ALTUS PLANNING

68 Canning Highway,
South Perth WA 6151
t: (08) 9474 1449
e: contact@altusplan.com.au
www.altusplan.com.au

28 June 2023

Shire of Serpentine Jarrahdale
6 Paterson Street
MUNDIJONG WA 6123

Attention: Statutory Planning

Via email: *info@sjshire.wa.gov.au*

Dear Sir/Madam,

# Lot 104 (No. 3) Larsen Road, Byford – DAP Form 2 Application to Amend a DAP Determination

On behalf of Byford Development No. 3 Pty Ltd, the landowner of Lot 104 (No. 3) Larsen Road, Byford (**subject site** or **site**), Altus Planning have prepared this submission as part of a DAP Form 2 application to amend Development Assessment Panel (**DAP**) determination DA18/372 to extend the period of time to substantially commence development.

The following attachments have been included as part of this submission to provide a comprehensive understanding of the approved development:

| | |
|---|---|
| **Attachment 1** | Certificate of Title |
| **Attachment 2** | JDAP approval DA18/372 |
| **Attachment 3** | Site plans, floor plans and elevations of the approved development (which remain unchanged as part of this application). |
| **Attachment 4** | The original Peter Webb and Associates (**PWA**) planning report (which still provides a relevant and extensive description of the development and assessment against the planning framework). |
| **Attachment 5** | Stormwater Management Plan |
| **Attachment 6** | Tree Survey Report |

| | |
|---|---|
| **Attachment 7** | Landscaping Plan |
| **Attachment 8** | Transport Impact Assessment |

## Background & Proposal

On 24 December 2018, the Metro East Joint Development Assessment Panel (**JDAP**) approved, subject to conditions, a service station, car wash, vehicle service/tyre centre, showroom/restricted retail and carpark at the subject site.

Since that time, the Applicants have continued to evaluate the financial viability of the project and at the same time, other alternative development options.

The purpose of this DAP Form 2 application is to seek an extension of the period within which DA18/372 must be substantially commenced. As the development was not substantially commenced by the end of the approval period, being 24 December 2022[1], the approval expired and pursuant to regulation 17 of the *Planning and Development (Development Assessment Panels) Regulations 2011* (**DAP Regulations**), we seek that the period in which to substantially commence the approved development is extended by an additional 2 years from the date of determination of this DAP Form 2 application.

The proposed development has not changed from the approved development in 2018 and as detailed in this covering letter, the proposal remains compliant with the current and likely impending planning framework.

## Compliance with Planning Framework

The original application was compliant with the relevant planning framework, satisfying majority of the required development objectives and controls.

A comprehensive planning assessment is detailed within the PWA report at **Attachment 4**.

### *Local Planning Scheme No. 2*

The development was assessed against the Shire of Serpentine Jarrahdale's (**Shire**) Tocal Planning Scheme No. 2 (**TPS2**).

[1] Being 2 years from the date of the original determination, plus a further 2 years pursuant to clause 4.2 of the Clause 78H Notice of Exemption (30 April 2020).

The proposed activities were classified as 'Automotive Vehicle Wash', 'Industry Service', 'Service Station' and 'Showroom', all of which are 'P' (permissible) uses within the 'Showroom/Warehouse' zone, except for the 'Service Station' land use, which is an 'SA' use. The SA use class means that Council may, at its discretion, permit the use after notice of the application has been given in accordance with Clause 64 of the Deemed Provisions. The required advertising period was undertaken back in 2018 in accordance with the Shire's Local Planning Policy 1.4 – Public Consultation for Planning Matters.

Since the original development approval, TPS2 has been amended 8 times. The only amendments that have any bearing on the development are Amendments 207 and 208, which deal with development contributions within the Byford Development Contribution Area. These changes do not impact the development controls of TPS2 relating to the proposed development and accordingly, the unchanged proposal is still considered compliant.

## *Draft Local Planning Scheme No. 3*

In September 2019, the Shire's Draft Local Planning Scheme No. 3 (**LPS3**) was prepared and has since been publicly advertised and is understood to be currently under review by the Western Australian Planning Commission (**WAPC**). Notwithstanding that LPS3 is not a gazetted planning instrument, it does show the future intent and desire for development controls within the Shire and is to be given regard pursuant to clause 67(2)(b) of the Deemed Provisions. Accordingly, we have undertaken an investigation of the land uses proposed against the new zoning of the subject site under LPS3.

Under Draft LPS3, the proposed 'Service Commercial' zone has the following objectives:

- *To accommodate commercial activities which, because of the nature of the business, require good vehicular access and/or large sites.*

- *To provide for a range of wholesale sales, showrooms, trade and services which, by reason of their scale, character, operational or land requirements, are not generally appropriate in, or cannot conveniently or economically be accommodated in, the central area, shops and offices or industrial zones.*

The proposed development is considered to fall within the following land use terms of Draft LPS3:

***bulky goods showroom***

*means premises -*

*(a) used to sell by retail any of the goods and accessories of the following types that are principally used for domestic purposes -*

*(i) automotive parts and accessories;*

*(ii) camping, outdoor and recreation goods;*

*(iii) electric light fittings;*

*(iv) animal supplies including equestrian and pet goods;*

*(v) floor and window coverings;*

*(vi) furniture, bedding, furnishings, fabrics, manchester and homewares;*

*(vii) household appliances, electrical goods and home entertainment goods;*

*(viii) party supplies;*

*(ix) office equipment and supplies;*

*(x) babies' and children's goods, including play equipment and accessories;*

*(xi) sporting, cycling, leisure, fitness goods and accessories;*

*(xii) swimming pools.*

*or*

*(b) used to sell goods and accessories by retail if –*

*(i) a large area is required for the handling, display or storage of the goods; or*

*(ii) vehicular access is required to the premises for the purpose of collection of purchased goods.*

***motor vehicle repair***

*means premises used for or in connection with -*

*(a) electrical and mechanical repairs, or overhauls, to vehicles other than panel beating, spray painting or chassis reshaping of vehicles; or*

*(b) repairs to tyres other than recapping or retreading of tyres.*

***motor vehicle wash***

*means premises primarily used to wash motor vehicles.*

***service station***

*means premises other than premises used for a transport depot, panel beating, spray painting, major repairs or wrecking, that are used for -*

*(a) the retail sale of petroleum products, motor vehicle accessories and goods of an incidental or convenience nature; or*

*(b) the carrying out of greasing, tyre repairs and minor mechanical repairs to motor vehicles.*

The land use compatibility of the abovementioned under Draft LPS3 is depicted in Table 1 below.

| Land Use | Zone | Permissibility |
|---|---|---|
| Bulky Goods Showroom | Service Commercial | P (Permitted) |
| Motor Vehicle Repair | Service Commercial | A* |
| Motor Vehicle Wash | Service Commercial | D* |
| Service Station | Service Commercial | A* |
| A* means the use is not permitted unless the local government has exercised its discretion by granting development approval after giving notice in accordance with clause 64 of the deemed provisions.<br>D* means that the use is not permitted unless the local government has exercised its discretion by granting development approval | | |

*Table 1 - Land Use Permissibility*

The proposal therefore remains capable of approval under Draft LPS3 and is considered to achieve the zone objectives given the nature of the development requiring good vehicle access and a larger site, and by providing showrooms, trades and services outside of the zones and areas listed in the second objective.

## *Byford District Structure Plan*

The proposed development remains compliant with the Byford District Structure Plan (**DSP**), which has been amended since the original approval. The subject site is included within the 'Service Commercial' zone under the DSP (in line with the Draft LPS3), which is different to the zoning under the TPS2. Notwithstanding this, the proposal is consistent with the vision and objectives of the DSP, especially as they relate to the District Centre and establishing an active main street environment.

## *Byford Townsite Local Development Plan*

The proposed development remains compliant with the Byford Townsite Local Development Plan (**LDP**), which has not been amended since the original approval and therefore the assessment against the provisions of the LDP as detailed in the PWA report remain relevant.

## *Local Planning Policies*

The proposed development remains compliant with the Shire's local planning policies (**LPP**), specifically:

- LPP3.7 George Street Design Guidelines – this LPP has not been amended since the original approval and therefore the assessment against the LPP as detailed in the PWA report remains relevant.

- LPP4.11 Advertising – this LPP has not been amended since the original approval except for the title, as it is referred to as 'LPP 5 Control of Advertisements' in the PWA report. Notwithstanding this, the assessment against the LPP as detailed in the PWA report remains relevant and the application was advertised prior to the JDAP determination.

- LPP4.16 Tree Retention and Planting – this LPP has replaced 'LPP4 Revegetation' identified in the PWA report. Notwithstanding this, the proposal is compliant with LPP4.16, as 26 mature trees are being retained on-site and those trees being removed are proposed to be replaced (22 removed and 22 planted). The proposed replacement tree species listed on the Landscaping Plan at **Attachment 7** are all native to Western Australia.

- LPP24 Designing Out Crime – this LPP has not been amended since the original approval and therefore the assessment against the LPP as detailed in the PWA report remains relevant.

## *WAPC Development Control Policies*

The proposed development remains consistent with the objectives of Development Control Policy 5.1 Regional Roads (Vehicular Access) as detailed in the PWA report as it has not been amended since the original approval.

## *Deemed Provisions*

The assessment of the development against, and compliance with, the relevant deemed provisions of Clause 67 of Part 2 of Schedule 2 (Deemed Provisions) of the *Planning and Development (Local Planning Schemes) Regulations 2015* (Regulations) outlined in section 4.7 of the PWA report remain relevant.

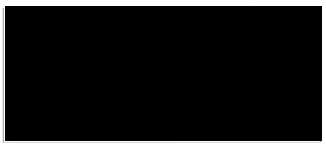
In addition, this submission has further considered Draft LPS3 pursuant to subclause (b) and found that the proposal remains consistent with, and capable of approval under, the impending new local planning scheme. It therefore follows that approval of this DAP Form 2 application would be consistent with the requirements or orderly and proper planning.

## Conclusion

We submit that the proposal remains compliant with the applicable planning framework. In addition, the proposal remains a well-designed development that will bring desired services, businesses and employment opportunities to Byford and will improve the overall amenity of the locality and this portion of the district centre.

We trust the above is of assistance to you. Should you have any queries regarding the above, please do not hesitate to contact me on 6268 0017 or via email at ben@altusplan.com.au.

Yours sincerely,



**Ben Laycock**
*Senior Town Planner*

# Attachment 1
# Certificate of Title

# Attachment 2
# JDAP Determination DA18/372

# Attachment 3
# Development Plans

# Attachment 4
# PWA Planning Report

# Attachment 5
# Stormwater Management Plan

# Attachment 6
# Tree Survey Report

# Attachment 7
# Landscape Plan

# Attachment 8
# Transport Impact Assessment

ALTUS PLANNING

68 Canning Highway,
South Perth WA 6151
t: (08) 9474 1449
e: contact@altusplan.com.au
www.altusplan.com.au

28 June 2023

Shire of Serpentine Jarrahdale
6 Paterson Street
MUNDIJONG WA 6123

Attention: Statutory Planning

Via email: *info@sjshire.wa.gov.au*

Dear Sir/Madam,

# Lot 104 (No. 3) Larsen Road, Byford – DAP Form 2 Application to Amend a DAP Determination

On behalf of Byford Development No. 3 Pty Ltd, the landowner of Lot 104 (No. 3) Larsen Road, Byford (**subject site** or **site**), Altus Planning have prepared this submission as part of a DAP Form 2 application to amend Development Assessment Panel (**DAP**) determination DA18/372 to extend the period of time to substantially commence development.

The following attachments have been included as part of this submission to provide a comprehensive understanding of the approved development:

| | |
|---|---|
| **Attachment 1** | Certificate of Title |
| **Attachment 2** | JDAP approval DA18/372 |
| **Attachment 3** | Site plans, floor plans and elevations of the approved development (which remain unchanged as part of this application). |
| **Attachment 4** | The original Peter Webb and Associates (**PWA**) planning report (which still provides a relevant and extensive description of the development and assessment against the planning framework). |
| **Attachment 5** | Stormwater Management Plan |
| **Attachment 6** | Tree Survey Report |

| | |
|---|---|
| **Attachment 7** | Landscaping Plan |
| **Attachment 8** | Transport Impact Assessment |

## Background & Proposal

On 24 December 2018, the Metro East Joint Development Assessment Panel (**JDAP**) approved, subject to conditions, a service station, car wash, vehicle service/tyre centre, showroom/restricted retail and carpark at the subject site.

Since that time, the Applicants have continued to evaluate the financial viability of the project and at the same time, other alternative development options.

The purpose of this DAP Form 2 application is to seek an extension of the period within which DA18/372 must be substantially commenced. As the development was not substantially commenced by the end of the approval period, being 24 December 2022[1], the approval expired and pursuant to regulation 17 of the *Planning and Development (Development Assessment Panels) Regulations 2011* (**DAP Regulations**), we seek that the period in which to substantially commence the approved development is extended by an additional 2 years from the date of determination of this DAP Form 2 application.

The proposed development has not changed from the approved development in 2018 and as detailed in this covering letter, the proposal remains compliant with the current and likely impending planning framework.

## Compliance with Planning Framework

The original application was compliant with the relevant planning framework, satisfying majority of the required development objectives and controls.

A comprehensive planning assessment is detailed within the PWA report at **Attachment 4**.

### *Local Planning Scheme No. 2*

The development was assessed against the Shire of Serpentine Jarrahdale's (**Shire**) Tocal Planning Scheme No. 2 (**TPS2**).

[1] Being 2 years from the date of the original determination, plus a further 2 years pursuant to clause 4.2 of the Clause 78H Notice of Exemption (30 April 2020).

The proposed activities were classified as 'Automotive Vehicle Wash', 'Industry Service', 'Service Station' and 'Showroom', all of which are 'P' (permissible) uses within the 'Showroom/Warehouse' zone, except for the 'Service Station' land use, which is an 'SA' use. The SA use class means that Council may, at its discretion, permit the use after notice of the application has been given in accordance with Clause 64 of the Deemed Provisions. The required advertising period was undertaken back in 2018 in accordance with the Shire's Local Planning Policy 1.4 – Public Consultation for Planning Matters.

Since the original development approval, TPS2 has been amended 8 times. The only amendments that have any bearing on the development are Amendments 207 and 208, which deal with development contributions within the Byford Development Contribution Area. These changes do not impact the development controls of TPS2 relating to the proposed development and accordingly, the unchanged proposal is still considered compliant.

## *Draft Local Planning Scheme No. 3*

In September 2019, the Shire's Draft Local Planning Scheme No. 3 (**LPS3**) was prepared and has since been publicly advertised and is understood to be currently under review by the Western Australian Planning Commission (**WAPC**). Notwithstanding that LPS3 is not a gazetted planning instrument, it does show the future intent and desire for development controls within the Shire and is to be given regard pursuant to clause 67(2)(b) of the Deemed Provisions. Accordingly, we have undertaken an investigation of the land uses proposed against the new zoning of the subject site under LPS3.

Under Draft LPS3, the proposed 'Service Commercial' zone has the following objectives:

- *To accommodate commercial activities which, because of the nature of the business, require good vehicular access and/or large sites.*

- *To provide for a range of wholesale sales, showrooms, trade and services which, by reason of their scale, character, operational or land requirements, are not generally appropriate in, or cannot conveniently or economically be accommodated in, the central area, shops and offices or industrial zones.*

The proposed development is considered to fall within the following land use terms of Draft LPS3:

***bulky goods showroom***

*means premises -*

*(a) used to sell by retail any of the goods and accessories of the following types that are principally used for domestic purposes -*

*(i) automotive parts and accessories;*

*(ii) camping, outdoor and recreation goods;*

*(iii) electric light fittings;*

*(iv) animal supplies including equestrian and pet goods;*

*(v) floor and window coverings;*

*(vi) furniture, bedding, furnishings, fabrics, manchester and homewares;*

*(vii) household appliances, electrical goods and home entertainment goods;*

*(viii) party supplies;*

*(ix) office equipment and supplies;*

*(x) babies' and children's goods, including play equipment and accessories;*

*(xi) sporting, cycling, leisure, fitness goods and accessories;*

*(xii) swimming pools.*

*or*

*(b) used to sell goods and accessories by retail if –*

*(i) a large area is required for the handling, display or storage of the goods; or*

*(ii) vehicular access is required to the premises for the purpose of collection of purchased goods.*

***motor vehicle repair***

*means premises used for or in connection with -*

*(a) electrical and mechanical repairs, or overhauls, to vehicles other than panel beating, spray painting or chassis reshaping of vehicles; or*

*(b) repairs to tyres other than recapping or retreading of tyres.*

***motor vehicle wash***

*means premises primarily used to wash motor vehicles.*

***service station***

*means premises other than premises used for a transport depot, panel beating, spray painting, major repairs or wrecking, that are used for -*

*(a) the retail sale of petroleum products, motor vehicle accessories and goods of an incidental or convenience nature; or*

*(b) the carrying out of greasing, tyre repairs and minor mechanical repairs to motor vehicles.*

The land use compatibility of the abovementioned under Draft LPS3 is depicted in Table 1 below.

| Land Use | Zone | Permissibility |
|---|---|---|
| Bulky Goods Showroom | Service Commercial | P (Permitted) |
| Motor Vehicle Repair | Service Commercial | A* |
| Motor Vehicle Wash | Service Commercial | D* |
| Service Station | Service Commercial | A* |
| A* means the use is not permitted unless the local government has exercised its discretion by granting development approval after giving notice in accordance with clause 64 of the deemed provisions.<br>D* means that the use is not permitted unless the local government has exercised its discretion by granting development approval | | |

*Table 1 - Land Use Permissibility*

The proposal therefore remains capable of approval under Draft LPS3 and is considered to achieve the zone objectives given the nature of the development requiring good vehicle access and a larger site, and by providing showrooms, trades and services outside of the zones and areas listed in the second objective.

## *Byford District Structure Plan*

The proposed development remains compliant with the Byford District Structure Plan (**DSP**), which has been amended since the original approval. The subject site is included within the 'Service Commercial' zone under the DSP (in line with the Draft LPS3), which is different to the zoning under the TPS2. Notwithstanding this, the proposal is consistent with the vision and objectives of the DSP, especially as they relate to the District Centre and establishing an active main street environment.

## *Byford Townsite Local Development Plan*

The proposed development remains compliant with the Byford Townsite Local Development Plan (**LDP**), which has not been amended since the original approval and therefore the assessment against the provisions of the LDP as detailed in the PWA report remain relevant.

## *Local Planning Policies*

The proposed development remains compliant with the Shire's local planning policies (**LPP**), specifically:

- LPP3.7 George Street Design Guidelines – this LPP has not been amended since the original approval and therefore the assessment against the LPP as detailed in the PWA report remains relevant.

