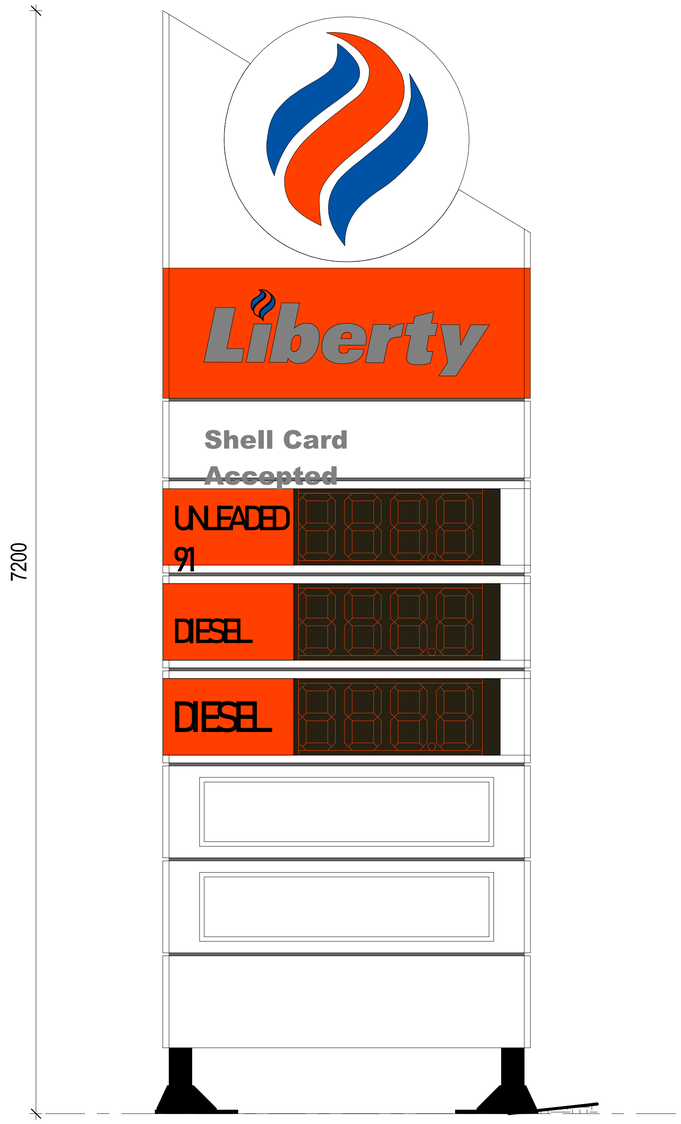

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DATE: 13.12.2023

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project: COMMERCIAL DEVELOPMENT
location: LOT 104 LARSEN RD, BYFORD
drawn: Author
checked: Checker
description: SIGNAGE ELEVATIONS

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Engineering a better future for over 20 years!

Proposed Commercial Development

Lot 104 (No 3) Larsen Road, Byford

Transport Impact Assessment

PREPARED FOR:
Capital Prudential

November 2023

Document history and status

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Project manager: Behnam Bordbar

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Project: 3 Larsen Road, Byford

Document revision: r01

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1 Introduction

This Transport Impact Assessment (TIA) has been prepared by Transcore on behalf of Capital Prudential with respect to the proposed commercial development to be located at 3 Larsen Road, Byford in the Shire of Serpentine-Jarrahdale (Shire).

The subject site is approximately 11,635m^2. It is bound by Larsen Road to the north, South Western Highway (SWH) to the east, George Street to the west and existing developments to the south as shown in **Figure 1**.

Figure 1: Location of the subject site

The key issues that will be addressed in this report include the traffic generation and distribution of the proposed development, review of the existing and proposed site crossovers and capacity analysis of the development crossovers and intersection of South Western Highway and Larson Road as a network.

The location of the subject site within the *Metropolitan Region Scheme (MRS)* context is illustrated in **Figure 2**. Review of the *MRS* identifies South Western Highway as a "Primary Regional Road" under care and control of Main Roads WA and all other roads surrounding the subject site are local roads under care and control of the Shire. The subject site is zoned as *"Urban"* in the *MRS*.

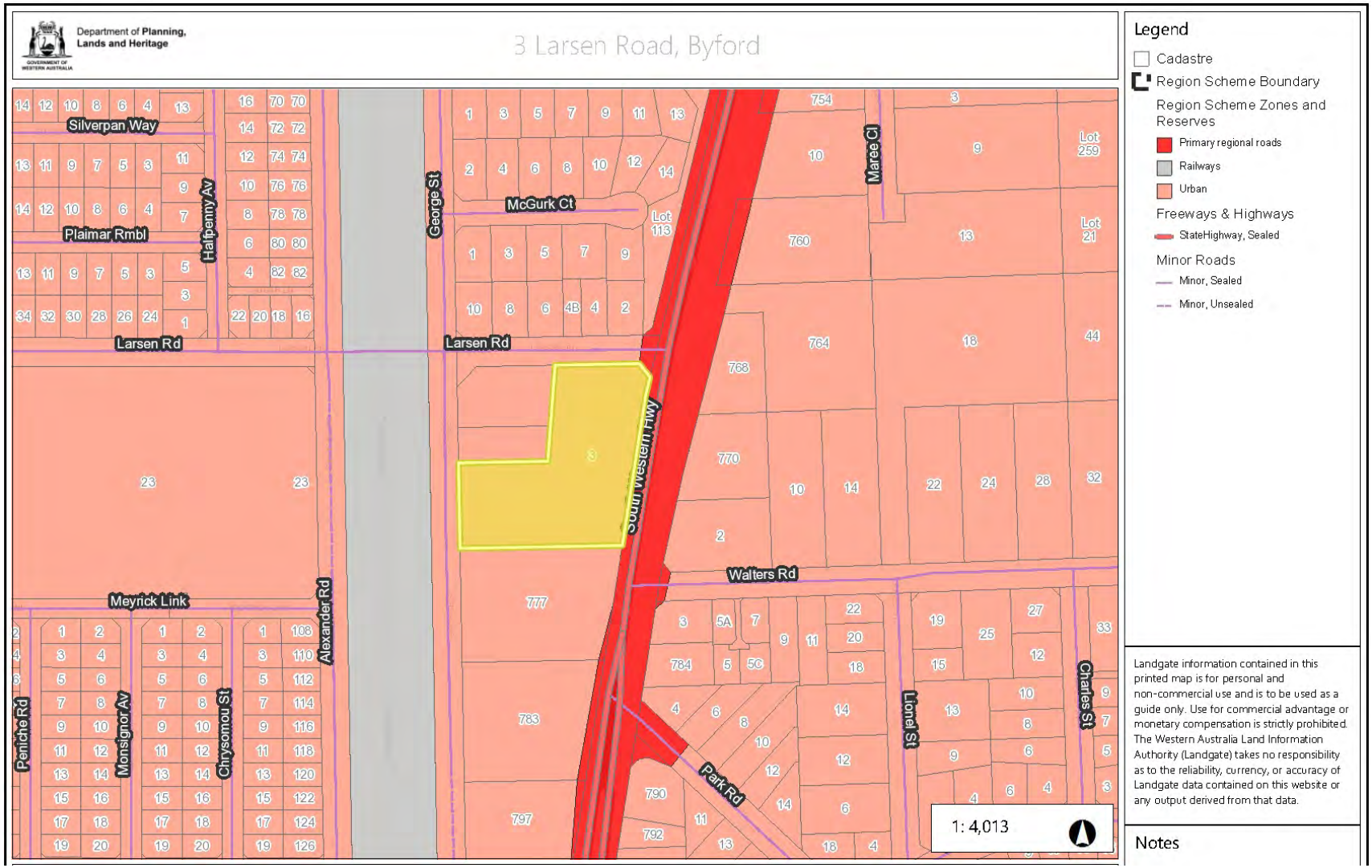


Figure 2: Location of the subject site within the MRS

2 Development Proposal

The proposal is for construction of a commercial development comprising the following elements:

- Fast Food Outlet 1 with Drive-through: 220m^2 GFA;
- Fast Food Outlet 2 with Drive-through: 250m^2 GFA;
- Service Centre: 400m^2 GFA;
- Car Wash: 3 manual bays plus 3 auto bays;
- Dog wash:1 bay;
- Service Station: 300m^2 convenience store plus 8 light vehicle fill points.

The site currently has one full movement crossover on SWH. The intention is to retain the existing full-movement crossover on SWH without any modifications and add one full movement crossover on Larsen Road and another one on Geroge Street to create an efficient accessibility and circulation system and distribute the development traffic satisfactorily on the surround roads and intersections. **Figure 3** shows the location of the existing and proposed crossovers. The site layout has been reviewed to ensure efficient and satisfactory movement of various vehicles entering and exiting the site (refer **Appendix B**).

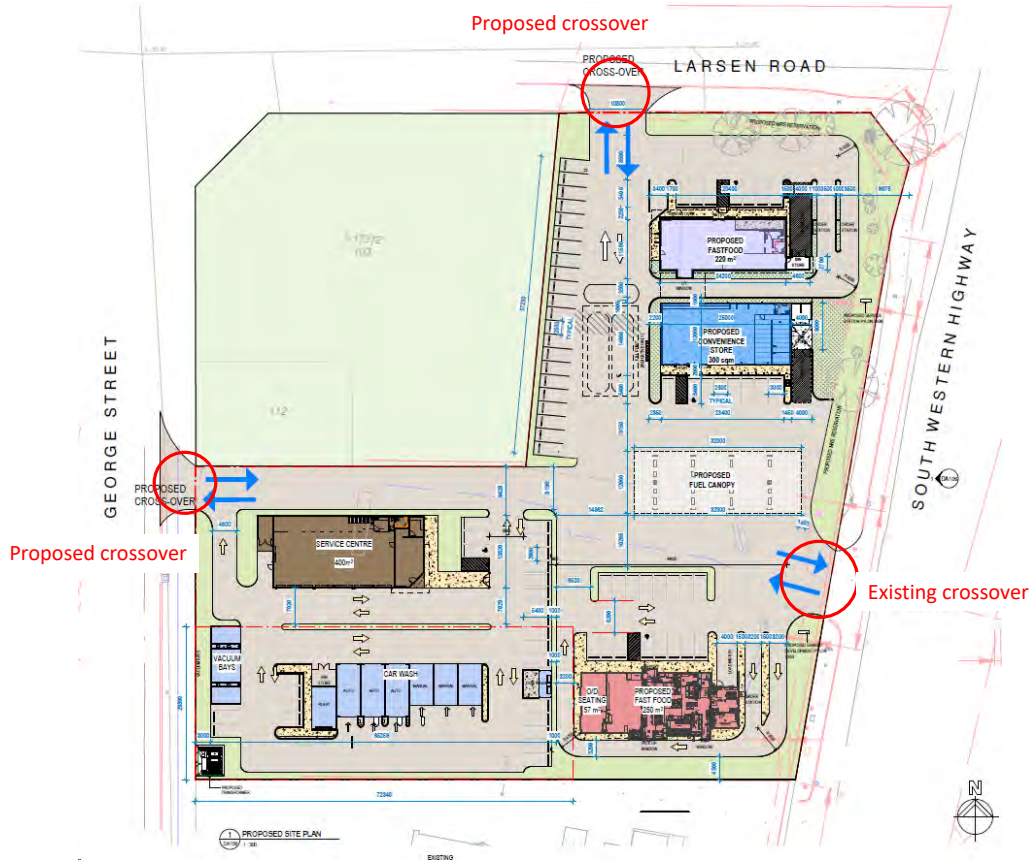


Figure 3: Existing and proposed crossovers

3 Existing Situation

3.1 Existing Road Network

The existing road hierarchy and standard of the surrounding roads are presented in Figure 4.

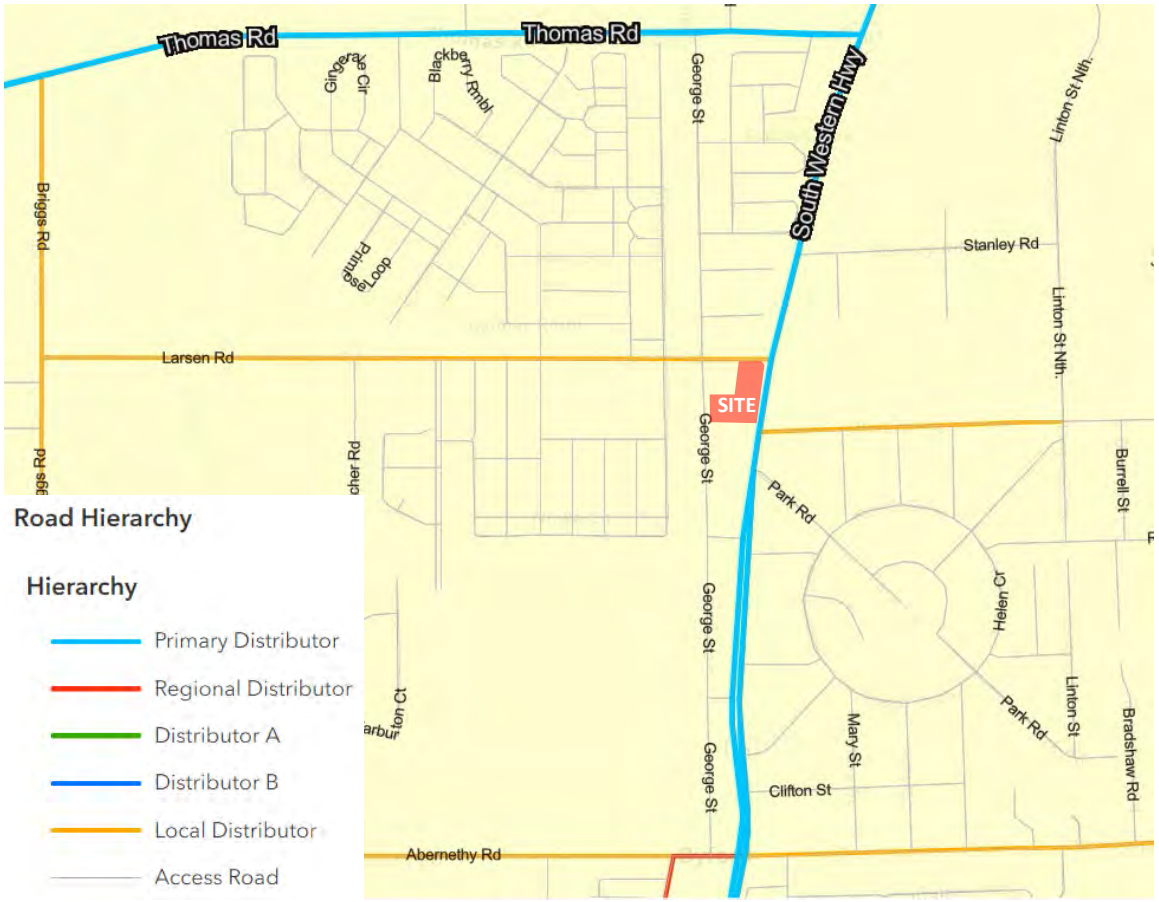


Figure 4: Existing road hierarchy

South Western Highway (SWH) is classified as a *Primary Distributor* in the Main Roads WA *Functional Road Hierarchy*. It is also classified as a *Primary Regional Road* (i.e. a red road) in the *Metropolitan Region Scheme*. SWH is under the care and control of Main Roads WA and operates under the sign-posted speed limit of 60km/h in the vicinity of the subject site.

The existing SWH reserve width is approximately 35m in the vicinity of the site and reduces to 30m past Walters Road. This section is constructed as an 11m-wide two-lane single carriageway road. It has a 2m shared path within both verges. It forms a full movement T-intersection with Larsen Road at the northeast corner of the site and at Walters Road south of the site. Basic widening is in place on SWH at Larsen Road intersection to allow for through movement on SWH to pass the right turning vehicles from SWH to Larsen Road. This intersection also entails a left turn lane on SWH.

Figure 5: South Western Highway looking south at Larsen Road intersection

Larsen Road is classified as a *Local Distributor* in the Main Roads WA *Functional Road Hierarchy*. Larsen Road operates under the default built-up area speed limit of 50km/h.

The existing road reserve width is approximately 20m and is constructed as a 9m-wide single-carriageway two-lane road. Larsen Road has a 2m shared path on the southern side of the road. It forms a T-intersection with South Western Highway at its eastern end and a four-way intersection with George Street in the west, adjacent to an existing railway crossing of Armadale Line railway.

Figure 6: Larsen Road looking west towards the existing railway crossing

George Street is classified as an *Access Road* in the Main Roads WA *Functional Road Hierarchy*. George Street operates under the default built-up area speed limit of 50km/h with 6.2m carriageway and 2m shared path on the eastern side.

Figure 7: George Street looking south at Larsen Road

George Street is currently constructed for approximately 290m south of Larsen Road (adjacent to the subject site) but is not yet constructed through to Evans Way south of the site. Georger Street is then constructed from Evans Way to Abernethy Road.

3.2 Existing Traffic Volume on Roads

The existing daily traffic counts obtained from Main Roads WA are presented in **Figure 8**. The traffic counts survey conducted by Matrix on September 2021 for Main Roads WA provides the peak hour counts at the intersection of SWH/Larsen Road. This survey by Matrix also included queue counts and delay surveys, which have been utilised for the calibration of the SIDRA analysis of the intersection. The available peak hour traffic counts at the intersections Larson Road with George Street and SWH are presented in **Figure 9**.

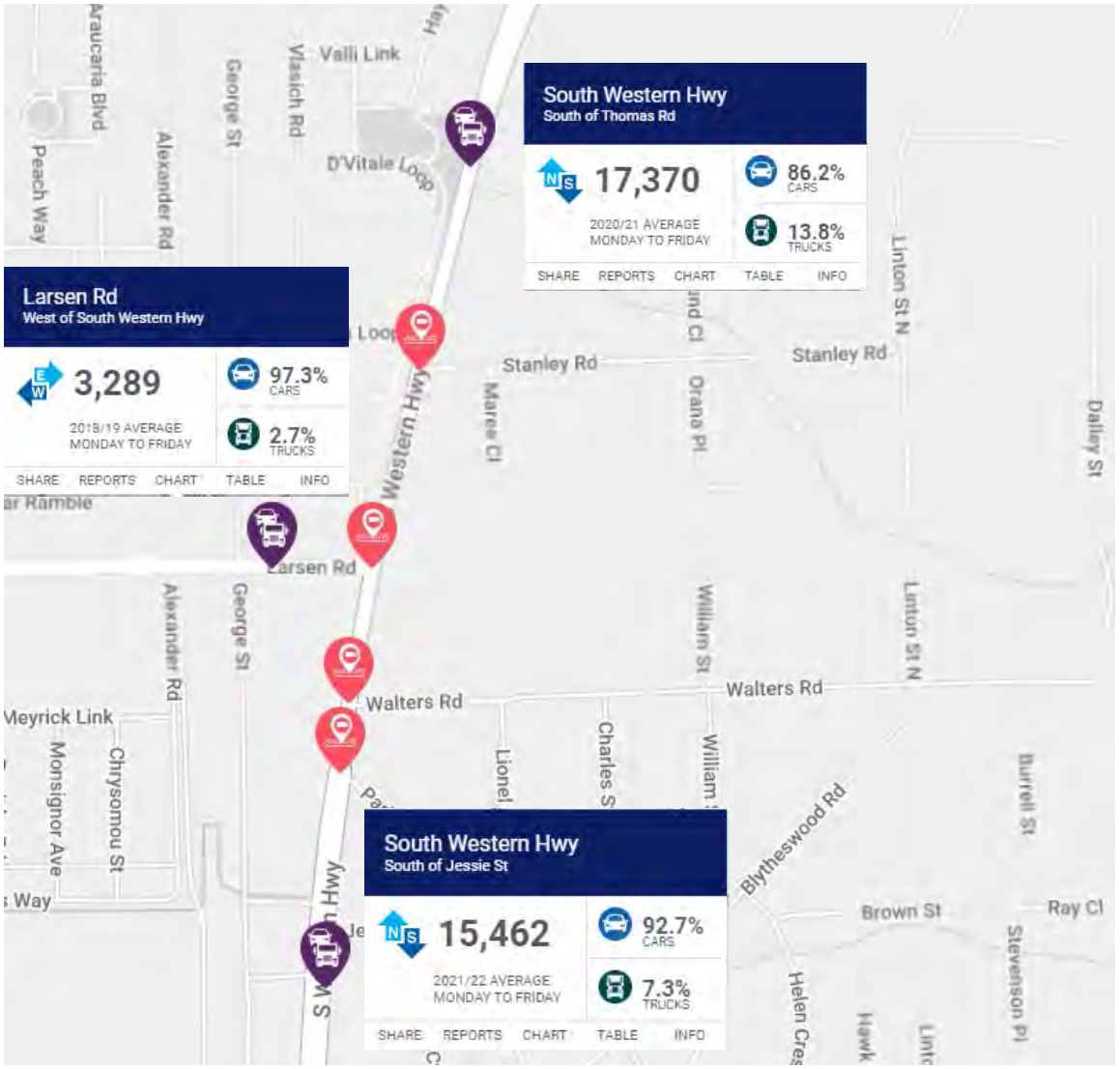


Figure 8: Existing daily traffic counts (Source: Main Roads WA)

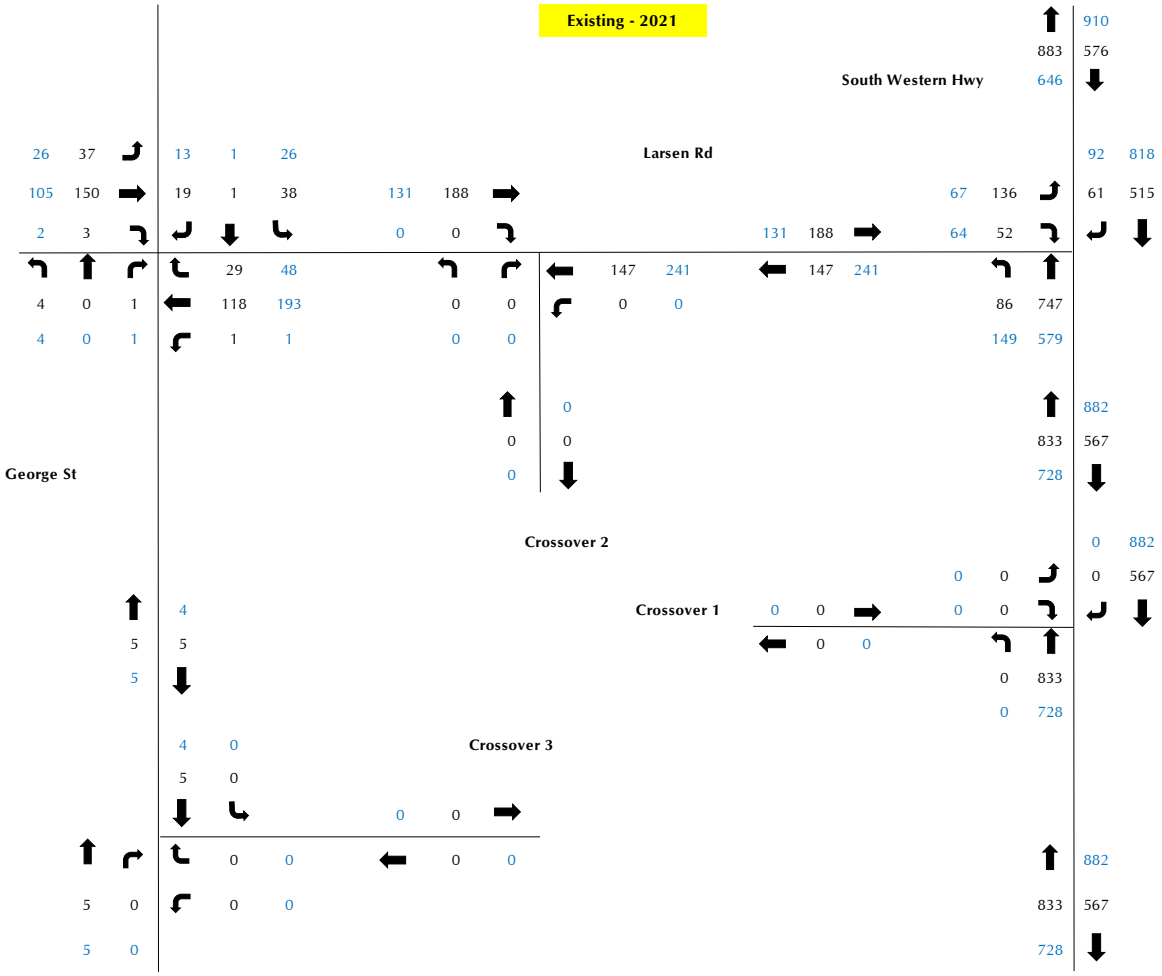


Figure 9: Existing traffic 2021 counts AM/ PM peak hour

3.3 Public Transport Access

Existing bus routes in the vicinity of the subject site are presented in Figure 10. The closest bus stops are located on SWH to the north and south of the site.

Planning work is underway to extend the Armadale Line approximately 7 kilometres south of the existing Armadale Station with a new station at Byford. This new station is planned to be located between Evans Way and Clara Street (south of the subject site) and will include facilities such as Park N Ride (P n R), Kiss N Ride (K n R), a new bus interchange, as well as a cyclist/pedestrian path network connecting to and from the station complex (refer Figure 11). As part of this new station the existing railway crossing at Larsen Road will be closed and a new railway crossing at Clara Street will be constructed. It is understood that George Street will also be constructed through to Evans Way south of the site as part of this Metronet project.

It is expected that the current bus routes being operated by Transperth would respond to the new station and new growth areas in the vicinity.

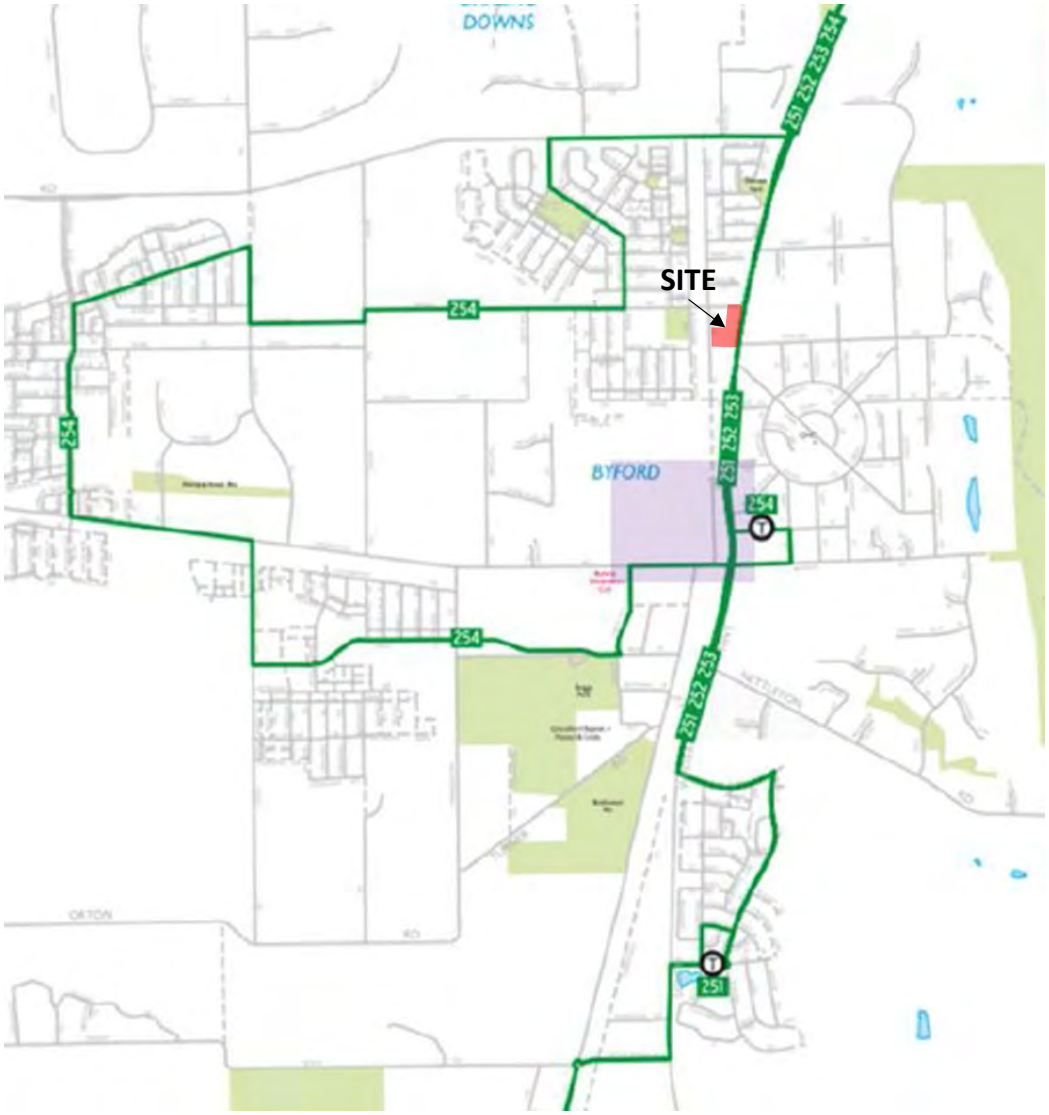


Figure 10: Existing bus services

Figure 11: Location of the new Byford station and new railway crossing in the vicinity

3.4 Pedestrian and Cyclist Facilities

The existing bicycle facilities (as at 2021), are shown in **Figure 12**, which is taken from the Department of Transport's *Perth Bike Map* series.

According to this map a high-quality shared path exists along George Street.

Figure 12: Bike map (source: Department of Transport)

3.5 Crash Data

The Main Roads WA website includes *summary crash history* data for all roads and intersections that recorded crashes over the 5-year period ending 31 December 2022.

Review of the crash history at SWH/ Larsen Road indicates a total of 2 rear end crashes at the intersection. No crashes were reported at Larsen Road/ George Street intersection.

4 Changes to Surrounding Transport Networks

Proposed changes to the surrounding road network as part of the Metronet Project are shown in **Figure 13**.

Legend

1. Closure of existing railway crossing at Larsen Rd.
2. New railway crossing at Clara St.
3. George St connection Larsen Rd to Evans Way.
4. Sansimeon Blvd connection

Figure 13: Proposed changes in the surrounding road network

The proposed relocation of the railway level crossing from Larsen Road further south to Clara Street would remove most of the existing traffic along Larsen Road towards SWH. Review of the 2018 traffic counts at the 4-way intersection of Larsen Road/ George Street indicates that more than 80% of the traffic on Larsen Road between George Street and SWH is generated by the residential areas to the west of George Street and less than 20% was generated from the residential area to the north of Larsen Road.