- LPP4.11 Advertising – this LPP has not been amended since the original approval except for the title, as it is referred to as 'LPP 5 Control of Advertisements' in the PWA report. Notwithstanding this, the assessment against the LPP as detailed in the PWA report remains relevant and the application was advertised prior to the JDAP determination.

- LPP4.16 Tree Retention and Planting – this LPP has replaced 'LPP4 Revegetation' identified in the PWA report. Notwithstanding this, the proposal is compliant with LPP4.16, as 26 mature trees are being retained on-site and those trees being removed are proposed to be replaced (22 removed and 22 planted). The proposed replacement tree species listed on the Landscaping Plan at **Attachment 7** are all native to Western Australia.

- LPP24 Designing Out Crime – this LPP has not been amended since the original approval and therefore the assessment against the LPP as detailed in the PWA report remains relevant.

## *WAPC Development Control Policies*

The proposed development remains consistent with the objectives of Development Control Policy 5.1 Regional Roads (Vehicular Access) as detailed in the PWA report as it has not been amended since the original approval.

## *Deemed Provisions*

The assessment of the development against, and compliance with, the relevant deemed provisions of Clause 67 of Part 2 of Schedule 2 (Deemed Provisions) of the *Planning and Development (Local Planning Schemes) Regulations 2015* (Regulations) outlined in section 4.7 of the PWA report remain relevant.

In addition, this submission has further considered Draft LPS3 pursuant to subclause (b) and found that the proposal remains consistent with, and capable of approval under, the impending new local planning scheme. It therefore follows that approval of this DAP Form 2 application would be consistent with the requirements or orderly and proper planning.

## Conclusion

We submit that the proposal remains compliant with the applicable planning framework. In addition, the proposal remains a well-designed development that will bring desired services, businesses and employment opportunities to Byford and will improve the overall amenity of the locality and this portion of the district centre.

We trust the above is of assistance to you. Should you have any queries regarding the above, please do not hesitate to contact me on 6268 0017 or via email at ben@altusplan.com.au.

Yours sincerely,

**Ben Laycock**
*Senior Town Planner*

# Attachment 1
# Certificate of Title

# Attachment 2
# JDAP Determination DA18/372

Government of **Western Australia**
Development Assessment Panels

LG Ref: DA18/372
DAP Ref: DAP/18/01419
Enquiries: (08) 6551 9919

Mr Nik Hidding
Peter Webb & Associates
PO Box 920, Subiaco WA 6904

Dear Mr Hidding

**METRO EAST JDAP - SHIRE OF SERPENTINE JARRAHDALE - DAP APPLICATION - DA18/372 - DETERMINATION**

| | |
|---|---|
| Property Location: | Lot 104 (3) Larsen Road, Byford |
| Application Details: | Service station, car wash, vehicle service/tyre centre, showroom/restricted retail and carpark |

Thank you for your Form 1 Development Assessment Panel (DAP) application and plans submitted to the Shire of Serpentine Jarrahdale on 16 May 2018 for the above-mentioned development.

This application was considered by the Metro East JDAP at its meeting held on 11 December 2018, where in accordance with the provisions of the Shire of Serpentine Jarrahdale Town Planning Scheme No. 2, it was resolved to **approve** the application as per the attached notice of determination.

Should the applicant not be satisfied by this decision, an application may be made to amend or cancel this planning approval in accordance with regulation 17 and 17A of the *Planning and Development (Development Assessment Panels) Regulations 2011*.

Please also be advised that there is a right of review by the State Administrative Tribunal in accordance with Part 14 of the *Planning and Development Act 2005*. Such an application must be made within 28 days of the determination, in accordance with the *State Administrative Tribunal Act 2004*.

Should you have any queries with respect to the conditions of approval, please contact Ms Helen Maruta on behalf of the Shire of Serpentine Jarrahdale on 9526 1111.

Yours sincerely,

**DAP Secretariat**

24 December 2018

Encl. DAP Determination Notice
Approved Plans

Cc: Ms Helen Maruta
Shire of Serpentine Jarrahdale

Postal address: Locked Bag 2506 Perth WA Street address: 140 William Street Perth WA 6000
Tel: (08) 6551 9919 Fax: (08) 6551 9961 TTY: 6551 9007 Infoline: 1800 626 477
daps@dplh.wa.gov.au www.dplh.wa.gov.au
ABN 68 565 723 484

Government of **Western Australia**
Development Assessment Panels

***Planning and Development Act 2005***

**Shire of Serpentine Jarrahdale Town Planning Scheme No. 2**

**Metro East Joint Development Assessment Panel**

# Determination on Development Assessment Panel Application for Planning Approval

**Property Location:** Lot 104 (3) Larsen Road, Byford
**Application Details:** Service station, car wash, vehicle service/tyre centre, showroom/restricted retail and carpark

In accordance with regulation 8 of the *Planning and Development (Development Assessment Panels) Regulations 2011*, the above application for planning approval was **granted** on 11 December 2018, subject to the following:

**Approve** DAP Application reference DAP/18/01419 and accompanying plans TP01 – TP14 in accordance with clause 68 of the *Planning and Development (Local Planning Schemes) Regulations 2015* and the provisions of the Shire of Serpentine Jarrahdale Town Planning Scheme No.2, subject to the following conditions:

**Conditions**

1. The development is to be carried out in compliance with the plans and documentation listed below and endorsed with the Shire of Serpentine Jarrahdale stamp, except where amended by other conditions of this consent.

| | |
|---|---|
| Plans and Specifications | 1 – TP01 August 2018 – Revision E<br>2 – TP02 August 2018 – Revision A<br>3 – TP03 April 2018 – Revision M<br>4 – TP03A October 2018 – Revision A<br>5 – TP03B October 2018 – Revision A<br>6 – TP03C October 2018 – Revision A<br>7 – TP03D October 2018 – Revision A<br>8 – TP04 August 2018 – Revision C<br>9 – TP05 August 2018 – Revision B<br>10 – TP06 August 2018 – Revision D<br>11 – TP07 August 2018 – Revision C<br>12 – TP08 August 2018 – Revision B<br>13 – TP09 August 2018 – Revision D<br>14 – TP10 August 2018 – Revision D<br>15 – TP11 November 2018 – Revision A<br>16 – TP12 November 2018 – Revision A<br>17 – TP13 November 2018 – Revision A<br>18 – TP14 November 2018 – Revision A<br>received at the Shire Offices on 9 November 2018<br>Traffic Impact Assessment November 2018 |

Government of **Western Australia**
Development Assessment Panels

2. Prior to occupation, a monetary contribution of 1% being paid the Shire, for the establishment of public art or, alternatively, the provision of public art being provided in accordance with the Shire of Serpentine Jarrahdale Local Planning Policy 1.6 – Public Art for Major Developments to the satisfaction of the Shire.

3. Prior to commencement of works, detailed engineering drawings shall be submitted and approved by the Shire of Serpentine Jarrahdale in consultation with Main Roads Western Australia detailing the dual lane approach on Larsen Road with left and right channelisation at the South Western Highway intersection. The upgrade shall be carried out in accordance with the approved drawings prior to occupation at the applicant's cost.

4. Prior to occupation of the development, the applicant shall widen / upgrade the George Street / Larsen Road intersection to the satisfaction of the Shire of Serpentine Jarrahdale.

5. Prior to construction works, an updated Stormwater Management Plan, on advice from DWER shall be submitted and approved by the Shire of Serpentine Jarrahdale. Once approved, the Stormwater Management Plan shall be implemented and maintained thereafter. The Plan shall be prepared in accordance with the Byford Town Centre Local Water Management Strategy and Local Planning Policy 2.4 – Water Sensitive Design.

6. Prior to commencement of works, an updated Landscape and Vegetation Management Plan for the development, including all car parking areas, access roads and road verges shall be submitted and approved by the Shire of Serpentine Jarrahdale. Once approved, the Landscape and Vegetation Management Plan shall be implemented prior to occupation and maintained thereafter.

7. Prior to occupation, the applicant is required to submit an updated Noise Assessment from a suitably qualified person demonstrating that the development, particularly the mechanical services associated with the tyre and auto services, will not result in unacceptable impacts in relation to noise.

8. The pylon sign shall not exceed 6.5m in height and shall be in accordance with LPP4.11 – Advertising.

9. Prior to commencement of works, an updated site plan showing the revised location of the loading bay, adjacent to George Street entrance shall be submitted and approved by the Shire of Serpentine Jarrahdale. The loading bay shall then be constructed in accordance with the approved site plan thereafter.

10. All loading and unloading associated with the development must be undertaken within the subject property boundaries.

11. Prior to occupation, a lighting plan shall be submitted to and approved by the Shire of Serpentine Jarrahdale in consultation with Main Roads Western Australia. The approved lighting plan shall be implemented and maintained thereafter.

Government of **Western Australia**
Development Assessment Panels

12. Prior to occupation, shared paths, bicycle parking facilities shall be installed in accordance with Local Planning Policy 4.15 Bicycle Facilities to the satisfaction of the Shire of Serpentine Jarrahdale.

13. Prior to commencement of works, an amended drawing of the eastern elevation of the fuel shop, shall be submitted to and approved by the Shire of Serpentine Jarrahdale. The elevation shall include further design features addressing South Western Highway in accordance with the Byford Townsite Detailed Area Plan. The building shall be constructed in accordance with this approved drawing.

14. Service deliveries shall occur outside the hours of 4:00pm to 5:00pm Monday to Friday. Service vehicles shall enter from the George Street entrance and exit from the Larsen Road exit.

15. Prior to occupation, the redundant crossover on South Western Highway shall be removed and the verge reinstated at the applicant's cost to the satisfaction of Main Roads.

16. Prior to occupation, modifications to South Western Highway must be undertaken to the satisfaction of the Shire of Serpentine Jarrahdale at the applicant's cost and on advice from Main Roads Western Australia as follows:-

    i). The construction of left and right turn auxiliary lanes from South Western Highway onto Larsen Road, as depicted on Drawing No. TP03 Revision dated October 2018 at the expense of the applicant.

    ii.) The construction of a median on Larsen Road, as depicted on Drawing No. TP03 Revision dated October 2018 (attached) at the expense of the applicant.

17. Signage illumination shall not exceed the cd/m2 as per Main Roads Advertising Policy.

18. Vegetation within the road reserve must not be removed or trimmed to improve the visibility of the proposed advertising devices.

**Advice Notes**

1. A planning consent is not an approval to commence any works. A building permit must be obtained for all works. Any application for a building permit must satisfy the conditions specified in this decision notice.

2. Any food premises must comply with the Food Act 2008, Food Regulations 2009, Australian and New Zealand Food Safety Standards Code.

3. Any works within the South Western Highway Road Reserve may require the approval of Main Roads WA.

4. This decision constitutes planning approval only and is valid for a period of 2 years from the date of approval. If the subject development is not substantially commenced within the 2 year period, the approval shall lapse and be of no further effect.

Government of **Western Australia**
Development Assessment Panels

Where an approval has so lapsed, no development shall be carried out without further approval having first been sought and obtained, unless the applicant has applied and obtained Development Assessment Panel approval to extend the approval term under regulation 17(1)(a) of the *Planning and Development (Development Assessment Panels) Regulations 2011*.

## AREA SCHEDULE:

| | |
|---|---|
| TOTAL SITE AREA - | 11,630m² |
| FUEL SHOP - | 400m² |
| VEHICLE SERVICE STORE - | 400m² |
| RESTRICTED RETAIL | 630m² |
| | 100m² |
| | 1,530m² |
| | 3,095m² (26.61%) |
| - | 69 cars |

**DEVELOPMENT ASSESSMENT PANEL**

**APPROVED**

**11-Dec-2018**

GEORGE STREET

EXISTING FOOTPATH

TITLE BOUNDARY 60.35m

OUT IN

VACUUM BAYS

WATER TANK

WATER TANK

LOADING BAY

RESTRICTED RETAIL 630m²

PLANT AREA

CAR WASH 100m²

LOT 112 PUMP HOUSE WATER CORP.

LOT 103

TITLE BOUNDARY 63.27m

POSSIBLE CONNECTION LOCATION TO BE CONFIRMED

CAR SPACES (23)

CAR SPACES (16)

SITE AREA 11635m²

LOT 104

TITLE BOUNDARY 68.04m

LARSEN ROAD

TITLE BOUNDARY 115.05m

LOADING BAY

BIN AREA

SERVICE CENTRE 400m²

SHOWROOM

OFFICES

RECEP.

LUNCH ROOM

FUEL CANOPY

UNDERGROUND FUEL TANKS

CAR SPACES (10)

CAR SPACES (20)

OUTDOOR SEATING 125m²

FUEL SHOP 400m²

LOADING AREA

WAITING BAY

LANDSCAPE ZONE

RETAIN EX. TREES

NEW TREE

TITLE BOUNDARY 81.69m

TITLE BOUNDARY 59.69m

8m HIGH PRICE SIGN

ENTRY FEATURE - SIGNAGE & FUEL PRICE

SOUTH WESTERN HIGHWAY

PROPOSED ROAD WIDENING TO FUTURE DESIGN

TITLE BOUNDARY 107.5m

EXISTING FOOTPATH

NEW FOOTPATH

EXTENDED LEFT TURN LANE, 75m LONG

12.92m

12.25m

0m 3m 6m 9m 12m

1:300 @ A1 SIZE / 1:600@ A3 SIZE

5 - TP03B - October 2018 - Revision A

Not for Planning Purposes

| REV | AMENDMENT DETAILS | BY | DATE |
|---|---|---|---|
| A | PLAN REVISED TO SUIT TP03 REV.M | JS | 09-11-18 |
| Ø | PLANNING ISSUE | KM | 26-10-18 |

PROCON DEVELOPMENTS
www.procon.net.au

trg
BRISBANE + MELBOURNE

concept + design + interiors + project management

Level 3, Suite 37, 799 Springvale Road,
Mulgrave, Victoria 3170 Australia
T: +61 3 9542 9300 F: +61 3 9542 9310
www.trg-aus.com
The Retail Group Pty Ltd ABN 85 050 134 686
RBP No. DP-AD1689



PROJECT
PROPOSED MIXED USE DEVELOPEMENT

PROJECT ADDRESS
3 LARSEN ROAD

BYFORD
WA 6122

DRAWING TITLE
PROPOSED SITE PLAN - 12.5m RIGID SERVICE VEHICLE SWEEP PATH (REST. RETAIL)

CLIENT
PROCON DEVELOPMENTS PTY LTD

| DATE | SCALE @ A1 | NORTH |
|---|---|---|
| OCT.'18 | 1:300 | |
| DRAWN KM | CHECKED AB | |
| ISSUE PLANNING | | |

| PROJECT No. | DRAWING No. | REVISION No. | SHEET |
|---|---|---|---|
| 15316 | TP03B | A | 05of 18 |

PROPOSED MIXED USE DEVELOPMENT
AT
# 3 LARSEN ROAD, BYFORD, WA

## ARCHITECTURAL DRAWING LIST:

| | |
|---|---|
| TP.01 | TITLE PAGE AND SITE LOCALITY PLAN |
| TP.02 | EXISTING CONDITIONS SITE PLAN & DEMOLITION PLAN |
| TP.03 | PROPOSED SITE PLAN |
| TP03A | TANKER PATH |
| TP03B | DELIVERY TRUCK PATH SHEET 1 |
| TP03C | DELIVERY TRUCK PATH SHEET 2 |
| TP03D | DELIVERY TRUCK PATH SHEET 3 |
| TP.04 | PROPOSED FLOOR PLAN - FUEL SHOP |
| TP.05 | PROPOSED FLOOR PLANS - SERVICE CENTRE |
| TP.06 | PROPOSED FLOOR PLANS - CAR WASH & RETAIL |
| TP.07 | ELEVATIONS - FUEL SHOP & CANOPY |
| TP.08 | ELEVATIONS - SERVICE CENTRE |
| TP.09 | ELEVATIONS - CAR WASH & RETAIL |
| TP.10 | SIGNAGE PLAN |
| TP.11 | PERSPECTIVE VIEW 1 |
| TP.12 | PERSPECTIVE VIEW 2 |
| TP.13 | PERSPECTIVE VIEW 3 |
| TP.14 | PERSPECTIVE VIEW 4 |

DEVELOPMENT ASSESSMENT PANEL
APPROVED
11-Dec-2018


1 - TP01 - August 2018 - Revision E

## AREA SCHEDULE:

| | |
|---|---|
| TOTAL SITE AREA - | 11,630m² |
| FUEL SHOP - | 400m² |
| VEHICLE SERVICE STORE - | 400m² |
| RESTRICTED RETAIL - | 630m² |
| CAR WASH - | 100m² |
| TOTAL AREA: | 1,530m² |
| LANDSCAPE AREA - | 3,095m² (26.61%) |
| CAR SPACES PROVIDED - | 69 cars |

| REV | AMENDMENT DETAILS | BY | DATE |
|---|---|---|---|
| E | PLAN REVISED TO SUIT TP03 REV.M | JS | 09-11-18 |
| D | PLAN REVISED TO SUIT TP03 REV.L | JS | 08-11-18 |
| C | PLAN REVISED TO SUIT TP03 REV.G | KM | 24-08-18 |
| B | PLAN REVISED TO SUIT TP03 REV.B | JS | 06-07-18 |
| A | SITE KERB TO SOUTH WESTERN HIGHWAY MODIFIED | JP | 09-05-18 |
| Ø | PLANNING ISSUE | JP | 08-05-18 |
| P3 | LOCALITY PLAN REVISED, DRAWING LIST UPDATED | JP | 07-05-18 |
| P2 | LOCALITY PLAN REVISED TO MATCH TP03 REV. P2 | JS | 17-04-18 |
| P1 | PRELIMINARY ISSUE | KM | 10-04-18 |

PROCON DEVELOPMENTS
www.procon.net.au

trg
BRISBANE + MELBOURNE

concept + design + interiors + project management

Level 3, Suite 37, 799 Springvale Road, Mulgrave, Victoria 3170 Australia
T: +61 3 9542 9300 F: +61 3 9542 9310
www.trg-aus.com
The Retail Group Pty Ltd ABN 85 050 134 686
RBP No. DP-AD1689



PROJECT
PROPOSED MIXED USE DEVELOPEMENT

PROJECT ADDRESS
3 LARSEN ROAD
BYFORD
WA 6122

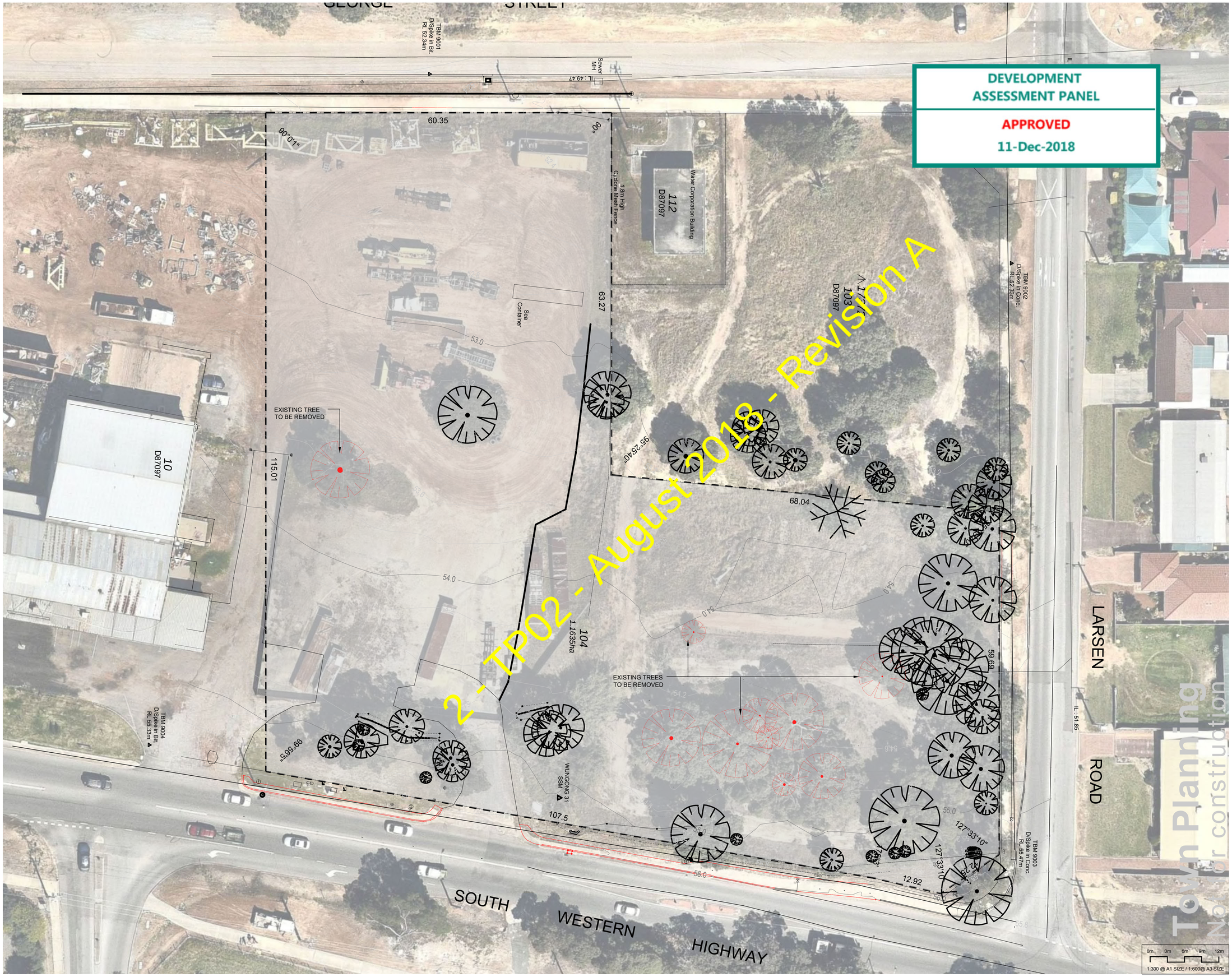
DRAWING TITLE
TITLE PAGE & LOCALITY PLAN

CLIENT
PROCON DEVELOPMENTS PTY LTD

Town Planning
Not for construction

| | | | |
|---|---|---|---|
| DATE AUG.'18 | SCALE @ A1 1:500 | NORTH | |
| DRAWN KM | CHECKED AB | | |
| ISSUE PLANNING | | | |
| PROJECT No. 15316 | DRAWING No. TP01 | REVISION No. E | SHEET 01 of 18 |

0m 5m 10m 15m 20m
1:500 @ A1 SIZE / 1:1000@ A3 SIZE




| REV | AMENDMENT DETAILS | BY | DATE |
|---|---|---|---|
| A | TREES TO BE REMOVED SHOWN | JS | 08-11-18 |
| Ø | PLANNING ISSUE | JP | 08-05-18 |
| P1 | PRELIMINARY ISSUE | KM | 10-04-18 |

PROCON DEVELOPMENTS
www.procon.net.au

trg
BRISBANE + MELBOURNE

concept + design + interiors + project management

Level 3, Suite 37, 799 Springvale Road,
Mulgrave, Victoria 3170 Australia
T: +61 3 9542 9300 F: +61 3 9542 9310
www.trg-aus.com
The Retail Group Pty Ltd ABN 85 050 134 686
RBP No. DP-AD1689



PROJECT
PROPOSED MIXED USE DEVELOPEMENT

PROJECT ADDRESS
3 LARSEN ROAD

BYFORD
WA 6122

DRAWING TITLE
EXISTING CONDITIONS PLAN & DEMOLITION PLAN

CLIENT
PROCON DEVELOPMENTS PTY LTD

| DATE | SCALE @ A1 | NORTH |
|---|---|---|
| AUG.'18 | 1:300 | |
| DRAWN | CHECKED | |
| KM | AB | |
| ISSUE | | |
| PLANNING | | |

| PROJECT No. | DRAWING No. | REVISION No. | SHEET |
|---|---|---|---|
| 15316 | TP02 | A | 02of 18 |

GEORGE STREET

EXISTING FOOTPATH

TITLE BOUNDARY 60.35m

OUT IN

VACUUM BAYS

WATER TANK

WATER TANK

LOADING BAY

RESTRICTED RETAIL 630m²

CAR WASH 100m²

PLANT AREA

LOT 112 PUMP HOUSE WATER CORP.

LOT 103

TITLE BOUNDARY 63.27m

CAR SPACES (23)

POSSIBLE CONNECTION LOCATION TO BE CONFIRMED

POSSIBLE CONNECTION LOCATION TO BE CONFIRMED

SITE AREA 11635m²

LOT 104

CAR SPACES (16)

TITLE BOUNDARY 115.05m

LARSEN ROAD

TITLE BOUNDARY 68.04m

LOADING BAY

BIN AREA

SERVICE CENTRE 400m²

OFFICE

SHOWROOM

LUNCH ROOM

RECEP.

CAR SPACES (10)

FUEL CANOPY

UNDERGROUND FUEL TANKS

UNDERGROUND PETROLEUM PRODUCTS CONTAINMENT TANK

WAITING BAY

CAR SPACES (20)

BIKES

CELLAR 25m²

OUTDOOR SEATING 125m²

FUEL SHOP 400m²

LOADING AREA

AIR & WATER

LANDSCAPE ZONE

4m HIGH PRICE SIGN

ENTRY FEATURE - SIGNAGE & FUEL PRICE

TITLE BOUNDARY 59.69m

TITLE BOUNDARY 81.69m

TITLE BOUNDARY 107.5m

SOUTH WESTERN HIGHWAY

PROPOSED ROAD WIDENING TO FUTURE DESIGN

EXISTING FOOTPATH

NEW FOOTPATH

EXTENDED LEFT TURN LANE 75m LONG

12.92m

12.25m

0m 3m 6m 9m 12m

1:300 @ A1 SIZE / 1:600@ A3 SIZE

DEVELOPMENT ASSESSMENT PANEL

APPROVED

11-Dec-2018

## AREA SCHEDULE:

| | |
|---|---|
| TOTAL SITE AREA - | 11,630m² |
| FUEL SHOP - | 400m² |
| VEHICLE SERVICE STORE - | 400m² |
| RESTRICTED RETAIL | 630m² |
| | 100m² |
| | 1,530m² |
| | 3,095m² (26.61%) |
| - | 69 cars |

## LEGEND:

- EXISTING TREE RETAINED 32 No.
- EXIST. TREE REMOVED 10 No.
- NEW TREE ADDED (REFER LANDSCAPE PLAN AND TREE SURVEY REPORT)
- MRWA PLANNING CONCEPT OVERLAY

ALL AREAS ARE APPROXIMATE AND SUBJECT TO FINAL SURVEY

| REV | AMENDMENT DETAILS | BY | DATE |
|---|---|---|---|
| M | AUTO CAR WASH & BIN AREA REVISED. NO. OF CAR PARKING REVISED | JS | 09-11-18 |
| L | TIMBER BATTEN ADDED | JS | 08-11-18 |
| K | PARKING AREA REVISED | KM | 30-10-18 |
| J | CAR CANOPY, SERVICE CENTRE & CAR WASH REVISED | KM | 23-10-18 |
| H | CAR WASH & SERVICE CENTRE REVISED. | KM | 19-10-18 |
| G | PARKING REVISED. | KM | 24-08-18 |
| F | TENANCIES & PARKING REVISED. | KM | 22-08-18 |
| E | FUEL SHOP & CANOPY REVISED. | KM | 13-08-18 |
| D | SITE ACCESS & CAR WASH REVISED. | KM | 17-07-18 |
| C | CAR CANOPY & CAR WASH REVISED. | KM | 12-07-18 |
| B | TRUCK CANOPY DELETED. CAR CANOPY REVISED. | JS | 06-07-18 |
| A | SITE KERB TO SOUTH WESTERN HIGHWAY AMENDED | JP | 09-05-18 |
| Ø | PLANNING ISSUE | JP | 08-05-18 |
| P2 | CARWASH LAYOUT REVISED | JS | 17-04-18 |
| P1 | PRELIMINARY ISSUE | KM | 10-04-18 |

PROCON DEVELOPMENTS
www.procon.net.au

trg
BRISBANE + MELBOURNE

concept + design + interiors + project management

Level 3, Suite 37, 799 Springvale Road, Mulgrave, Victoria 3170 Australia
T: +61 3 9542 9300 F: +61 3 9542 9310
www.trg-aus.com
The Retail Group Pty Ltd ABN 85 050 134 686
RBP No. DP-AD1689



PROJECT
PROPOSED MIXED USE DEVELOPEMENT

PROJECT ADDRESS
3 LARSEN ROAD

BYFORD
WA 6122

DRAWING TITLE
PROPOSED SITE PLAN

CLIENT
PROCON DEVELOPMENTS PTY LTD

| DATE | SCALE @ A1 | NORTH |
|---|---|---|
| APR.'18 | 1:300 | |
| DRAWN KM | CHECKED AB | |
| ISSUE PLANNING | | |

| PROJECT No. | DRAWING No. | REVISION No. | SHEET |
|---|---|---|---|
| 15316 | TP03 | M | 03of 18 |

## AREA SCHEDULE:

| | |
|---|---|
| TOTAL SITE AREA - | 11,630m² |
| FUEL SHOP - | 400m² |
| VEHICLE SERVICE STORE - | 400m² |
| RESTRICTED RETAIL | 630m² |
| | 100m² |
| | 1,530m² |
| | 3,095m² (26.61%) |
| - | 69 cars |

**DEVELOPMENT ASSESSMENT PANEL**

**APPROVED**

**11-Dec-2018**

GEORGE STREET

EXISTING FOOTPATH

TITLE BOUNDARY 60.35m

AV - Articulated Vehicle

OUT IN

VACUUM BAYS

WATER TANK

WATER TANK

LOADING BAY

RESTRICTED RETAIL 630m²

LOT 112 PUMP HOUSE WATER CORP.

PLANT AREA

CAR WASH 100m²

TITLE BOUNDARY 63.27m

LOT 103

POSSIBLE CONNECTION LOCATION TO BE CONFIRMED

CAR SPACES (23)

SITE AREA 11635m²

LOT 104

CAR SPACES (16)

TITLE BOUNDARY 68.04m

LARSEN ROAD

TITLE BOUNDARY 115.05m

BIN AREA

LOADING BAY

SERVICE CENTRE 400m²

OFFICE

RECEP.

SHOWROOM

LUNCH ROOM

FUEL CANOPY

UGROUND FUEL TANKS

CAR SPACES (10)

WAITING BAY

CAR SPACES (20)

BIKES

PYLON SIGN

OUTDOOR SEATING 25m²

FUEL SHOP 400m²

LOADING AREA

9m HIGH PRICE SIGN

FTC SIGNAGE

ENTRY FEATURE SIGNAGE & FUEL PRICE

TITLE BOUNDARY 59.69m

TITLE BOUNDARY 81.69m

SOUTH WESTERN HIGHWAY

PROPOSED ROAD WIDENING TO FUTURE DESIGN

TITLE BOUNDARY 107.5m

NEW FOOTPATH

EXTENDED LEFT TURN LANE 75m LONG

12.92m

12.25m

LANDSCAPE ZONE

RETAIN EX. TREES

NEW TREE

0m 3m 6m 9m 12m

1:300 @ A1 SIZE / 1:600@ A3 SIZE





| REV | AMENDMENT DETAILS | BY | DATE |
|---|---|---|---|
| A | PLAN REVISED TO SUIT TP03 REV.M | JS | 09-11-18 |
| Ø | PLANNING ISSUE | KM | 30-10-18 |

PROCON DEVELOPMENTS
www.procon.net.au

trg
BRISBANE + MELBOURNE

concept + design + interiors + project management

Level 3, Suite 37, 799 Springvale Road,
Mulgrave, Victoria 3170 Australia

T: +61 3 9542 9300 F: +61 3 9542 9310

www.trg-aus.com
The Retail Group Pty Ltd ABN 85 050 134 686

RBP No. DP-AD1689



PROJECT
PROPOSED MIXED USE DEVELOPEMENT

PROJECT ADDRESS
3 LARSEN ROAD

BYFORD
WA 6122

DRAWING TITLE
PROPOSED SITE PLAN - 19m AV VEHICLE SWEEP PATH

CLIENT
PROCON DEVELOPMENTS PTY LTD

| DATE | SCALE @ A1 | NORTH |
|---|---|---|
| OCT.'18 | 1:300 | |
| DRAWN | CHECKED | |
| KM | AB | |
| ISSUE | | |
| PLANNING | | |

| PROJECT No. | DRAWING No. | REVISION No. | SHEET |
|---|---|---|---|
| 15316 | TP03A | A | 04of 18 |

## AREA SCHEDULE:

| | |
|---|---|
| TOTAL SITE AREA - | 11,630m² |
| FUEL SHOP - | 400m² |
| VEHICLE SERVICE STORE - | 400m² |
| RESTRICTED RETAIL | 630m² |
| | 100m² |
| | 1,530m² |
| | 3,095m² (26.61%) |
| - | 69 cars |

**DEVELOPMENT ASSESSMENT PANEL**

**APPROVED**

**11-Dec-2018**

GEORGE STREET

EXISTING FOOTPATH

TITLE BOUNDARY 60.35m

OUT IN

VACUUM BAYS

WATER TANK

WATER TANK

LOADING BAY

RESTRICTED RETAIL 630m²

PLANT AREA

CAR WASH 100m²

LOT 112 PUMP HOUSE WATER CORP.

LOT 103

TITLE BOUNDARY 63.27m

POSSIBLE CONNECTION LOCATION TO BE CONFIRMED

CAR SPACES (23)

CAR SPACES (16)

SITE AREA 11635m²

LOT 104

TITLE BOUNDARY 68.04m

LARSEN ROAD

TITLE BOUNDARY 115.05m

LOADING BAY

BIN AREA

SERVICE CENTRE 400m²

SHOWROOM

OFFICES

RECEP.

LUNCH ROOM

FUEL CANOPY

UNDERGROUND FUEL TANKS

CAR SPACES (10)

CAR SPACES (20)

OUTDOOR SEATING 125m²

FUEL SHOP 400m²

LOADING AREA

WAITING BAY

LANDSCAPE ZONE

RETAIN EX. TREES

NEW TREE

TITLE BOUNDARY 81.69m

TITLE BOUNDARY 59.69m

8m HIGH PRICE SIGN

ENTRY FEATURE - SIGNAGE & FUEL PRICE

SOUTH WESTERN HIGHWAY

PROPOSED ROAD WIDENING TO FUTURE DESIGN

TITLE BOUNDARY 107.5m

EXISTING FOOTPATH

NEW FOOTPATH

EXTENDED LEFT TURN LANE, 75m LONG

12.92m

12.25m

0m 3m 6m 9m 12m

1:300 @ A1 SIZE / 1:600@ A3 SIZE

5 - TP03B - October 2018 - Revision A

Not for Planning Purposes

| REV | AMENDMENT DETAILS | BY | DATE |
|---|---|---|---|
| A | PLAN REVISED TO SUIT TP03 REV.M | JS | 09-11-18 |
| Ø | PLANNING ISSUE | KM | 26-10-18 |

PROCON DEVELOPMENTS
www.procon.net.au

trg
BRISBANE + MELBOURNE

concept + design + interiors + project management

Level 3, Suite 37, 799 Springvale Road,
Mulgrave, Victoria 3170 Australia
T: +61 3 9542 9300 F: +61 3 9542 9310
www.trg-aus.com
The Retail Group Pty Ltd ABN 85 050 134 686
RBP No. DP-AD1689



PROJECT
PROPOSED MIXED USE DEVELOPEMENT

PROJECT ADDRESS
3 LARSEN ROAD

BYFORD
WA 6122

DRAWING TITLE
PROPOSED SITE PLAN - 12.5m RIGID SERVICE VEHICLE SWEEP PATH (REST. RETAIL)

CLIENT
PROCON DEVELOPMENTS PTY LTD

| DATE | SCALE @ A1 | NORTH |
|---|---|---|
| OCT.'18 | 1:300 | |
| DRAWN KM | CHECKED AB | |
| ISSUE PLANNING | | |

| PROJECT No. | DRAWING No. | REVISION No. | SHEET |
|---|---|---|---|
| 15316 | TP03B | A | 05of 18 |

GEORGE STREET

EXISTING FOOTPATH

TITLE BOUNDARY 60.35m

EXISTING FOOTPATH

HRV – Heavy Rigid Vehicle

HRV – Heavy Rigid Vehicle

7m

OUT IN

LOADING BAY

RESTRICTED RETAIL 630m²

VACUUM BAYS

WATER TANK

WATER TANK

CAR WASH 100m²

PLANT AREA

LOT 112 PUMP HOUSE WATER CORP.

LOT 103

TITLE BOUNDARY 63.27m

CAR SPACES (23)

POSSIBLE CONNECTION LOCATION TO BE CONFIRMED

POSSIBLE CONNECTION LOCATION TO BE CONFIRMED

SITE AREA 11635m² LOT 104

CAR SPACES (16)

TITLE BOUNDARY 115.05m

TITLE BOUNDARY 68.04m

LARSEN ROAD

BIN AREA

LOADING BAY

SERVICE CENTRE 400m²

OFFICE

RECEP.