5 Integration with Surrounding Area

The proposed development is of a commercial/retail character and is expected to address the existing and future demand for this type of services within Byford and specifically within this locality. The proposed land uses are in line with existing and future land uses that are located between SWH and Goerge Street in this locality.

6 Traffic Assessment

6.1 Assessment Period

Due to the nature of the development, it is expected that the greatest demand on the local road network capacity will be experienced during the combined peak hour of business activity of the development and the commuter traffic activity during the weekday morning and afternoon periods.

The assessment year that is adopted for the analysis is 2025. It is understood that Byford Station would be constructed in the near future, which would reduce the car mode share in the immediate locality and may change the traffic pattern due to the new park and ride facility. Further, due to capacity issues for this section of SWH, Tonkin Highway is anticipated to be extended south in the short-to-medium term (within 10 years) and as a result the traffic patterns and volumes on SWH will change. Therefore, due to the uncertainty about the future status and traffic volumes on SWH,10-year post development assessment is not undertaken in this instance.

6.2 Trip Generation and Distribution

6.2.1 Service Station with Convenience Store – Regular Fuelling Points

Based on the feedback received from a number of Western Australia service station operators that the trip rates published in the Institute of Transportation Engineers 11th Edition Trip Generation Guidelines (a US trip generation source) significantly overestimate the actual patronage numbers, Transcore undertook extensive traffic surveys during 2022. As part of this survey, a total of 15 service stations were surveyed, in order to establish more accurate local traffic generation rates for this type of land use in Western Australia. All of the sites selected entailed different operators in order to ensure robust data with a high level of confidence. The surveys were undertaken on Mondays, Tuesdays and Wednesdays in order to include trade activity during the discounted fuel days as well and to ensure a conservative approach.

The following sites were surveyed for the purpose of the study:

7-Eleven, 194 Great Eastern Hwy, Ascot WA
Ampol, 204 Great Eastern Hwy, Ascot WA
BP, 1 Canham Way, Greenwood WA
BP, 88 Gilbertson Road, Kardinya WA
BP, 848 Canning Hwy, Applecross WA
Coles Express, 73A Frobisher Street, Osborne Park WA
Puma, 58 Montana Crescent, Alkimos WA
Ampol 3, Morwell Street, Yanchep WA
Liberty, 2341 Albany Highway, Gosnells WA
7-Eleven, 931 Wanneroo Road, Wanneroo WA
7-Eleven, 13 Lakes Road, Greenfield WA

Shell, 582 Stirling Highway, Mosman WA
Puma, Cnr Johnson Street & Helena Street, Guildford WA
United, 2 Feilman Drive, Leda WA
United, 101 Terrier Place, Southern River WA

Accordingly, the trip rates which were used to estimate the traffic generation for the service station component of the proposed development are as follows:

Weekday daily: 162.20vpd per filling point;
Weekday AM peak hour: 9.49vph per filling point; and,
Weekday PM peak hour: 11.27vph per filling point.

6.2.2 Proposed fast-food outlets

ITE 11 was used to estimate the trip generation of the proposed fast-food outlets. The fast-food outlet 1 (220m^2) with drive through facility is expected to serve breakfast but the fast-food outlet 2 (250m^2) would not serve breakfast and is expected to generate less traffic compared to a high-traffic-generating fast-food outlet. Therefore, fast food outlet 2 was assumed to generate minimal traffic in the morning peak hour and about 70% of the trip rates suggested by ITE 11 Guidelines for fast-food outlet with drive through during the PM peak hours.

Fast-food Outlet with drive through facility (#934)

Weekday daily: 503 vehicles per day per 100m^2 GFA;
Weekday AM peak hour: 48 vehicles per day per 100m^2 GFA; and,
Weekday PM peak hour: 36 vehicles per day per 100m^2 GFA.

6.2.3 Proposed service centre

ITE 11 was used to estimate the trip generation of the proposed service centre. Accordingly, the following trip rates were sourced (ITE 943):

Weekday daily: 18 vehicles per day per 100m^2 GFA;
Weekday AM peak hour: 2 vehicles per day per 100m^2 GFA; and,
Weekday PM peak hour: 2 vehicles per day per 100m^2 GFA.

6.2.4 Proposed car wash traffic generation

The trip rates for a car wash in ITE 11 appear to be unreasonably high for the road network peak hours. For example, for automatic car wash the trip rate is equivalent to one car being washed every 46 sends of the entire peak hour, which is clearly unreasonable. Accordingly, the traffic volumes likely to be generated by the proposed car wash were estimated based on projected customer numbers and number of staff and the information available in Transcore's database for similar land use.

Accordingly, the trip generation of the proposed manual and auto car wash are estimated as below:

Manual Car Wash

Weekday AM peak hour: 6 trips per hour per bay;
Weekday PM peak hour: 6 trips per hour per bay; and,
Weekday: 60 trips per day per bay.

Auto Car Wash

Weekday AM peak hour: 15 trips per hour per bay;
Weekday PM peak hour: 15 trips per hour per bay; and,
Weekday: 150 trips per day per bay.

6.2.5 Proposed dog wash traffic generation

In the absence of any trip rates, it is conservatively assumed than one customer would use the dog wash every 20 minutes of the peak hour and therefore three customers per hour would utilise the proposed dog wash. This translates to the below trip generation during the road network peak hour:

Weekday AM peak hour: 6 trips per hour;
Weekday PM peak hour: 6 trips per hour; and;
Weekday: 64 trips per day;

Data source and other assumptions are as follows:

- Directional splits of 50% in / 50% out assumed for all land uses as they are all dominated by customer arrival / departure except Service Centre which 72%/ 28% was assumed for AM peak hour and 39%/ 61% was assumed for PM peak hour (In accordance with ITE handbook).
- Pass-by rates were sourced from ITE Trip Generation Handbook 3rd Ed: Service Station with Convenience Market (#945): 62% for AM and 56% for PM (average of 60% for both peak hours were used). Fast-Food outlets (#933 and #934): 50%/ 50% for weekday AM and PM peak hours.
- Conservatively, 0% pass-by rate was assumed for the other land uses (Service Centre, Dog Wash, Auto Car Wash and Manual Car Wash).
- Fast-Food outlet 2 (250m^2 GFA) is not expected to be open in AM peak hour, therefore, zero trips was assumed for the AM peak hour.

Table 1 shows the trip generation of the proposed development. The passing trade and primary trips associated with the proposed development are summarised in **Table 2**.

Due to the land use mix within the proposed development, incidences of multi-purpose trips[1] (i.e., cross-trade) are anticipated. Accordingly, the applied cross-trade adjustment is calculated to result in a moderate overall reduction in trip generation of approximately 20% (In accordance with RTA NSW – Guide to Traffic Generating Developments) but only during the PM peak period and for overall daily trips.

Accordingly, it is estimated that the proposed development would generate a total of about 3,261 daily trips (both inbound and outbound) with about 207vph and 248vph during the weekday AM and PM peak hours respectively.

The distribution of traffic to and from the proposed development for year 2025 (post development) was established by considering the catchment area of the proposed development as well as the available access and egress routes to and from the site. It should be noted that by year 2025 or full development of the site it is assumed that the existing railway crossing at Larsen Road would be closed and the section of George Street between Larsen Road and Evans Way would be constructed. **Figure 14** shows the available access and egress routes to and from the site.

Consequently, the directional distribution of primary and passing traffic to and from the site is assumed to be as follows:

Primary trip distribution:

- 40% of all traffic to/from north direction (SWH);
- 30% of all traffic to/from south direction (SWH); and
- 30% of all traffic to/from Geroge Street.

Passing trip distribution:

- 35% of all traffic to/from north direction (SWH);
- 45% of all traffic to/from south direction (SWH); and
- 20% of all traffic to/from Geroge Street.

The distribution of the proposed development traffic is illustrated in **Figure 15** for the AM and PM peak hours.

[1] *Multi-purpose trips are incidences where more than one shop/outlet are visited within the development (also referred to as "cross-trade")*

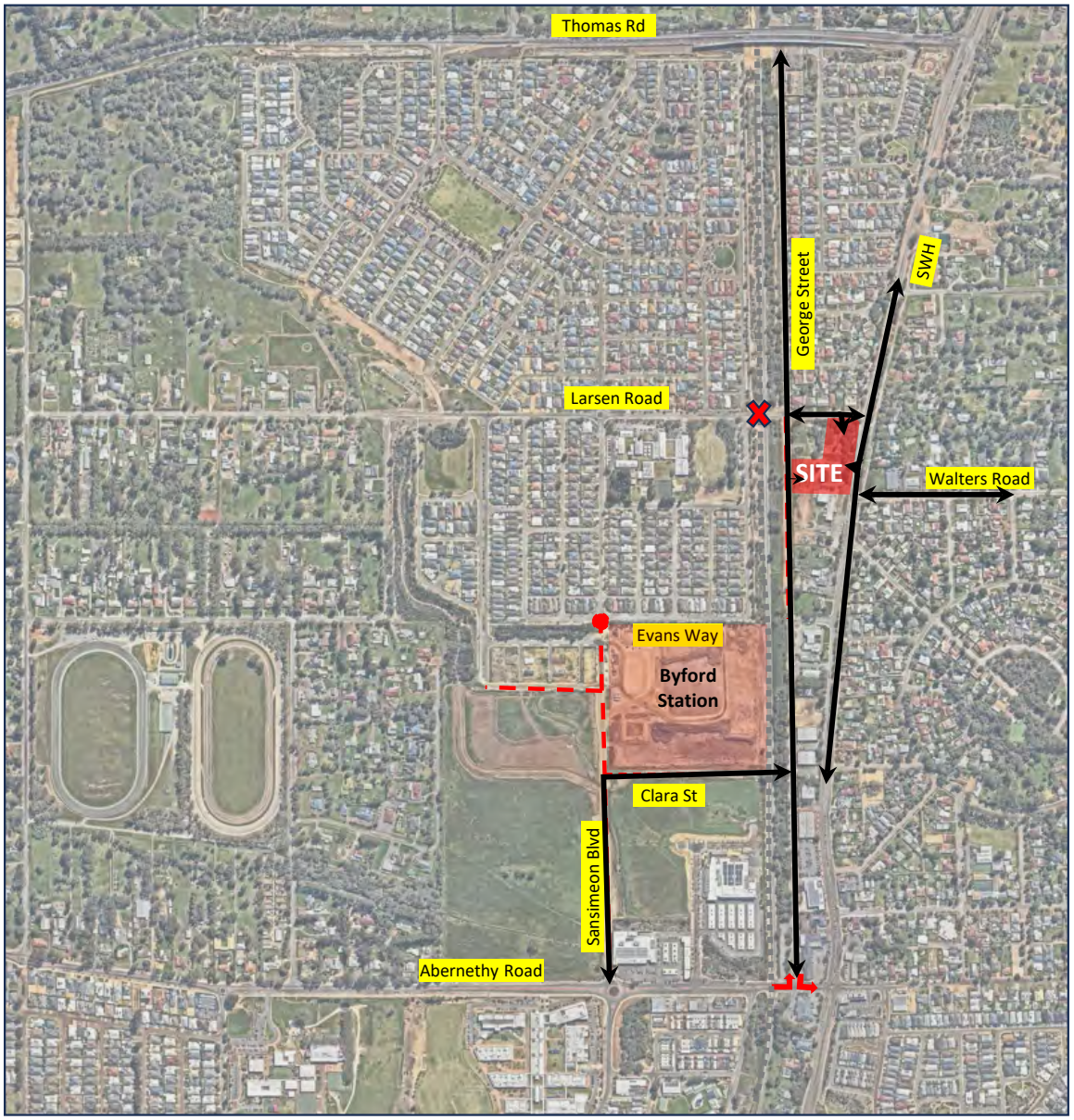


Figure 14: Available access and egress routes to and from the site in 2025

Table 1: Weekday daily, morning, afternoon peak hours trip generation for the proposed land uses

Source	Land Use	Quantity	Daily Rate	AM Peak	PM Peak	Cross trade	Daily Trips	AM Trips	PM Trips	AM		PM	
										IN	OUT	IN	OUT
ITE 943	Service Centre	400	0.18	0.02	0.02	20%	57	7	7	5	2	3	4
Transcore	Automated car wash	3	150	15	15	20%	360	36	36	18	18	18	18
Transcore	Manual car wash	3	60	6	6	20%	144	14	14	7	7	7	7
Transcore	Service station + Convenience store	8	162.20	9.49	11.27	20%	1038	61	72	30	30	36	36
ITE 934	Proposed Fast food	250	5.03	0.00	0.26	20%	1006	0	51	0	0	26	26
ITE 934	Proposed Fast food	220	5.03	0.48	0.36	20%	886	85	63	42	42	31	31
Transcore	Dog Wash	1	64.00	6.00	6.00	20%	51	5	5	2	2	2	2
Total							**3542**	**207**	**248**	**105**	**102**	**123**	**125**

Table 2: Passing trade and primary trip components of the trip generation

Passing Trade Component

Passing Trade			Daily	AM		PM	
Daily	AM	PM		IN	OUT	IN	OUT
0%	0%	0%	0	0	0	0	0
0%	0%	0%	0	0	0	0	0
0%	0%	0%	0	0	0	0	0
60%	60%	60%	623	18	18	22	22
50%	50%	50%	503	0	0	13	13
50%	50%	50%	443	21	21	16	16
0%	0%	0%	0	0	0	0	0
Total			**1569**	**39**	**39**	**51**	**51**

Primary Trips

Daily	AM		PM	
	IN	OUT	IN	OUT
57	5	2	3	4
360	18	18	18	18
144	7	7	7	7
415	12	12	14	14
503	0	0	13	13
443	21	21	15	15
51	2	2	2	2
1973	**66**	**63**	**72**	**74**

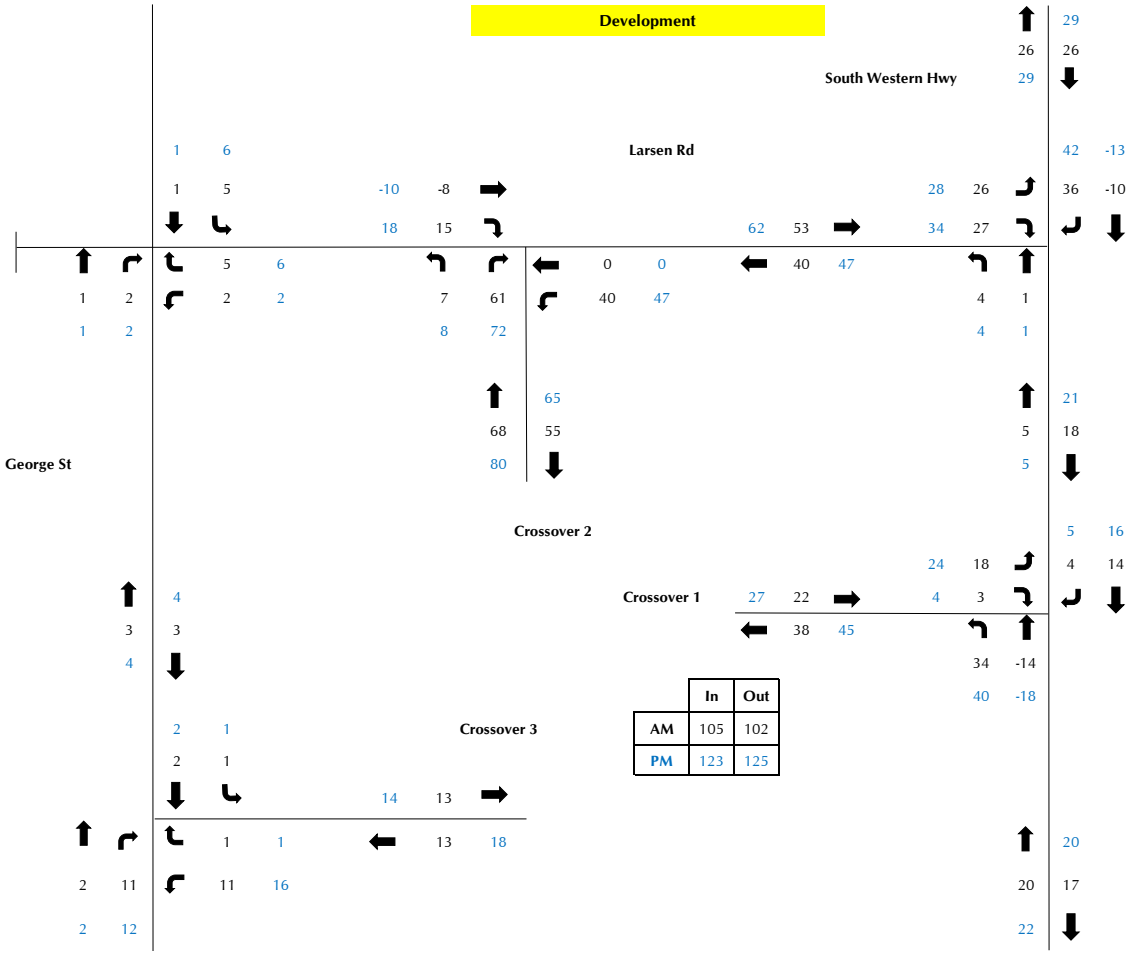


Figure 15: Development trip distribution during the AM and PM peak hours

6.3 Traffic Flow Forecasts

The existing peak hour traffic counts on surrounding roads and intersections were established by traffic counts sourced from Main Roads WA (refer **Figure 8**). It is anticipated that existing railway crossing at Larsen Road would be closed and Clara Street crossing will open before the full development of the site and therefore, the existing base traffic on Larsen Road would reduce after the closure.

Figure 13 illustrates the existing traffic on the surrounding road network in 2025 after closure of the railway crossing. A 2% per year traffic growth rate was applied to the background traffic to establish the 2025 traffic on SWH and George Street.

The total post development traffic for the assessment year was calculated with the base 2025 background traffic plus the development traffic.

The total projected traffic volumes for the assessment year are presented in **Figure 16**.

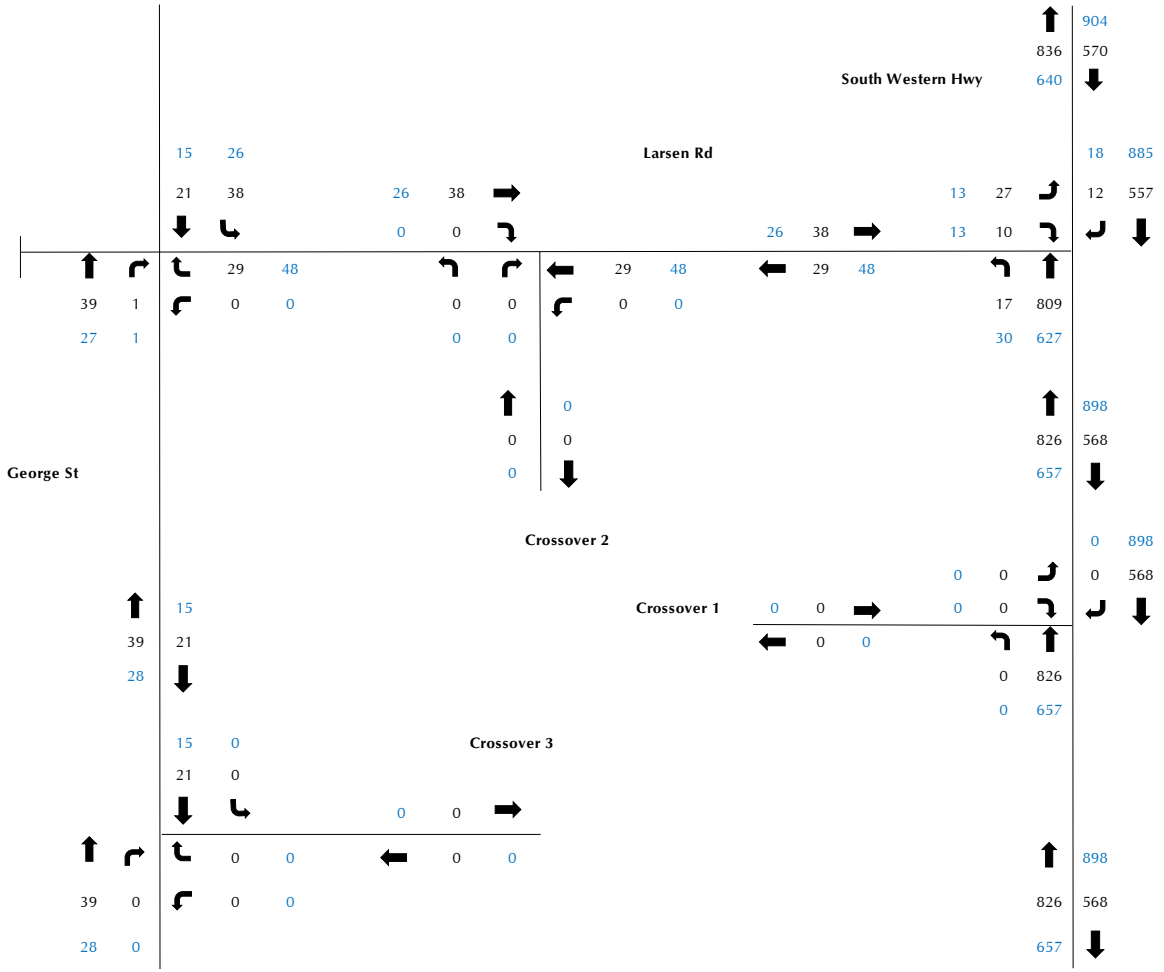


Figure 16: Total 2025 base traffic (after closure of railway crossing without development traffic)– AM Weekday and PM Weekday peak hours

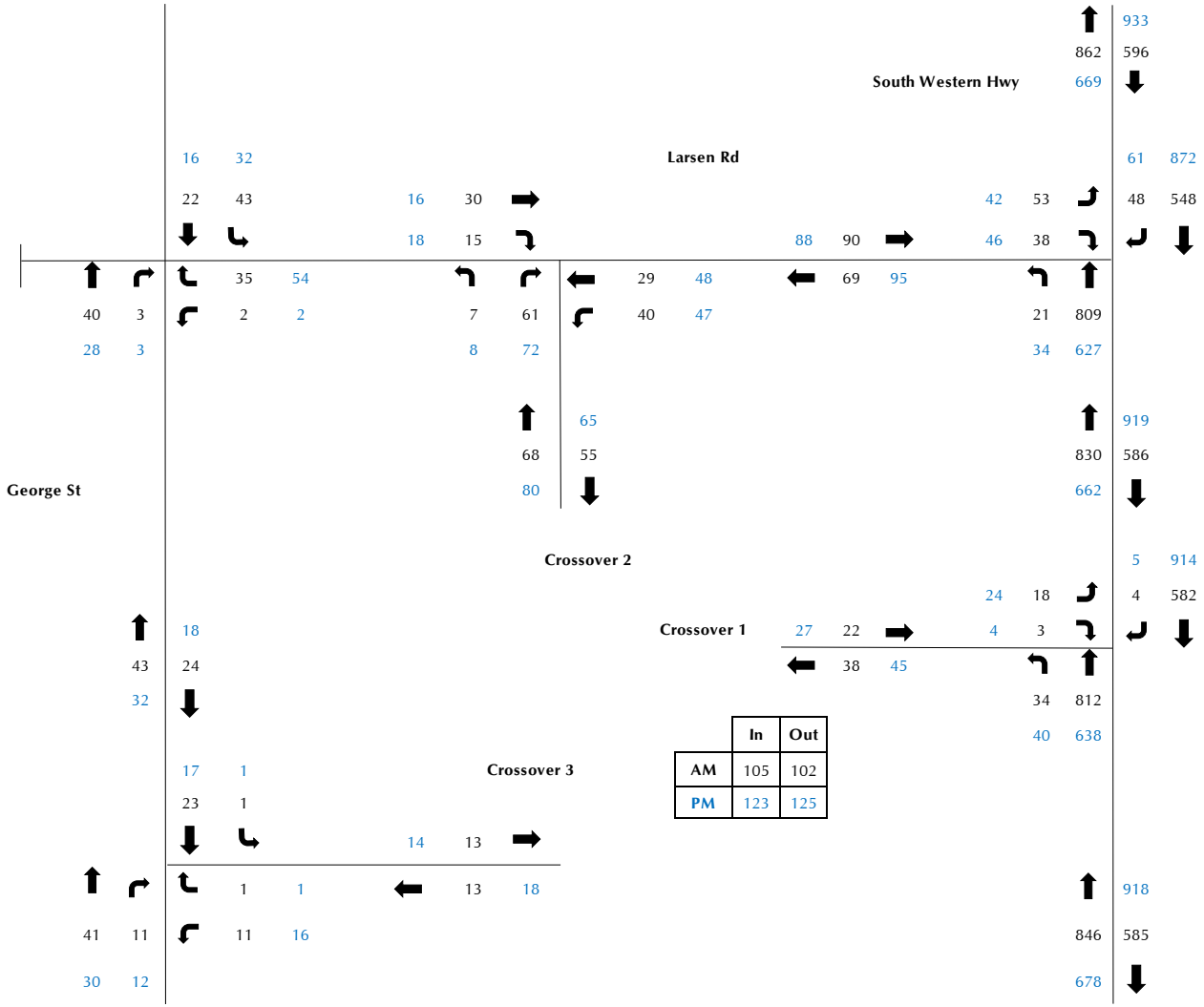


Figure 17: Total (2025 with development) traffic – AM Weekday and PM Weekday peak hours

6.4 Analysis of Local Intersections & Crossovers

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

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

The results of the SIDRA analysis are summarised in **Appendix C**. Figure C1 in Appendix C shows the network layout modelled in SIDRA. The SIDRA intersection models were coded with reference to Main Roads WA Operation Modelling Guidelines. All relevant parameters such as heavy vehicle groups, PCU factors etc. were coded as per the Main Roads WA Guidelines.

SWH/ Larsen Road intersection

The SIDRA analysis results and site observations indicate that the intersection of SWH/ Larsen Road presently operates at capacity with level of service F for the critical right turn movement out of Larsen Road during both weekday peak hours. The gap acceptance and follow up parameters in SIDRA were adjusted slightly for this movement to calibrate the 2021 queues and delays at the intersection. **Figure 3** summarises the calibrated queues and delays at the intersection for the critical right turn movement out of Larsen Road.

Table 3: Sidra results for the critical movement at the SWH / Larsen Rd intersection in 2021

	Movement: Right turn out from Larsen Rd			
	Observed (2021)		Modeled (2021)	
	AM	PM	AM	PM
95% back of queue (Veh)	5.3	4.6	5.6	3.3
Average delay time (S)	68	52	69.2	54.7
LoS	F	F	F	F

The closure of the railway crossing at Larsen Road and the addition of the development-generated traffic to the intersection resulted in less traffic at the intersection in 2025 compared to 2021 and consequently minor decreases in overall queues and delays are reported. No change in overall LoS for the intersection is reported. **Table 4** summarises the performance parameters for the critical right turn movement out of Larsen Road in 2025.

Table 4: Sidra results for the critical movement at the SWH / Larsen Rd intersection in 2025

	Movement: Right turn out from Larsen Rd	
	2025 After road closure and with development	
	AM	PM
95% back of queue (Veh)	2.3	2.3
Average delay time (S)	58.7	57.2
LoS	F	F

Development crossovers

SIDRA analysis indicates that the existing SWH crossover and proposed development crossover on Larson Road will operate satisfactorily in 2025 during assessed peak hours. All movements operate with acceptable levels of service with minimal delays and queuing. The reported LOS for the critical right turn movement out of SWH crossover is reported as E in 2025 with less than one vehicle queue at the crossover. The reported queue for the right in movement from SWH into the crossover is less than one vehicle.

Notwithstanding that the SIDRA has reported maximum of only one vehicle queue for the right turn into the SWH crossover, Sk17a in Appendix B indicates that currently the width of SWH southbound at the existing crossover is sufficient to accommodate up to three B99 vehicles stopped on SWH to turn right into the crossover. This allows another vehicle to bypass the queue without colliding with the stationary vehicles.

Due to minimal traffic projections, George Street development crossover has not been assessed in SIDRA.

Network Operations

Relevant SIDRA network outputs were reviewed for assessed peak hours to establish the operation of the SWH/ Larsen Road intersection and development crossovers as an integrated network.

As detailed in **Figure 18** there are no queue backs from the SWH/ Larsen Road intersection to the existing and proposed development crossovers on SWH and Larsen Road. Similarly, no queue backs from the development crossovers to SWH intersection is reported.

Hence, the capacity analysis confirms that the proposed development will not have an adverse impact on the operation of the local road network and that the proposed development crossovers will operate satisfactorily.

Figure 18: Critical weekday AM/PM peak hour network analysis – queue storage ratio (2025)

6.5 Impact on Surrounding Roads and Neighbouring Areas

The WAPC Transport Impact Assessment Guidelines (2016) provides the following guidance on the assessment of traffic impacts:

"As a general guide, an increase in traffic of less than 10 percent of capacity would not normally be likely to have a material impact on any particular section of road, but increases over 10 percent may. All sections of road with an increase greater than 10 percent of capacity should therefore be included in the analysis. For ease of assessment, an increase of 100 vehicles per hour for any lane can be considered as equating to around 10 percent of capacity. Therefore, any section of road where development traffic would increase flows by more than 100 vehicles per hour for any lane should be included in the analysis."

The proposed development will not increase traffic flows near the quoted WAPC threshold on the surrounding roads and therefore the traffic impact on surrounding roads are considered to be insignificant.

6.6 Traffic Noise and Vibration

It generally requires a doubling of traffic volumes on a road to produce a perceptible 3dB(A) increase in road noise. The proposed development will not increase traffic volumes or noise on surrounding roads near this level.

7 Parking

The proposed parking provision for the proposed development consists of 75 on-site parking spaces (including three ACROD bays). The parking supply calculation does not include the waiting bays within drive-through facilities and the bays under the service station canopy.

It is considered that the proposed parking provision is adequate to meet the parking demand of the proposed development.

8 Provision for Service Vehicles

There will be a number of service vehicles servicing the different land uses within the proposed development as outlined below:

Service station
A 19.0m fuel tanker is likely to deliver fuel to the proposed service station. The tanker is anticipated to turn right from SWH into Larson Road and then enter the site using the proposed crossover on Larsen Road and leave the site through the George Street crossover, heading north towards the Laren Road/George Street intersection. From there, the fuel tanker will proceed to exit onto SWH in the southbound direction.

A 12.5m service truck would be able to service the loading dock of the proposed convenience store. The proposed 12.5m truck would follow the same path as the fuel tanker to enter and exit the site.