SHOWROOM

LUNCH ROOM

CAR SPACES (10)

FUEL CANOPY

UNDERGROUND FUEL TANKS

UNDERGROUND FUEL TANK CONTAINMENT SYSTEM

WAITING BAY

CAR SPACES (20)

BOLLARD

OUTDOOR SEATING 25m²

FUEL SHOP 400m²

LOADING AREA

LANDSCAPE ZONE

9m HIGH PRICE SIGN

FTC SIGNAGE

ENTRY FEATURE SIGNAGE & FUEL PRICE

TITLE BOUNDARY 81.69m

TITLE BOUNDARY 107.5m

TITLE BOUNDARY 99.69m

SOUTH WESTERN HIGHWAY

SOUTH WESTERN HIGHWAY

PROPOSED ROAD WIDENING TO FUTURE DESIGN

EXISTING FOOTPATH

NEW FOOTPATH

EXTENDED LEFT TURN LANE 75m LONG

12.92m

12.25m

50.0

55.0

RETAIN EX. TREES

NEW TREE

VENTS

FILL POINT

0m 3m 6m 9m 12m

1:300 @ A1 SIZE / 1:600@ A3 SIZE

## AREA SCHEDULE:

| | |
|---|---|
| TOTAL SITE AREA - | 11,630m² |
| FUEL SHOP - | 400m² |
| VEHICLE SERVICE STORE - | 400m² |
| | 630m² |
| | 100m² |
| | 1,530m² |
| | 3,095m² (26.61%) |
| - | 69 cars |

**DEVELOPMENT ASSESSMENT PANEL**

**APPROVED**

**11-Dec-2018**

October 2018 - Revision A

6 of TP03C - October

| REV | AMENDMENT DETAILS | BY | DATE |
|---|---|---|---|
| A | PLAN REVISED TO SUIT TP03 REV.M | JS | 09-11-18 |
| Ø | PLANNING ISSUE | KM | 26-10-18 |

PROCON DEVELOPMENTS
www.procon.net.au

trg
BRISBANE + MELBOURNE

concept + design + interiors + project management

Level 3, Suite 37, 799 Springvale Road,
Mulgrave, Victoria 3170 Australia

T: +61 3 9542 9300 F: +61 3 9542 9310

www.trg-aus.com
The Retail Group Pty Ltd ABN 85 050 134 686

RBP No. DP-AD1689



PROJECT
PROPOSED MIXED USE DEVELOPEMENT

PROJECT ADDRESS
3 LARSEN ROAD

BYFORD
WA 6122

DRAWING TITLE
PROPOSED SITE PLAN - 12.5m RIGID SERVICE VEHICLE SWEEP PATH (SERV. CENTRE)

CLIENT
PROCON DEVELOPMENTS PTY LTD

| DATE | SCALE @ A1 | NORTH |
|---|---|---|
| OCT.'18 | 1:300 | |
| DRAWN | CHECKED | |
| KM | AB | |
| ISSUE | | |
| PLANNING | | |

| PROJECT No. | DRAWING No. | REVISION No. | SHEET |
|---|---|---|---|
| 15316 | TP03C | A | 06of 18 |

## AREA SCHEDULE:

| | |
|---|---|
| TOTAL SITE AREA - | 11,630m² |
| FUEL SHOP - | 400m² |
| VEHICLE SERVICE STORE - | 400m² |
| RESTRICTED RETAIL | 630m² |
| | 100m² |
| | 1,530m² |
| | 3,095m² (26.61%) |
| - | 69 cars |

**DEVELOPMENT ASSESSMENT PANEL**

**APPROVED**

**11-Dec-2018**



GEORGE STREET

HRV – Heavy Rigid Vehicle

EXISTING FOOTPATH

TITLE BOUNDARY 60.35m

OUT IN

VACUUM BAYS

WATER TANK

WATER TANK

LOADING BAY

RESTRICTED RETAIL 630m²

LOT 112 PUMP HOUSE WATER CORP.

PLANT AREA

CAR WASH 100m²

LOT 103

TITLE BOUNDARY 63.27m

CAR SPACES (23)

POSSIBLE CONNECTION LOCATION TO BE CONFIRMED

SITE AREA 11635m²

LOT 104

CAR SPACES (16)

TITLE BOUNDARY 68.04m

LARSEN ROAD

TITLE BOUNDARY 115.05m

LOADING BAY

BIN AREA

SERVICE CENTRE 400m²

SHOWROOM

OFFICE

RECEP.

LUNCH ROOM

CAR SPACES (10)

FUEL CANOPY

UNDERGROUND FUEL TANKS

WAITING BAY

CAR SPACES (20)

BIKES

PILLAR

OUTDOOR SEATING 125m²

FUEL SHOP 400m²

LOADING AREA

AIR & WATER

ENTRY FEATURE - SIGNAGE & FUEL PRICE

6m HIGH PRICE SIGN

LANDSCAPE ZONE

NEW TREE

RETAIN EX. TREES

TITLE BOUNDARY 81.69m

TITLE BOUNDARY 107.5m

TITLE BOUNDARY 59.69m

PROPOSED ROAD WIDENING TO FUTURE DESIGN

SOUTH WESTERN HIGHWAY

EXTENDED LEFT TURN LANE 75m LONG

NEW FOOTPATH

12.92m

12.25m

0m 3m 6m 9m 12m

1:300 @ A1 SIZE / 1:600@ A3 SIZE

| REV | AMENDMENT DETAILS | BY | DATE |
|---|---|---|---|
| A | PLAN REVISED TO SUIT TP03 REV.M | JS | 09-11-18 |
| Ø | PLANNING ISSUE | KM | 26-10-18 |

PROCON DEVELOPMENTS
www.procon.net.au

trg
BRISBANE + MELBOURNE

concept + design + interiors + project management

Level 3, Suite 37, 799 Springvale Road,
Mulgrave, Victoria 3170 Australia
T: +61 3 9542 9300 F: +61 3 9542 9310
www.trg-aus.com
The Retail Group Pty Ltd ABN 85 050 134 686
RBP No. DP-AD1689



PROJECT
PROPOSED MIXED USE DEVELOPEMENT

PROJECT ADDRESS
3 LARSEN ROAD

BYFORD
WA 6122

DRAWING TITLE
PROPOSED SITE PLAN - 12.5m RIGID SERVICE VEHICLE SWEEP PATH (FUEL SHOP)

CLIENT
PROCON DEVELOPMENTS PTY LTD

| DATE | SCALE @ A1 | NORTH |
|---|---|---|
| OCT.'18 | 1:300 | |
| DRAWN KM | CHECKED AB | |
| ISSUE PLANNING | | |

| PROJECT No. | DRAWING No. | REVISION No. | SHEET |
|---|---|---|---|
| 15316 | TP03D | A | 07 of 18 |

DEVELOPMENT ASSESSMENT PANEL

APPROVED

11-Dec-2018

| REV | AMENDMENT DETAILS | BY | DATE |
|---|---|---|---|
| C | PLAN REVISED TO SUIT TP03 REV.L | JS | 08-11-18 |
| B | PLAN REVISED TO SUIT TP03 REV.G | KM | 24-08-18 |
| A | PLAN REVISED TO SUIT TP03 REV.B | JS | 06-07-18 |
| Ø | PLANNING ISSUE | JP | 08-05-18 |
| P1 | PRELIMINARY ISSUE | KM | 10-04-18 |





PROCON DEVELOPMENTS
www.procon.net.au

trg
BRISBANE + MELBOURNE

concept + design + interiors + project management

Level 3, Suite 37, 799 Springvale Road,
Mulgrave, Victoria 3170 Australia
T: +61 3 9542 9300 F: +61 3 9542 9310
www.trg-aus.com
The Retail Group Pty Ltd ABN 85 050 134 686
RBP No. DP-AD1689



PROJECT
PROPOSED MIXED USE DEVELOPEMENT

PROJECT ADDRESS
3 LARSEN ROAD

BYFORD
WA 6122

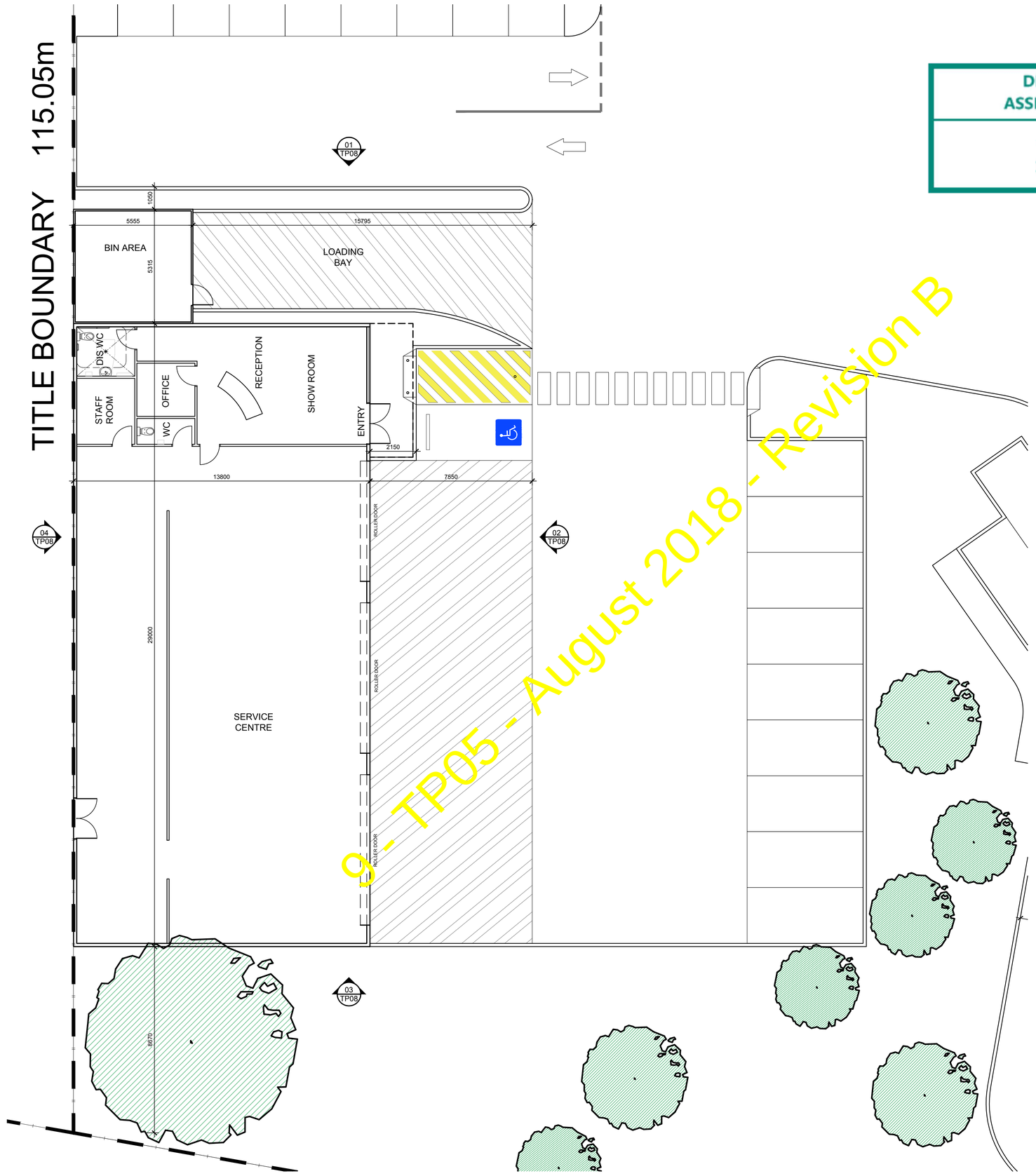
DRAWING TITLE
PROPOSED FLOOR PLAN - FUEL SHOP

CLIENT
PROCON DEVELOPMENTS PTY LTD

| DATE | SCALE @ A1 | NORTH |
|---|---|---|
| AUG.'18 | 1:100 | |
| DRAWN | CHECKED | |
| KM | AB | |
| ISSUE | | |
| PLANNING | | |

| PROJECT No. | DRAWING No. | REVISION No. | SHEET |
|---|---|---|---|
| 15316 | TP04 | C | 08of 18 |

0m 1m 2m 3m 4m
1:100 @ A1 SIZE / 1:200@ A3 SIZE








| REV | AMENDMENT DETAILS | BY | DATE |
|---|---|---|---|
| B | PLAN REVISED TO SUIT TP03 REV.L | JS | 08-11-18 |
| A | PLAN REVISED TO SUIT TP03 REV.G | KM | 24-08-18 |
| Ø | PLANNING ISSUE | JP | 08-05-18 |
| P2 | CARWASH LAYOUT REVISED | JS | 17-04-18 |
| P1 | PRELIMINARY ISSUE | KM | 10-04-18 |

PROCON DEVELOPMENTS
www.procon.net.au

trg
BRISBANE + MELBOURNE
concept + design + interiors + project management
Level 3, Suite 37, 799 Springvale Road, Mulgrave, Victoria 3170 Australia
T: +61 3 9542 9300 F: +61 3 9542 9310
www.trg-aus.com
The Retail Group Pty Ltd ABN 85 050 134 686
RBP No. DP-AD1689



PROJECT
PROPOSED MIXED USE DEVELOPEMENT

PROJECT ADDRESS
3 LARSEN ROAD

BYFORD
WA 6122

DRAWING TITLE
PROPOSED FLOOR PLAN - SERVICE CENTRE

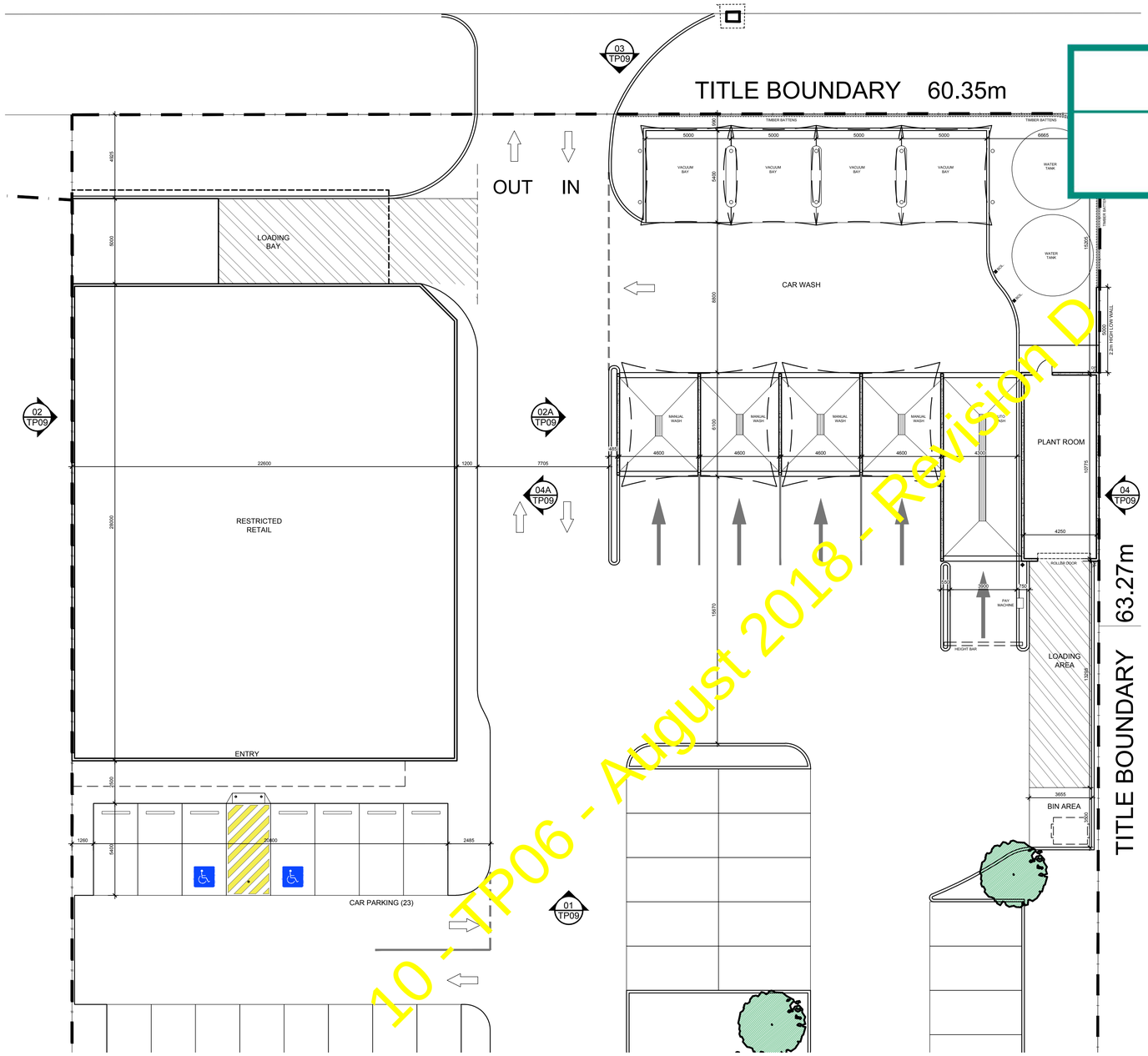
CLIENT
PROCON DEVELOPMENTS PTY LTD

| DATE | SCALE @ A1 | NORTH |
|---|---|---|
| AUG.'18 | 1:100 | |
| DRAWN | CHECKED | |
| KM | AB | |
| ISSUE | | |
| PLANNING | | |

| PROJECT No. | DRAWING No. | REVISION No. | SHEET |
|---|---|---|---|
| 15316 | TP05 | B | 09of 18 |

0m 1m 2m 3m 4m
1:100 @ A1 SIZE / 1:200@ A3 SIZE

Town Planning
Not for construction








| REV | AMENDMENT DETAILS | BY | DATE |
|---|---|---|---|
| D | DIMENSIONS REVISED | JS | 09-11-18 |
| C | PLAN REVISED TO SUIT TP03 REV.L | JS | 08-11-18 |
| B | PLAN REVISED TO SUIT TP03 REV.G | KM | 24-08-18 |
| A | SERVICE CENTRE INTERNAL LAYOUT REVISED | JS | 06-07-18 |
| Ø | PLANNING ISSUE | JP | 08-05-18 |
| P1 | PRELIMINARY ISSUE | KM | 10-04-18 |

PROCON DEVELOPMENTS
www.procon.net.au

trg
BRISBANE + MELBOURNE
concept + design + interiors + project management
Level 3, Suite 37, 799 Springvale Road, Mulgrave, Victoria 3170 Australia
T: +61 3 9542 9300 F: +61 3 9542 9310
www.trg-aus.com
The Retail Group Pty Ltd ABN 85 050 134 686
RBP No. DP-AD1689



PROJECT
PROPOSED MIXED USE DEVELOPEMENT

PROJECT ADDRESS
3 LARSEN ROAD

BYFORD
WA 6122

DRAWING TITLE
PROPOSED FLOOR PLAN - CAR WASH & RETAIL

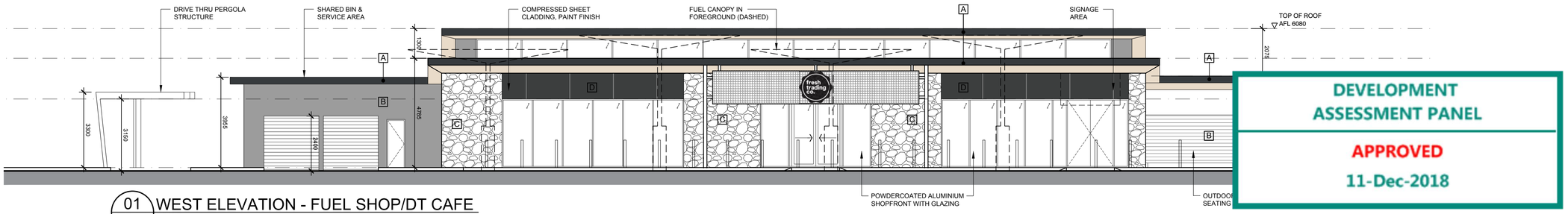
CLIENT
PROCON DEVELOPMENTS PTY LTD

| DATE | SCALE @ A1 | NORTH |
|---|---|---|
| AUG.'18 | 1:150 | |
| DRAWN | CHECKED | |
| KM | AB | |
| ISSUE | | |
| PLANNING | | |

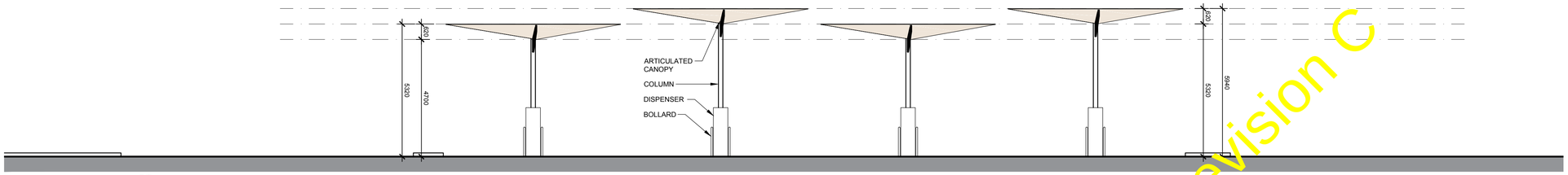
| PROJECT No. | DRAWING No. | REVISION No. | SHEET |
|---|---|---|---|
| 15316 | TP06 | D | 10of 18 |

Town Planning
Not for construction

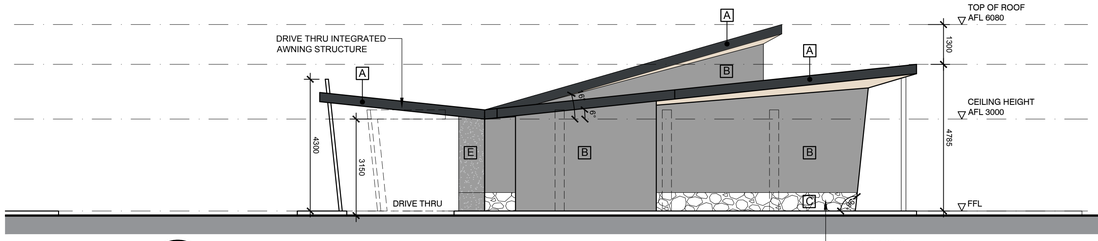
0m 1.5m 3m 4.5m 6m
1:150 @ A1 SIZE / 1:300@ A3 SIZE



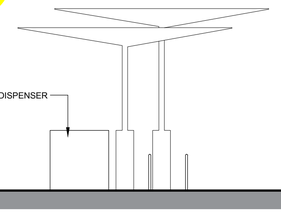

01 TP04 WEST ELEVATION - FUEL SHOP/DT CAFE
SCALE 1:100

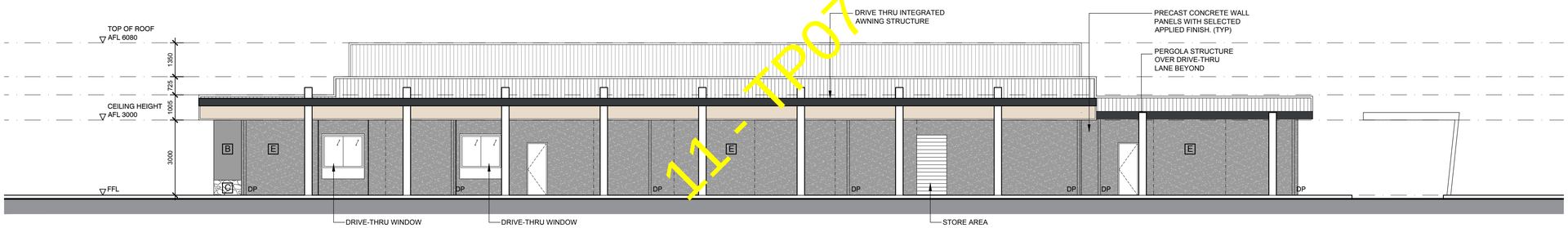



01A TP04 WEST ELEVATION - FUEL & DIESEL CANOPY
SCALE 1:100

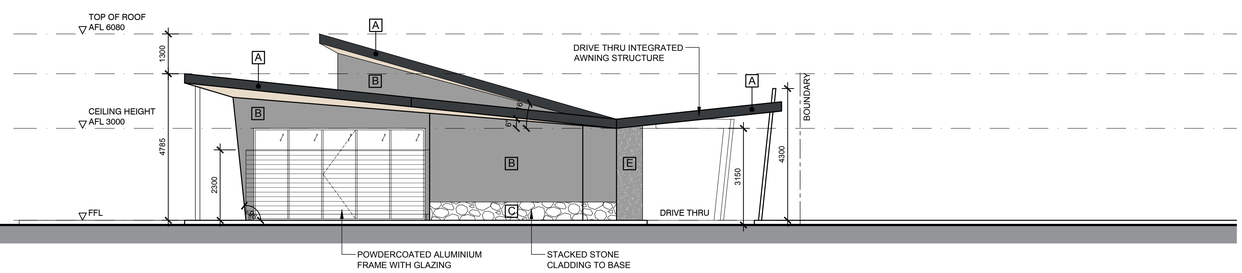



02 TP04 NORTH ELEVATION - DT CAFE (LARSEN RD)
SCALE 1:100




03 TP04 EAST ELEVATION - FUEL SHOP/DT CAFE (STH WESTERN HWY)
SCALE 1:100




04 TP04 SOUTH ELEVATION - FUEL SHOP
SCALE 1:100

## EXTERNAL COLOUR SCHEDULE

| | | |
|---|---|---|
| A | PAINT FINISH, DULUX 'CHARCOAL' |
| B | PAINT FINISH, DULUX 'NATURAL STONE' |
| C | STAKED STONE CLADDING |
| D | ALUCOBOND CLADDING, 'GREY BROWN' |
| E | TEXTURED PAINT FINISH, DULUX 'SILKWORT' |
| F | PAINT FINISH, CONCRETE PANEL LOOK |
| G | PAINT FINISH, 'BRIDGESTONE RED' |
| H | METAL CLADDING, PAINT FINISH COLORBOND 'SURFMIST' |
| J | PAINT FINISH DULUX 'ZEUS WHITE' GLOSS |

**DEVELOPMENT ASSESSMENT PANEL**

**APPROVED**

**11-Dec-2018**

| REV | AMENDMENT DETAILS | BY | DATE |
|---|---|---|---|
| C | PLAN REVISED TO SUIT TP03 REV.L | JS | 08-11-18 |
| B | PLAN REVISED TO SUIT TP03 REV.G | KM | 24-08-18 |
| A | ELEVATIONS REVISED TO SUIT PLAN | KM | 06-07-18 |
| Ø | PLANNING ISSUE | JP | 08-05-18 |
| P1 | PRELIMINARY ISSUE | KM | 10-04-18 |

PROCON DEVELOPMENTS
www.procon.net.au

trg
BRISBANE + MELBOURNE

concept + design + interiors + project management

Level 3, Suite 37, 799 Springvale Road, Mulgrave, Victoria 3170 Australia
T: +61 3 9542 9300 F: +61 3 9542 9310
www.trg-aus.com
The Retail Group Pty Ltd ABN 85 050 134 686
RBP No. DP-AD1689



PROJECT
PROPOSED MIXED USE DEVELOPEMENT

PROJECT ADDRESS
3 LARSEN ROAD

BYFORD
WA 6122

DRAWING TITLE
PROPOSED ELEVATIONS - FUEL SHOP & CANOPY

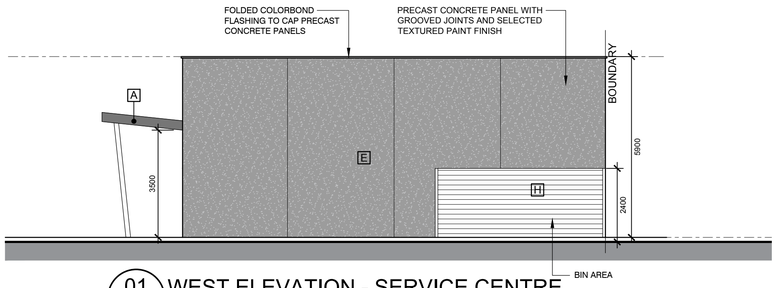
CLIENT
PROCON DEVELOPMENTS

| | | |
|---|---|---|
| DATE: AUG. '18 | SCALE @ A1: 1:100 | NORTH |
| DRAWN: KM | CHECKED: AB | |
| ISSUE: PLANNING | | |

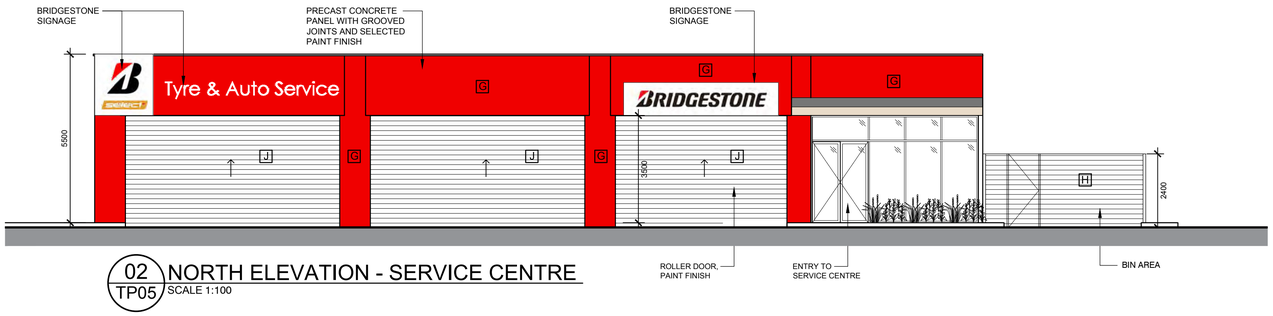
| PROJECT No. | DRAWING No. | REVISION No. | SHEET |
|---|---|---|---|
| 15316 | TP07 | C | 11of 18 |

0m 1m 2m 3m 4m
1:100 @ A1 SIZE / 1:200@ A3 SIZE

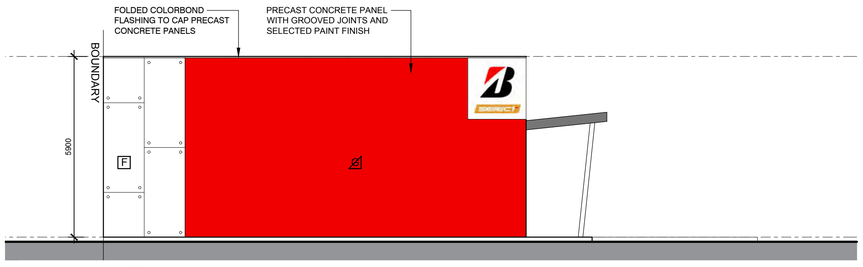
Town Planning
Not for construction



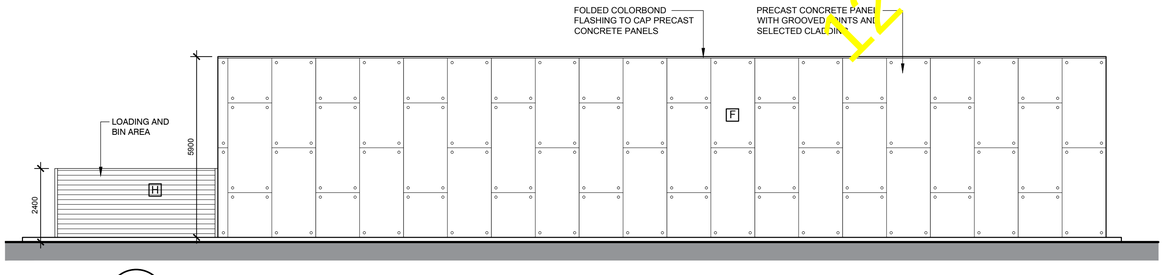

01 TP05 WEST ELEVATION - SERVICE CENTRE
SCALE 1:100




02 TP05 NORTH ELEVATION - SERVICE CENTRE
SCALE 1:100




03 TP05 EAST ELEVATION - SERVICE CENTRE
SCALE 1:100




04 TP05 SOUTH ELEVATION - SERVICE CENTRE
SCALE 1:100

## EXTERNAL COLOUR SCHEDULE

- A PAINT FINISH, DULUX 'CHARCOAL'
- RAL STONE'
- EY BROWN'
- ULUX 'SILKWORT'
- ANEL LOOK
- E RED'
- H METAL CLADDING, PAINT FINISH COLORBOND 'SURFMIST'
- J PAINT FINISH DULUX 'ZEUS WHITE' GLOSS

DEVELOPMENT ASSESSMENT PANEL
APPROVED
11-Dec-2018



| REV | AMENDMENT DETAILS | BY | DATE |
|---|---|---|---|
| B | PLAN REVISED TO SUIT TP03 REV.L | JS | 08-11-18 |
| A | PLAN REVISED TO SUIT TP03 REV.G | KM | 24-08-18 |
| Ø | PLANNING ISSUE | JP | 08-05-18 |
| P2 | CAR WASH REVISED. STAINLESS STEEL WIRE ADDED | JS | 17-04-18 |
| P1 | PRELIMINARY ISSUE | KM | 05-04-18 |

PROCON DEVELOPMENTS
www.procon.net.au

trg
BRISBANE + MELBOURNE

concept + design + interiors + project management

Level 3, Suite 37, 799 Springvale Road, Mulgrave, Victoria 3170 Australia
T: +61 3 9542 9300 F: +61 3 9542 9310
www.trg-aus.com
The Retail Group Pty Ltd ABN 85 050 134 686
RBP No. DP-AD1689



PROJECT
PROPOSED MIXED USE DEVELOPEMENT

PROJECT ADDRESS
3 LARSEN ROAD

BYFORD
WA 6122

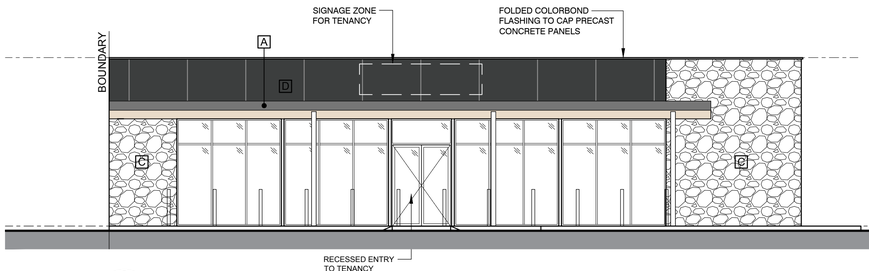
DRAWING TITLE
PROPOSED ELEVATIONS - SERVICE CENTRE

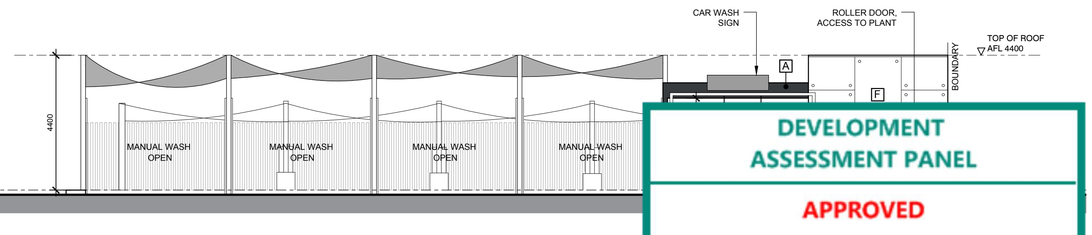
CLIENT
PROCON DEVELOPMENTS

| DATE | SCALE @ A1 | NORTH | |
|---|---|---|---|
| AUG. '18 | 1:100 | | |
| DRAWN | CHECKED | | |
| KM | AB | | |
| ISSUE | | | |
| PLANNING | | | |
| PROJECT No. | DRAWING No. | REVISION No. | SHEET |
| 15316 | TP08 | B | 12of 18 |

Town Planning
Not for construction

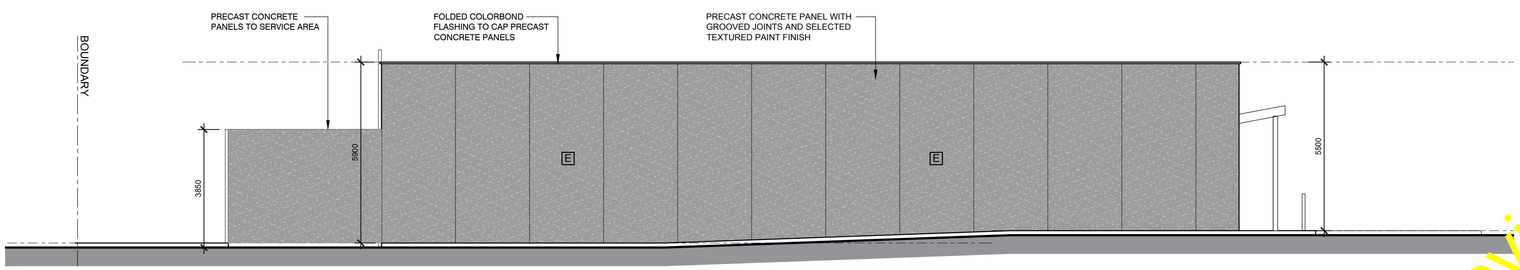
0m 1m 2m 3m 4m
1:100 @ A1 SIZE / 1:200@ A3 SIZE