Fast Food Outlets
The fast-food outlet 1 (220m^2 GFA) is expected to be serviced by 8.8m service vehicles, while fast-food outlet 2 (250m^2 GFA) would be serviced by a 12.5m service vehicle. Both the 8.8m and 12.5m service trucks will have the ability to enter the site using either the existing crossover on SWH or the proposed crossover on Larson Road. They will exit the site using the same crossovers.

Service Centre
An 8.8m truck would be able to enter and exit the proposed service bay of the service centre. The service vehicle would be able to enter and exit the site via the existing SWH crossover or the proposed Larson Road crossover.

Carwash
An 8.8m truck would be able to service the car wash as shown by the turn path plan. The service vehicle would be able to enter and exit the site via the existing SWH crossover or the proposed Larson Road crossover.

Turn path analysis undertaken for 19.0m fuel tanker, 12.5m and 8.8m service vehicles (refer **Appendix B**) indicate satisfactory movements.

9 Conclusions

This Transport Impact Assessment (TIA) has been prepared by Transcore on behalf of Capital Prudential with respect to the proposed commercial development to be located at 3 Larsen Road, Byford in the Shire of Serpentine-Jarrahdale.

The site currently has one full-movement crossover on SWH. The plan is to keep this existing crossover without any modifications and add two new crossovers on Larsen Road and Geroge Street. This will ensure efficient accessibility and circulation and satisfactory distribution of development traffic on the surrounding road network.

The proposed relocation of the railway level crossing from Larsen Road further south to Clara Street would remove most of the existing traffic along Larsen Road towards SWH. This will provide spare capacity on Larsen Road and its intersection with SWH. As part of this project George Street between Larson Road and Evans Way will also be constructed.

It is assumed that Larson Road rail crossing closure and George Street construction will occur by the time the proposed development is fully operational. This timeframe is assumed to be 2025.

It is understood that Byford Station would be constructed in the near future, which would reduce the car mode share in the immediate locality and may change the traffic pattern due to the new park and ride facility. Further, Tonkin Highway is anticipated to be extended south in the short-to-medium term (due to capacity issues along this section of SWH) and as a result the traffic volumes and pattern on SWH will change, with an expected reduction. Therefore, due to the uncertainty about the future status and traffic volumes on SWH,10-year post development assessment is not undertaken in this instance.

The SIDRA analysis results and 2021 traffic turn counts undertaken for Main Roads WA indicate that the intersection of SWH/ Larsen Road presently operates at capacity with level of service F for the critical right turn movement out of Larsen Road during both weekday peak hours.

The closure of the railway crossing at Larsen Road and the addition of the development-generated traffic to the intersection is estimated to result in less traffic at the intersection in 2025 compared to 2021 and consequently minor decreases in overall queues and delays are reported by SIDRA.

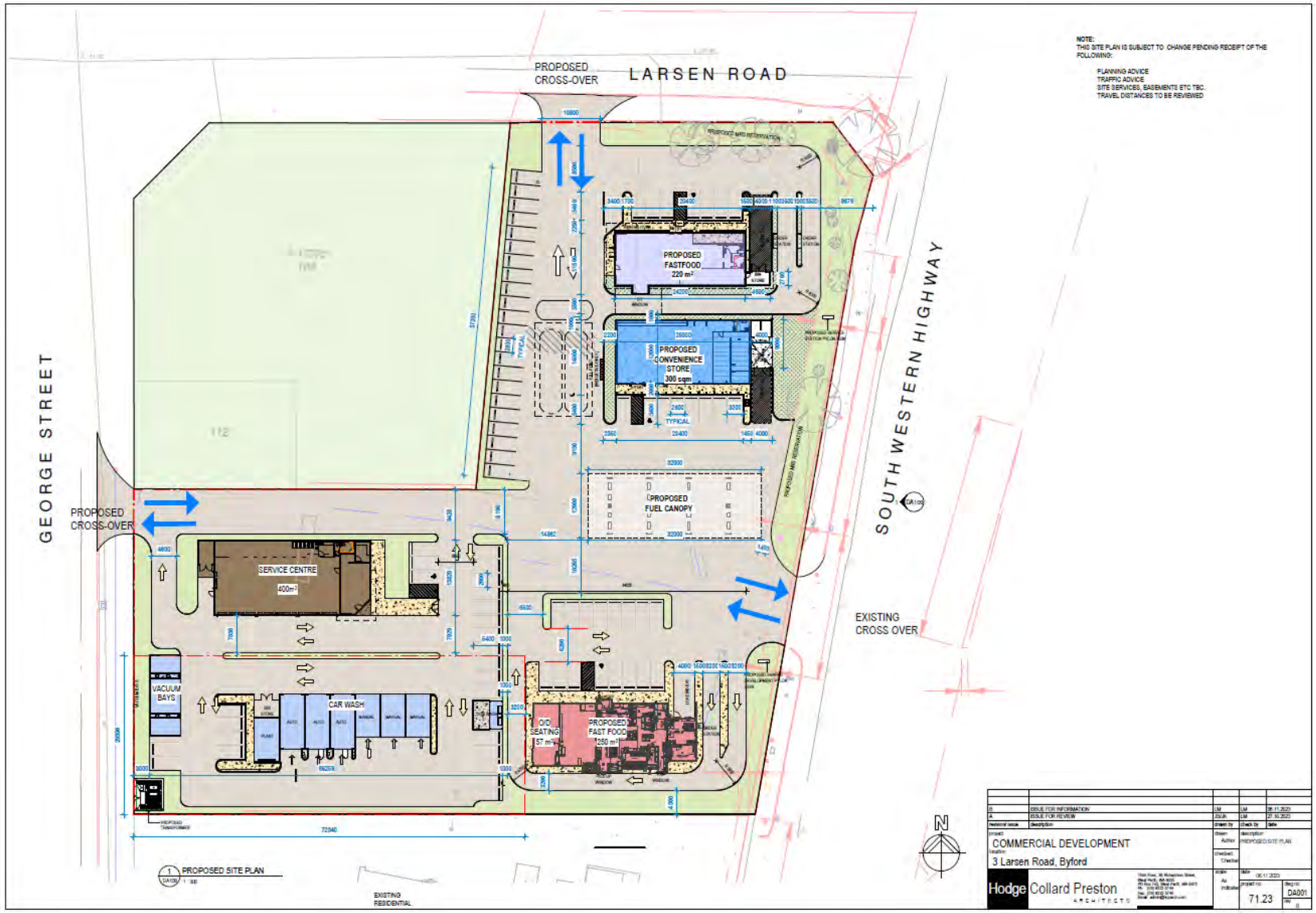
SIDRA analysis indicates that the existing and proposed development crossovers will operate satisfactorily in 2025 during assessed peak hours. All movements operate with acceptable levels of service with minimal delays and queuing.

It is concluded that the findings of this Transport Impact Statement are supportive of the proposed development.

Appendix A

PROPOSED DEVELOPMENT PLANS

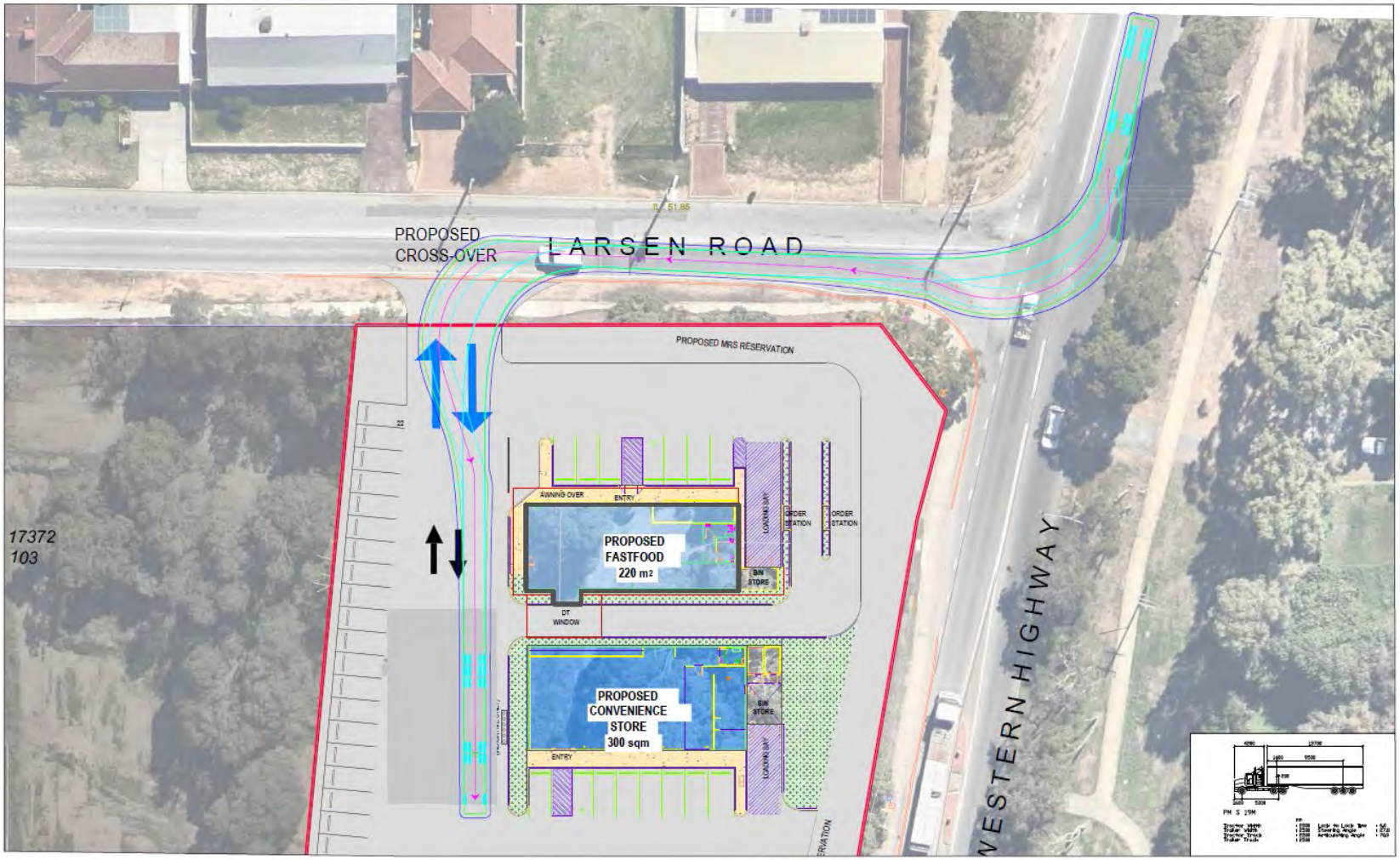
Engineering a better future for over 20 years!


NOTE:
THIS SITE PLAN IS SUBJECT TO CHANGE PENDING RECEIPT OF THE FOLLOWING:
PLANNING ADVICE
TRAFFIC ADVICE
SITE SERVICES, EASEMENTS ETC TBC.
TRAVEL DISTANCES TO BE REVIEWED
PROPOSED CROSS-OVER
LARSEN ROAD
GEORGE STREET
SOUTH WESTERN HIGHWAY
PROPOSED FASTFOOD 220 m²
PROPOSED CONVENIENCE STORE 300 sqm
PROPOSED FUEL CANOPY
SERVICE CENTRE
400m²
VACUUM BAYS
CAR WASH
O/D SEATING 57 m²
PROPOSED FAST FOOD 250 m²
EXISTING CROSS OVER
EXISTING RESIDENTIAL
PROPOSED SITE PLAN
COMMERCIAL DEVELOPMENT
3 Larsen Road, Byford
Hodge Collard Preston
ARCHITECTS
71.23
DA001

Appendix B

TURN PATH ANALYSIS

Engineering a better future for over 20 years!

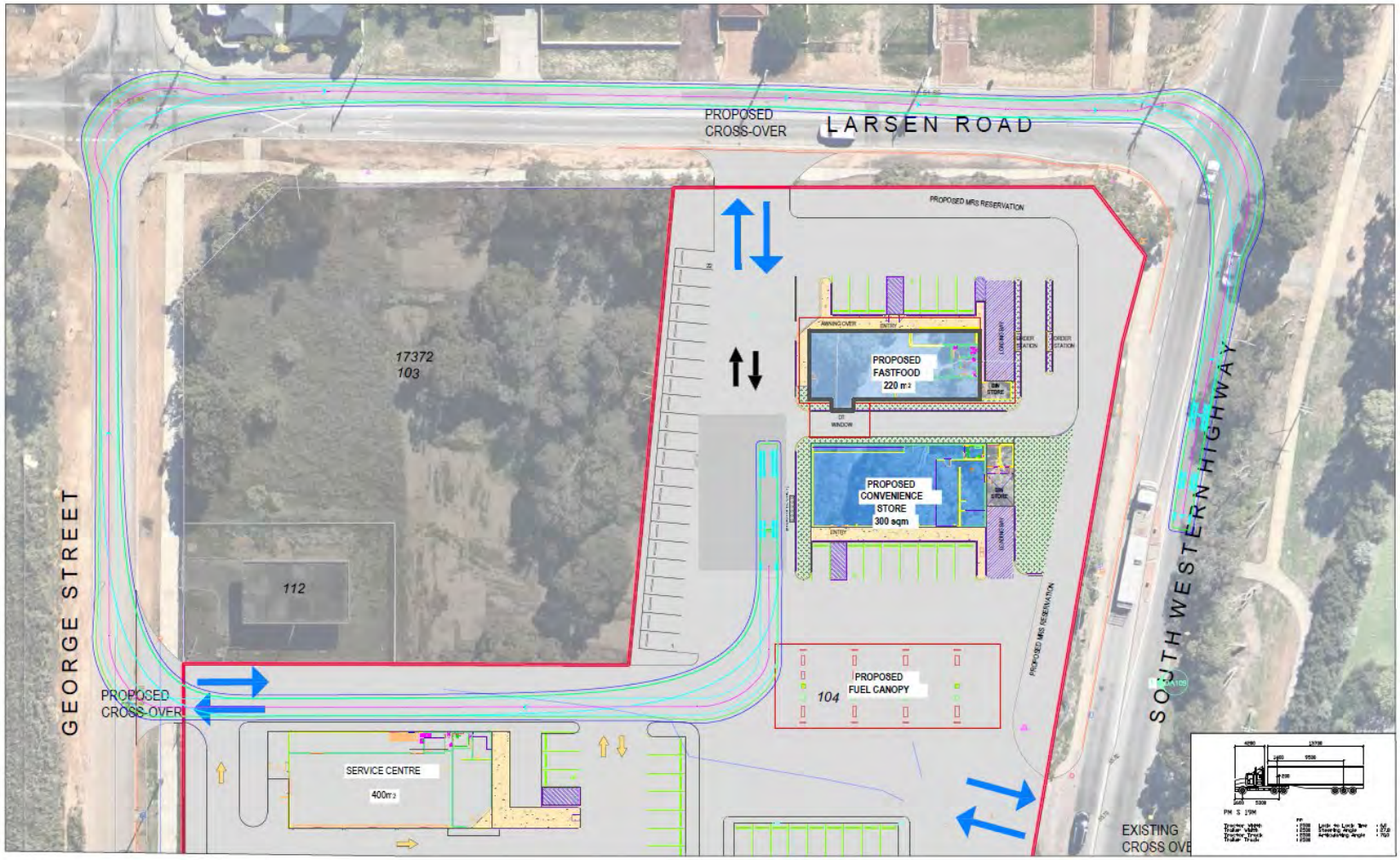


3 Larsen Road, Byford
Austroads 2013: 19.0m Fuel-tanker (MRWA 15m R)
Fuel-tanker entry

LEGEND
Vehicle Body
Wheel Path
500mm Clearance

t23.129.sk08a
30/10/2023
Scale: 1:400 @ A3

transcore



3 Larsen Road, Byford
Austroads 2013: 19.0m Fuel-tanker (MRWA 15m R)
Fuel-tanker exit

LEGEND
Vehicle Body
Wheel Path
500mm Clearance

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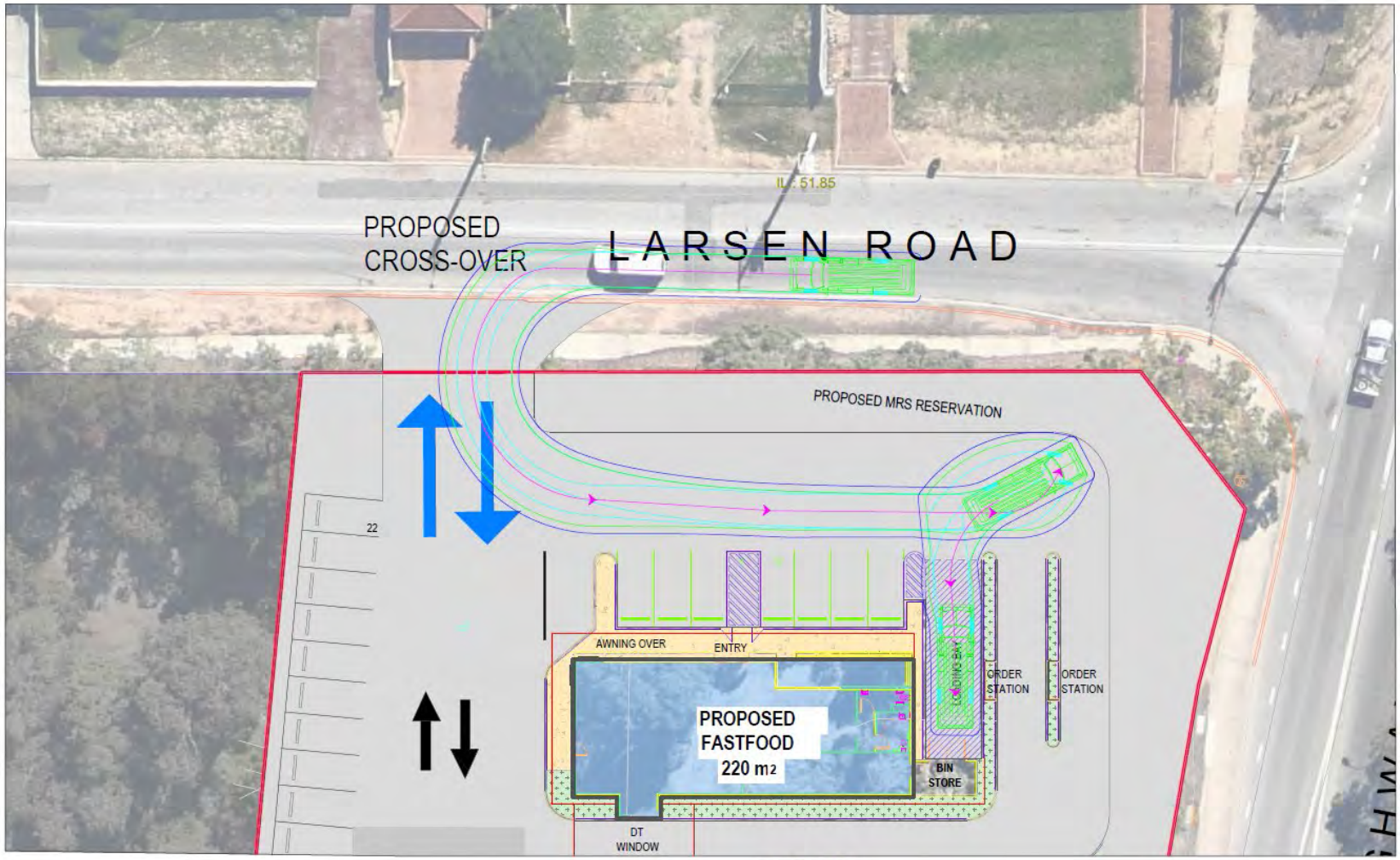
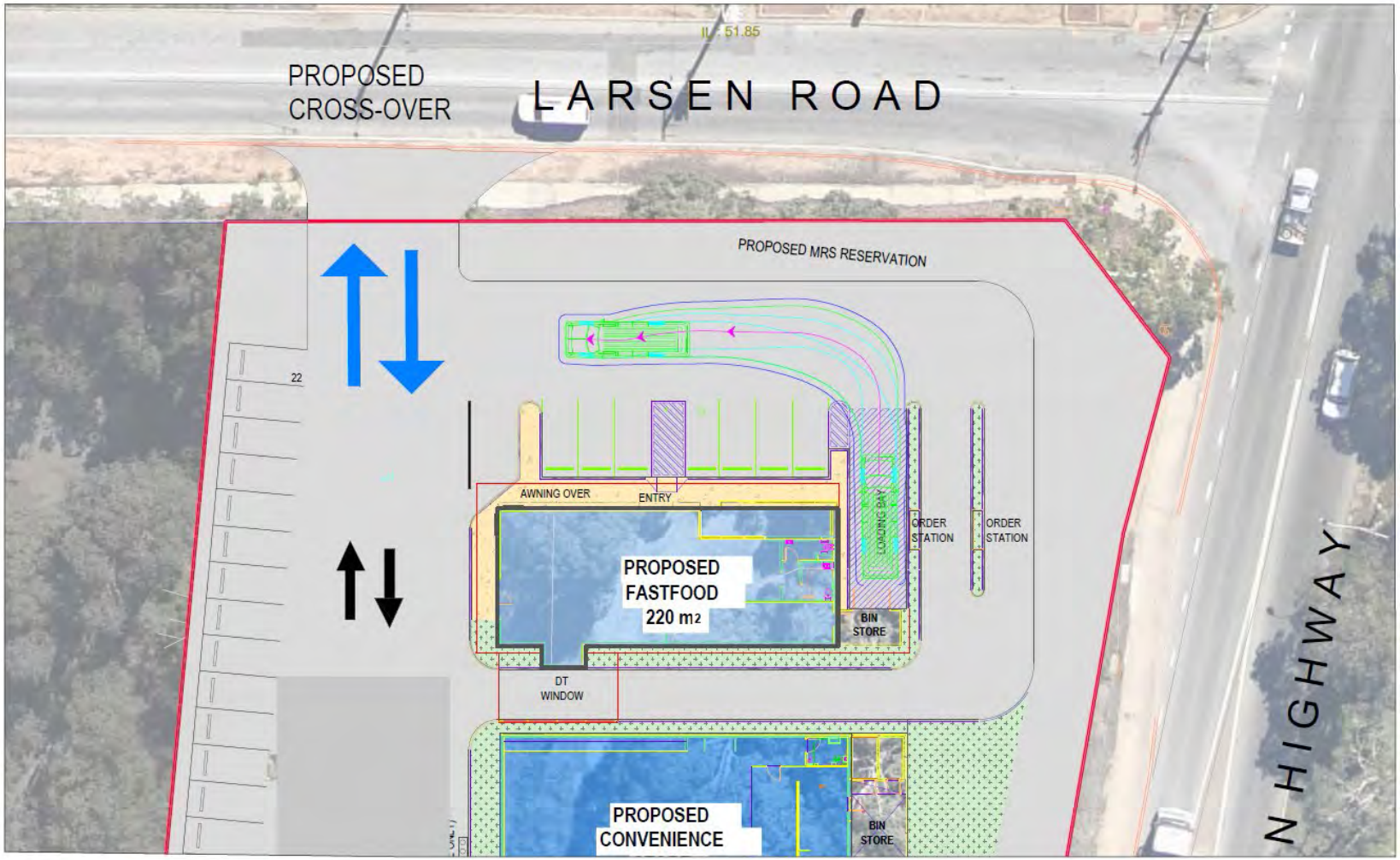


3 Larsen Road, Byford
Austroads 2013: 8.8m MRV
Fastfood: Service vehicle entry

LEGEND
Vehicle Body
Wheel Path
500mm Clearance

t23.129.sk11a
30/10/2023
Scale: 1:250 @ A3

transcore



3 Larsen Road, Byford
Austroads 2013: 8.8m MRV
Fastfood: Service vehicle exit

LEGEND
Vehicle Body
Wheel Path
500mm Clearance

t23.129.sk12a
30/10/2023
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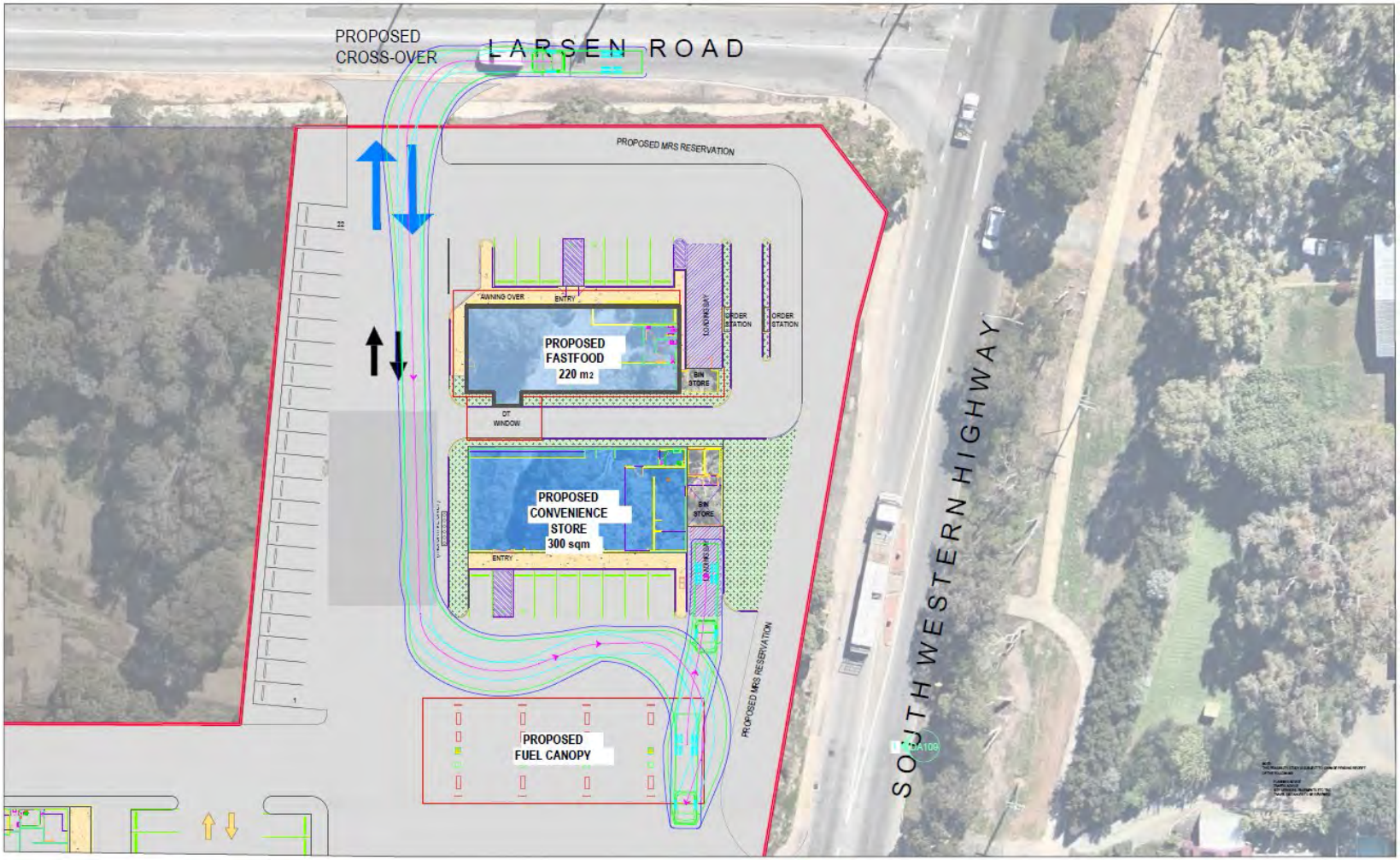
transcore