01 TP06 EAST ELEVATION - RETAIL TENANCY/CAR WASH
SCALE 1:100

DEVELOPMENT ASSESSMENT PANEL
APPROVED
11-Dec-2018

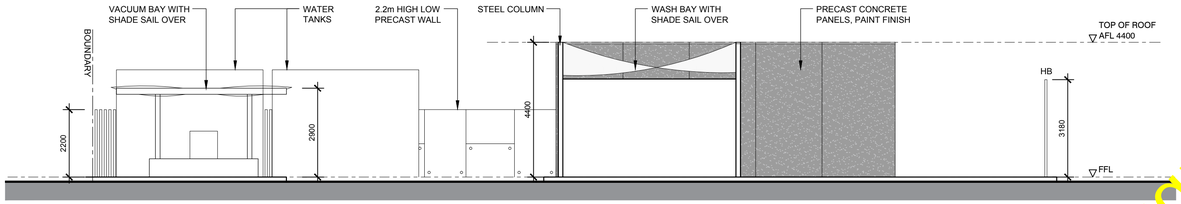



02 TP06 SOUTH ELEVATION - RETAIL TENANCY
SCALE 1:100

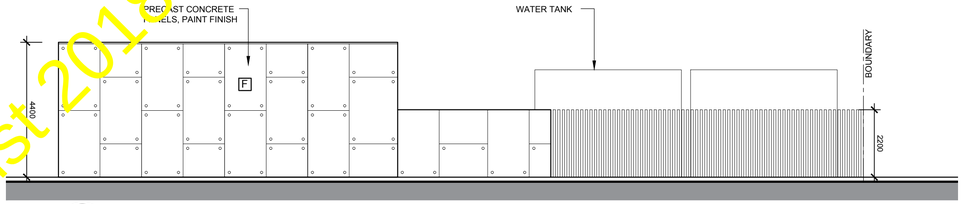
## EXTERNAL COLOUR SCHEDULE

| | | |
|---|---|---|
| A | PAINT FINISH, DULUX 'CHARCOAL' |
| B | PAINT FINISH, DULUX 'NATURAL STONE' |
| C | STAKED STONE CLADDING |
| D | ALUCOBOND CLADDING, 'GREY BROWN' |
| E | TEXTURED PAINT FINISH, DULUX 'SILKWORT' |
| F | PAINT FINISH, CONCRETE PANEL LOOK |
| G | PAINT FINISH, 'BRIDGESTONE RED' |
| H | METAL CLADDING, PAINT FINISH COLORBOND 'SURFMIST' |
| J | PAINT FINISH DULUX 'ZEUS WHITE' GLOSS |

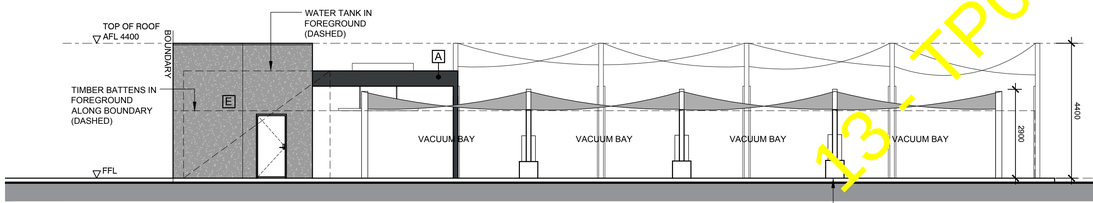
| REV | AMENDMENT DETAILS | BY | DATE |
|---|---|---|---|
| D | PLAN REVISED TO SUIT TP03 REV.M | JS | 09-11-18 |
| C | PLAN REVISED TO SUIT TP03 REV.L | JS | 08-11-18 |
| B | PLAN REVISED TO SUIT TP03 REV.G | KM | 24-08-18 |
| A | ELEVATIONS REVISED TO SUIT PLAN & FINISHES REVISED. BRIDGESTONE SIGNAGE & DOWNPIPE ADDED | JS | 06-07-18 |
| Ø | PLANNING ISSUE | JP | 08-05-18 |
| P2 | STAINLESS STEEL WIRE ADDED | JS | 17-04-18 |
| P1 | PRELIMINARY ISSUE | KM | 05-04-18 |



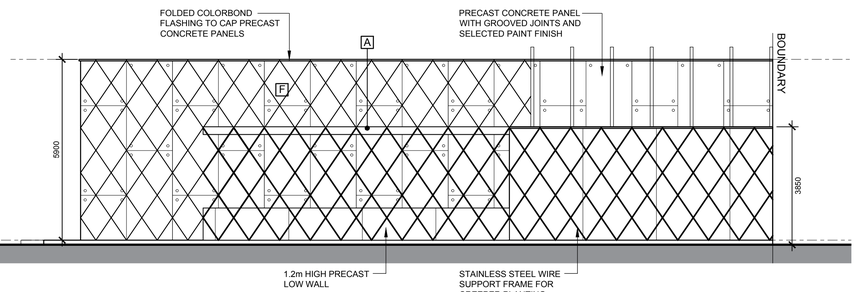

02A TP06 SOUTH ELEVATION - CAR WASH
SCALE 1:100

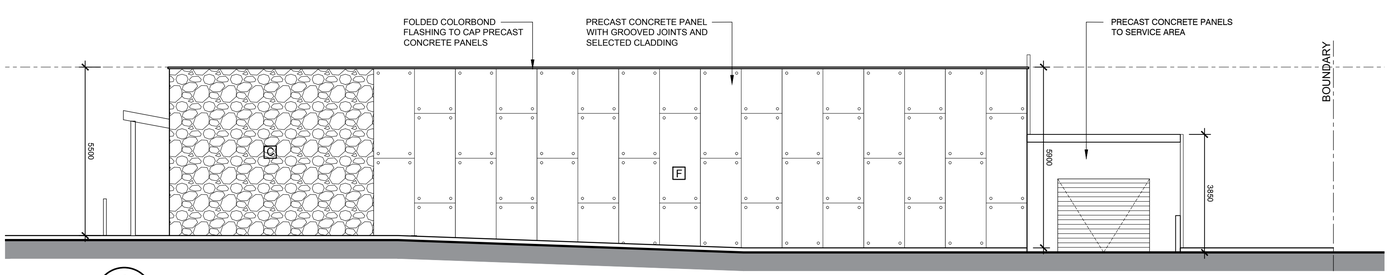



04 TP06 NORTH ELEVATION - CAR WASH
SCALE 1:100




03 TP06 WEST ELEVATION - CAR WASH/RETAIL TENANCY (GEORGE ST)
SCALE 1:100




04A TP06 NORTH ELEVATION - RETAIL TENANCY
SCALE 1:100



Town Planning
Not for construction

0m 1m 2m 3m 4m
1:100 @ A1 SIZE / 1:200@ A3 SIZE

PROCON DEVELOPMENTS
www.procon.net.au

trg
BRISBANE + MELBOURNE

concept + design + interiors + project management
Level 3, Suite 37, 799 Springvale Road, Mulgrave, Victoria 3170 Australia
T: +61 3 9542 9300 F: +61 3 9542 9310
www.trg-aus.com
The Retail Group Pty Ltd ABN 85 050 134 686
RBP No. DP-AD1689



PROJECT
PROPOSED MIXED USE DEVELOPEMENT

PROJECT ADDRESS
3 LARSEN ROAD

BYFORD
WA 6122

DRAWING TITLE
PROPOSED ELEVATIONS - CAR WASH & RETAIL

CLIENT
PROCON DEVELOPMENTS

| DATE | SCALE @ A1 | NORTH |
|---|---|---|
| AUG. '18 | 1:100 | |
| DRAWN | CHECKED | |
| KM | AB | |
| ISSUE | | |
| PLANNING | | |

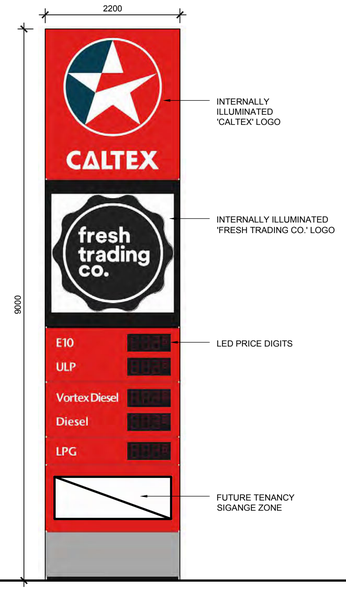
| PROJECT No. | DRAWING No. | REVISION No. | SHEET |
|---|---|---|---|
| 15316 | TP09 | D | 13of 18 |



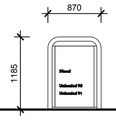


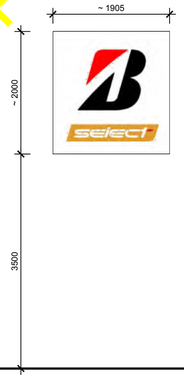

| REV | AMENDMENT DETAILS | BY | DATE |
|---|---|---|---|
| D | PLAN REVISED TO SUIT TP03 REV.M | JS | 09-11-18 |
| C | PLAN REVISED TO SUIT TP03 REV.L | JS | 08-11-18 |
| B | PLAN REVISED TO SUIT TP03 REV.G | KM | 24-08-18 |
| A | PLAN REVISED TO SUIT TP03 REV.B. BRIDGESTONE SIGNAGE ADDED | JS | 06-07-18 |
| Ø | PLANNING ISSUE | JP | 08-05-18 |

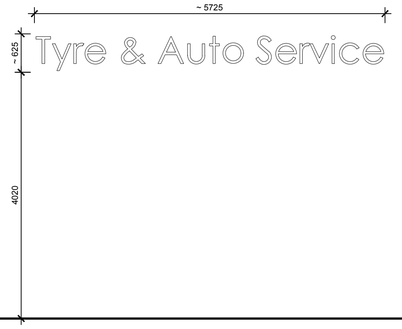
PROCON DEVELOPMENTS
www.procon.net.au

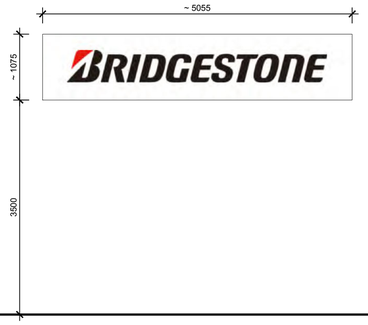







01 - SIGN 01 SCALE 1:50
PROPOSED 9m HIGH COMBINED PRICE SIGN & PYLON SIGN

02 - SIGN 02 SCALE 1:50
SHOP FASCIA SIGNAGE 'FRESH TRADING CO.' LOGO

03 - SIGN 03 SCALE 1:50
FUEL DISPENSER LEADERBOARD

04 - SIGN 04 SCALE 1:50
INTERNALLY ILLUMINATED BRIDGESTONE SIGNAGE

05 - SIGN 05 SCALE 1:50
NON-ILLUMINATED SIGNAGE

06 - SIGN 06 SCALE 1:50
NON-ILLUMINATED SIGNAGE

Town Planning
Not for construction

0m .5m 1m 1.5m 2m
1:50 @ A1 SIZE / 1:100@ A3 SIZE

trg
BRISBANE + MELBOURNE

concept + design + interiors + project management

Level 3, Suite 37, 799 Springvale Road, Mulgrave, Victoria 3170 Australia
T: +61 3 9542 9300 F: +61 3 9542 9310
www.trg-aus.com
The Retail Group Pty Ltd ABN 85 050 134 686
RBP No. DP-AD1689



PROJECT
PROPOSED MIXED USE DEVELOPMENT

PROJECT ADDRESS
3 LARSEN ROAD

BYFORD
WA 6122

DRAWING TITLE
SIGNAGE PLAN

CLIENT
PROCON DEVELOPMENTS

| DATE | SCALE @ A1 | NORTH |
|---|---|---|
| AUG. '18 | 1:50 | |
| DRAWN | CHECKED | |
| KM | AB | |
| ISSUE | | |
| PLANNING | | |

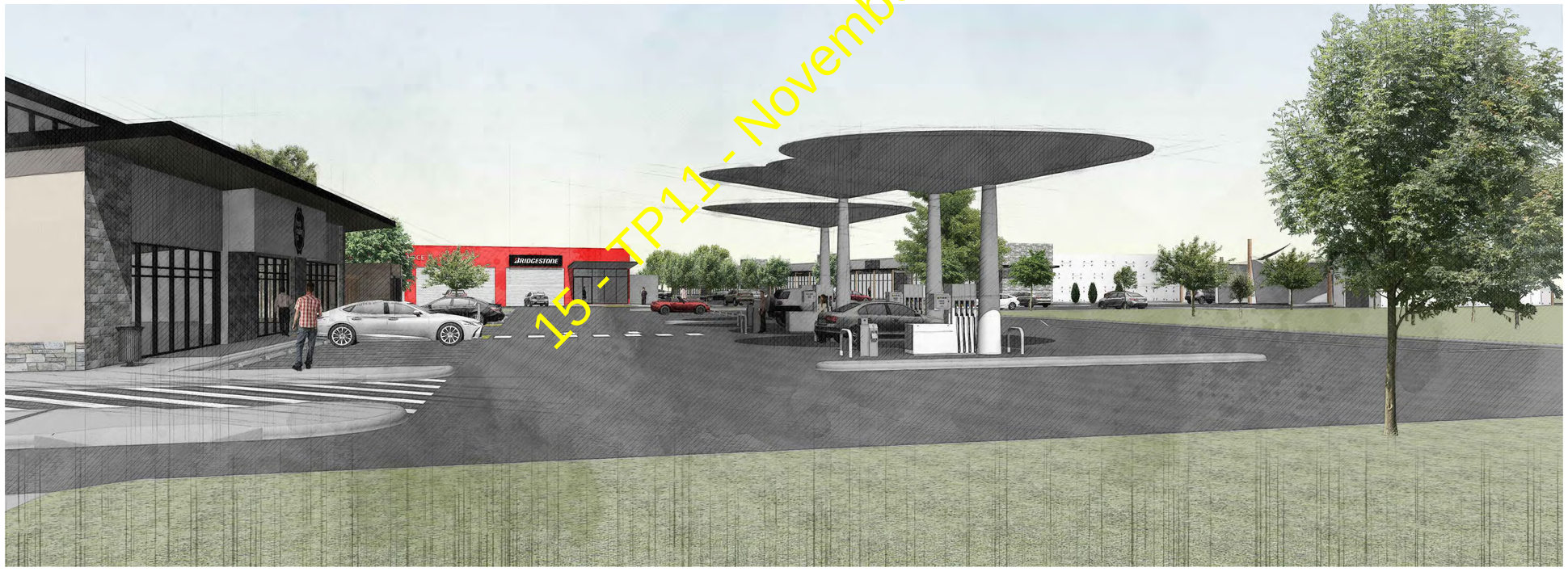
| PROJECT No. | DRAWING No. | REVISION No. | SHEET |
|---|---|---|---|
| 15316 | TP10 | D | 14of 18 |

DEVELOPMENT ASSESSMENT PANEL

APPROVED

11-Dec-2018

1A - VIEW FROM LARSEN ROAD LOOKING EAST TOWARDS THE FUEL SHOP




2A - VIEW LOOKING SOUTH TOWARDS THE FUEL SHOP & SERVICE CENTRE



Town Planning
Not for construction

| REV | AMENDMENT DETAILS | BY | DATE |
|---|---|---|---|
| A | PLANNING ISSUE | TC | 08-11-18 |
| Ø | PLANNING ISSUE | TC | 08-05-18 |
| P1 | PRELIMINARY ISSUE | KM | 05-04-18 |

PROCON DEVELOPMENTS
www.procon.net.au

trg
BRISBANE + MELBOURNE
concept + design + interiors + project management
Level 3, Suite 37, 799 Springvale Road, Mulgrave, Victoria 3170 Australia
T: +61 3 9542 9300 F: +61 3 9542 9310
www.trg-aus.com
The Retail Group Pty Ltd ABN 85 050 134 686
RBP No. DP-AD1689



PROJECT
PROPOSED MIXED USE DEVELOPEMENT

PROJECT ADDRESS
3 LARSEN ROAD

BYFORD
WA 6122

DRAWING TITLE
PROPOSED 3D VIEWS

CLIENT
PROCON DEVELOPMENTS

| DATE | SCALE @ A1 | NORTH | |
|---|---|---|---|
| NOV. '18 | NTS | | |
| DRAWN | CHECKED | | |
| TC | AB | | |
| ISSUE | | | |
| PLANNING | | | |
| PROJECT No. | DRAWING No. | REVISION No. | SHEET |
| 15316 | TP11 | A | 15of 18 |

DEVELOPMENT ASSESSMENT PANEL

APPROVED

11-Dec-2018

16 - TP12 - November 2018 - Revision A

1A - VIEW FROM GEORGE STREET LOOKING NORTH TOWARDS THE CARWASH

2A - VIEW FROM GEORGE STREET LOOKING SOUTH TOWARDS THE CARWASH

Town Planning
Not for construction

| REV | AMENDMENT DETAILS | BY | DATE |
|---|---|---|---|
| A | PLANNING ISSUE | TC | 08-11-18 |
| Ø | PLANNING ISSUE | TC | 08-05-18 |
| P1 | PRELIMINARY ISSUE | KM | 05-04-18 |

PROCON DEVELOPMENTS
www.procon.net.au

trg
BRISBANE + MELBOURNE

concept + design + interiors + project management

Level 3, Suite 37, 799 Springvale Road,
Mulgrave, Victoria 3170 Australia

T: +61 3 9542 9300 F: +61 3 9542 9310

www.trg-aus.com
The Retail Group Pty Ltd ABN 85 050 134 686

RBP No. DP-AD1689



PROJECT
PROPOSED MIXED USE DEVELOPEMENT

PROJECT ADDRESS
3 LARSEN ROAD

BYFORD
WA 6122

DRAWING TITLE
PROPOSED 3D VIEWS

CLIENT
PROCON DEVELOPMENTS

| DATE | SCALE @ A1 | NORTH | |
|---|---|---|---|
| NOV. '18 | NTS | | |
| DRAWN | CHECKED | | |
| TC | AB | | |
| ISSUE | | | |
| PLANNING | | | |
| PROJECT No. | DRAWING No. | REVISION No. | SHEET |
| 15316 | TP12 | A | 16of 18 |


DEVELOPMENT ASSESSMENT PANEL

APPROVED

11-Dec-2018

1A / - VIEW FROM SOUTH WESTERN HIGHWAY LOOKING NORTH-WEST TOWARDS THE SERVICE CENTRE


2A / - VIEW FROM SOUTH WESTERN HIGHWAY LOOKING SOUTH-WEST TOWARDS THE FUEL SHOP





| REV | AMENDMENT DETAILS | BY | DATE |
|---|---|---|---|
| A | PLANNING ISSUE | TC | 08-11-18 |
| Ø | PLANNING ISSUE | TC | 08-05-18 |