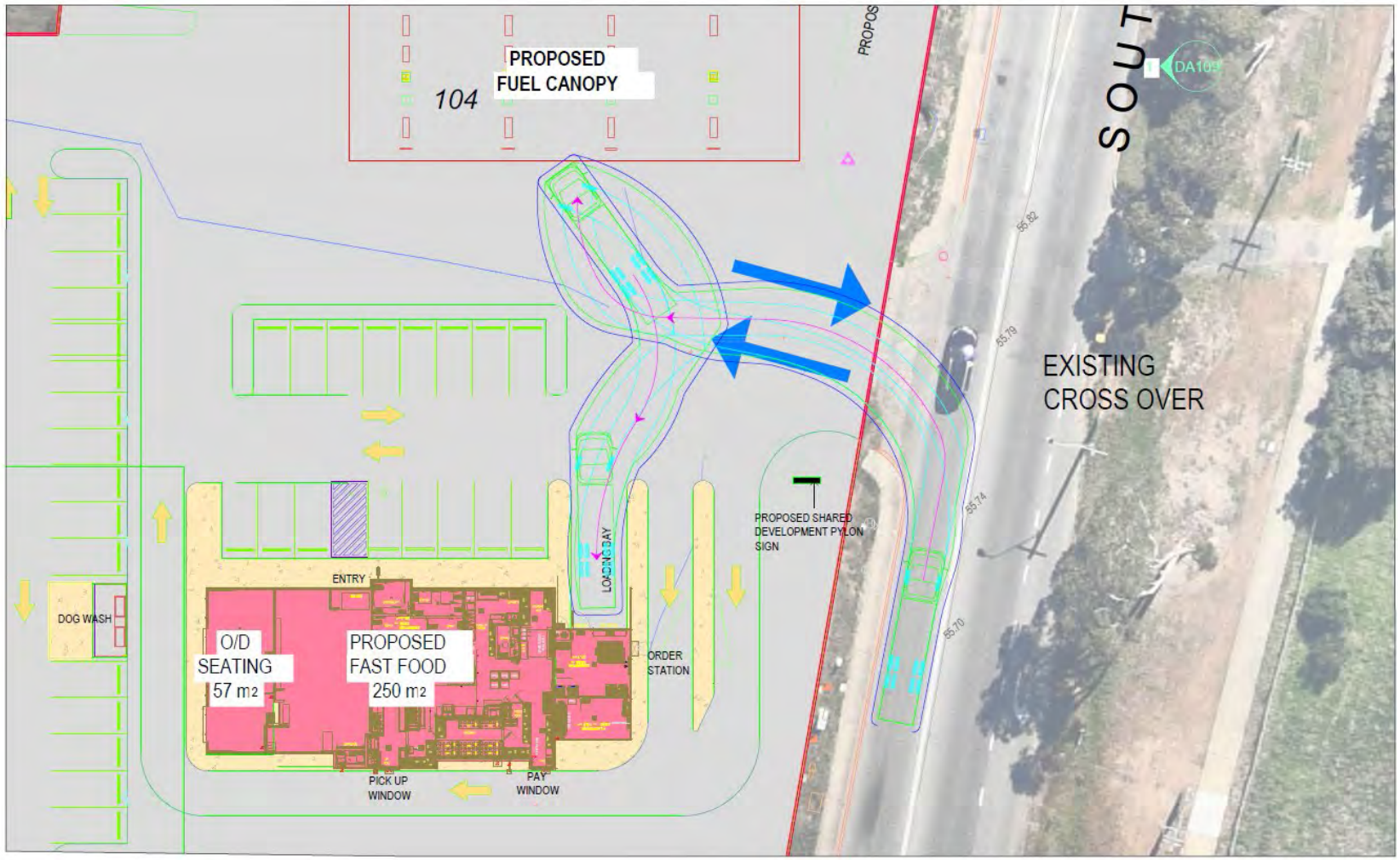


3 Larsen Road, Byford
Austroads 2013: 12.5m HRV
Service Station: Service vehicle entry

LEGEND
Vehicle Body
Wheel Path
500mm Clearance

t23.129.sk13a
30/10/2023
Scale: 1:400 @ A3

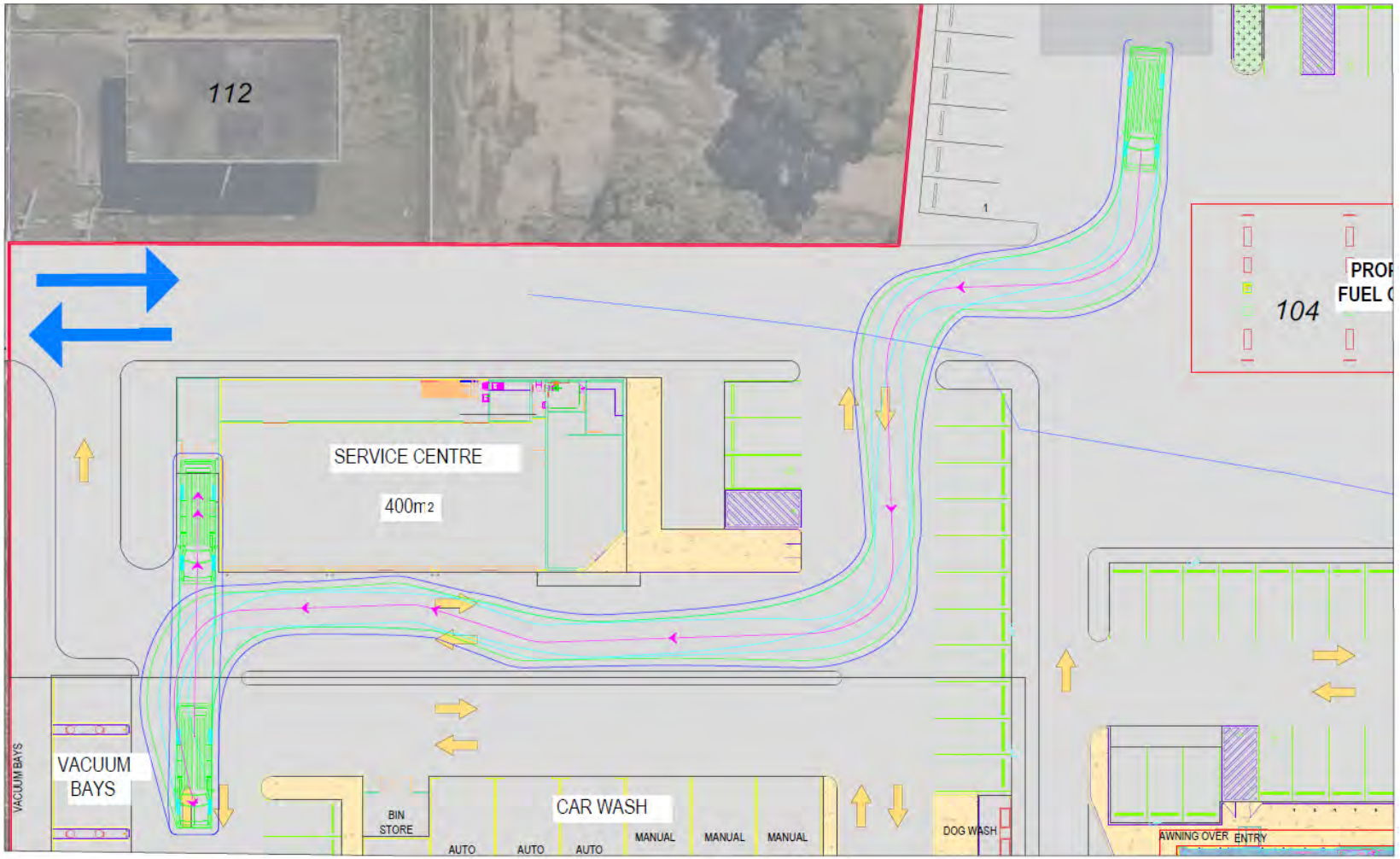
transcore



3 Larsen Road, Byford
Austroads 2013: 12.5m HRV (MRWA 15m R)
Service vehicle entry - Fast Food Outlet 2

LEGEND
Vehicle Body
Wheel Path
500mm Clearance

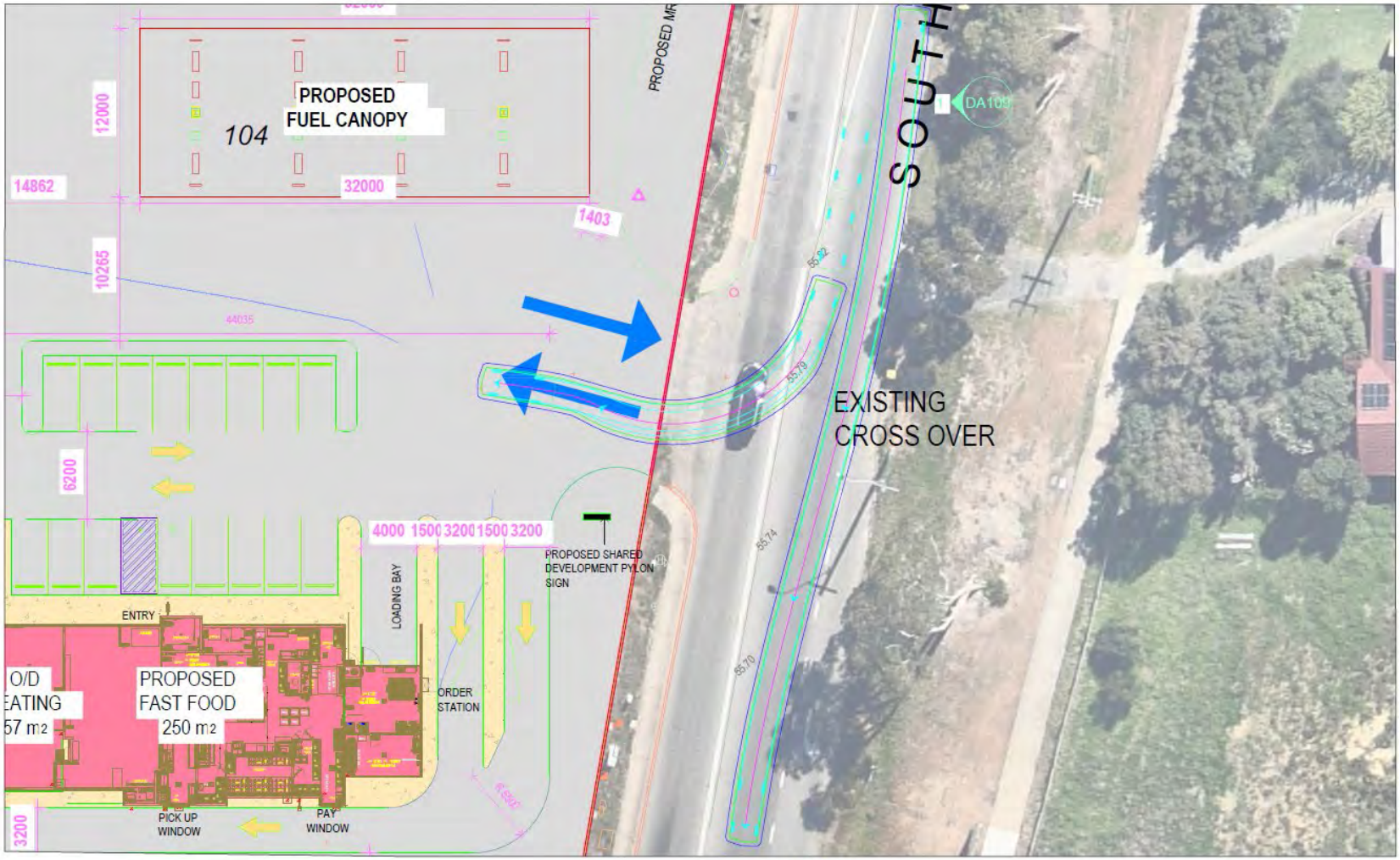
t23.129.sk14b
22/11/2023
Scale: 1:250 @ A3



3 Larsen Road, Byford
Austroads 2013: 8.8m MRV
Service Centre: Service vehicle entry

t23.129.sk15a
30/10/2023
Scale: 1:250 @ A3


GEORGE ST
112
PROPOSED
CROSS-OVER
3 Larsen Road, Byford
Austroads 2013: B99 Passenger Car
Passenger car entry: Left-in from George St
LEGEND
Vehicle Body
Wheel Path
300mm Clearance
t23.129.sk16a
30/10/2023
Scale: 1:100 @ A3
transcore



3 Larsen Road, Byford

Austroads 2013: B99 Passenger Car

Passenger car passing through

LEGEND

Vehicle Body

Wheel Path

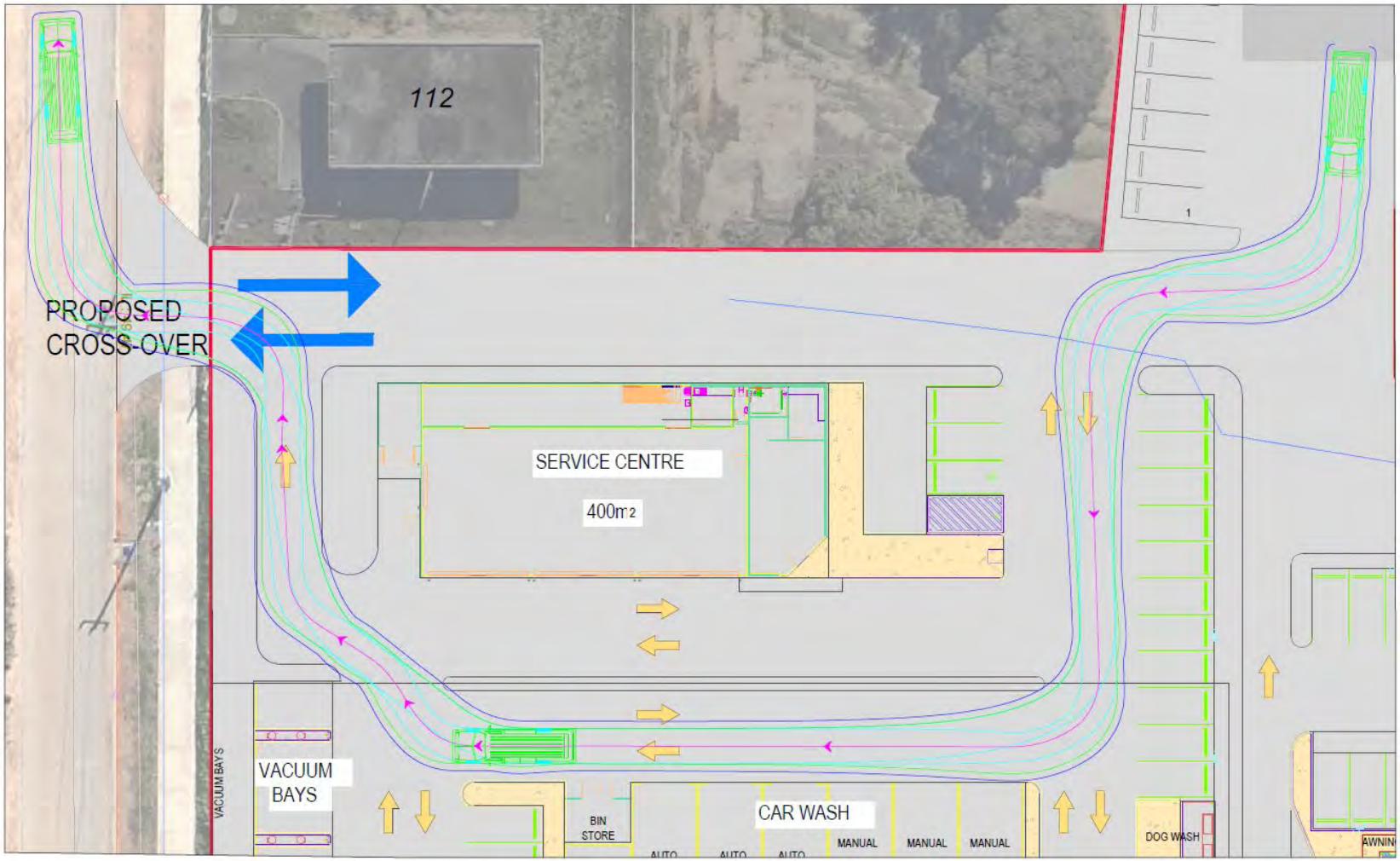
300mm Clearance

t23.129.sk17b

22/11/2023

Scale: 1:250 @ A3

transcore



3 Larsen Road, Byford
Austroads 2013: 8.8m MRV
Car Wash: Service vehicle entry

LEGEND
Vehicle Body
Wheel Path
500mm Clearance

t23.129.sk18
30/10/2023
Scale: 1:250 @ A3

transcore

Appendix C

SIDRA RESULTS

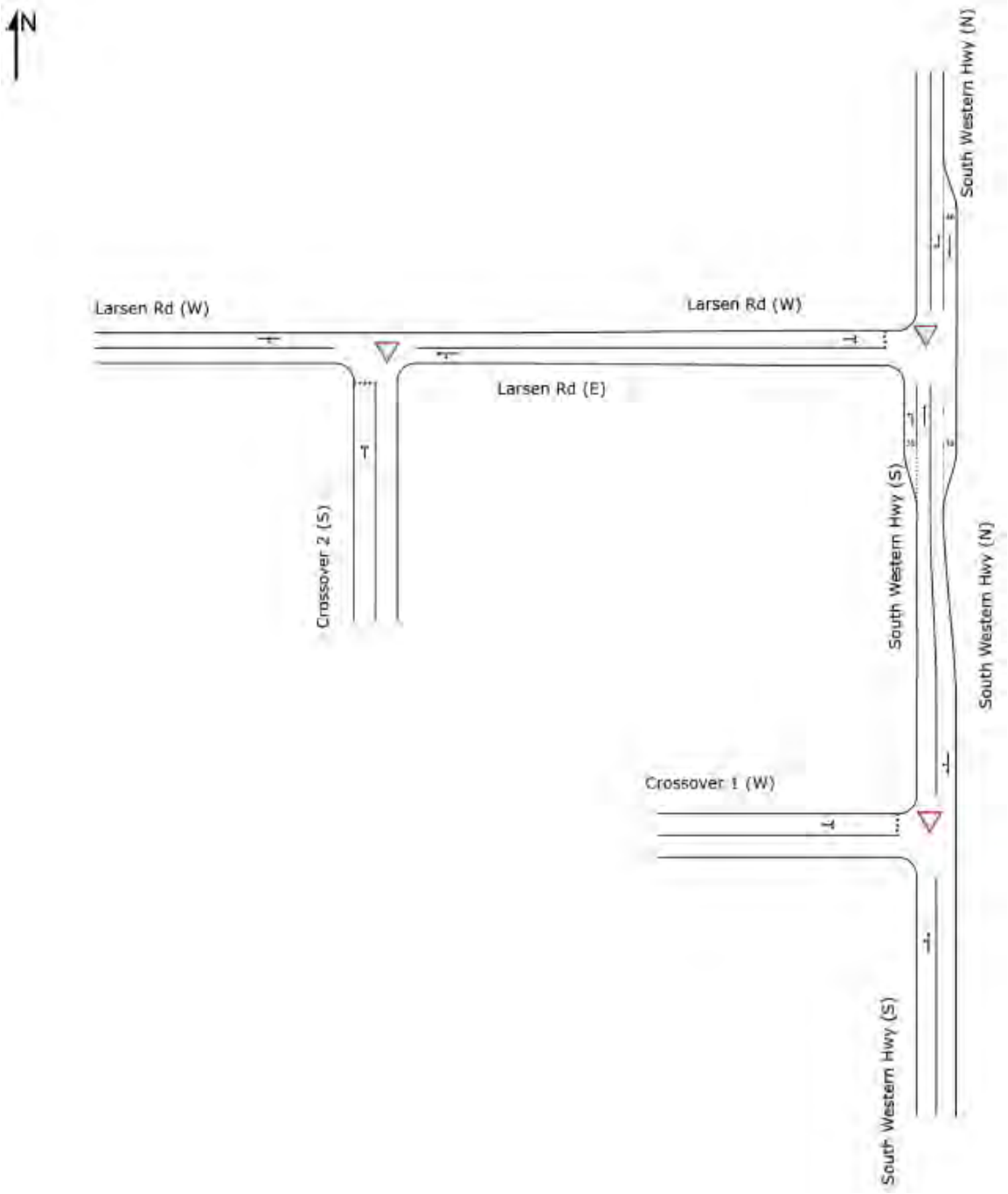


Figure C1: Network layout modelled in SIDRA

MOVEMENT SUMMARY

▽ Site: [South Western Hwy & Larsen Rd - Existing - AM (Site Folder: Existing - Calibrated - 2021)]

Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: South Western Hwy (S)														
7	L2	86	4.1	91	4.1	0.052	5.6	LOS A	0.0	0.0	0.00	0.58	0.00	42.6
8	T1	747	7.9	786	7.9	0.449	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	59.6
Approach		833	7.5	877	7.5	0.449	0.6	NA	0.0	0.0	0.00	0.06	0.00	57.7
North: South Western Hwy (N)														
2	T1	515	9.8	542	9.8	0.316	0.2	LOS A	0.0	0.0	0.00	0.00	0.00	59.8
3	R2	61	4.1	64	4.1	0.153	13.4	LOS B	0.5	4.1	0.74	0.89	0.74	35.4
Approach		576	9.2	606	9.2	0.316	1.6	NA	0.5	4.1	0.08	0.09	0.08	55.7
West: Larsen Rd (W)														
4	L2	136	3.8	143	3.8	0.854	38.5	LOS E	5.8	44.5	0.94	1.52	2.66	19.2
6	R2	52	3.8	55	3.8	0.854	72.1	LOS F	5.8	44.5	0.94	1.52	2.66	16.0
Approach		188	3.8	198	3.8	0.854	47.8	LOS E	5.8	44.5	0.94	1.52	2.66	18.4
All Vehicles		1597	7.7	1681	7.7	0.854	6.5	NA	5.8	44.5	0.14	0.24	0.34	46.0

MOVEMENT SUMMARY

▽ Site: [South Western Hwy & Larsen Rd - Existing - PM (Site Folder: Existing - Calibrated - 2021)]

Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: South Western Hwy (S)														
7	L2	149	4.1	157	4.1	0.090	5.6	LOS A	0.0	0.0	0.00	0.58	0.00	42.6
8	T1	579	7.9	609	7.9	0.348	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	59.8
Approach		728	7.1	766	7.1	0.348	1.2	NA	0.0	0.0	0.00	0.12	0.00	56.0
North: South Western Hwy (N)														
2	T1	818	9.8	861	9.8	0.502	0.3	LOS A	0.0	0.0	0.00	0.00	0.00	59.5
3	R2	92	4.1	97	4.1	0.182	11.4	LOS B	0.7	5.2	0.67	0.87	0.67	37.2
Approach		910	9.2	958	9.2	0.502	1.4	NA	0.7	5.2	0.07	0.09	0.07	56.1
West: Larsen Rd (W)														
4	L2	67	3.8	71	3.8	0.783	35.0	LOS D	4.1	31.2	0.92	1.33	2.04	18.1
6	R2	64	3.8	67	3.8	0.783	70.3	LOS F	4.1	31.2	0.92	1.33	2.04	15.0
Approach		131	3.8	138	3.8	0.783	52.2	LOS F	4.1	31.2	0.92	1.33	2.04	16.7
All Vehicles		1769	8.0	1862	8.0	0.783	5.1	NA	4.1	31.2	0.10	0.19	0.19	48.3

MOVEMENT SUMMARY

Site: [South Western Hwy & Larsen Rd - 2025 - AM (Site Folder: 2025 - With Development)]

Network: N101 [AM (Network Folder: 2025 - With Development - 2% pa growth)]

Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h]	HV %	ARRIVAL FLOWS [Total veh/h]	HV %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh]	Dist m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: South Western Hwy (S)														
7	L2	22	4.1	22	4.1	0.013	5.3	LOS A	0.0	0.0	0.00	0.57	0.00	31.8
8	T1	852	7.9	852	7.9	0.486	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	59.6
Approach		874	7.8	874	7.8	0.486	0.2	NA	0.0	0.0	0.00	0.01	0.00	59.2
North: South Western Hwy (N)														
2	T1	577	9.8	577	9.8	0.336	0.2	LOS A	0.0	0.0	0.00	0.00	0.00	59.8
3	R2	51	4.1	51	4.1	0.126	13.6	LOS B	0.4	3.3	0.74	0.90	0.74	31.9
Approach		627	9.3	627	9.3	0.336	1.2	NA	0.4	3.3	0.06	0.07	0.06	55.8
West: Larsen Rd (W)														
4	L2	56	3.8	56	3.8	0.596	24.1	LOS C	2.3	17.7	0.93	1.11	1.42	18.3
6	R2	40	3.8	40	3.8	0.596	58.7	LOS F	2.3	17.7	0.93	1.11	1.42	5.0
Approach		96	3.8	96	3.8	0.596	38.5	LOS E	2.3	17.7	0.93	1.11	1.42	13.8
All Vehicles		1597	8.2	1597	8.2	0.596	2.9	NA	2.3	17.7	0.08	0.10	0.11	51.2

MOVEMENT SUMMARY

Site: [South Western Hwy & Crossover 1 - 2025 - AM (Site Folder: 2025 - With Development)]

Network: N101 [AM (Network Folder: 2025 - With Development - 2% pa growth)]

Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h]	HV %	ARRIVAL FLOWS [Total veh/h]	HV %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh]	Dist m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: South Western Hwy (S)														
7	L2	36	2.0	36	2.0	0.471	5.8	LOS A	0.0	0.0	0.00	0.02	0.00	49.1
8	T1	855	7.9	855	7.9	0.471	0.2	LOS A	0.0	0.0	0.00	0.02	0.00	59.2
Approach		891	7.7	891	7.7	0.471	0.4	NA	0.0	0.0	0.00	0.02	0.00	58.7
North: South Western Hwy (N)														
2	T1	613	9.8	613	9.8	0.339	0.2	LOS A	0.2	1.4	0.03	0.00	0.03	59.5
3	R2	4	2.0	4	2.0	0.339	15.2	LOS C	0.2	1.4	0.03	0.00	0.03	60.0
Approach		617	9.7	617	9.7	0.339	0.3	NA	0.2	1.4	0.03	0.00	0.03	59.5
West: Crossover 1 (W)														
4	L2	19	2.0	19	2.0	0.078	5.5	LOS A	0.2	1.8	0.79	0.79	0.79	7.2
6	R2	3	2.0	3	2.0	0.078	46.1	LOS E	0.2	1.8	0.79	0.79	0.79	38.3
Approach		22	2.0	22	2.0	0.078	11.3	LOS B	0.2	1.8	0.79	0.79	0.79	17.2
All Vehicles		1529	8.4	1529	8.4	0.471	0.5	NA	0.2	1.8	0.02	0.03	0.02	58.6

MOVEMENT SUMMARY

Site: [Larsen Rd & Crossover 2 - 2025 - AM (Site Folder: 2025 - With Development)]

Network: N101 [AM (Network Folder: 2025 - With Development - 2% pa growth)]

Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Crossover 2 (S)														
4	L2	7	2.0	7	2.0	0.060	0.1	LOS A	0.2	1.5	0.15	0.10	0.15	25.6
6	R2	64	2.0	64	2.0	0.060	0.6	LOS A	0.2	1.5	0.15	0.10	0.15	19.3
Approach		72	2.0	72	2.0	0.060	0.5	LOS A	0.2	1.5	0.15	0.10	0.15	20.1
East: Larsen Rd (E)														
7	L2	42	2.0	42	2.0	0.039	3.7	LOS A	0.0	0.0	0.00	0.31	0.00	39.6
8	T1	31	4.1	31	4.1	0.039	0.0	LOS A	0.0	0.0	0.00	0.31	0.00	41.7
Approach		73	2.9	73	2.9	0.039	2.1	NA	0.0	0.0	0.00	0.31	0.00	40.4
West: Larsen Rd (W)														
2	T1	32	3.8	32	3.8	0.026	0.1	LOS A	0.1	0.6	0.11	0.18	0.11	39.4
3	R2	16	2.0	16	2.0	0.026	4.8	LOS A	0.1	0.6	0.11	0.18	0.11	29.3
Approach		47	3.2	47	3.2	0.026	1.7	NA	0.1	0.6	0.11	0.18	0.11	33.6
All Vehicles		192	2.6	192	2.6	0.060	1.4	NA	0.2	1.5	0.08	0.20	0.08	29.2

MOVEMENT SUMMARY

Site: [South Western Hwy & Larsen Rd - 2025 - PM (Site Folder: 2025 - With Development)]

Network: N101 [PM (Network Folder: 2025 - With Development - 2% pa growth)]

Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: South Western Hwy (S)														
7	L2	36	4.1	36	4.1	0.020	5.4	LOS A	0.0	0.0	0.00	0.57	0.00	31.8
8	T1	660	7.9	660	7.9	0.377	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	59.7
Approach		696	7.7	696	7.7	0.377	0.3	NA	0.0	0.0	0.00	0.03	0.00	58.9
North: South Western Hwy (N)														
2	T1	918	9.8	918	9.8	0.535	0.3	LOS A	0.0	0.0	0.00	0.00	0.00	59.5
3	R2	64	4.1	64	4.1	0.112	10.5	LOS B	0.4	3.1	0.62	0.85	0.62	35.7
Approach		982	9.4	982	9.4	0.535	1.0	NA	0.4	3.1	0.04	0.06	0.04	57.0
West: Larsen Rd (W)														
4	L2	44	3.8	44	3.8	0.593	21.6	LOS C	2.3	17.4	0.91	1.11	1.40	17.8
6	R2	48	3.8	48	3.8	0.593	57.2	LOS F	2.3	17.4	0.91	1.11	1.40	4.8
Approach		93	3.8	93	3.8	0.593	40.2	LOS E	2.3	17.4	0.91	1.11	1.40	12.1
All Vehicles		1771	8.5	1771	8.5	0.593	2.8	NA	2.3	17.4	0.07	0.10	0.10	51.5

MOVEMENT SUMMARY

Site: [South Western Hwy & Crossover 1 - 2025 - PM (Site Folder: 2025 - With Development)]

Network: N101 [PM (Network Folder: 2025 - With Development - 2% pa growth)]

Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: South Western Hwy (S)														
7	L2	42	2.0	42	2.0	0.377	5.7	LOS A	0.0	0.0	0.00	0.04	0.00	49.1
8	T1	672	7.9	672	7.9	0.377	0.1	LOS A	0.0	0.0	0.00	0.04	0.00	59.1
Approach		714	7.6	714	7.6	0.377	0.5	NA	0.0	0.0	0.00	0.04	0.00	58.4
North: South Western Hwy (N)														
2	T1	962	9.8	962	9.8	0.527	0.1	LOS A	0.2	1.7	0.02	0.00	0.03	59.7
3	R2	5	2.0	5	2.0	0.527	14.1	LOS B	0.2	1.7	0.02	0.00	0.03	60.8
Approach		967	9.8	967	9.8	0.527	0.2	NA	0.2	1.7	0.02	0.00	0.03	59.7
West: Crossover 1 (W)														
4	L2	25	2.0	25	2.0	0.092	3.4	LOS A	0.3	2.1	0.73	0.70	0.73	8.0
6	R2	4	2.0	4	2.0	0.092	47.0	LOS E	0.3	2.1	0.73	0.70	0.73	39.7
Approach		29	2.0	29	2.0	0.092	9.6	LOS A	0.3	2.1	0.73	0.70	0.73	18.6
All Vehicles		1711	8.7	1711	8.7	0.527	0.5	NA	0.3	2.1	0.02	0.03	0.03	58.7

MOVEMENT SUMMARY

Site: [Larsen Rd & Crossover 2 - 2025 - PM (Site Folder: 2025 - With Development)]

Network: N101 [PM (Network Folder: 2025 - With Development - 2% pa growth)]

Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Crossover 2 (S)														
4	L2	8	2.0	8	2.0	0.071	0.2	LOS A	0.2	1.8	0.18	0.12	0.18	25.5
6	R2	76	2.0	76	2.0	0.071	0.6	LOS A	0.2	1.8	0.18	0.12	0.18	19.2
Approach		84	2.0	84	2.0	0.071	0.6	LOS A	0.2	1.8	0.18	0.12	0.18	20.0
East: Larsen Rd (E)														
7	L2	49	2.0	49	2.0	0.054	3.7	LOS A	0.0	0.0	0.00	0.26	0.00	40.4
8	T1	51	4.1	51	4.1	0.054	0.0	LOS A	0.0	0.0	0.00	0.26	0.00	42.7
Approach		100	3.1	100	3.1	0.054	1.8	NA	0.0	0.0	0.00	0.26	0.00	41.5
West: Larsen Rd (W)														
2	T1	17	3.8	17	3.8	0.021	0.2	LOS A	0.1	0.7	0.18	0.27	0.18	35.1
3	R2	19	2.0	19	2.0	0.021	4.9	LOS A	0.1	0.7	0.18	0.27	0.18	28.0
Approach		36	2.8	36	2.8	0.021	2.7	NA	0.1	0.7	0.18	0.27	0.18	29.8
All Vehicles		220	2.6	220	2.6	0.071	1.5	NA	0.2	1.8	0.10	0.21	0.10	29.1

Engineering a better future for over 20 years!

Technical Note: No 2a **Date:** 20/03/2024
Project No: t23.129
Project: Lot 104 (No 3) Larsen Road, Byford
Subject: Assessment of the revised access arrangement for the development and addressing Main Roads WA comments

1 Introduction

This technical note has been prepared by Transcore on behalf of Capital Prudential with respect to the revised access arrangement for the proposed new development entailing Service Station, Fast Food Outlet, Motor Vehicle Repair and Motor Vehicle Wash land uses at the abovementioned site.

This technical note is an addendum to the Transport Impact Assessment (TIA) report prepared by Transcore in November 2023 and will address the removal of the George Street crossover and recent Main Roads WA comments outlined in their letter of 14 Match 2024 with respect to:

- SIDRA analysis of the left in crossover on South Western Highway (SWH); and,
- Lack of physical restriction at the SWH crossover to enforce left in movement.

The SIDRA analysis for the left in only crossover on South Western Highway has been undertaken and the SIDRA files has been provided to Main Roads.

The Applicant's proposal for the left-in only movement at the existing SWH crossover is to enforce it through signage and line markings without any physical modifications. However, if Main Roads WA supports the proposed left-in only crossover on SWH, the Applicant is prepared to accept a suitably worded development approval condition to design the crossover in a way that it physically enforces the left-in only movements.

The Public Transport Authority's referral comment regarding the connection to George Street has been addressed in the updated plan by removing this development crossover on George Street. A copy of the updated development site plan, reflecting this change, is provided in **Appendix A**. Additionally, the turn paths for the fuel tanker has been updated to reflect this modification, and the turn path plans are provided in **Appendix B**.

As a result of the removal of the George Street crossover, the development trip distribution and SIDRA analysis have been updated to reflect this change.

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This technical note documents the outcome of the updated modelling and analysis for the updated development plan.

2 Assessment Period

The assessment year that is adopted for the analysis is 2025. It is anticipated that the construction of Byford Station will take place in the near future, resulting in a decrease in the car mode share within the immediate vicinity. This change, coupled with the introduction of a new park and ride facility, may alter the traffic patterns in the area.

Additionally, the recently announced and funded Tonkin Highway extension project is expected to divert regional traffic away from SWH, leading to a reduction in existing traffic volumes after the completion of the extension, which is anticipated in the short term. On this basis the assessment undertaken does not include 10 years post development scenario.

3 Trip generation and distribution

The proposed removal of the George Street crossover would not change the trip generation of the proposed development; however, the trip distribution of the development would change and the turning movements at the George Street crossover would be shifted to the Larsen Road crossover.

The updated distribution of the proposed development traffic is illustrated in **Figure 1** for the AM and PM peak hours.

The proposed relocation of the railway level crossing from Larsen Road further south to Clara Street would remove most of the existing traffic along Larsen Road towards SWH. Accordingly, the redistributed traffic on the surrounding road network in 2025 after closure of the railway crossing was estimated and the development traffic was added to the redistributed traffic. A 2% per year traffic growth rate was applied to the background traffic to establish the 2025 traffic on SWH and George Street.

The total projected traffic volumes for the assessment year are presented in **Figure 2**.

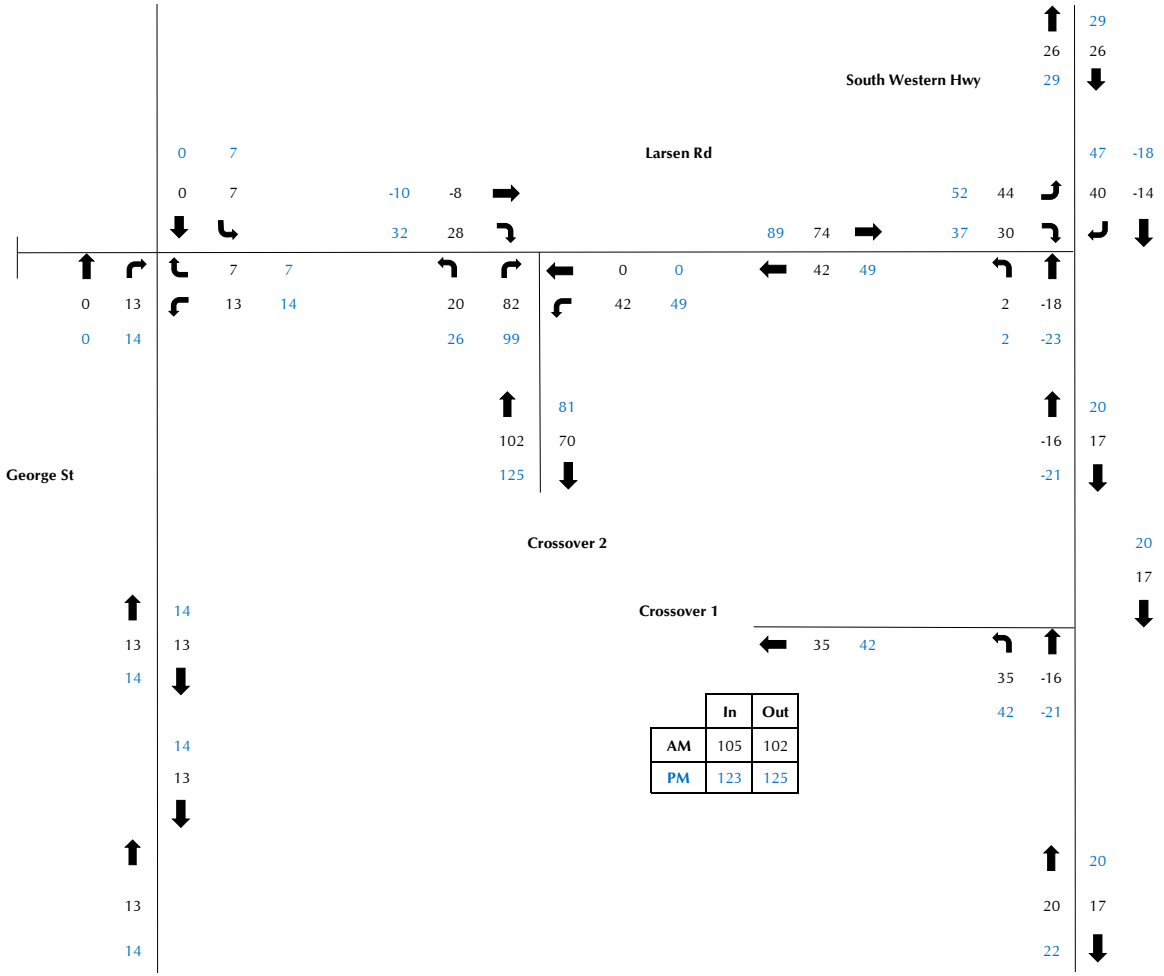


Figure 1: Updated development trip distribution during the AM and PM peak hours

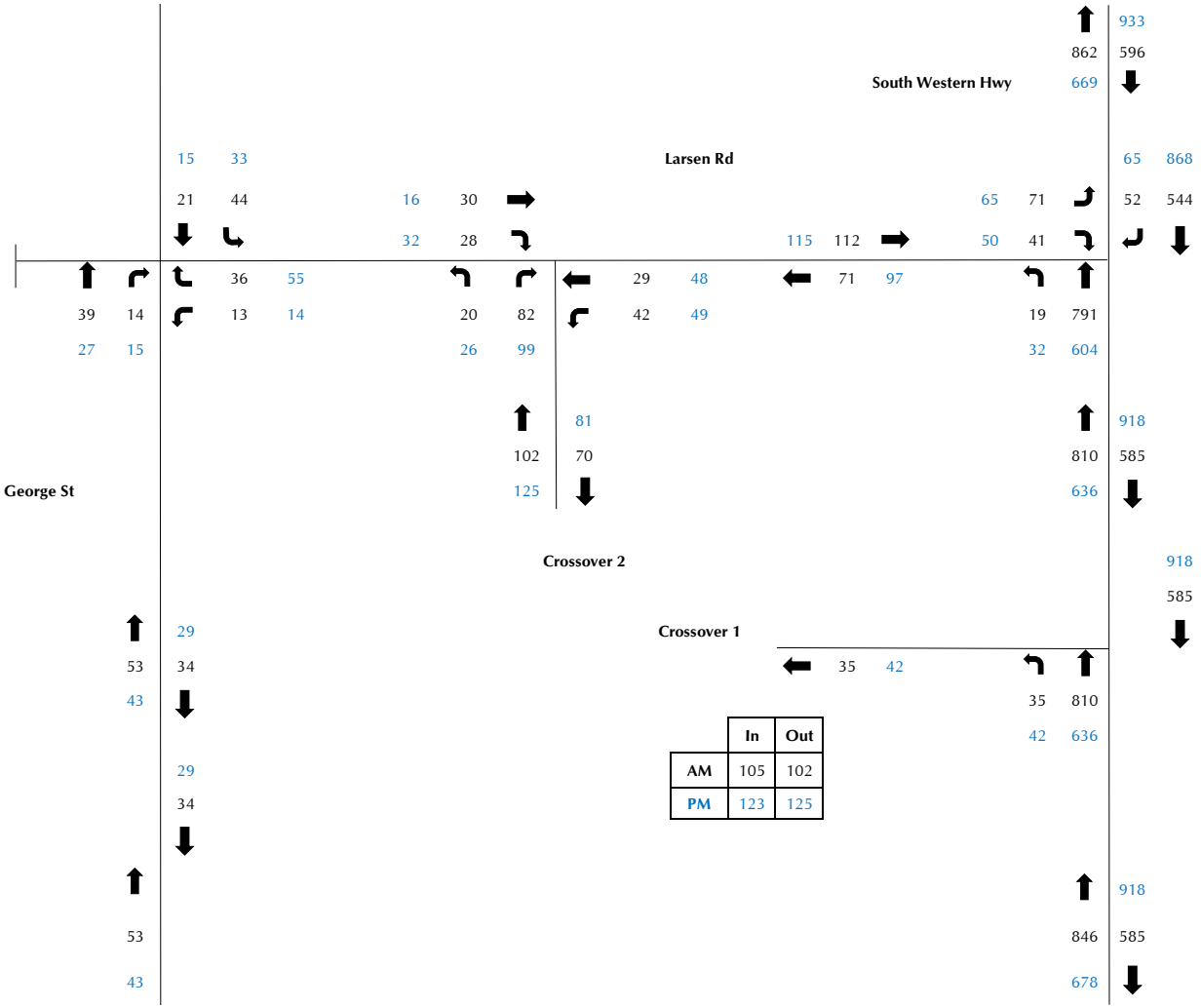


Figure 2: Total (2025 with development) traffic – AM Weekday and PM Weekday peak hours

4 SIDRA Results

Capacity analysis of the development crossovers on Larsen Road and SWH and intersection of Larson Road/SWH was undertaken using the SIDRA computer software package.

The results of the SIDRA analysis are summarised in **Appendix C**. The SIDRA intersection models were coded with reference to Main Roads WA Operation Modelling Guidelines. All relevant parameters such as heavy vehicle groups, PCU factors etc. were coded as per the Main Roads WA Guidelines.

SWH/ Larsen Road intersection

The SIDRA analysis results and site observations indicate that the intersection of SWH/ Larsen Road presently operates at capacity with level of service F for the critical right turn movement out of Larsen Road during both weekday peak hours. The gap acceptance and follow up parameters in SIDRA were adjusted slightly for this movement to calibrate to the 2021 queues and delays at the intersection. **Table 1** summarises the calibrated queues and delays at the intersection for the critical right turn movements out of Larsen Road.

Table 1: SIDRA results for the critical right turn movements at the SWH / Larsen Rd intersection in 2021

	Movement: Right turn out from Larsen Rd			
	Observed (2021)		Modelled (2021)	
	AM	PM	AM	PM
95% back of queue (Veh)	5.3	4.6	5.8	4.1
Average delay time (S)	68	52	72.1	70.3
LoS	F	F	F	F

The closure of the railway crossing at Larsen Road and the addition of the development-generated traffic to the intersection will result in less traffic at the intersection in 2025 compared to 2021 and consequently minor decreases in overall queues and delays are reported. No change in overall LoS for the intersection is reported. **Table 2** summarises the performance parameters for the critical right turn movements out of Larsen Road in 2025.

Table 2: SIDRA results for the critical right movements at the SWH / Larsen Rd intersection in 2025

	Movement: Right turn out from Larsen Rd	
	2025 After road closure and with development	
	AM	PM
95% back of queue (Veh)	2.7	2.8
Average delay time (S)	57.9	56.7
LoS	F	F

SWH left in crossover

SIDRA analysis indicates that the proposed left in crossover on SWH will operate satisfactorily in 2025 with LoS A and minimal queues and delays during assessed peak hours.

Larsen Road crossover

SIDRA analysis indicates that the proposed development crossover on Larson Road will operate satisfactorily in 2025 during assessed peak hours. All movements operate with acceptable levels of service with minimal delays and queuing.

Network Operations

Relevant SIDRA network outputs were reviewed for assessed peak hours to establish the operation of the SWH/ Larsen Road intersection and development crossovers on Larsen Road and SWH as an integrated network.

As detailed in **Figure 3** there are no queue backs reported from the SWH/ Larsen Road intersection to the proposed development crossovers on Larsen Road and SWH. Similarly, no queue backs from the development crossover on Larsen Road to SWH intersection is reported.

Hence, the capacity analysis confirms that the proposed development with the revised crossover arrangement will not have an adverse impact on the operation of the road network and that the proposed development crossovers on Larsen Road and SWH will operate satisfactorily.

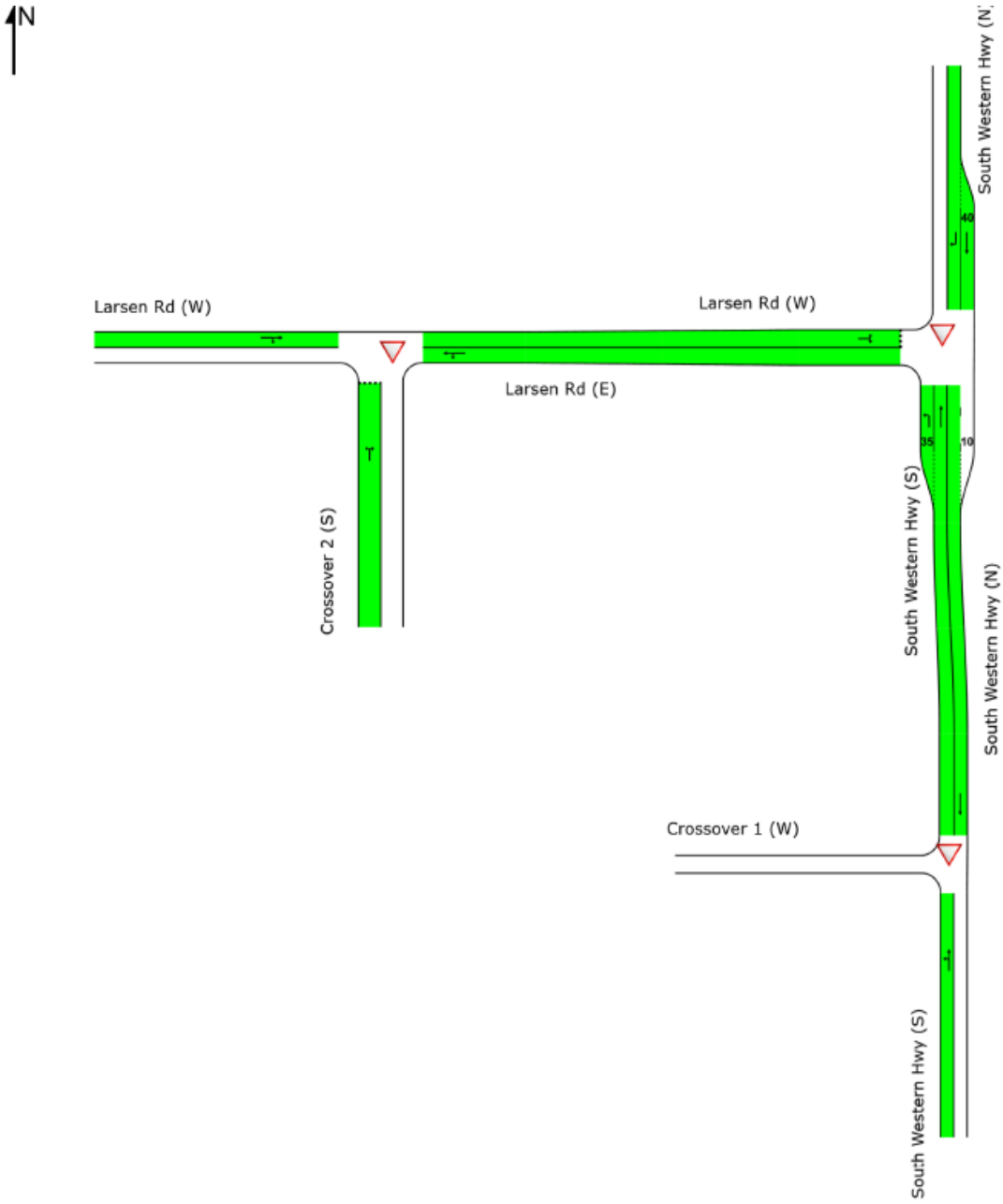


Figure 3: Critical weekday AM/PM peak hour network analysis – queue storage ratio (2025)

5 Conclusion

In response to Main Roads WA's concern regarding the SWH crossover, the proposed development now only entails a left in only crossover on South Western Highway.

The Applicant's proposes that the left-in only movements at the existing SWH crossover is enforced through signage and line markings without any physical modifications. However, if Main Roads WA supports the proposed left-in only crossover on SWH, the Applicant is prepared to accept a suitably worded development approval condition to design the crossover in a way that it physically enforces the left-in only movements.

In response to Public Transport Authority (PTA) referral comments regarding the connection to George Street, the proposed development George Street crossover is removed in the updated development plan. Turn paths undertaken for the fuel tanker shows the tanker can satisfactorily enter and exit the site without reliance on George Street crossover.

The assessment year that is adopted for the analysis is 2025. It is anticipated that the construction of Byford Station will result in a decrease in the car mode share within the immediate vicinity. Additionally, the recently announced and funded Tonkin Highway extension project is expected to divert regional traffic away from South Western Highway, leading to a reduction in existing traffic volumes in the short term.

The closure of the railway crossing at Larsen Road and the addition of the development-generated traffic to the intersection is estimated to result in less traffic at the intersection in 2025 (post development) compared to existing situation and consequently minor decreases in overall queues and delays are reported by SIDRA.

It is concluded that downgrading the existing SWH crossover to left in only and removal of the George Street crossover would not adversely impact the traffic operation of the intersection of SWH/ Larsen Road and the development Larson Road crossover.

SIDRA analysis indicates that the proposed left in only crossover on SWH will operate satisfactorily in 2025 with LOS A and minimal queues and delays during assessed peak hours.

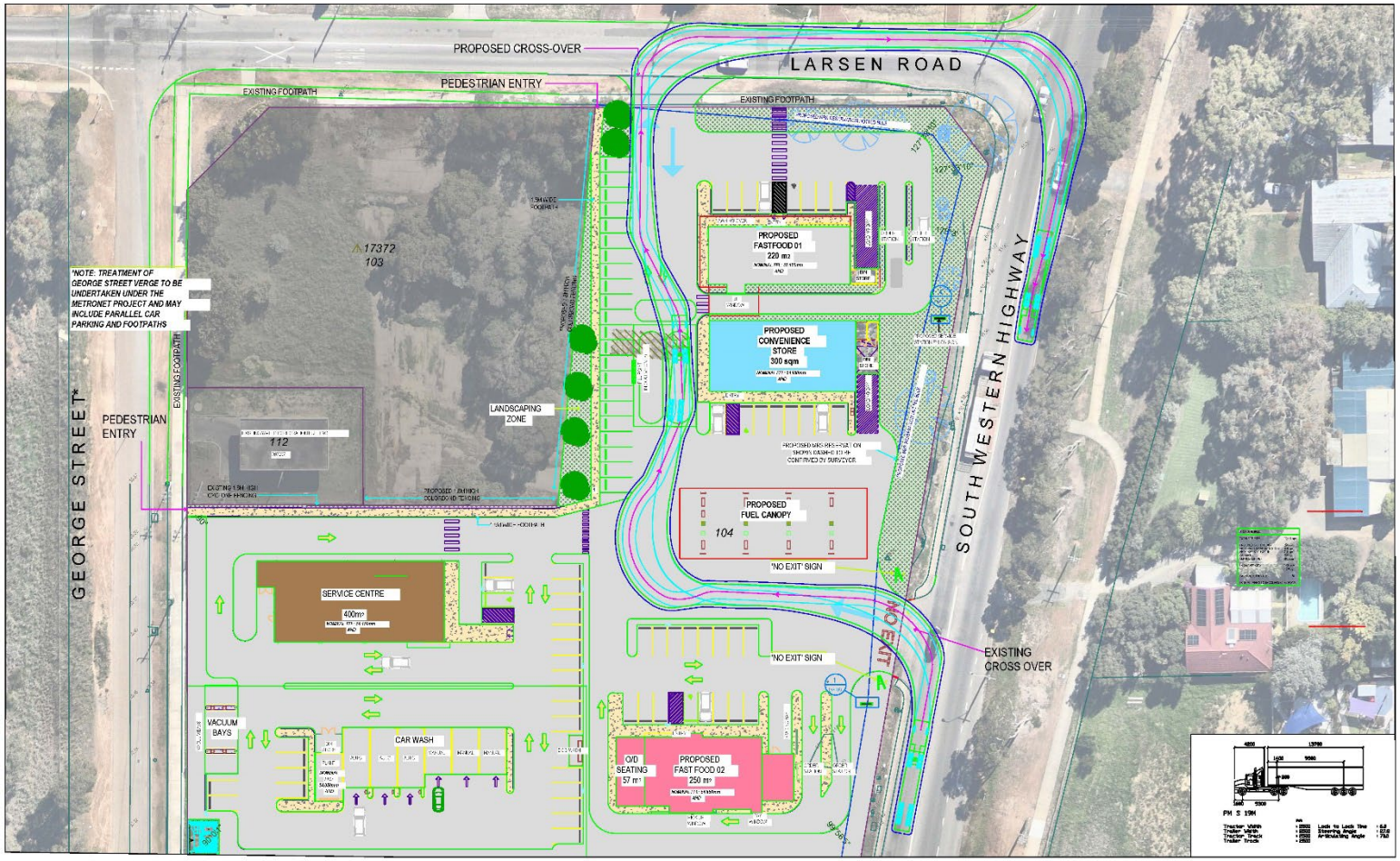
APPENDIX A

PROPOSED REVISED DEVELOPMENT SITE PLAN


LARSEN ROAD
PROPOSED CROSS-OVER
PEDESTRIAN ENTRY
EXISTING FOOTPATH
EXISTING FOOTPATH
SOUTH WESTERN HIGHWAY
GEORGE STREET*
PEDESTRIAN ENTRY
EXISTING FOOTPATH
*NOTE: TREATMENT OF GEORGE STREET VERGE TO BE UNDERTAKEN UNDER THE METRONET PROJECT AND MAY INCLUDE PARALLEL CAR PARKING AND FOOTPATHS
LANDSCAPING ZONE
PROPOSED FASTFOOD 01 220 m²
PROPOSED CONVENIENCE STORE 300 sqm
PROPOSED FUEL CANOPY
SERVICE CENTRE 400m²
CAR WASH
VACUUM BAYS
PROPOSED FAST FOOD 02 290 m²
QUEUING 57 m²
SEATING
'NO EXIT' SIGN
'NO RIGHT TURN' SIGN
'NO EXIT' BITUMEN MAKING
EXISTING CROSS OVER
'NO RIGHT TURN' SIGN
'NO EXIT' SIGN
'NO EXIT' SIGN
'NO RIGHT TURN' SIGN
NO EXIT
R2-6R
1 PROPOSED SITE PLAN
LOT 104 (SN3) LARSEN RD, (CNR SOUTH WESTERN HIGHWAY) BYFORD
AREA SCHEDULE:
TOTAL SITE AREA - 11,630 sqm
PROPOSED FAST FOOD 01- 220 sqm
PROPOSED CONVENIENCE STORE - 300 sqm
PROPOSED FAST FOOD 02- 250 sqm
CARWASH - 220 sqm
SERVICE CENTRE - 400 sqm
LANDSCAPE AREA - 1833 sqm (15.8 %)
CAR SPACES PROVIDED - 78
NOTE: ALL AREAS TO BE CONFIRMED BY SURVEY
ISS. ED FOR REVIEW
ISS. ED FOR DA - CROSSING NOTES ADDED
ISS. ED FOR DA
COMMERCIAL DEVELOPMENT
LOT 104 LARSEN RD, BYFORD
Hodge Collard Preston
71.23
DA001

APPENDIX B

TURN PATHS



3 Larsen Road, Byford
Austroads 2013: 19.0m Fuel-tanker (MRWA 15m R)
Fuel-tanker circulation

LEGEND
Vehicle Body
Wheel Path
500mm Clearance

t23.129.sk21
20/03/2024
Scale: 1:600 @ A3

transcore

APPENDIX C

SIDRA RESULTS

MOVEMENT SUMMARY

Site: [Larsen Rd & Crossover 2 - 2025 - AM (Site Folder: 2025 - With Development)]

Network: N101 [AM (Network Folder: 2025 - With Development - 2% pa growth)]

Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Crossover 2 (S)														
4	L2	21	2.0	21	2.0	0.089	0.1	LOS A	0.3	2.3	0.14	0.10	0.14	25.7
6	R2	86	2.0	86	2.0	0.089	0.6	LOS A	0.3	2.3	0.14	0.10	0.14	19.3
Approach		107	2.0	107	2.0	0.089	0.5	LOS A	0.3	2.3	0.14	0.10	0.14	20.9
East: Larsen Rd (E)														
7	L2	44	2.0	44	2.0	0.040	3.7	LOS A	0.0	0.0	0.00	0.31	0.00	39.4
8	T1	31	4.1	31	4.1	0.040	0.0	LOS A	0.0	0.0	0.00	0.31	0.00	41.5
Approach		75	2.9	75	2.9	0.040	2.2	NA	0.0	0.0	0.00	0.31	0.00	40.2
West: Larsen Rd (W)														
2	T1	32	3.8	32	3.8	0.035	0.2	LOS A	0.1	1.1	0.15	0.25	0.15	36.2
3	R2	29	2.0	29	2.0	0.035	4.8	LOS A	0.1	1.1	0.15	0.25	0.15	28.3
Approach		61	2.9	61	2.9	0.035	2.4	NA	0.1	1.1	0.15	0.25	0.15	30.7
All Vehicles		243	2.5	243	2.5	0.089	1.5	NA	0.3	2.3	0.10	0.20	0.10	27.6

MOVEMENT SUMMARY

Site: [South Western Hwy & Crossover 1- 2025 - AM (Site Folder: 2025 - With Development)]

Network: N101 [AM (Network Folder: 2025 - With Development - 2% pa growth)]

Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: South Western Hwy (S)														
7	L2	37	2.0	37	2.0	0.508	5.8	LOS A	0.0	0.0	0.00	0.02	0.00	48.4
8	T1	853	7.9	853	7.9	0.508	0.2	LOS A	0.0	0.0	0.00	0.02	0.00	59.1
Approach		889	7.7	889	7.7	0.508	0.5	NA	0.0	0.0	0.00	0.02	0.00	58.5
North: South Western Hwy (N)														
2	T1	616	9.8	616	9.8	0.359	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	59.7
Approach		616	9.8	616	9.8	0.359	0.0	NA	0.0	0.0	0.00	0.00	0.00	59.7
All Vehicles		1505	8.5	1505	8.5	0.508	0.3	NA	0.0	0.0	0.00	0.01	0.00	59.0

MOVEMENT SUMMARY

Site: [South Western Hwy & Larsen Rd - 2025 - AM (Site Folder: 2025 - With Development)]

Network: N101 [AM (Network Folder: 2025 - With Development - 2% pa growth)]

Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: South Western Hwy (S)														
7	L2	20	4.1	20	4.1	0.011	5.3	LOS A	0.0	0.0	0.00	0.57	0.00	31.8
8	T1	833	7.9	833	7.9	0.475	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	59.6
Approach		853	7.8	853	7.8	0.475	0.2	NA	0.0	0.0	0.00	0.01	0.00	59.2
North: South Western Hwy (N)														
2	T1	573	9.8	573	9.8	0.334	0.2	LOS A	0.0	0.0	0.00	0.00	0.00	59.8
3	R2	55	4.1	55	4.1	0.131	13.2	LOS B	0.4	3.4	0.73	0.89	0.73	32.3
Approach		627	9.3	627	9.3	0.334	1.3	NA	0.4	3.4	0.06	0.08	0.06	55.6
West: Larsen Rd (W)														
4	L2	75	3.8	75	3.8	0.645	24.5	LOS C	2.7	20.8	0.92	1.15	1.54	18.9
6	R2	43	3.8	43	3.8	0.645	57.9	LOS F	2.7	20.8	0.92	1.15	1.54	5.3
Approach		118	3.8	118	3.8	0.645	36.7	LOS E	2.7	20.8	0.92	1.15	1.54	14.9
All Vehicles		1598	8.1	1598	8.1	0.645	3.3	NA	2.7	20.8	0.09	0.12	0.14	50.1

MOVEMENT SUMMARY

Site: [Larsen Rd & Crossover 2 - 2025 - PM (Site Folder: 2025 - With Development)]

Network: N101 [PM (Network Folder: 2025 - With Development - 2% pa growth)]

Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Crossover 2 (S)														
4	L2	27	2.0	27	2.0	0.110	0.2	LOS A	0.4	2.9	0.18	0.12	0.18	25.6
6	R2	104	2.0	104	2.0	0.110	0.7	LOS A	0.4	2.9	0.18	0.12	0.18	19.2
Approach		132	2.0	132	2.0	0.110	0.6	LOS A	0.4	2.9	0.18	0.12	0.18	20.8
East: Larsen Rd (E)														
7	L2	52	2.0	52	2.0	0.055	3.7	LOS A	0.0	0.0	0.00	0.27	0.00	40.3
8	T1	51	4.1	51	4.1	0.055	0.0	LOS A	0.0	0.0	0.00	0.27	0.00	42.6
Approach		102	3.0	102	3.0	0.055	1.9	NA	0.0	0.0	0.00	0.27	0.00	41.4
West: Larsen Rd (W)														
2	T1	17	3.8	17	3.8	0.030	0.3	LOS A	0.1	1.0	0.20	0.34	0.20	32.9
3	R2	34	2.0	34	2.0	0.030	4.9	LOS A	0.1	1.0	0.20	0.34	0.20	27.3
Approach		51	2.6	51	2.6	0.030	3.3	NA	0.1	1.0	0.20	0.34	0.20	28.2
All Vehicles		284	2.5	284	2.5	0.110	1.5	NA	0.4	2.9	0.12	0.21	0.12	27.5

MOVEMENT SUMMARY

Site: [South Western Hwy & Crossover 1- 2025 - PM (Site Folder: 2025 - With Development)]

Network: N101 [PM (Network Folder: 2025 - With Development - 2% pa growth)]

Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: South Western Hwy (S)														
7	L2	44	2.0	44	2.0	0.407	5.7	LOS A	0.0	0.0	0.00	0.04	0.00	48.4
8	T1	669	7.9	669	7.9	0.407	0.2	LOS A	0.0	0.0	0.00	0.04	0.00	59.0
Approach		714	7.5	714	7.5	0.407	0.5	NA	0.0	0.0	0.00	0.04	0.00	58.1
North: South Western Hwy (N)														
2	T1	966	9.8	966	9.8	0.563	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	59.4
Approach		966	9.8	966	9.8	0.563	0.1	NA	0.0	0.0	0.00	0.00	0.00	59.4
All Vehicles		1680	8.8	1680	8.8	0.563	0.2	NA	0.0	0.0	0.00	0.02	0.00	58.9

MOVEMENT SUMMARY

Site: [South Western Hwy & Larsen Rd - 2025 - PM (Site Folder: 2025 - With Development)]

Network: N101 [PM (Network Folder: 2025 - With Development - 2% pa growth)]

Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: South Western Hwy (S)														
7	L2	34	4.1	34	4.1	0.019	5.4	LOS A	0.0	0.0	0.00	0.57	0.00	31.8
8	T1	636	7.9	636	7.9	0.363	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	59.7
Approach		669	7.7	669	7.7	0.363	0.3	NA	0.0	0.0	0.00	0.03	0.00	58.9
North: South Western Hwy (N)														
2	T1	914	9.8	914	9.8	0.533	0.3	LOS A	0.0	0.0	0.00	0.00	0.00	59.5
3	R2	68	4.1	68	4.1	0.114	10.2	LOS B	0.4	3.2	0.60	0.84	0.60	36.2
Approach		982	9.4	982	9.4	0.533	1.0	NA	0.4	3.2	0.04	0.06	0.04	56.9
West: Larsen Rd (W)														
4	L2	68	3.8	68	3.8	0.646	21.8	LOS C	2.8	21.3	0.90	1.16	1.54	18.8
6	R2	53	3.8	53	3.8	0.646	56.7	LOS F	2.8	21.3	0.90	1.16	1.54	5.2
Approach		121	3.8	121	3.8	0.646	37.0	LOS E	2.8	21.3	0.90	1.16	1.54	14.0
All Vehicles		1773	8.4	1773	8.4	0.646	3.2	NA	2.8	21.3	0.08	0.12	0.13	50.2

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Technical Note: No 1 **Date:** 18/02/2024
Project No: t23.129
Project: Lot 104 (No 3) Larsen Road, Byford
Subject: Addressing the Shire of Stephanite Jarrahdale comments

1 Introduction

This technical note has been prepared by Transcore on behalf of Capital Prudential with respect to the proposed new development entailing Service Station, Fast Food Outlet, Motor Vehicle Repair and Motor Vehicle Wash land uses at the abovementioned site.