PROCON DEVELOPMENTS
www.procon.net.au

trg
BRISBANE + MELBOURNE
concept + design + interiors + project management
Level 3, Suite 37, 799 Springvale Road, Mulgrave, Victoria 3170 Australia
T: +61 3 9542 9300 F: +61 3 9542 9310
www.trg-aus.com
The Retail Group Pty Ltd ABN 85 050 134 686
RBP No. DP-AD1689



PROJECT
PROPOSED MIXED USE DEVELOPEMENT

PROJECT ADDRESS
3 LARSEN ROAD

BYFORD
WA 6122

DRAWING TITLE
PROPOSED 3D VIEW BUILDING & CANOPY

CLIENT
PROCON DEVELOPMENTS

| DATE | SCALE @ A1 | NORTH | |
|---|---|---|---|
| NOV. '18 | NTS | | |
| DRAWN | CHECKED | | |
| TC | AB | | |
| ISSUE | | | |
| PLANNING | | | |
| PROJECT No. | DRAWING No. | REVISION No. | SHEET |
| 15316 | TP13 | A | 17of 18 |

DEVELOPMENT ASSESSMENT PANEL

APPROVED

11-Dec-2018



1A - VIEW FROM THE CARPARK LOOKING NORTH-EAST TOWARDS THE FUEL SHOP



2A - VIEW FROM LARSEN ROAD LOOKING SOUTH-EAST TOWARDS THE FUEL SHOP



| REV | AMENDMENT DETAILS | BY | DATE |
|---|---|---|---|
| A | PLANNING ISSUE | TC | 08-11-18 |
| Ø | PLANNING ISSUE | TC | 08-05-18 |

PROCON DEVELOPMENTS
www.procon.net.au

trg
BRISBANE + MELBOURNE
concept + design + interiors + project management
Level 3, Suite 37, 799 Springvale Road, Mulgrave, Victoria 3170 Australia
T: +61 3 9542 9300 F: +61 3 9542 9310
www.trg-aus.com
The Retail Group Pty Ltd ABN 85 050 134 686
RBP No. DP-AD1689



PROJECT
PROPOSED MIXED USE DEVELOPEMENT

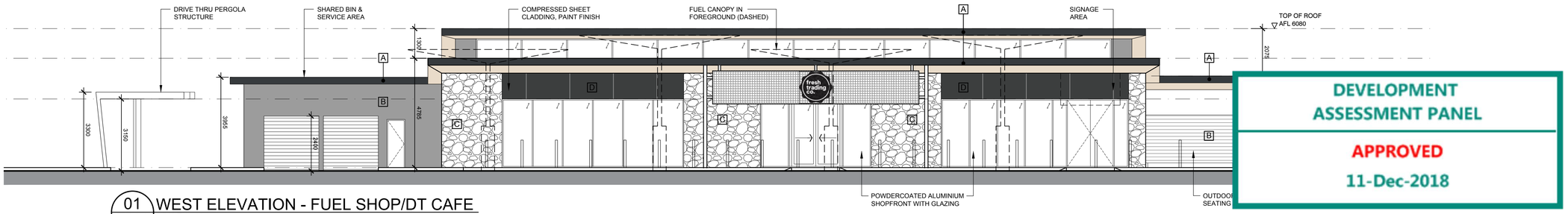
PROJECT ADDRESS
3 LARSEN ROAD

BYFORD
WA 6122

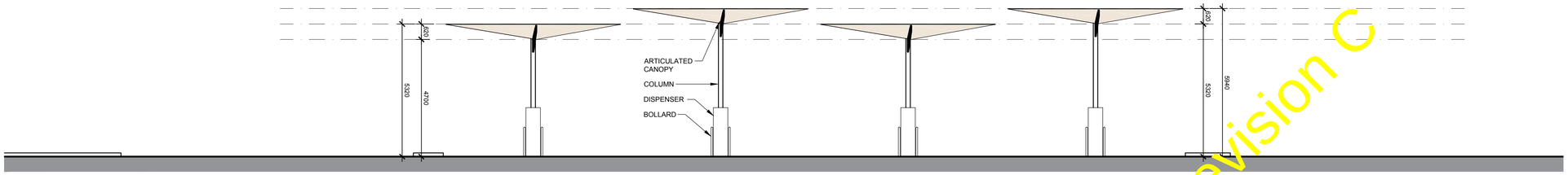
DRAWING TITLE
PROPOSED 3D VIEW BUILDING & CANOPY

CLIENT
PROCON DEVELOPMENTS

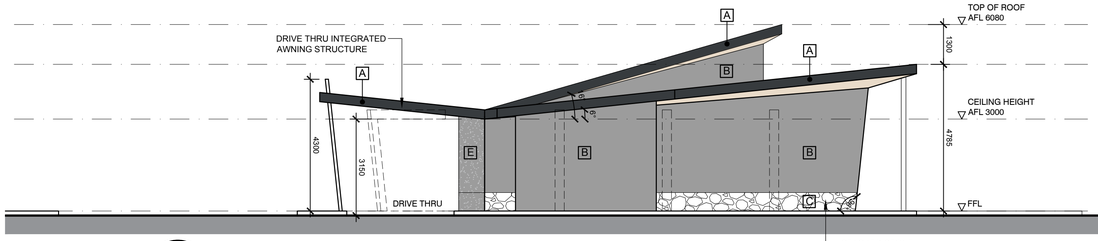
| DATE | SCALE @ A1 | NORTH | |
|---|---|---|---|
| NOV. '18 | NTS | | |
| DRAWN | CHECKED | | |
| TC | AB | | |
| ISSUE | | | |
| PLANNING | | | |
| PROJECT No. | DRAWING No. | REVISION No. | SHEET |
| 15316 | TP14 | A | 18of 18 |



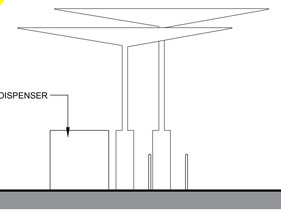

01 TP04 WEST ELEVATION - FUEL SHOP/DT CAFE
SCALE 1:100

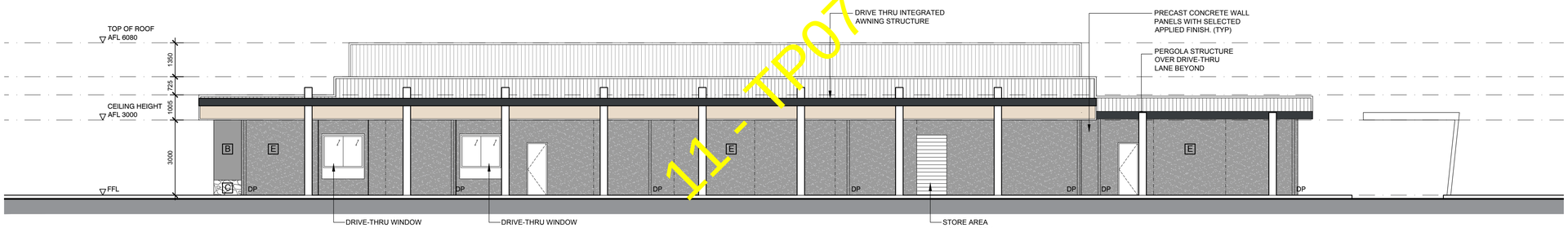



01A TP04 WEST ELEVATION - FUEL & DIESEL CANOPY
SCALE 1:100

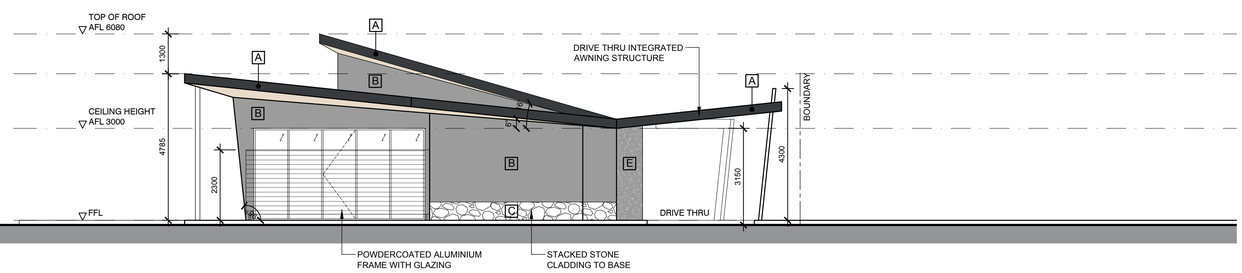



02 TP04 NORTH ELEVATION - DT CAFE (LARSEN RD)
SCALE 1:100




03 TP04 EAST ELEVATION - FUEL SHOP/DT CAFE (STH WESTERN HWY)
SCALE 1:100




04 TP04 SOUTH ELEVATION - FUEL SHOP
SCALE 1:100

## EXTERNAL COLOUR SCHEDULE

| | | |
|---|---|---|
| A | PAINT FINISH, DULUX 'CHARCOAL' |
| B | PAINT FINISH, DULUX 'NATURAL STONE' |
| C | STAKED STONE CLADDING |
| D | ALUCOBOND CLADDING, 'GREY BROWN' |
| E | TEXTURED PAINT FINISH, DULUX 'SILKWORT' |
| F | PAINT FINISH, CONCRETE PANEL LOOK |
| G | PAINT FINISH, 'BRIDGESTONE RED' |
| H | METAL CLADDING, PAINT FINISH COLORBOND 'SURFMIST' |
| J | PAINT FINISH DULUX 'ZEUS WHITE' GLOSS |

**DEVELOPMENT ASSESSMENT PANEL**

**APPROVED**

**11-Dec-2018**

| REV | AMENDMENT DETAILS | BY | DATE |
|---|---|---|---|
| C | PLAN REVISED TO SUIT TP03 REV.L | JS | 08-11-18 |
| B | PLAN REVISED TO SUIT TP03 REV.G | KM | 24-08-18 |
| A | ELEVATIONS REVISED TO SUIT PLAN | KM | 06-07-18 |
| Ø | PLANNING ISSUE | JP | 08-05-18 |
| P1 | PRELIMINARY ISSUE | KM | 10-04-18 |

PROCON DEVELOPMENTS
www.procon.net.au

trg
BRISBANE + MELBOURNE

concept + design + interiors + project management

Level 3, Suite 37, 799 Springvale Road, Mulgrave, Victoria 3170 Australia
T: +61 3 9542 9300 F: +61 3 9542 9310
www.trg-aus.com
The Retail Group Pty Ltd ABN 85 050 134 686
RBP No. DP-AD1689



PROJECT
PROPOSED MIXED USE DEVELOPEMENT

PROJECT ADDRESS
3 LARSEN ROAD

BYFORD
WA 6122

DRAWING TITLE
PROPOSED ELEVATIONS - FUEL SHOP & CANOPY

CLIENT
PROCON DEVELOPMENTS

| | | |
|---|---|---|
| DATE: AUG. '18 | SCALE @ A1: 1:100 | NORTH |
| DRAWN: KM | CHECKED: AB | |
| ISSUE: PLANNING | | |

| PROJECT No. | DRAWING No. | REVISION No. | SHEET |
|---|---|---|---|
| 15316 | TP07 | C | 11of 18 |

0m 1m 2m 3m 4m
1:100 @ A1 SIZE / 1:200@ A3 SIZE

Town Planning
Not for construction

Application for Planning Approval

# Proposed Service Station, Car Wash, Tyre Centre & Showrooms

Lot 104 (#3) Larsen Road, Byford

Shire of Serpentine-Jarrahdale / Metro East JDAP

Application for Planning Approval

# Proposed Service Station, Car Wash, Tyre Centre & Showrooms

Lot 104 (#3) Larsen Road, Byford

Shire of Serpentine-Jarrahdale / Metro East JDAP

Prepared by:

**PETER WEBB & ASSOCIATES**

PO Box 920
SUBIACO WA 6904

T: (08) 9388 7111
F: (08) 9388 7240
E: nik@webbplan.com.au

Principal: Mr Nik Hidding
Job Number: C2145
Version / Date: Final – 10 May 2018

PETER D WEBB AND ASSOCIATES
CONSULTANTS IN TOWN PLANNING AND URBAN DESIGN

Prepared for:

**BYFORD DEVELOPMENT No. 3 PTY LTD**

PO Box 522
KILSYTH VIC 3137

# 1.0 INTRODUCTION

This report has been prepared by Peter Webb & Associates (PWA) on behalf of *Byford Development No. 3 Pty Ltd* as part of an Application for Planning Approval for the development and use of Lot 104 (#3) Larsen Road, Byford (the Subject Site). This Application proposes the land uses of "Service Station", "Automotive Vehicle Wash", "Industry-Service" (Tyre Centre) and "Showroom" (x2) on the Subject Site.

This report considers the planning context of the proposed development and provides an assessment of the application against the relevant State and local planning framework. The information contained in this report confirms that the proposed uses are appropriate for the site and reflects the applicable planning framework.

## 1.1 Joint Development Assessment Panel (JDAP) Determination

As the anticipated construction cost of the project is **$4.95 million**, the Applicant has "opted in" to the Development Assessment Panel (DAP) process and therefore, this Development Application will be required to be determined by the Metro-East Joint Development Assessment Panel (JDAP).

Accordingly, please find ***attached*** our completed Shire of Serpentine-Jarrahdale Application for Development Approval Form, MRS Form 1 and DAP Form 1, all signed by the director of *Byford Development No. 3 Pty Ltd* (the landowner).

The following reports/plans are appended to this report in support of the application:

- Transport Impact Assessment (TIA) – *i3 Consultants*
- Tree Survey Report – *Paperbark Technologies Pty Ltd*
- Landscaping Plan – *Urban Retreat Garden Design*
- Stormwater Management Plan – *Procon Developments*

# 2.0 OVERVIEW & SITE LOCATION

## 2.1 Overview

| | | |
|---|---|---|
| **Applicant:** | | Peter Webb & Associates (PWA) |
| **Designer:** | | TRG |
| **Landowner:** | | Byford Development No. 3 Pty Ltd |
| **Scheme:** | | Local Planning Scheme No. 2 (LPS 2) |
| **Zoning:** | LPS 2: | "Showroom/Warehouse" |
| | MRS: | "Urban" |
| **Current Use:** | | Vacant/Hardstands |
| **Lot Size:** | | 1.1635ha |
| **Proposed Uses:** | | "Service Station" |
| | | "Automotive Vehicle Wash" |
| | | "Industry-Service" (Tyre Centre) |
| | | "Showroom" |
| **Construction Cost:** | | $4.95 million |

## 2.2 Location

The subject site comprises Lot 104 (#3) Larsen Road, Byford which is located within the Shire of Serpentine-Jarrahdale, approximately 32km south-east of the Perth Central Business District and 8km south of the Armadale Town Centre. The subject site is located within the Byford Town Centre and is surrounded by a range of commercial and residential land uses.

A context plan showing the subject site and its surrounds is provided in **Figure 1**.

**Figure 1: Context Plan**

The site is located within the “Showroom/Warehouse” zone in the Shire of Serpentine-Jarrahdale Local Planning Scheme No. 2 (LPS 2).

The subject site is strategically located in the context of the expansion of the Byford Town Centre and is in a prominent location at the gateway to Byford.

## 2.3 Legal Description

This development application refers to Lot 104 (#3) Larsen Road, Byford, the details of which are provided in **Table 1** below

| Lot | Plan | Vol/Folio | Area | Address | Proprietor |
|---|---|---|---|---|---|
| 104 | 169930 | 1843/126 | 1.1635ha | 3 Larsen Road, Byford | Byford Development No. 3 Pty Ltd |

**Table 1: Legal Description**

The Certificate of Title for the subject site is attached at **Annexure 1**.

# 3.0 THE PROPOSAL

The proposed development is depicted on comprehensive Development Plans prepared by TRG (see **Annexure 2**). Artist Impressions of the proposed development are also provided to demonstrate the high quality nature of the development.

Byford has many local attributes which contribute to its unique character and identity. This proposal seeks to maintain Byford's character by proposing interesting built form and using materials that are reflective of the earlier traditional rural locality, whilst providing complementary land uses necessary to service the surrounding residential and commercial areas.

The development utilises the South Western Highway frontage as the primary access to the site (entry only). An exit-only crossover to Larsen Road is also proposed. Rear full-movement access to George Street is proposed, which provides opportunity for enhanced traffic distribution.

The proposal includes the establishment of Service Station, Automotive Vehicle Wash, Industry Service (Tyre Centre) and Showroom land uses. The design and layout of the proposed uses on the site has been specifically designed to ensure appropriate vehicle legibility across the site and between the proposed uses.

## 3.1 Service Station

The proposed Service Station is located at the north-eastern corner of the subject site fronting Larsen Road and South Western Highway. The Service Station consists of the following components:

- 432m$^2$ convenience store and associated café, outdoor seating area and drive thru;
- 8 filling point forecourt inclusive of high quality articulated canopy;
- 2 filling point truck facility inclusive of high quality articulated canopy;
- 9m high pylon sign adjacent to South Western Highway;
- Associated car parking bays;
- Loading bay;
- Underground fuel tanks

The design of this Service Station is quite different to standard service stations, which therefore provides a high quality amenity to customers and passers-by.

The design of the Service Station convenience store building will include a skillion roof, stacked stone cladding to visible walls, extensive glazing areas and earth coloured painted surfaces. The articulated fuel canopy structures also provide visual interest and functionality.

The drive thru (for takeaway coffee only) that 'wraps' around the western part of the convenience store building includes interesting pergola structures at the entrance to the drive thru. All of the western part of the drive thru area will be covered by the proposed integrated awning structure.

### 3.1.1 Hours of Operation & Staff

The proposed Service Station will be operated 24/7 to provide customers of the area with the ability to refuel and purchase a range of food, drink and associated items at all times. The café and drive through coffee outlet will operate between the hours of 5:00am and 9:00pm. This is a service which is currently in demand in this part Byford.

The operation will require a maximum of five (5) employees on site at any one time, with approximately 10 employment positions being created by the operation of the Service Station.

### 3.1.2 Convenience Store

The convenience store associated with the Service Station proposes to incorporate an internal area of 432m$^2$, which will include a point-of-sale and offer for sale of goods generally expected in a Service Station, including food and drink products and other associated items for the convenience of motorists, workers and residents in the area. The convenience store building will also provide a café and drive through coffee outlet and an outdoor seating area. The convenience store building will also include standard amenities and an adminstration office.

Pedestrians can access the convenience store building through a linked footpath to Larsen Road. There is also a bike rack for bike users near the entry to the convenience store building.