Following consideration of the Development Application by the Shire, the Shire has provided the following comments on the Transport Impact Assessment prepared by Transcore (TIA dated November 2023):

1. *Traffic Impact Assessment to be updated to show parking/demand assessment.*

2. *Assessment of turn treatment warrants for access and advice on the slip lane/road upgrade requirements.*

3. *Liaise with Metronet to show the most updated design of George St and design the access accordingly. Ensure swept path of 19m truck exiting to George St complies to Austroads and AS2890.1,*

With respect to Item 3 the most recent advice received from Metronet states that *"Metronet are still finalising design details for the design of George Street and will have a firmer layout of the final design in mid to late March. When this information is available, we will be happy to share it with you"*. Therefore Item 3 will be addressed when most updated design of George St becomes available.

Accordingly, this technical note will address Items 1 and 2. Copy of the latest development plan is included in **Appendix A**.

2 Parking requirement and supply

The parking requirement for the proposed development is established in line with LPS3 and is summarised in **Table 1**. This table also includes the parking supply associated with the development and the theoretical parking shortfall in accordance with LPS3.

Address: 61 York Street, Subiaco WA 6008. P.O.Box 42 Subiaco WA 6904
Phone: +61 (08) 9382 4199
Fax: +61 (08) 9382 4177
Email: admin@transcore.net.au
Transcore Pty Ltd ACN 094 951 318 ABN 19 094 951 318

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www.linkedin.com/company/transcore/
instagram: @transcoreaustralia

Table 1: Car parking assessment

Use	Requirement	Calculation	Bays Required
Fast Food Outlet 1	1 bay per 4 m^2 of counter and/or dining areas, 1 bay per 4 m^2 of public assembly areas and 1 bay per employee. Where a drive through facility is provided, 4 stacking bays and 1 waiting bay shall be provided	50m2 counter and dining areas,10 staff members, 4 stacking bays and Waiting Bay provided	22
Fast Food Outlet 2	1 bay per 4 m^2 of counter and/or dining areas, 1 bay per 4 m^2 of public assembly areas and 1 bay per employee. Where a drive through facility is provided, 4 stacking bays and 1 waiting bay shall be provided	100m2 counter and dining areas,10 staff members, 4 stacking bays and Waiting Bay provided	35
Motor Vehicle Repair	1 bay per 50 m^2 NLA and 1 bay per employee	400m2 NLA = 8 bays 8 employees = 8 bays	16
Motor Vehicle Wash	1 bay per 50 m^2 NLA and 1 bay per employee	220m NLA = 5 bays 0 employees = 0 bays	5
Service Station	2 bays per service bay and 1 bay per employee	3 employee	3
Total parking bays required			**81**
Total parking bays provided - On site			**78**
Total parking bays			**78**
Surplus (+)/ Shortfall (-)			**-3**

As evident based on LPS3, there would be a theoretical parking shortfall of only 3 bays for the proposed development. However, parking requirement calculation in accordance with LPS3 is simply establishes the sum of the parking requirement for each land use. This approach does not allow for the fact that patrons to the development may visit more than one land use and the fact that the peak operating times for each land use may be different.

For example, motor vehicle repair will be closed during peak times of the fast-food outlets.

In order to establish a more realistic parking requirement and demand for the proposed development, a temporal parking assessment was undertaken for the proposed development based on the anticipated peak operating times for each land use and the anticipated parking demand during other times. This assessment was undertaken for a typical Friday and typical Saturday when the peak parking demand for the proposed development is expected to occur. The assessments are provided in **Section 3** of the technical note.

3 Parking Assessment

As the peak parking demand periods for the various land-uses within the proposed development does not completely overlap, a daily anticipated parking demand profile (for a typical Friday and a typical Saturday) was established for each of the proposed land-uses to estimate the anticipated actual combined parking demand throughout the day.

The percentage of parking demand assumptions outlined in **Table B1** and **Table B2** in **Appendix B** are based on the project team experience and operator's advice.

The anticipated demand for parking is then calculated by multiplying the anticipated percentage of parking demand for each land-use by its theoretical parking requirement in accordance with LPS3. The resulting estimated parking demands are summarised in **Table B3** (for a typical Friday) and **Table B4** (for a typical Saturday). The parking surplus (+)/ shortfall (-) for each land-use is calculated by subtracting the total anticipated parking demand from the proposed number of bays.

As shown in **Figure 1** , the maximum combined parking demand for a typical Friday is anticipated to occur at 13:00 and 14:00. During this period, it is estimated that a total of 9 bays would be unoccupied/available. Similarly, As detailed in **Table B4** and **Figure 2** , the maximum combined parking demand for a typical Saturday is anticipated to occur at 12:00 and 19:00. During this period, it is estimated that a total of 18 bays would be unoccupied/available.

It should be noted the temporal parking assessment undertaken does not allow for cross trades between various land uses. Arguably the estimated parking demand will be less than that established in this assessment.

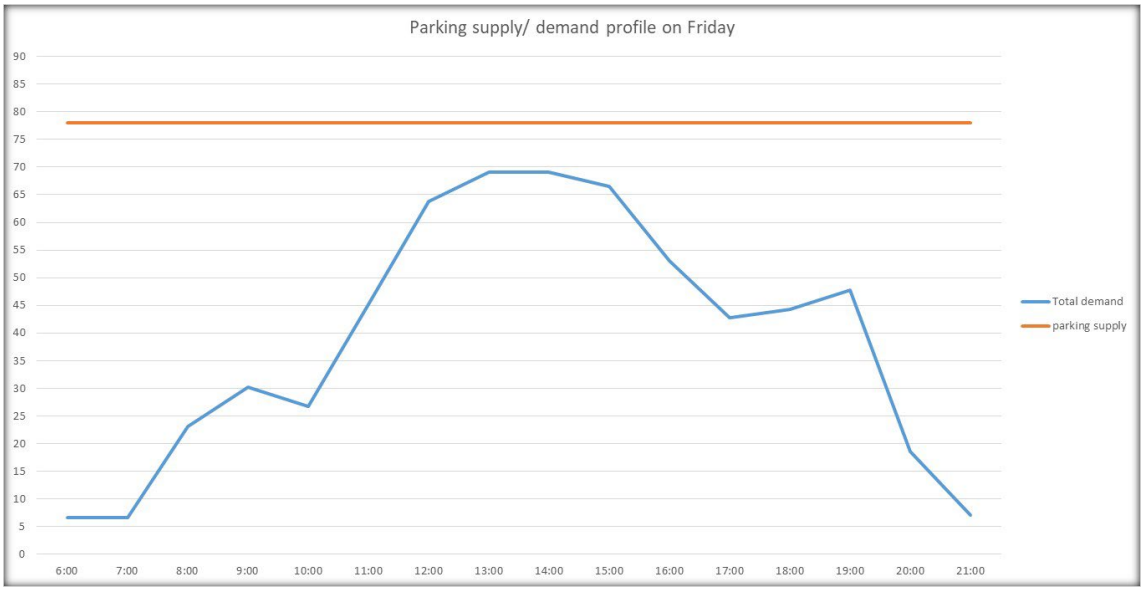


Figure 1: Parking supply/ demand on a typical Friday

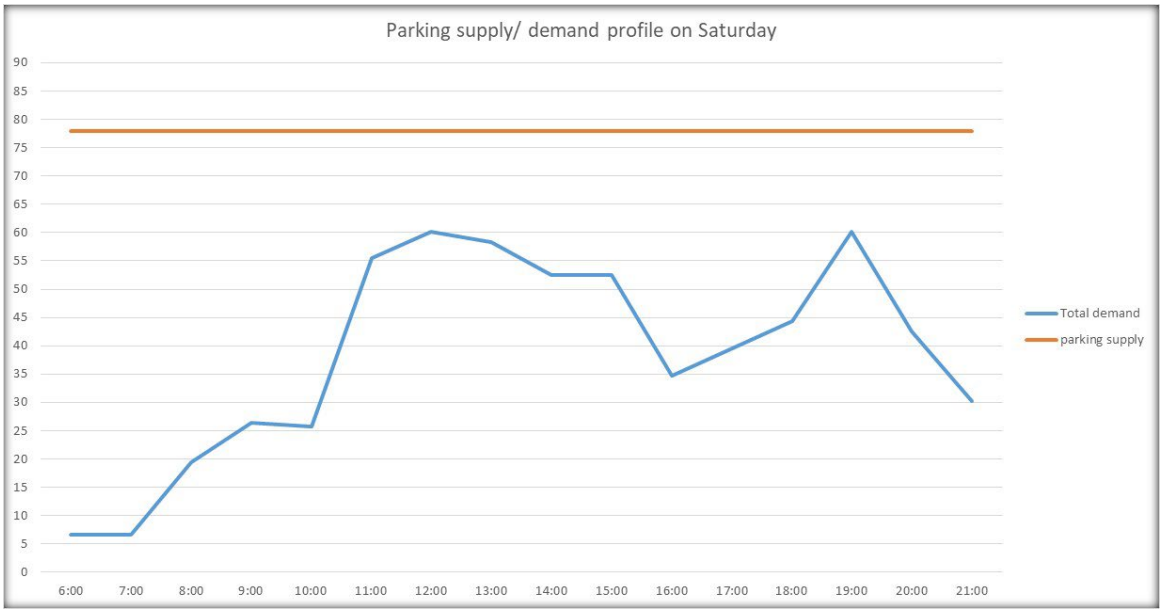


Figure 2: Parking supply/ demand on a typical Saturday

4 3.1 Turn Lane Assessment

Austroads Guide to Road Design Part 4A: Unsignalised and Signalised Intersections (2009) introduced new warrants for turn treatments on high-speed roads (>100km/h operating speed) and on low and intermediate speed roads (<100km/h operating speed), with graphs on page 45 presenting those warrants in terms of turning traffic volume against the opposing major road traffic volume (vehicles per hour).

However, the warrants only distinguish between roads as having speeds above or below 100km/h. It is evident that accident frequency and severity are more likely to be greater at higher speeds, so there is some concern that relying on these warrants (above or below 100km/h) is very likely to over-prescribe the construction of costly turn treatments like channelised right turn lanes and left turn slip lanes (because of road widening required) on lower speed urban roads (eg. 60km/h speed limit on this section of South Western Highway).

In line with the Austroads Guide, Main Roads WA has prepared an excel spreadsheet for turn lane assessments, which has been utilised for the proposed development crossover on South Western Highway. The outcomes of the turn lane assessments for the AM and PM peak hours are presented in Appendix B, indicating that a right turn and left turn lane may be necessary at the crossover to meet Austroads requirements. It should be noted that the calculation of turn lane requirements is highly sensitive to the specific turning movements. For example, during the PM peak hour, there is an anticipated total of 5 right turn movements from South Western Highway to the development, resulting in a requirement for a channelised right turn lane (CHR). However, reducing the right turn movements to 4 would lead to a requirement for a basic auxiliary right turn lane (BAR), which is already in place at the crossover. It is also evident that the threshold for turn lane requirement is set very low and as a result turn lane treatments are not generally provided in low-speed urban environments due to significant costs and potential land impacts.

Accordingly, it is important to note that none of the existing crossovers on South Western Highway in the vicinity currently include turn lanes.

Main Roads WA has advised that this section of South Western Highway is planned for future upgrading, which will involve the provision of a median and extension of the existing left turn lane on South Western Highway to Larsen Road (refer **Figure 3**). Furthermore, due to the recently announced funded Tonkin High way extension project, any upgrade to South Western Highway is expected to be a long-term undertaking because the existing traffic volumes on South Western Highway will be reduced because at least the regional traffic will be diverted to Tonkin Highway.

Based on these considerations, it is recommended that the existing development crossover on South Western Highway should be retained in its current format until the upgrades to this section of the highway are implemented. Once the upgrades are finalised and put into effect, the existing crossover on South Western Highway may be downgraded to a left in/left out crossover because of the centre median. It should be also noted that there are numerous examples where Main Roads has upgraded its roads while maintaining a crossover within a new left turn lane as part of an upgraded intersection (e.g., Albany Hwy, Great Eastern Hwy, etc.).

It is also important to note that the retention of the development crossover on South Western Highway is critical to reduce the traffic demand at the intersection of South Western Highway and Larson Road.

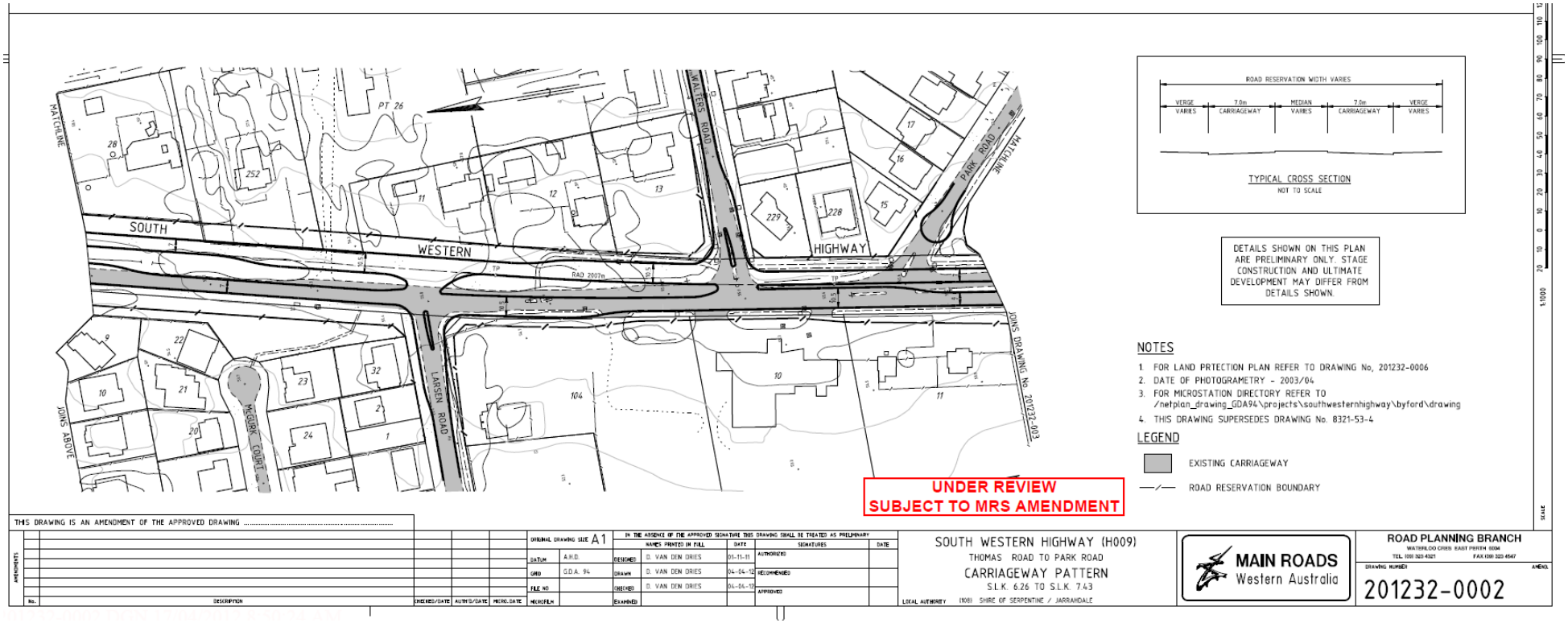


Figure 3: Proposed future upgrades on South Western Highway in the vicinity of the subject site

5 Conclusion

The parking investigations and assessments undertaken and documented in this technical note indicates that the parking provision of the proposed development meets and exceeds the anticipated actual typical peak parking demand of the development.

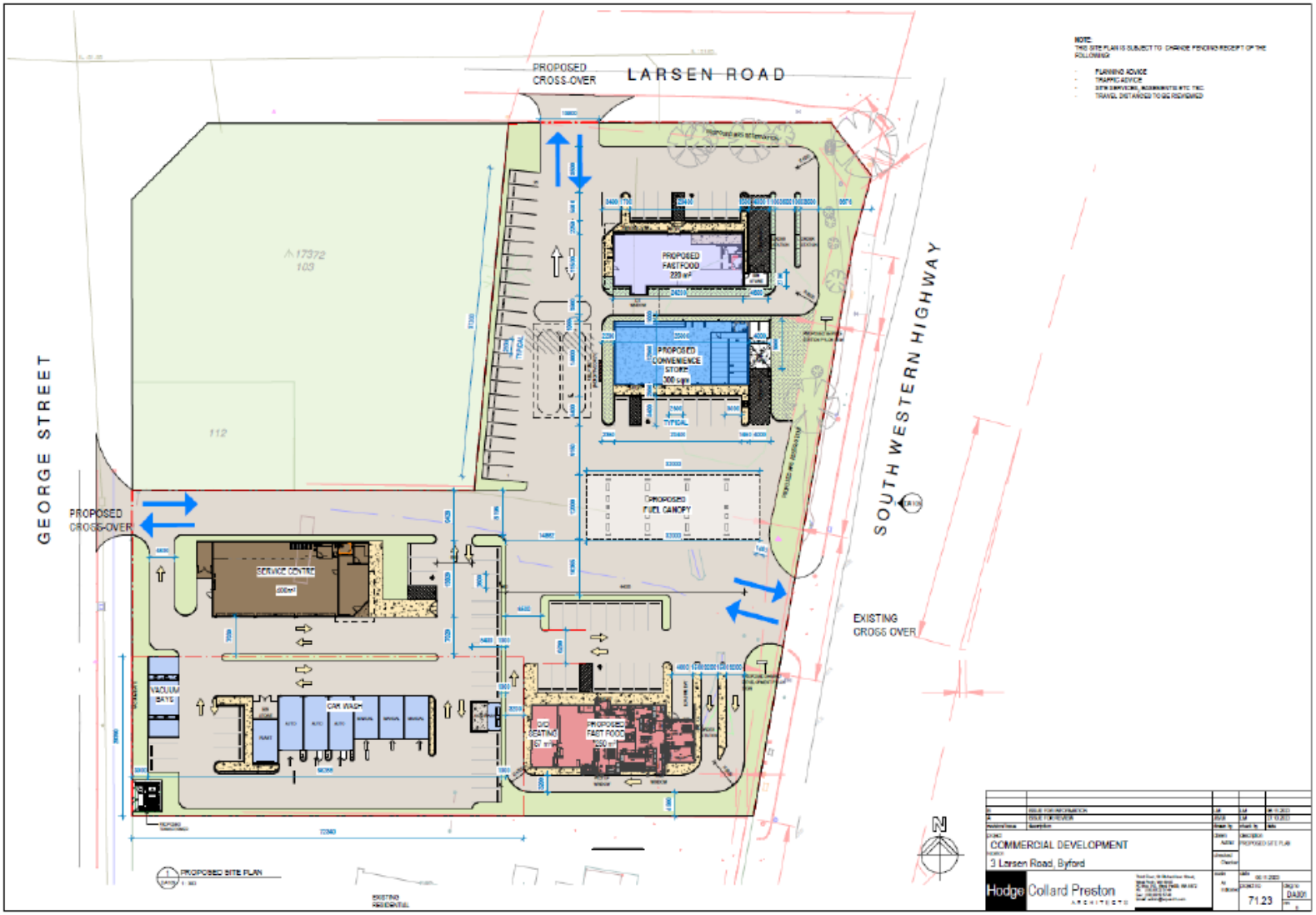
Considering the low operating speed on this section of South Western Highway and the absence of turn lanes at existing crossovers in the vicinity (low speed urban environment), it is determined that turn lanes are not necessary at the development crossover, particularly considering the significant costs and potential land impacts.

Main Roads WA has provided advice indicating that future upgrades to this section of South Western Highway will include the introduction of a median and an extension of the existing left turn lane to Larsen Road. Because of the recently announced and funded Tonkin Highway extension, this project is expected to be long term and the traffic volumes along South Western Highway are expected to reduce as at least the regional traffic will switch to Tonkin Highway.

Based on these factors, it is recommended that the existing development crossover on South Western Highway be retained in its current format until the planned upgrades to this section of the highway are confirmed, funded and implemented. Once the upgrades are completed, the existing crossover may be modified to a left in/left out configuration because of the proposed centre median.

APPENDIX A

PROPOSED DEVELOPMENT SITE PLAN


LARSEN ROAD
PROPOSED CROSS-OVER
GEORGE STREET
SOUTH WESTERN HIGHWAY
PROPOSED CROSS-OVER
EXISTING CROSS OVER
PROPOSED FASTFOOD
PROPOSED CONVENIENCE STORE
PROPOSED FUEL CANOPY
SERVICE CENTRE
VACUUM BAYS
CAR WASH
DRIVE THROUGH
PROPOSED FAST FOOD
17372
103
112
PROPOSED SITE PLAN
EXISTING RESIDENTIAL
COMMERCIAL DEVELOPMENT
3 Larsen Road, Byford
Hodge Collard Preston
71.23
DA001

APPENDIX B

PARKING ASSESSMENT

(LPS32)

Table B1. Percentage of parking demand temporal analysis – Typical Friday

Time	Fast Food Outlet 1	Fast Food Outlet 2	Motor Vehicle Repair	Motor Vehicle Wash	Service station
6:00	10%	10%	0%	0%	30%
7:00	10%	10%	0%	0%	30%
8:00	10%	10%	100%	10%	30%
9:00	20%	20%	100%	20%	60%
10:00	20%	20%	70%	50%	60%
11:00	50%	50%	70%	80%	60%
12:00	80%	80%	70%	80%	100%
13:00	90%	90%	70%	70%	100%
14:00	90%	90%	70%	70%	100%
15:00	80%	80%	90%	70%	100%
16:00	70%	70%	50%	70%	60%
17:00	60%	60%	30%	60%	30%
18:00	70%	70%	0%	50%	60%
19:00	80%	80%	0%	20%	30%
20:00	30%	30%	0%	10%	30%
21:00	10%	10%	0%	10%	30%

Table B2. Percentage of parking demand temporal analysis – Typical Saturday

Time	Fast Food Outlet 1	Fast Food Outlet 2	Motor Vehicle Repair	Motor Vehicle Wash	Service station
6:00	10%	10%	0%	0%	30%
7:00	10%	10%	0%	0%	30%
8:00	10%	10%	80%	0%	30%
9:00	20%	20%	80%	10%	60%
10:00	20%	20%	70%	30%	60%
11:00	70%	70%	70%	60%	60%
12:00	80%	80%	50%	80%	100%
13:00	90%	90%	0%	90%	100%
14:00	80%	80%	0%	90%	100%
15:00	80%	80%	0%	90%	100%
16:00	50%	50%	0%	100%	60%
17:00	60%	60%	0%	80%	60%
18:00	70%	70%	0%	60%	60%
19:00	100%	100%	0%	50%	30%
20:00	70%	70%	0%	40%	30%
21:00	50%	50%	0%	20%	30%

Table B3. Actual parking demand temporal analysis – Typical Friday

Time	Fast Food Outlet 1	Fast Food Outlet 2	Motor Vehicle Repair	Motor Vehicle Wash	Service Station	Total demand	Parking surplus/ shortfall
6:00	2	4	0	0	1	7	71
7:00	2	4	0	0	1	7	71
8:00	2	4	16	0	1	23	55
9:00	4	7	16	1	2	30	48
10:00	4	7	11	2	2	27	51
11:00	11	18	11	4	2	45	33
12:00	18	28	11	4	3	63	15
13:00	20	32	11	3	3	69	9
14:00	20	32	11	3	3	69	9
15:00	18	28	14	3	3	66	12
16:00	15	25	8	3	2	53	25
17:00	13	21	5	3	1	43	35
18:00	15	25	0	2	2	44	34
19:00	18	28	0	1	1	47	31
20:00	7	11	0	0	1	18	60
21:00	2	4	0	0	1	7	71

Table B4. Actual parking demand temporal analysis – Typical Saturday

Time	Fast Food Outlet 1	Fast Food Outlet 2	Motor Vehicle Repair	Motor Vehicle Wash	Service Station	Total demand	Parking surplus/ shortfall
6:00	2	4	0	0	1	7	71
7:00	2	4	0	0	1	7	71
8:00	2	4	13	0	1	19	59
9:00	4	7	13	0	2	26	52
10:00	4	7	11	1	2	26	52
11:00	15	25	11	3	2	56	22
12:00	18	28	8	4	3	60	18
13:00	20	32	0	4	3	58	20
14:00	18	28	0	4	3	53	25
15:00	18	28	0	4	3	53	25
16:00	11	18	0	4	2	35	43
17:00	13	21	0	4	2	40	38
18:00	15	25	0	3	2	44	34
19:00	22	35	0	2	1	60	18
20:00	15	25	0	2	1	43	35
21:00	11	18	0	1	1	30	48

APPENDIX B

TURN LANE ASSESSMENTS

INTERSECTION WARRANTS

Main Roads WA Supplement to Austroads Guide to Road Design - Part 4 A.8

Source: Austroads GTM Part 6 - 2017

DESIGN SPEED =	70km/h
SPLITTER ISLAND YES / NO =	No
DUAL CARRIAGEWAY YES / NO =	No

MOVEMENT	COUNT (v/h)	HV (%)
Q_{T1} =	582	9.2
Q_R =	4	1.6
Q_{T2} =	812	5.3
Q_L =	34	2.3

RIGHT TURN ASSESSMENT

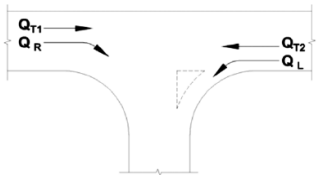
Q_m =	1428
% HV =	6.818
x =	2.95
TREATMENT =	BAR

LEFT TURN ASSESSMENT

Q_m =	812
% HV =	5.300
x =	4.16
TREATMENT =	AUL or CHL

Guide to Traffic Management Part 6: Intersections, Interchanges and Crossings

Figure 2.27: Calculation of the major road traffic volume Q_M



Road type	Turn type	Splitter island	Q_M (veh/h)
Two-lane two-way	Right	No	= Q_{T1} + Q_{T2} + Q_L
		Yes	= Q_{T1} + Q_{T2}
	Left	Yes or no	= Q_{T2}
Four-lane two-way	Right	No	= 50% x Q_{T1} + Q_{T2} + Q_L
		Yes	= 50% x Q_{T1} + Q_{T2}
	Left	Yes or no	= 50% x Q_{T2}
Six-lane two-way	Right	No	= 33% x Q_{T1} + Q_{T2} + Q_L
		Yes	= 33% x Q_{T1} + Q_{T2}
	Left	Yes or no	= 33% x Q_{T2}

Source: TMR (2016a).

Turn lane assessment for the AM peak hour

INTERSECTION WARRANTS

Main Roads WA Supplement to Austroads Guide to Road Design - Part 4 A.8

Source: Austroads GTM Part 6 - 2017

DESIGN SPEED =	70km/h
SPLITTER ISLAND YES / NO =	No
DUAL CARRIAGEWAY YES / NO =	No

MOVEMENT	COUNT (v/h)	HV (%)
Q_{T1} =	914	2.5
Q_R =	5	2.1
Q_{T2} =	638	4.5
Q_L =	40	0.6

RIGHT TURN ASSESSMENT

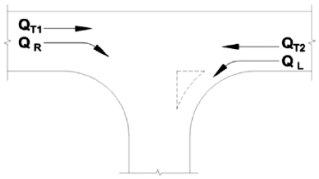
Q_m =	1592
% HV =	3.254
x =	3.48
TREATMENT =	CHR

LEFT TURN ASSESSMENT

Q_m =	638
% HV =	4.500
x =	3.55
TREATMENT =	AUL or CHL

Guide to Traffic Management Part 6: Intersections, Interchanges and Crossings

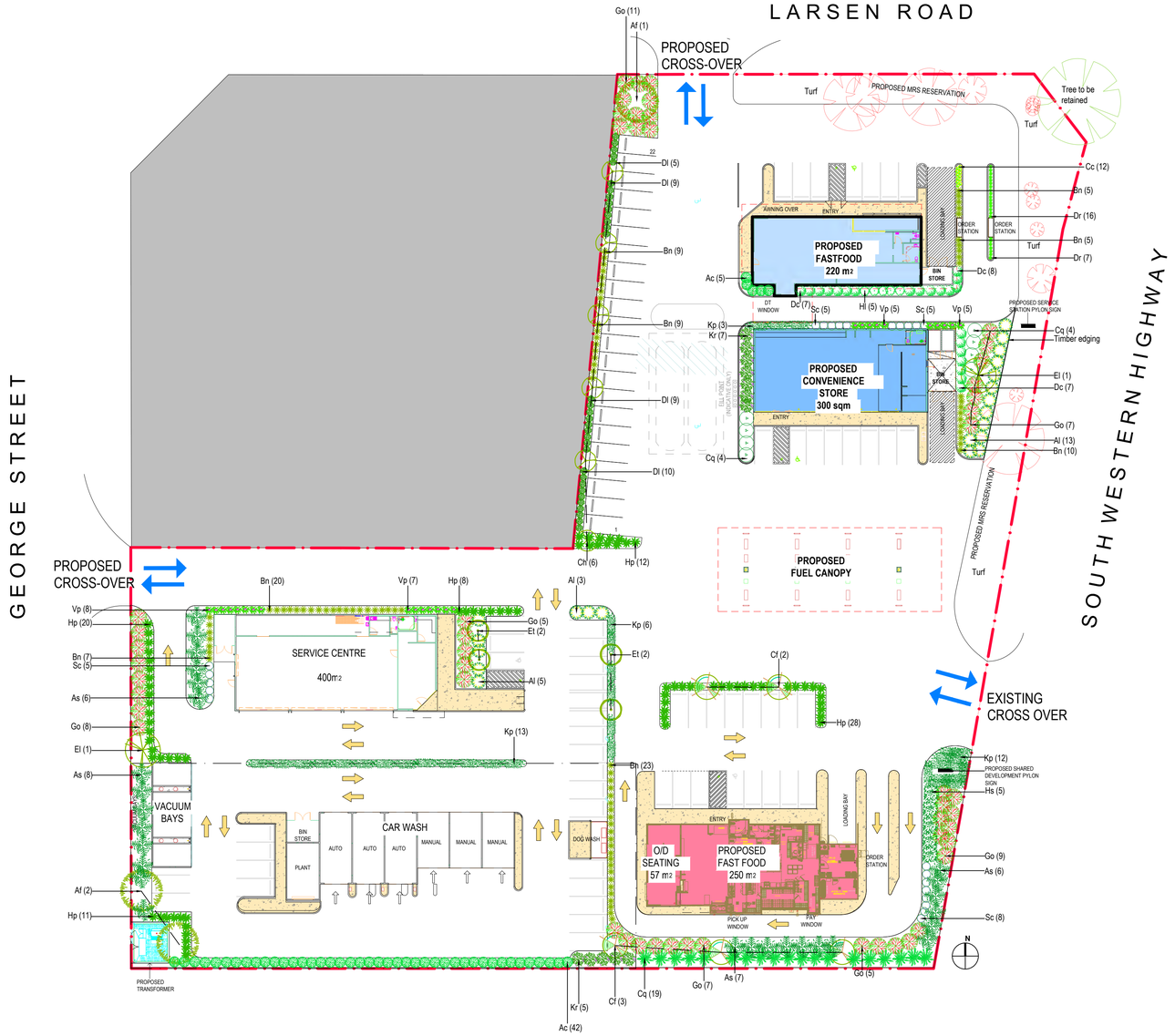
Figure 2.27: Calculation of the major road traffic volume Q_M



Road type	Turn type	Splitter island	Q_M (veh/h)
Two-lane two-way	Right	No	= Q_{T1} + Q_{T2} + Q_L
		Yes	= Q_{T1} + Q_{T2}
	Left	Yes or no	= Q_{T2}
Four-lane two-way	Right	No	= 50% x Q_{T1} + Q_{T2} + Q_L
		Yes	= 50% x Q_{T1} + Q_{T2}
	Left	Yes or no	= 50% x Q_{T2}
Six-lane two-way	Right	No	= 33% x Q_{T1} + Q_{T2} + Q_L
		Yes	= 33% x Q_{T1} + Q_{T2}
	Left	Yes or no	= 33% x Q_{T2}

Source: TMR (2016a).

Turn lane assessment for the PM peak hour



INSTALLATION SPECIFICATIONS

1. TREE AND PLANT MATERIAL SUPPLY AND PLANTING

1.1 PLANT MATERIAL

- ALL PLANT STOCK SUPPLIED BY CONTRACTOR SHALL BE OF THE SPECIES AND SIZES AS THOSE ON THE PLANT SCHEDULE. SHOULD THERE BE ANY DIFFICULTIES IN SOURCING PLANTS, THE CONTRACTOR SHALL RECOMMEND SIMILAR SUITABLE SUBSTITUTE SPECIES AND/OR SIZES TO THOSE SHOWN ON THE DRAWINGS. NO SUBSTITUTIONS SHALL TAKE PLACE WITHOUT WRITTEN APPROVAL BY THE SUPERINTENDENT.
- GREENLIFE AND TURF MUST BE WELL KEPT: DELIVERED TO SITE ON DAY OF INSTALLATION, OUT OF FULL SUN, AWAY FROM ANIMALS AND PESTS AND ROOTS NOT ALLOWED TO DRY OUT AND SHALL:
  - BE TRUE TO SPECIES, SUBSPECIES AND VARIETY
  - BE IN FIRST CLASS CONDITION AND HEALTHY
  - BE OF GOOD FORM CONSISTENT WITH SPECIES AND VARIETY
  - AND BE PLANTED AS PER THE INSTRUCTIONS BELOW.

1.2. GENERAL PLANTING INSTRUCTIONS

- SETTING OUT OF WORKS WHERE UNDERGROUND SERVICES, MANHOLES, CABLE PITS, KERBING, PAVING AND OTHER OBSTRUCTIONS OCCUR, PLANT CLEAR OF SUCH SERVICES AND OBSTRUCTIONS AND PROTECT SERVICES AND OBSTRUCTIONS FROM DAMAGE BY MACHINES AND EQUIPMENT.
- REMOVE ALL PLANTS FROM THEIR CONTAINERS, IN SUCH A MANNER AS TO DO AS LITTLE DISTURBANCE AS POSSIBLE TO THE ROOTS. WHERE NECESSARY, TEASE OUT ROOT-BALLS BEFORE PLANTING. PLACE TREES, SHRUBS AND PLANTS IN HOLES IN AN UP-RIGHT POSITION AND BACKFILL LEVEL WITH TOP OF ROOT-BALL. COMPACT SOIL BY HAND.
- REFER DETAILS 'TYPICAL TREE PLANTING' AND 'TYPICAL SHRUB PLANTING'.
- A ROOT BARRIER IS TO BE INSTALLED FOR ALL TREES.

1.3 SOIL CONDITIONER

- AFTER SITE WORKS AND BEFORE PLANTING SUPPLY AND INSTALL TO ALL PLANTING AREAS SOIL CONDITIONER
- PRIOR TO PLACEMENT ENSURE ALL BASE MATERIAL IS CLEAN, FREE DRAINING AND FREE OF ALL BUILDER'S RUBBLE, RUBBISH, DELETERIOUS MATERIAL AND CONTAMINATION. ALL AREAS CONTAMINATED BY THE BUILDER OR OTHERS SHALL BE REMOVED AND REPLACE WITH CLEAN FILL SAND TO THE APPROVAL OF THE SUPERINTENDENT.
- PLACE SOIL CONDITIONER TO A DEPTH OF 15MM OVER THE FULL EXTENT OF AREAS TO BE CONDITIONED. ROTARY-HOE OR SPADE DIG WHERE NECESSARY, SOIL CONDITIONER INTO EXISTING SITE SOIL TO A DEPTH OF 80MM TO PRODUCE A FULLY HOMOGENEOUS MIX. REMOVE ALL RUBBLE OR OTHER EXTRANEOUS AND DELETERIOUS MATTER EXPOSED AS A RESULT OF CULTIVATION, INCLUDING ANY BASE COURSE MATERIAL.
- SOIL CONDITIONER SHALL COMPLY WITH AS4454COMPOSTS, SOIL CONDITIONERS AND MULCHES.

1.4 FERTILISING

- AFTER PLANTING AND AT TIME OF BACK FILLING ALL PLANTS ARE TO RECEIVE APPROVED PROPRIETY ITEM OF EIGHT TO NINE MONTH SLOW-RELEASE FERTILISER SUITABLE FOR AUSTRALIAN NATIVE PLANTS.
- FERTILIZER TO BE APPLIED IN BACKFILL (BELOW GROUND) DURING PLANTING AT THE MANUFACTURERS' RECOMMENDED RATE FOR THE RELATIVE PLANT SIZE, AND AT A MINIMUM RATE AS FOLLOWS:
  - 30 LITRE POT SIZE PLANTS TO HAVE FOURTY GRAMS
  - 13CM - 14CM POT SIZE PLANTS TO HAVE TEN GRAMS

2. TURF

2.1 MINOR PREPARATION

- REMOVE ALL RUBBISH, ROOTS AND STONES GREATER THAN 10MM IN DIAMETER TO A DEPTH OF 300MM AND GRADE TO EVEN GRADES. GRADE OUT ALL DEPRESSIONS AND HUMPS LESS THAN 150MM FROM THE GENERAL GRADE.
- ALL SURFACES PREPARED FOR GRASSING TO FINISH FLUSH WITH ADJOINING KERBS TO ROADS, PARKING AND PAVED AREAS, AND WITH FOOT PAVEMENTS, MOWING STRIPS, MANHOLES, PIT AND THE LIKE. WHERE PLUMBING CONNECTOR TRAPS AND RAINWATER RELIEF OVERFLOWS OCCUR, FINISH GROUND LEVEL 75MM BELOW OVERFLOW LEVEL. ALL GRADING WORKS SHALL BE UNDERTAKEN BY HAND WORK OR BY MACHINE AS IS APPROPRIATE TO THE WORK HOWEVER ALL GRADING AND EARTHWORKS WITHIN A DISTANCE OF 600MM RADIUS OF SPRINKLERS OR OTHER FIXED RETICULATION APPARATUS SHALL BE HAND WORKED TO PREVENT DAMAGE TO EQUIPMENT. NO IRREGULARITIES, DEPRESSIONS, HOLLOWS OR ABRUPT CHANGES IN GRADES OR FALLS WILL BE ACCEPTED.

2.2 FERTILISING

- PRIOR TO TURF LAYING SUPPLY AND SPREAD TO THE FULL EXTENT OF AREA TO BE TURFED PELLETISED ORGANIC FERTILIZER EQUAL OR EQUIVALENT TO 'DYNAMIC LIFTER' AT THE RATE OF 100 GRAMS PER SQUARE METRE TO THE APPROVAL OF THE SUPERINTENDENT.

2.3 WATERING

- BEFORE COMMENCING PLANTING, ENSURE ADEQUATE WATERING SERVICES AND EQUIPMENT ARE AVAILABLE AND PROPERLY FUNCTIONING.
- AREAS TO BE PLANTED SHALL FIRST BE WATERED TO A DEPTH OF 100MM AND THE PLANTING SHALL BE CARRIED OUT IMMEDIATELY AFTER WATERING.
- THROUGHOUT THE CONTRACT UP TO PRACTICAL COMPLETION, WATERING SHALL BE PROPERLY UNDERTAKEN, EITHER BY HAND OR IRRIGATION SYSTEM TO KEEP THE PLANTED AREA MOIST TO A DEPTH OF 100MM AT NOT MORE THAN TWO (2) DAY INTERVALS EXCEPTING SATURDAYS, SUNDAYS AND PUBLIC HOLIDAYS UNLESS OTHERWISE DIRECTED BY THE SUPERINTENDENT.

2.4 TURF LAYING

- LAY THE TURF ALONG THE LAND CONTOURS WITH STAGGERED, CLOSE BUTTED JOINTS, AND SO THAT THE FINISHED TURF SURFACE FINISHES 20MM BELOW ADJACENT FINISHED SURFACES OF EDGING AND THE LIKE. AS SOON AS PRACTICABLE AFTER LAYING, ROLL THE TURF WITH A ROLLER WEIGHTING NOT MORE THAN 90 KG/M OR A PLATE COMPACTOR.

2.5 TOP DRESSING

- UNDERTAKE TOP DRESSING AS REQUIRED TO PRODUCE A TRUE AND EVEN SURFACE TO THE FULL EXTENT OF TURF AREAS FREE OF HUMPS, HOLLOWS AND DEPRESSIONS. SHOULD TOP DRESSING BE REQUIRED, UNDERTAKE WHEN THE TURF IS ESTABLISHED, MOW CLOSELY, REMOVE CUTTINGS AND LIGHTLY TOP DRESS TO A DEPTH OF 10MM WITH APPROVED QUALITY TOP DRESSING SAND. RUB THE DRESSING WELL INTO THE JOINS AND CORRECT ANY UNEVENNESS IN THE TURF SURFACE.

2.6 FERTILISING

- ONE WEEK AFTER LAYING TURF, APPLY TO THE WHOLE AREA A QUALITY PROPRIETARY BRAND FERTILISER.
- EVENLY SPREAD FERTILIZER AT THE RATE INDICATED ON PACKET AND IMMEDIATELY THOROUGHLY WATER IN.

3. TIMBER EDGING

- INSTALL EDGING AS INDICATED ON 'TIMBER EDGING DETAIL'.

4. MULCH

- ALL MULCH SHALL MEET AUSTRALIAN STANDARD 4454-2012.
- SITE MULCH SHALL BE CHUNKY PINE BARK WOOD CHIPS.
- MULCH IS TO BE COMPLETELY FREE OF ALL NOXIOUS WEEDS, SEEDS AND FUNGUS, INSECT PESTS AND OTHER DELETERIOUS MATERIAL.
- ALL GARDEN BEDS AND TREE SURROUNDS TO BE MULCHED TO A MINIMUM DEPTH OF 75MM, KEEPING MULCH CLEAR OF PLANT STEMS.
- TIDY AND GRADE MULCH AFTER APPLICATION, FINISHING 20MM BELOW SURROUNDING HARD SURFACES.

5. IRRIGATION

- ALL GARDEN BEDS TO BE IRRIGATED. INSTALL A SUB-MULCH DRIP SYSTEM FOR ALL GARDEN BEDS AND RECESSED SPRINKLERS FOR TURF AREAS.
- CONTROLLER TO BE AUTOMATIC SYSTEM WITH RAIN SENSOR. LOCATION TO BE CONFIRMED ON SITE.
- THE CONTRACTOR IS RESPONSIBLE FOR LAYOUT DESIGN AND INSTALLATION OF IRRIGATION SYSTEM.
- AT TIME OF COMPLETION THE IRRIGATION SYSTEM SHALL BE FULLY AUTOMATED, WORKING EFFICIENTLY AND EFFECTIVELY AND WATERING TIMES PROGRAMMED.

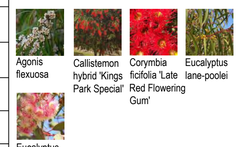
PLANT SCHEDULE AND SYMBOL LEGEND

Code on plan	Symbol	Botanic Name	Mature height x width	Minimum installation size	Number
TREES					
Af		Agonis flexuosa	6-8m x 5-6m*	30 Litre	3
Ch		Callistemon hybrid 'Kings Park Special'	4m x 3m	30 Litre	6
Cf		Corymbia ficifolia 'Late Red Flowering Gum'	5m x 4m	30 Litre	5
El		Eucalyptus lane-poolei	8m x 5m	30 Litre	2
Et		Eucalyptus torquata	5m x 3m	30 Litre	4
SHRUBS					
Ac		Adenanthos cygnorum	2m x 1.5m	13cm	47
Bn		Banksia nivea	80cm x 1m	13cm	88
Cq		Calothamnus quadrifidus	2.5m x 2.5m	13cm	19
Dc		Darwinia citriodora	1.5m x 1.5m	13cm	22
Hl		Hakea lissocarpha	1.5m x 1.5m	13cm	5
Kr		Kunzea recurva	2m x 2m	13cm	12
Vp		Verticordia plumosa	60cm x 1m	13cm	25
GRASSES					
Cc		Conostylus candicans	30cm x 50cm	13cm	12
Dr		Dianella revoluta 'Revelation'	50cm x 50cm	13cm	23
GROUND COVER					
Al		Acacia lasiocarpa prostrate	30cm x 2m	13cm	21
As		Acacia saligna prostrate	30cm x 3m	13cm	27
Cqp		Calothamnus quadrifidus prostrate	60cm x 2m	13cm	8
Dl		Dampiera linearis 'Blue'	30cm x 1m	13cm	33
Go		Grevillea obtusifolia 'Gin Gin Jewel'	50cm x 2.5m	13cm	52
Hp		Hemiandra pungens 'Alba'	30cm x 1.5m	13cm	79
Hs		Hibbertia scandens	30cm x 2m	13cm	5
Kp		Kennedia prostrata	10cm x 3m	13cm	34
Sc		Scaevola calliptera	40cm x 1.2m	13cm	23
TURF - approximately 675m²					
As indicated		Kikuyu		Roll on	Site measure
TOTAL PLANTS					555

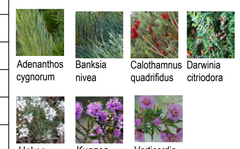
EXISTING TREE LEGEND

	Trees to be removed (13)

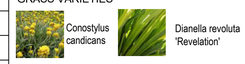
TREE VARIETIES



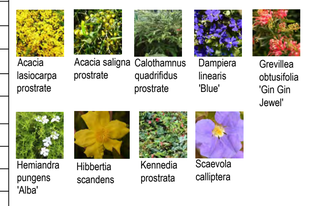
SHRUB VARIETIES



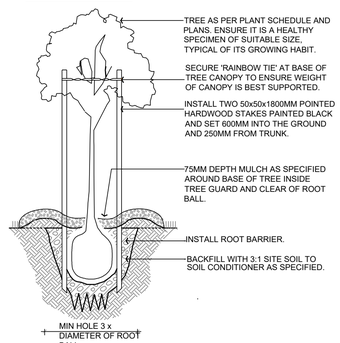
GRASS VARIETIES



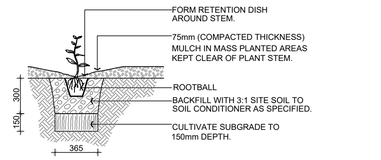
GROUND COVER VARIETIES



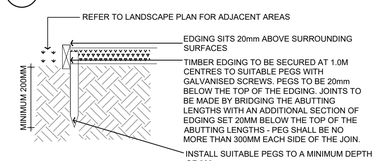
TYPICAL DRAWINGS



1 TREE PLANTING DETAIL — TYPICAL SECTION — NOT TO SCALE



2 13-14cm POT PLANTING — TYPICAL SECTION — NOT TO SCALE



3 TIMBER EDGING DETAIL — TYPICAL SECTION — NOT TO SCALE

URBAN Retreat GARDEN DESIGN

rev/issue	description	drawn	checked	date
B	DEVELOPMENT APPLICATION	AC	AC	08.12.2023
A	DEVELOPMENT APPLICATION	AC	AC	24.11.2023

project: PROPOSED MIXED USE COMMERCIAL DEVELOPMENT
location: 3 LARSON ROAD, BYFORD
drawing title: LANDSCAPE PLAN

URBAN RETREAT GARDEN DESIGN
COMMERCIAL AND RESIDENTIAL LANDSCAPE DESIGN SERVICES
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scale	project no	drawing no
1:400 @ A1	23275	L-01

issue: 01

HERRING STORER ACOUSTICS

CAPITAL PRUDENTIAL

COMMERCIAL DEVELOPMENT
3 LARSEN ROAD, BYFORD

ENVIRONMENTAL ACOUSTIC ASSESSMENT

NOVEMBER 2023

OUR REFERENCE: 31869-2-23358

DOCUMENT CONTROL PAGE

ENVIRONMENTAL ACOUSTIC ASSESSMENT
3 LARSEN ROAD, BYFORD

Job No: 23358

Document Reference: 31869-2-23358

FOR

CAPITAL PRUDENTIAL

DOCUMENT INFORMATION			
Author:	Geoffrey Harris	**Checked By:**	Tim Reynolds
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Revision	Description	Date	Author	Checked
1	Original Issue	15/11/23	GH	TR
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CONTENTS

APPENDICES

1. INTRODUCTION

Herring Storer Acoustics were commissioned by Capital Prudential to carry out an acoustic study with regards to compliance with the requirements of the Environmental Protection (Noise) Regulations 1997 for the proposed commercial development at 3 Larsen Road, Byford.

Based on information provided, noise emissions from associated with the operation of the development at 3 Larsen Road, Byford would meet the *Environmental Protection (Noise) Regulations 1997*.

This assessment contains details of noise associated with mechanical plant, fast food premises, car wash, deliveries, service station as well as car movements throughout the site.

2. CRITERIA

The allowable noise level at the surrounding locales is prescribed by the *Environmental Protection (Noise) Regulations 1997*. Regulations 7 & 8 stipulate maximum allowable external noise levels determined by the calculation of an influencing factor, which is then added to the base levels shown below in Table 1. The influencing factor is calculated for the usage of land within two circles, having radii of 100m and 450m from the premises of concern.

TABLE 1 - BASELINE ASSIGNED OUTDOOR NOISE LEVEL

Premises Receiving Noise	Time of Day	Assigned Level (dB)		
		L_{A10}	L_{A1}	L_{Amax}
Noise sensitive premises	0700 - 1900 hours Monday to Saturday (Day)	45 + IF	55 + IF	65 + IF
	0900 - 1900 hours Sunday and Public Holidays (Sunday / Public Holiday Day Period)	40 + IF	50 + IF	65 + IF
	1900 - 2200 hours all days (Evening)	40 + IF	50 + IF	55 + IF
	2200 hours on any day to 0700 hours Monday to Saturday and 0900 hours Sunday and Public Holidays (Night)	35 + IF	45 + IF	55 + IF
Commercial premises	All Hours	60	75	80

Note: L_{A10} is the noise level exceeded for 10% of the time.
L_{A1} is the noise level exceeded for 1% of the time.
L_{Amax} is the maximum noise level.
IF is the influencing factor.

It is a requirement that received noise be free of annoying characteristics (tonality, modulation and impulsiveness), defined below as per Regulation 9.

"impulsiveness" means a variation in the emission of a noise where the difference between L_{Apeak} and $L_{Amax\ Slow}$ is more than 15 dB when determined for a single representative event;

"modulation" means a variation in the emission of noise that –

(a) is more than 3dB $L_{A\ Fast}$ or is more than 3 dB $L_{A\ Fast}$ in any one-third octave band;
(b) is present for more at least 10% of the representative assessment period; and
(c) is regular, cyclic and audible;

"tonality" means the presence in the noise emission of tonal characteristics where the difference between –

(a) the A-weighted sound pressure level in any one-third octave band; and
(b) the arithmetic average of the A-weighted sound pressure levels in the 2 adjacent one-third octave bands,

is greater than 3dB when the sound pressure levels are determined as $L_{Aeq,T}$ levels where the time period T is greater than 10% of the representative assessment period, or greater than 8 dB at any time when the sound pressure levels are determined as $L_{A\ Slow}$ levels.

Where the noise emission is not music, if the above characteristics exist and cannot be practicably removed, then any measured level is adjusted according to Table 2 below.

TABLE 2 – ADJUSTMENTS TO MEASURED NOISE LEVELS

Where **tonality** is present	Where **modulation** is present	Where **impulsiveness** is present
+5 dB(A)	+5 dB(A)	+10 dB(A)

The nearest affected locations have been shown on Figure 1 and identified as:

R1 – Residential Premises to the North at 10 Larsen Road
R2 – Residential Premises to the North at 2-8 Larsen Road
R1 – Noise sensitive premises to the East on South Western Highway
C4 – Commercial Premises to the South
R5 – School to the East

The influencing factor at the residential premises R1 has been determined to be +3 dB;

18% commercial in inner circle;
2% commercial in outer circle;
within 450m of South Western Highway.

The influencing factor at the residential premises R2 and R3 has been determined to be +7 dB;

18% commercial in inner circle;
2% commercial in outer circle;
within 450m of South Western Highway.

The influencing factor at the residential premises R5 has been determined to be +2 dB;

within 450m of South Western Highway.

FIGURE 1 – AREA MAP

Accordingly, the Assigned Noise Levels are as per Table 3 below.

TABLE 3 - ASSIGNED OUTDOOR NOISE LEVEL

Premises Receiving Noise	Time of Day	Assigned Level (dB)		
		L_{A10}	L_{A1}	L_{Amax}
R1	0700 – 1900 hours Monday to Saturday	48	58	68
	0900 - 1900 hours Sunday and Public Holidays	43	53	68
	1900 – 2200 hours all days	43	53	58
	2200 hours on any day to 0700 hours Monday to Saturday and 0900 hours Sunday and Public Holidays	38	48	58
R2, R3	0700 – 1900 hours Monday to Saturday	52	62	72
	0900 - 1900 hours Sunday and Public Holidays	47	57	72
	1900 – 2200 hours all days	47	57	62
	2200 hours on any day to 0700 hours Monday to Saturday and 0900 hours Sunday and Public Holidays	42	52	62
R5	0700 – 1900 hours Monday to Saturday	47	57	67
	0900 - 1900 hours Sunday and Public Holidays	42	52	67
	1900 – 2200 hours all days	42	52	57
	2200 hours on any day to 0700 hours Monday to Saturday and 0900 hours Sunday and Public Holidays	37	47	57
Commercial Premises; C4	All Hours	60	75	80

Notes: L_{A10} is the noise level exceeded for 10% of the time.
L_{A1} is the noise level exceeded for 1% of the time.
L_{Amax} is the maximum noise level.

3. CALCULATED NOISE LEVELS

Based on information provided, we believe that the following scenarios are representative of the development.

Scenario 1: Mechanical Plant; Assessed against L_{A10} for all hours.

All mechanical plant operating simultaneously for accommodation and services. During the night time period, mechanical plant has been assumed to in "Night Mode". This would be considered conservative as diversity of operation would not necessarily have all pieces of plant operating simultaneously. Emissions have been considered tonal and attract a +5 dB(A) penalty.

Scenario 2: Car Movements within Drive through; assessed against L_{A1} for all hours.

Noise associated with individual car movements whilst in drive through.

Scenario 3: Car Movements around site; assessed against L_{A1} for all hours.

Noise associated with individual car movements around the site.

Scenario 4: Car Door Closing; assessed against L_{Amax} for all hours.

Noise associated with an individual car door closing at the most critical location. Emissions have been considered impulsive and attract a +10 dB(A) penalty.

Scenario 5: Car Engine Starts; assessed against L_{Amax} for all hours.

Noise associated with an individual car start at the most critical location.

Scenario 6: Service Centre Operations; assessed against L_{A10} for all hours.

Noise associated with the operation of the service centre; doors open.

Scenario 7: Car Wash; assessed against L_{A10} for all hours.

Noise associated with car wash operations, all units operating simultaneously, doors open.

Scenario 8: Delivery Trucks; assessed against L_{A1} for all hours.

Noise associated with delivery of goods to loading docks.

Note: The *Environmental Protection (Noise) Regulations 1997* state that noise associated with cars movements and cars starting are exempt from complying with the Regulations. However, noise emissions from car doors are not strictly exempt from the Regulations. As a result, door slams, engine starts and car movements on site have all been assessed.

To determine the noise at each receiver for each scenario, Sound Power Levels listed in Table 4 have been utilised.

TABLE 4 – SOUND POWER LEVEL

Item	Sound Power Level dB(A)
Air conditioning Unit	68 (65 Night Mode)
Kitchen Exhaust	75
Glass Dropping in Bin	110 L_{AMax}
Car Door Slam	87 L_{Amax}
Car Start	85 L_{Amax}
Car Movement	81 L_{A1}
Delivery Truck	85 L_{A1}
Vacuum Units – with acoustic hood	82
Self Carwash Water Jets	94
Auto Car Wash Equipment – No Doors	87
Dog Wash Unit	88

Using the above sound power level and development plans (Attached), modelling software "SoundPLAN" was utilised to calculate the noise highest noise level received at each of the premises, shown below, including any appropriate penalty. For brevity, the operations have only been assessed against the most stringent time period. Note, as there is a cumulative assessment for the car wash operations, tonality has been included into the modelled noise levels of Vacuum Units and Dog Wash Units.

TABLE 5 – CALCULATED NOISE LEVELS

Location	Noise Level dB(A)							
	S1	S2	S3	S4	S5	S6	S7	S8
R1	33 [38]	33	34	40 [50]	38	17	36	30
R2	37 [42]	37	45	46 [56]	44	17	40	40
R3	35 [40]	35	35	39 [49]	37	37	40	32
C4	41 [46]	41	46	56 [66]	52	49	56	38
R5	23 [28]	23	23	28 [38]	26	24	33	19

4. ASSESSMENT

Tables 6 to 13 identify provide the assessment for each of the eight scenarios based on the information presented in Section 4.

TABLE 6 – ASSESSMENT OF SCENARIO 1 – MECHANICAL PLANT

Location	Assessable Noise Level, dB(A)	Applicable Times of Day	Applicable L_{A10} Assigned Level (dB)	Exceedance to Assigned Noise Level (dB)
R1	38	Night Time	38	Complies
R2	42	Night Time	42	Complies
R3	40	Night Time	46	Complies
C4	46	Night Time	60	Complies
R5	28	Night Time	37	Complies

TABLE 7 – ASSESSMENT OF SCENARIO 2 – CAR MOVEMENTS IN DRIVE THROUGH

Location	Assessable Noise Level, dB(A)	Applicable Times of Day	Applicable L_{A1} Assigned Level (dB)	Exceedance to Assigned Noise Level (dB)
R1	33	Night Time	48	Complies
R2	37	Night Time	52	Complies
R3	35	Night Time	56	Complies
C4	41	Night Time	75	Complies
R5	23	Night Time	47	Complies

TABLE 8 – ASSESSMENT OF SCENARIO 3 - CAR MOVEMENTS AROUND SITE

Location	Assessable Noise Level, dB(A)	Applicable Times of Day	Applicable L_{A1} Assigned Level (dB)	Exceedance to Assigned Noise Level (dB)
R1	34	Night Time	48	Complies
R2	45	Night Time	52	Complies
R3	35	Night Time	56	Complies
C4	46	Night Time	75	Complies
R5	23	Night Time	47	Complies

TABLE 9 – ASSESSMENT OF SCENARIO 4 - CAR DOOR SLAMS

Location	Assessable Noise Level, dB(A)	Applicable Times of Day	Applicable L_{AMax} Assigned Level (dB)	Exceedance to Assigned Noise Level (dB)
R1	50	Night Time	58	Complies
R2	56	Night Time	62	Complies
R3	49	Night Time	66	Complies
C4	66	Night Time	80	Complies
R5	38	Night Time	57	Complies

TABLE 10 – ASSESSMENT OF SCENARIO 5 - CAR ENGINE STARTS

Location	Assessable Noise Level, dB(A)	Applicable Times of Day	Applicable L_{Amax} Assigned Level (dB)	Exceedance to Assigned Noise Level (dB)
R1	38	Night Time	58	Complies
R2	44	Night Time	62	Complies
R3	37	Night Time	66	Complies
C4	52	Night Time	80	Complies
R5	26	Night Time	57	Complies

TABLE 11 – ASSESSMENT OF SCENARIO 6 - SERVICE CENTRE

Location	Assessable Noise Level, dB(A)	Applicable Times of Day	Applicable L_{A10} Assigned Level (dB)	Exceedance to Assigned Noise Level (dB)
R1	17	Night Time	38	Complies
R2	17	Night Time	42	Complies
R3	37	Night Time	46	Complies
C4	49	Night Time	60	Complies
R5	24	Night Time	37	Complies

TABLE 12 – ASSESSMENT OF SCENARIO 7 – CAR WASH

Location	Assessable Noise Level, dB(A)	Applicable Times of Day	Applicable L_{A10} Assigned Level (dB)	Exceedance to Assigned Noise Level (dB)
R1	36	Night Time	38	Complies
R2	40	Night Time	42	Complies
R3	40	Night Time	46	Complies
C4	56	Night Time	60	Complies
R5	33	Night Time	37	Complies

TABLE 13 – ASSESSMENT OF SCENARIO 8 – DELIVERY TRUCKS

Location	Assessable Noise Level, dB(A)	Applicable Times of Day	Applicable L_{A1} Assigned Level (dB)	Exceedance to Assigned Noise Level (dB)
R1	30	Night Time	48	Complies
R2	40	Night Time	52	Complies
R3	32	Night Time	56	Complies
C4	38	Night Time	75	Complies
R5	19	Night Time	47	Complies

5. CONCLUSION

Based on the above, noise from the proposed development to the adjacent premises would comply with the *Environmental Protection (Noise) Regulations 1997* at their prescribed periods.

It is noted that hooded vacuum units were utilised for the assessment of the carwash, and it is recommended that, if possible, doors be closed on the Service Centre and Carwash where practicable to minimise noise spread.

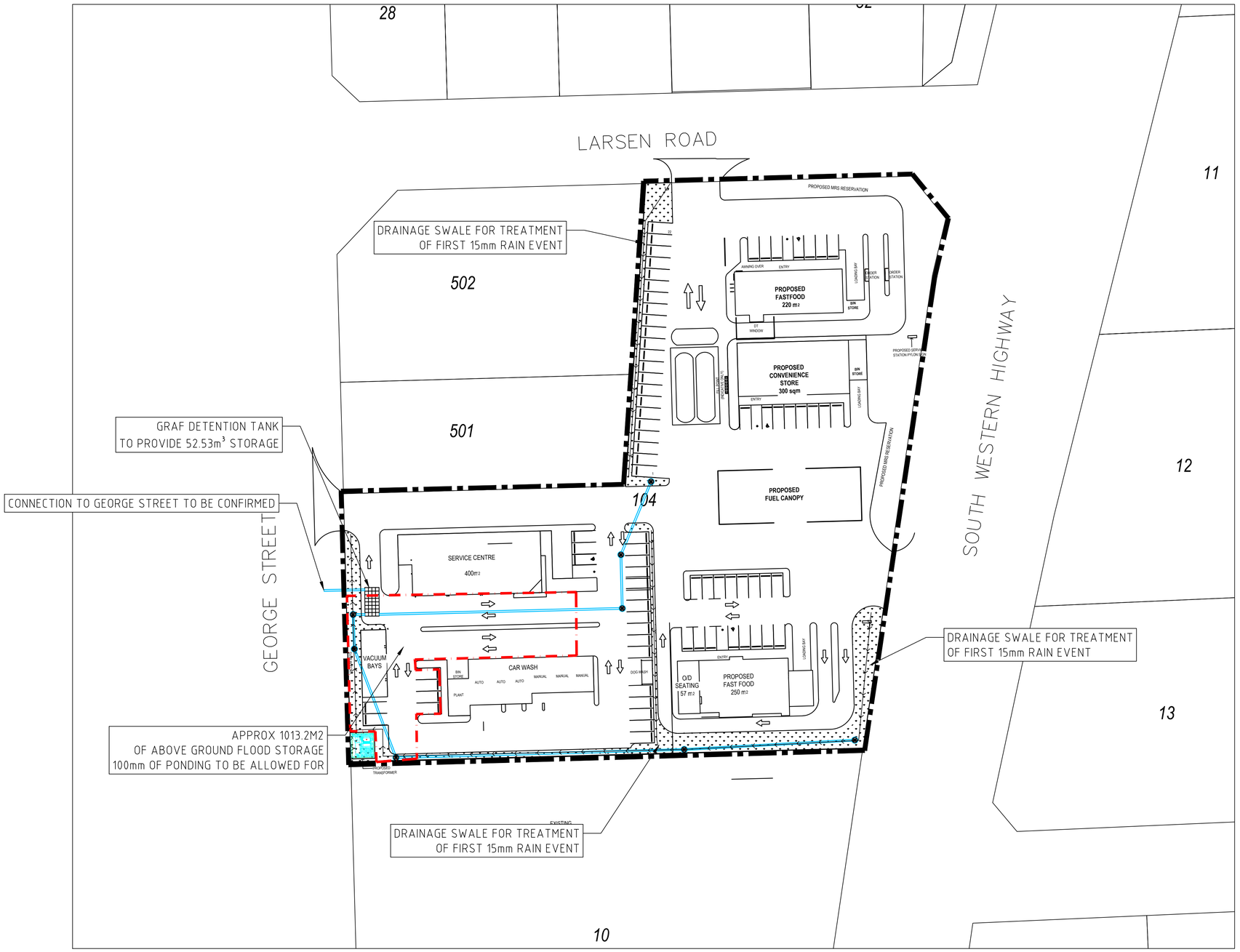
Finally, specific mechanical plant section has note been made, and this report would require updating once this has been finalised to ensure that compliance is still met.

APPENDIX A

PLANS


NOTE:
THIS SITE PLAN IS SUBJECT TO CHANGE PENDING RECEIPT OF THE FOLLOWING:
- PLANNING ADVICE
- TRAFFIC ADVICE
- SITE SERVICES, EASEMENTS ETC TBC
- TRAVEL DISTANCES TO BE REVIEWED
PROPOSED CROSS-OVER
LARSEN ROAD
GEORGE STREET
SOUTH WESTERN HIGHWAY
PROPOSED CROSS-OVER
EXISTING CROSS OVER
PROPOSED FASTFOOD 220 m²
PROPOSED CONVENIENCE STORE 300 sqm
PROPOSED FUEL CANOPY
SERVICE CENTRE 400m²
VACUUM BAYS
CAR WASH
O/D SEATING 57 m²
PROPOSED FAST FOOD 250 m²
PROPOSED MRS RESERVATION
PROPOSED TRANSFORMER
EXISTING RESIDENTIAL
1 PROPOSED SITE PLAN DA109 1 : 500
B ISSUE FOR INFORMATION LM LM 08.11.2023
A ISSUE FOR REVIEW JS/K LM 27.10.2022
revision issue description drawn by check by date
project COMMERCIAL DEVELOPMENT
location 3 Larsen Road, Byford
drawing description Author PROPOSED SITE PLAN
checked Checker
Hodge Collard Preston ARCHITECTS
scale As indicated
date 08.11.2023
project no 71.23
dwg no DA001
rev B

NOTES



STORMWATER CALCULATION SUMMARY

SITE AREA: 11,630m²

FIRST 15mm RUNOFF TO BIORETENTION SWALES: 134.61m³
SWALE STORAGE PROVIDED 350m³

PRE-DEVELOPMENT 10 YR ARI : 0.19 m³/s
POST-DEVELOPMENT 10 YR ARI: 0.30 m³/s

PRE-DEVELOPMENT 100 YR ARI:0.37m³/s
POST DEVELOPMENT 100 YR ARI: 0.58 m³/s

MINIMUM STORAGE REQUIRED FOR ATTENUATION 10YR ARI: 52.53m³ (TANK)

MINIMUM STORAGE REQUIRED FOR ATTENUATION 100YR ARI: 153.85m³ (CALCULATED AS A SUM OF BELOW STORAGES)

UNDERGROUND STORAGE REQUIRED: 52.53m³
ABOVE GROUND STORAGE/PONDING VOL REQUIRED: 101.32m³

LEGEND

WORKS BOUNDARY

SWALE

ABOVE GROUND STORAGE

1:500 AT A1
0 5m 10m 20m 30m

NOT FOR CONSTRUCTION

REVISION	DESCRIPTION	DRAWN	DATE
A	ISSUED FOR INFORMATION	CF	23/11/23

PERTH
P: 08 6336 9299
A: 74 GOODWOOD PDE, BURSWOOD, WA 6100
E: ENQUIRE@PERITASGROUP.COM.AU

MELBOURNE
P: 03 8657 9292
A: 1 QUEENS ROAD, MELBOURNE, VIC 3004
E: ENQUIRE@PERITASGROUP.COM.AU

CLIENT:
Capital Prudential

DESIGNED:	DRAWN:	CHECKED:
CF	CF	OO
SURVEY DATUM:	WAPC No:	SCALE:
PCG94		AS SHOWN @ A1
DWG IS NOT FOR CONSTRUCTION UNLESS SIGNED BELOW:		DATE CREATED:
		20/10/23

PROJECT:
3 LARSEN ROAD
BYFORD, WA, 6122
PROPOSED MIXED USE DEVELOPMENT

TITLE:
STORMWATER DRAINAGE PLAN

PROJECT NUMBER:	DRG NUMBER:	REV:
PC23356	CI-04.00	A

Calculation Sheet

Project	3 Larsen Road	Author	CF
Client	Jack Bennet - Capital Prudential	Approver	OO
Date	19-Oct-23	Doc Ref	1
Revision	A		

6.0 Post-Development

6.1 Post-Development Catchment

Area (A)	1.16	ha	Input from 3.0 "Allowable Outflow"
Flow Length (L)	0.20	km	
Slope (S)	1.00	m	
	200.00	m	
Horton retardance (n)	0.01		
Fraction Impervious (f)	1.00		
ARI	10	yr	Input from 3.0 "Allowable Outflow"

6.2 Post-Development Runoff [7.0]

Note: Flow rate calculation based on AR&R 1987 book VIII method.
Use this calculator to determine pre-development discharge (Allowable).

Q = CIA/360

t_c	8.00	min
C (Calculated)	0.90	
C (Engineers input)	0.90	
Q	0.30	m^3/s

6.4 Storage Volume

Design Infiltration Area	0.00	m^2
Design Storage Volume	**0.00**	m^3
Critical Duration	5	min
Minimum Storage Required	52.53	m^3

Waste Management Plan

3 Larsen Road, Byford

Prepared for Capital Prudential Pty Ltd

10 January 2024

Project Number: WMP24001

DOCUMENT CONTROL					
Version	**Description**	**Date**	**Author**	**Reviewer**	**Approver**
1.0	First Approved Release	10/01/2024	AB	DP	AB

Approval for Release

Name	**Position**	**File Reference**
Ann Brouwer	Project Manager – Waste Management Consultant	WMP24001-01_Waste Management Plan_1.0
Signature		

Executive Summary

Capital Prudential Pty Ltd is seeking development approval for the proposed commercial development located at 3 Larsen Road, Byford (the Proposal).

To satisfy the conditions of the development application the Shire of Serpentine Jarrahdale (the Shire) requires the submission of a Waste Management Plan (WMP) that will identify how waste is to be stored and collected from the Proposal. Talis Consultants has been engaged to prepare this WMP to satisfy the Shire's requirements.

As demonstrated within this WMP, the Proposal will provide sufficiently sized Bin Storage Areas for storage of refuse and recyclables, based on the estimated waste generation volumes and suitable configuration of bins.

A private contractor will service the Proposal onsite, directly from the respective Bin Storage Areas. The private contractor's waste collection vehicle will enter and exit the Proposal in forward gear via Larsen Road or South Western Highway.

A building manager will oversee the relevant aspects of waste management at the Proposal.

Table of Contents

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Diagrams

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1 Introduction

Capital Prudential Pty Ltd is seeking development approval for the proposed commercial development located at 3 Larsen Road, Byford (the Proposal).

To satisfy the conditions of the development application the Shire of Serpentine Jarrahdale (the Shire) requires the submission of a Waste Management Plan (WMP) that will identify how waste is to be stored and collected from the Proposal. Talis Consultants has been engaged to prepare this WMP to satisfy the Shire's requirements.

The Proposal is bordered by Larsen Road to the north, South Western Highway to the east, commercial properties to the south and George Street to the west, as shown in Figure 1.

1.1 Objectives and Scope

The objective of this WMP is to outline the equipment and procedures that will be adopted to manage waste (refuse and recyclables) at the Proposal. Specifically, the WMP demonstrates that the Proposal is designed to:

- Adequately cater for the anticipated volume of waste to be generated;
- Provide adequately sized Bin Storage Areas, including appropriate bins; and
- Allow for efficient collection of bins by appropriate waste collection vehicles.

To achieve the objective, the scope of the WMP comprises:

- Section 2: Waste Generation;
- Section 3: Waste Storage;
- Section 4: Waste Collection;
- Section 5: Waste Management; and
- Section 6: Conclusion.

2 Waste Generation

The following section shows the waste generation rates used and the estimated waste volumes to be generated at the Proposal.

2.1 Proposed Tenancies

The anticipated volume of refuse and recyclables is based on the floor area (m^2) of the commercial tenancies at the Proposal. The Proposal consists of the following:

- Fast Food 01 – 220m^2;
- Convenience Store – 300m^2;
- Fast Food 02 – 250m^2;
- Car Wash – 220m^2; and
- Service Centre – 400m^2.

The Car Wash will have its own small internal bins between each vacuum bay which will be emptied into the bins within the Service Centre's Bin Storage Area for collection, and therefore has not been included as part of this report.

2.2 Waste Generation Rates

In order to achieve an accurate projection of waste volumes for the Proposal, consideration was given to the City of Melbourne's *Guidelines for Waste Management Plans* (2021) and the City of Gosnells *Information Sheet – Waste Collection* as they contain contemporary estimates of waste generated from convenience stores, fast food tenancies, and shops (non-food).

Table 2-1 shows the waste generation rates which have been applied to the Proposal.

Table 2-1: Waste Generation Rates

Tenancy Use Type	Guideline Reference	Refuse Generation Rate	Recycling Generation Rate
Fast Food 01	Gosnells – Fast Food Outlet	150L/100m^2/day	150L/100m^2/day
Convenience Store	Melbourne – Convenience Store	300L/100m^2/day	150L/100m^2/day
Fast Food 02	Gosnells – Fast Food Outlet	150L/100m^2/day	150L/100m^2/day
Service Centre	Melbourne – Shops (non-food)	50L/100m^2/day	50L/100m^2/day

2.3 Waste Generation Volumes

Waste generation is estimated by volume in litres (L) as this is generally the influencing factor when considering bin size, numbers and storage space required.

Waste generation volumes in litres per week (L/week) adopted for this waste assessment are shown in Table 2-2. It is estimated that the commercial tenancies at the Proposal will generate a total of 12,435L of refuse and 9,285L of recyclables each week.

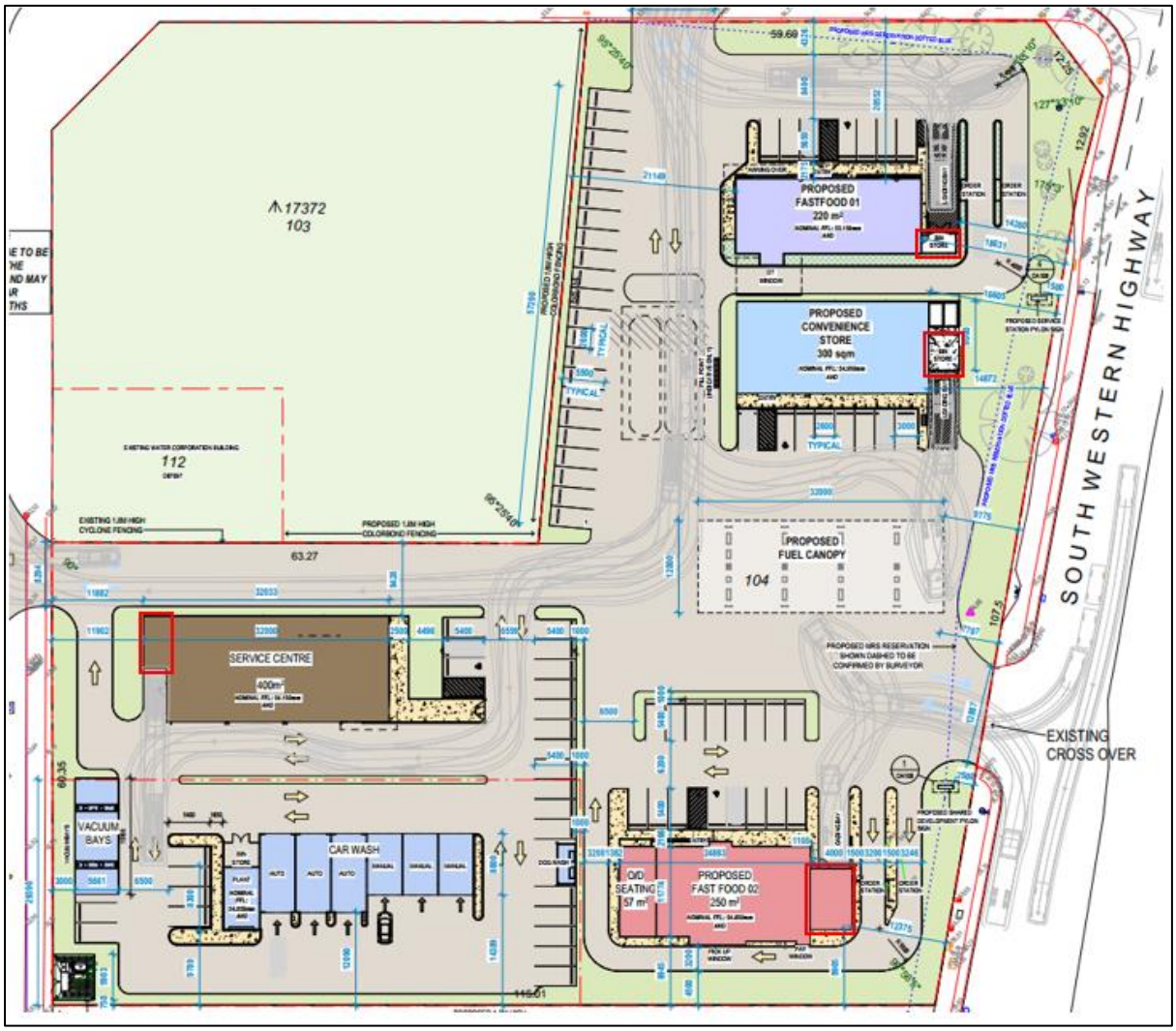
Table 2-2: Estimated Waste Generation

Commercial Tenancies	Area (m^2)	Waste Generation Rate (L/100m^2/day)	Waste Generation (L/week)
Refuse			
Fast Food 01	220	150	2,310
Convenience Store	300	300	6,300
Fast Food 02	250	150	2,625
Service Centre	400	400	1,200
		Total	**12,435**
Recyclables			
Fast Food 01	220	150	2,310
Convenience Store	300	150	3,150
Fast Food 02	250	150	2,625
Service Centre	400	50	1,200
		Total	**9,285**

3 Waste Storage

Waste materials generated within the Proposal will be collected in the bins located in the Bin Storage Areas, as shown in Diagram 1.

Diagram 1: Bin Storage Areas



3.1 Internal Transfer of Waste

To promote positive recycling behaviour and maximise diversion from landfill, internal bins will be available throughout each tenancy at the Proposal and between the vacuum bays at the Car Wash for the source separation of refuse and recycling.

These internal bins will be collected by the staff/cleaners and transferred to the respective Bin Storage Area for consolidation into the appropriate bins, as required. This internal servicing method may be conducted outside of main operational hours to mitigate disturbances to visitors.

All bins will be colour coded and labelled in accordance with Australian Standards (AS 4123.7) to assist visitors, staff and cleaners to dispose of their separate waste materials in the correct bins.

3.2 Bin Sizes

Table 3-1 gives the typical dimensions of standard bins sizes that may be utilised at the Proposal. It should be noted that these bin dimensions are approximate and can vary slightly between suppliers.

Table 3-1: Typical Bin Dimensions

Dimensions (m)	Bin Sizes		
	240L	660L	1,100L
Depth	0.730	0.780	1.070
Width	0.585	1.260	1.240
Height	1.060	1.200	1.330
Floor area (m^2)	0.427	0.983	1.327

Reference: SULO Bin Specification Data Sheets

3.3 Bin Storage Area Sizes

Each tenancy at the Proposal will have adequate space for the required number of bins, modelled utilising the estimated waste generation in Table 2-2, bin sizes in Table 3-1 and based on preferred collection frequencies of refuse and recyclables each week.

Bin requirements will be determined as the development becomes operational and the nature of the tenants and waste management requirements are known.

3.4 Bin Storage Area Design

The design of the Bin Storage Areas will take into consideration:

- Smooth impervious floor sloped to a drain connected to the sewer system;
- Taps for washing of bins and Bin Storage Areas;
- Adequate aisle width for easy manoeuvring of bins;
- No double stacking of bins;
- Doors to the Bin Storage Areas self-closing and vermin proof;
- Doors to the Bin Storage Areas wide enough to fit bins through;
- Ventilated to a suitable standard;
- Appropriate signage;
- Undercover where possible and be designed to not permit stormwater to enter the drain;
- Located behind the building setback line;
- Bins not to be visible from the property boundary or areas trafficable by the public; and
- Bins are reasonably secured from theft and vandalism.

Bin numbers and storage space within the Bin Storage Areas will be monitored by the building manager during the operation of the Proposal to ensure that the number of bins and collection frequency is sufficient.

4 Waste Collection

A private waste collection contractor will service bins at the Proposal at the preferred collection frequencies utilising a rear loader waste collection vehicle.

The private contractor's rear loader waste collection vehicle will service the bins onsite, directly from the Bin Storage Areas. The private contractor's rear loader waste collection vehicle will travel with left hand lane traffic flow on Larsen Road or South Western Highway and turn into the Proposal in forward gear, and pull up directly opposite the Bin Storage Areas for servicing, as shown in Diagram 2.

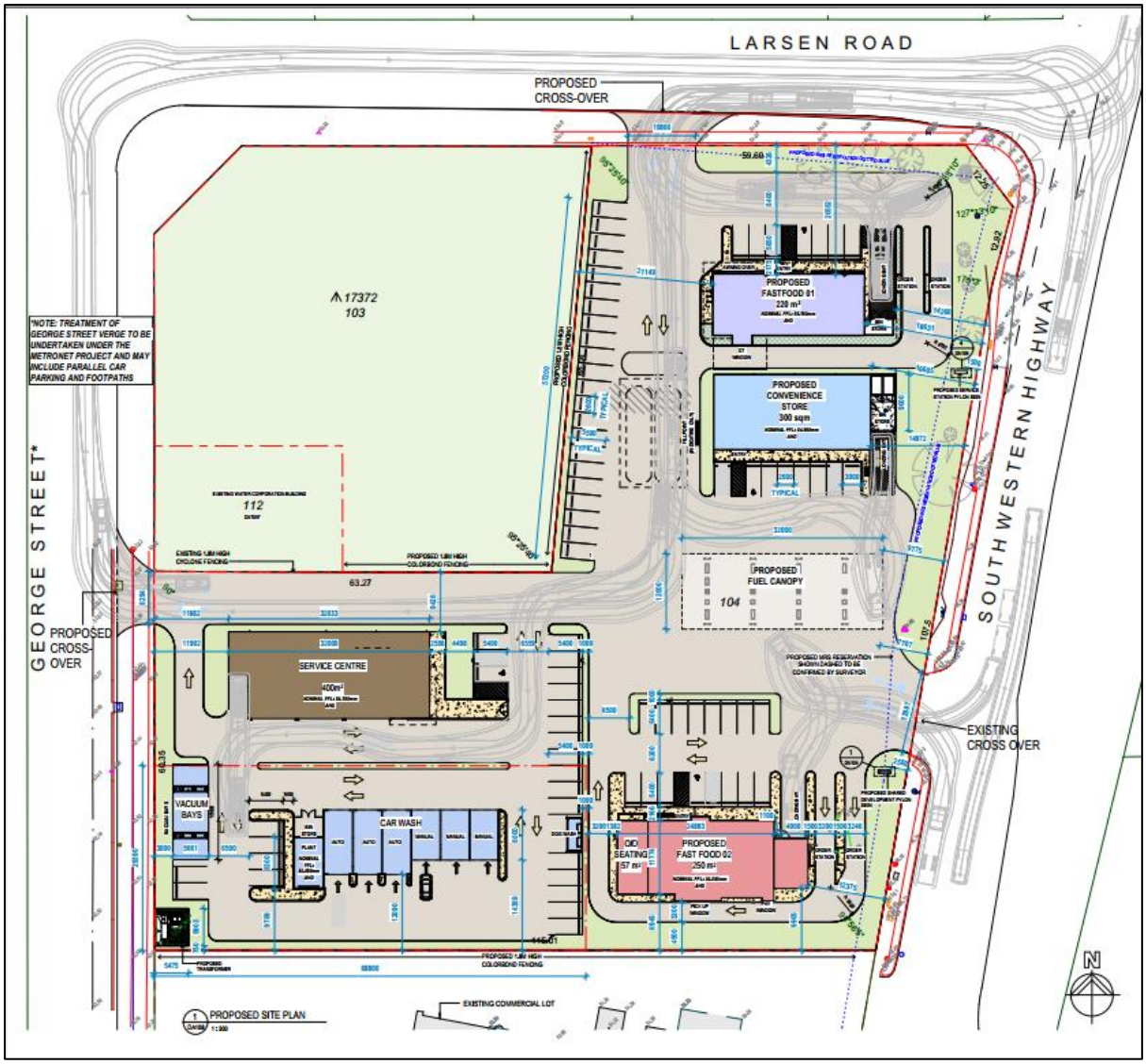
It is proposed that servicing may be conducted outside of normal operating hours to allow the waste collection vehicle to utilise the empty carpark for manoeuvring and mitigate impacts on local traffic movements during peak traffic hours.

Private contractor's staff will ferry bins to and from the rear loader waste collection vehicle and the Bin Storage Areas during servicing. The private contractor will be provided with key/PIN code access to the Bin Storage Areas and security access gates to facilitate servicing, if required.

Once servicing is complete the private contractor's rear loader waste collection vehicle will exit in a forward motion, turning onto Larsen Road or South Western Highway.

The above servicing method will preserve the amenity of the area by removing the requirement for bins to be presented to the street on collection days. In addition, servicing of bins onsite will reduce the noise generated in the area during collection. Noise from waste vehicles must comply with the Environmental Protection (Noise) Regulations and such vehicles should not service the site before 7.00am or after 7.00pm Monday to Saturday, or before 9.00am or after 7.00pm on Sundays and Public Holidays.

Diagram 2: Swept Path Analysis



4.1 Bulk and Speciality Waste

Bulk and speciality waste materials will be removed from the Proposal as they are generated on an 'as required' basis. A temporary skip bin could be utilised for collections, if required. Bulk and speciality waste collection will be monitored by the building manager who will organise their transport to the appropriate waste facility, as required.

5 Waste Management

A building manager will be engaged to complete the following tasks:

- Monitoring and maintenance of bins and the Bin Storage Areas;
- Cleaning of bins and Bin Storage Areas, when required;
- Ensure all staff/cleaners at the Proposal are made aware of this WMP and their responsibilities thereunder;
- Monitor staff/cleaner behaviour and identify requirements for further education and/or signage;
- Monitor bulk and speciality waste accumulation and assist with its removal, as required;
- Regularly engage with staff/cleaners to develop opportunities to reduce waste volumes and increase resource recovery; and
- Regularly engage with the private contractors to ensure efficient and effective waste service is maintained.

6 Conclusion

As demonstrated within this WMP, the Proposal will provide sufficiently sized Bin Storage Areas for storage of refuse and recyclables, based on the estimated waste generation volumes and suitable configuration of bins.

A private contractor will service the Proposal onsite, directly from the Bin Storage Areas. The private contractor's waste collection vehicle will enter and exit the Proposal in forward gear via Larsen Road or South Western Highway.

A building manager will oversee the relevant aspects of waste management at the Proposal.

Figures

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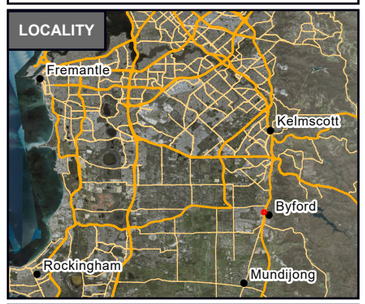
LEGEND

- Site Boundary

Cadastre

- Crown Allotment
- Freehold
- Road
- Reserve



0 10 20 30 40 km

LOCALITY

Lot 104 Larsen Rd
Byford WA 6122

Capital Prudential Pty Ltd

N 0 5 10 15 20 25 m

Coordinate System: GDA2020 MGA Zone 50
Scale @ A3: 1:600

Prepared:	E Jackson	Date:	10/01/2024
Reviewed:	A Brouwer	Revision:	A
Project:	WMP24001		

talis consultants

Figure 01

Data source: Roads, Cadastre - Landgate, 2023. Imagery: Nearmap, 2023.

Document Path: \\server\talis\SECTIONS\Waste\PROJECTS\WMP2024\WMP24001 - 3 Larsen Road, Byford\GIS\Maps\WMP24001 - 3 Larsen Road, Byford\WMP24001 - 3 Larsen Road, Byford.aprx

Assets | Engineering | Environment | Noise | Spatial | Waste

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