### 3.1.3 Fuel Types & Dispensing

The proposed Service Station will provide unleaded fuels (ULP, PULP95, PULP98), E10, LPG, and diesel. The dispensing arrangements are through standard bowsers, drawing from underground storage tanks.

### 3.1.4 Fuel Delivery & Storage

All fuel storage and delivery activities will be undertaken in a manner which complies with Australian Standard *1940 – The Storage and Handling of Combustible Liquids*. Fuel delivery will occur at a rate of one to two deliveries per week.

The proposed tanker swept path has been reviewed by i3 Consultants in its Transport Impact Assessment (TIA).

The fuel will be stored in two (2) underground horizontal cylindrical tanks with the tanks located in proximity to the main pump canopy.

### 3.1.5 Environmental Considerations

The risk of contamination and pollution of the local environment is considered minimal. Service Stations are a highly regulated land use and designers use industry best practices to minimise any fuel or other contaminant access to stormwater drains. Design, operational and management measures will include:

- The connection of washrooms and toilets to reticulated sewerage;
- The use of double-contained fuel storage tank systems with a leak monitoring space. Fuel tanks are also established in stable compacted soils;
- On-site retention and treatment of all stormwater using a using a SPEL Puraceptor Stormwater Treatment and Hydrocarbon Capture system;
- Vapour recovery systems compliant with the *Protection of the Environment Operation (Clean Air) Regulation* 2002 (NSW Guidance Document);
- Fuel spill kit compliant with the latest Australian Standards and Federal National Occupational Health and Safety Council (NOHSC Codes) or Practice that pertain to the handling, storage, clean-up and disposal of Dangerous Goods and Hazardous Substances: NOHSC: 2007(1994), 1005(1994), & 1015(2001) and AS/NZS 3816:1998, AS1940-2004, AS3780-1994, & AS2507-1998;
- Fuel distribution and leak detection infrastructure compliant with all the relevant Australian Standards, Regulations and Industry Best Practices.
- Site operators will be trained personnel to effectively handle incidents such as fuel and oil spills; and
- Equipment will be installed on site to use in the clean up of any fuel, oil or chemical spills.

## 3.2 Automotive Vehicle Wash

A car wash facility (under an Automotive Vehicle Wash land use) is located at the southern end of the site, adjacent to South Western Highway. The car wash facility will include one (1) fully automated wash bay, four (4) manual wash bays and four (4) vacuum bays. The wash facility includes shade sail canopies. The plant room will be a fully constructed building. Access to the car wash will be derived from the internal movement network.

### 3.2.1 Hours of Operation & Staff

The car wash will be operated 24/7 and is a fully automated system requiring limited attendance by the tenant (other than for cleaning and maintenance). Only one staff member will be required for cleaning and maintenance.

## 3.3 Tyre Centre

A tyre centre (under an “Industry Service” land use) is located along the southern boundary of the site, situated behind the car wash (as viewed from South Western Highway). The tyre centre building is 365m$^2$ in area and includes three (3) main roller doors on the northern side for access by vehicles to be fitted with new tyres. There is a reception area and office on the western side of this building.

There is forecourt area in front of the roller doors to allow for vehicles to be parked awaiting tyre fitment. There is a rear loading area and bin store behind the building. There is a car park with 43 car parking bays on the northern side of the tyre centre which will be shared by customers and staff of the two showroom uses and the tyre centre.

The tyre centre can be accessed directly from South Western Highway or George Street through the internal movement network.

### 3.3.1 Hours of Operation & Staff

The tyre centre will be operated during standard business hours of between 8:00am and 5:00pm Monday to Saturday, but it is likely that Saturday operating hours will finish around 1:00pm (at the discretion of the tenant). The tyre centre will not be operated on Sundays.

Approximately 15 staff members will be employed by the tyre centre, inclusive of technicians and administration staff.

## 3.4 Showroooms

Two showroom buildings are located along the western part of the site, adjacent to George Street. Tenancy 1 is 440m$^2$ in area and Tenancy 2 is 413m$^2$ in area. The showroom tenancies are typical of standard showrooms, with a large floorspace and central entry doors. The showroom tenancies are serviced with their own loading bays.

### 3.4.1 Hours of Operation & Staff

Each of the showrooms will be operated between the hours of 8:00am and 5:00pm on all days of the week, but it is likely that Saturday and Sunday operating hours will finish around 1:00pm (at the discretion of the tenant).

Each of the showroom uses will employ up to 10 staff members.

## 3.5 General

### 3.5.1 Access & Movement

Site access is principally from South Western Highway, allowing for safe and easy access for passing motorists. The crossover to South Western Highway (which will be through the modification of an existing crossover) will be an **entry-only** crossover.

Tanker movements into the site will be from the South Western Highway crossover and exit movements will be via the **exit-only** crossover to Larsen Road. Tanker movements associated with the site will only occur one to two times a week, at a non-peak time of the day.

The site also proposes full-movement vehicular access from George Street to provide for enhanced traffic distribution.

The site also provides opportunity for access across to the adjacent lot to the south (Lot 10) at a generally mid-point location, to assist with future site connectivity.

A Transport Impact Assessment (**Annexure 3**) has been prepared by i3 Consultants to support the proposed development. The design of the site has demonstrated that access requirements for both car and truck movement can be efficiently accommodated on this site, in accordance with both the Shire of Serpentine-Jarrahdale and Main Roads WA requirements.

### 3.5.2 On-Site Parking & Servicing

The proposed development has been provided with a total of 50 standard parking bays and 4 ACROD parking bays (total 54 car parking bays).

In addition, the site also includes four (4) standard fuel bowsers (servicing 8 light vehicles simultaneously).

Separate loading/unloading bays have been provided for each development component on the site (excluding the car wash).

### 3.5.3 Landscaping

The proposed extensive landscaping of the site will ensure that the development provides an attractive frontage and improves the visual amenity along South Western Highway and Larsen Road.

Extensive landscaping areas will be developed around the perimeter of the site and between each of the development components, totalling 2886m$^2$ (or **25% of the site area**) including the retention of 26 mature trees. 22 trees are proposed to be removed to facilitate the proposed development (and some are not in good health), however it is proposed to plant an additional 22 trees to account for the loss of existing ones.

In support of the application, a Tree Survey Report has been prepared by Paperbark Technologies Pty Ltd and is included at **Annexure 4**. This Tree Survey Report provides recommendations about the retention and removal of trees. The report satisfies the provisions of Clause 7.12 (Tree Preservation and Planting) of LPS 2.

A comprehensive Landscaping Plan has been prepared by Urban Retreat Garden Design for the site which is attached at **Annexure 5** which has accounted for the proposed trees to be retained and details additional landscape treatments and new trees.

### 3.5.4 Servicing

A Stormwater Management Plan (SWMP) has been prepared over the subject site in order to demonstrate the site can appropriately accommodate the stormwater generated by the proposal in the context of the local groundwater levels, topography of the land and amount of impervious surfaces proposed. This SWMP also confirms the ability for runoff associated with the fuel

forecourt to be contained. A copy of the SWMP prepared by Procon Developments is attached at **Annexure 6**. A Geotechnical Report will provided to the Shire within 2 weeks from the date of this submission.

Existing power and telecommunication infrastructure suggests the proposal can be readily serviced without major upgrade. The proposal is to be connected to reticulated sewer and water systems.

# 4.0 PLANNING ASSESSMENT

## 4.1 Metropolitan Region Scheme

The subject land is zoned "Urban" under the Metropolitan Region Scheme (MRS). The land fronts South Western Highway which is reserved under the MRS as a "Primary Regional Road".

## 4.2 Local Planning Scheme No. 2

### 4.2.1 Zoning

The subject land is zoned "Showroom/Warehouse" under the Shire of Serpentine-Jarrahdale Local Planning Scheme No. 2 (LPS 2). The subject land is adjacent to a Local Scheme Reserve for "Public and Community Purposes". An extract of the Scheme Map is included at **Figure 2**.

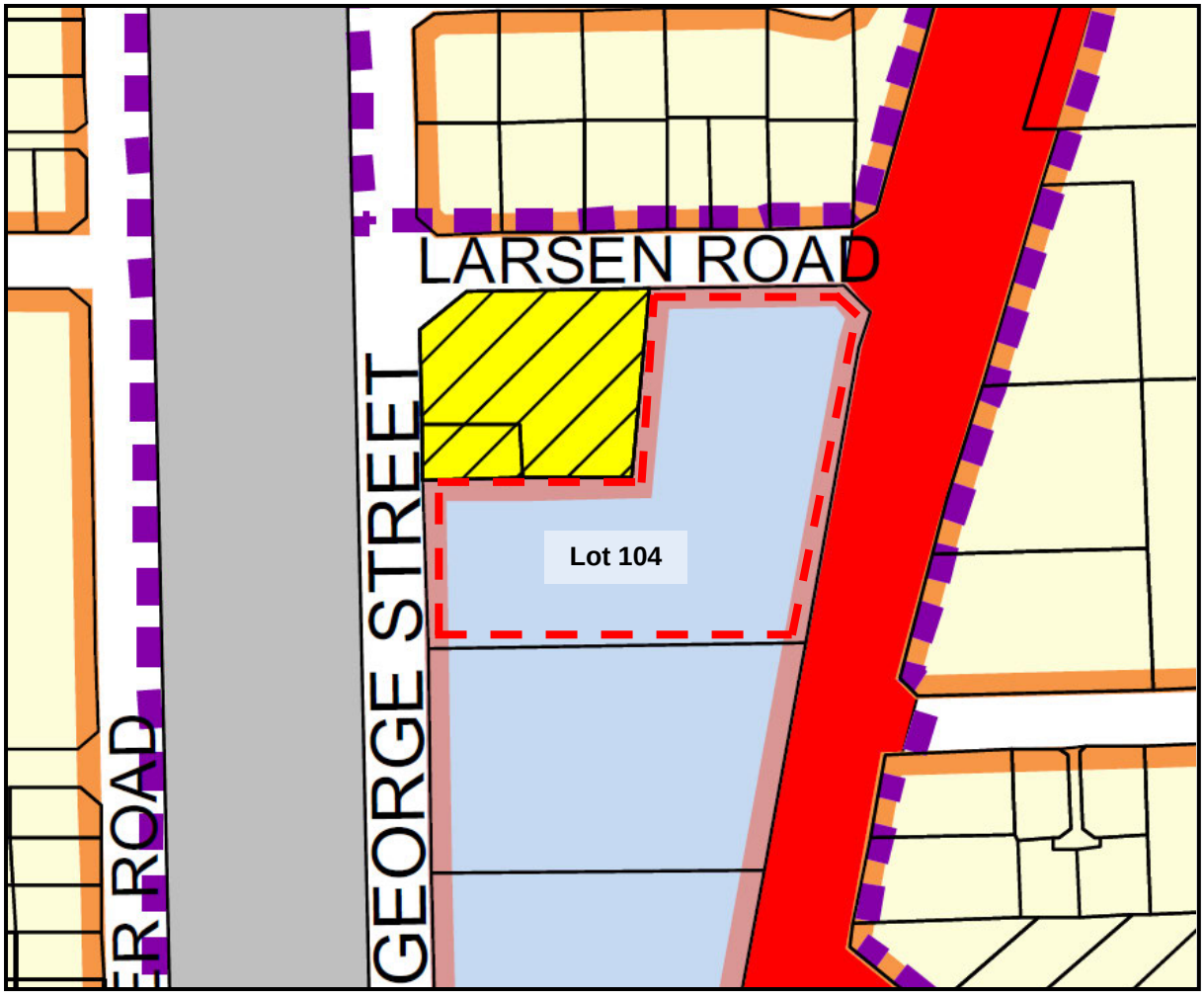



**Figure 2: LPS 2 Scheme Map Extract**

Clause 5.7.1 of LPS 2 states that, *"The purpose and intent of the Showroom Warehouse Zone is to provide for a range of commercially oriented uses with low traffic generating characteristics and dealing in goods of a bulky nature."*

Under LPS 2, the proposed uses fall under the following land use classifications:

***Service Station*** *- means land and buildings used for the supply of petroleum products and motor vehicle accessories and for carrying out greasing, tyre repairs and minor mechanical repairs and may include a cafeteria, restaurant or shop incidental to the primary use; but does not include a transport depot, panel beating, spray painting, major repairs or wrecking.*

***Automotive Vehicle Wash*** *– means a building or portion of a building wherein vehicles are washed and cleaned by or primarily by mechanical means.*

***Industry Service*** *– means a light industry carried out on land or in buildings which may have a retail shop front and from which goods manufactured on the premises may be sold; or land and buildings having a retail shop front and used as a depot for receiving goods to be serviced.*

***Showroom*** *– means land and buildings wherein goods are displayed and may be offered for sale by wholesale and/or by retail excluding the sale by retail of: foodstuffs, liquor or beverages, items of clothing or apparel, magazines, newspapers, books or paper products, medical or pharmaceutical products, china, glassware or domestic hardware, and items of personal adornment.*

The land use permissibility for each of the proposed uses is set out in **Table 2** below.

| Land Use | Zone | Use Class |
|---|---|---|
| **Service Station** | Highway Commercial | SA* |
| **Automotive Vehicle Wash** | Highway Commercial | P (Permitted) |
| **Industry Service** | Highway Commercial | P (Permitted) |
| **Showroom** | Highway Commercial | P (Permitted) |
| **SA – means that the Council may, at its discretion, permit the use after notice of the application has been given in accordance with Clause 64 of the Deemed Provisions.* | | |

**Table 2 Land Use Permissibility**

Given the above, there is discretion to approve the proposed Service Station. There is no need for the exercise of discretion for the three Permitted uses, as long as these uses comply with the provisions of the Scheme (to be discussed later in this report).

### 4.2.2 Development Requirements

Table 4 of LPS 2 indicates that development in the Showroom/Warehouse zone is to be set back a minimum of 9.00m from the primary street. The proposed development complies with the setback requirement.

Clause 5.7.7 of LPS 2 states that any building erected in the Showroom/Warehouse zone shall have a facade to the street constructed of brick, stone, timber, concrete or glass or any

combination of these. The proposed development complies with this requirement, as it provides high quality buildings and façade finishes.

### 4.2.3 Car Parking

Car parking is required to be provided in accordance with Table 5 of LPS 2.

The development proposes to provide 50 standard car parking bays and 4 ACROD parking bays (total 54 car parking bays).

The car parking calculation is demonstrated below at **Table 3**.

| Use Class | LPS2 Requirement | Provided | Complies |
|---|---|---|---|
| "Service Station" | 1.5 spaces per Service Bay<br>Plus **(0)**<br>1 space per Employee.<br>5 employees<br>**(5)** | **11** | **Yes** |
| "Automotive Vehicle Wash" | 2 spaces per wash stall<br>5 wash stalls = 10<br>**(10)** | **0** | **No** |
| Industry Service (Tyre Centre) | 1 space per 50m$^2$ GLA<br>365/50 = 7.3<br>**(7)** | **16** | **Yes** |
| Showroom | 1 space per 60m$^2$ GLA<br>(853/60 = 14.2)<br>**(14)** | **27** | **Yes** |
| **Total** | **36** | **54** | **Yes** |

**Table 3: Car Parking Requirements of LPS 2**

The proposed development is required under LPS 2 to provide a total of 36 car parking bays. The proposed development complies with the overall requirement by providing a total of 54 car parking bays (in addition to the fuel bowser bays and car wash stall and vacuum bays).

The Service Station has been provided with 11 designated parking bays directly adjacent to the Service Station convenience store building, including one (1) disabled bay. In addition, there is the ability for customers to leave their cars/trucks at the bowsers to access the convenience store building, as is common practice.

The Car Wash does not propose to include any standalone car parking bays, as it is envisaged that customers wishing to use the facility will access the automatic wash bay or the four other manual wash bays. If the facility is full, there is opportunity to wait in front of each of the five wash bays. There are also four vaccuum bays. There is plenty of room in front of the car wash for vehicles to leave if the facility is full and they do not want to wait. The need for separate car parking bays for a car wash needs to be questioned, given the use is to wash cars.

The Tyre Centre and Showroom uses have surplus car parking requirements in close proximity to each use.

Having considered the range of car parking options across the site and the total number of bays provided, the car parking provision complies with the requirements of LPS 2.

#### 4.2.4 Clause 5.2 – Discretion to Modify Development Standards

We are aware that the decision-maker has the ability to conditionally approve developments that do not necessarily comply with the requirements/standards of LPS 2.

### 4.3 Byford District Structure Plan

The subject land is included in the "Highway Commercial" zone in the Byford District Structure Plan (DSP). As demonstrated within the text of the DSP and LPS 2, the proposal is consistent with the objectives and intentions for the "Highway Commercial" zone even though the land is zoned "Showroom/Warehouse" under LPS 2.

The site is not included in a Development Area (DA).

The site is also not within a DCP Precinct (refer to Plan 15A of LPS 2).

### 4.4 Byford Townsite Local Development Plan

The subject land is included in the Commercial "Character Area H" of the Byford Townsite Local Development Plan (LDP) (previously Byford Townsite Detailed Area Plan) which identifies the site as "Highway Commercial".

The LDP states that *"'Highway Commercial' land uses will be an appropriate form of new development in the northern area, complementing and invigorating existing commercial developments."*

The LDP also states that the sites are, *"proposed to accommodate showrooms, bulky goods, offices, medical centres, consulting rooms, and the like."*

No indicative Concept Plans are included in the LDP.

We consider that the proposed uses are consistent with the intent of the "Highway Commercial" precinct of the LDP.

### 4.5 Local Planning Policies

#### 4.5.1 Local Planning Policy 4 "Revegetation"

The objective of LPP 4 is to encourage the use of local native flora for revegetation.

As set out previously in this Report, the proposed development encourages the retention of mature vegetation, and proposes new areas of planting and revegetation using local native species (refer to Landscaping Plan). The proposed development complies with the provisions of LPP 4.

### 4.5.2 Local Planning Policy 5 "Control of Advertisements"

The objective of LPP 5 is to provide guidance on the provision of signage. LPP 5 has a number of objectives including:

- Ensuring the visual quality and character of the locality is not eroded;
- Ensure signage is not misleading or dangerous to vehicular and pedestrian traffic;
- Minimise the total area and impacts of outdoor advertising;
- Prohibit superfluous or unnecessary outdoor advertising;
- Reduce and minimise clutter; and
- Promote a high standard of design and presentation.

The proposed Service Station includes signage associated with the operator (Caltex), inclusive of 9.00m high, 2.20m wide pylon sign located along the South Western Highway frontage of the site, on the southern side of the entry crossover.

The proposed pylon sign incorporates the Caltex logo, the Fresh Trading Co. logo (convenience store operator), fuel types provided, pricing of fuel and opportunity for signage for one of the other tenancies on the site (yet to be determined).

The pylon sign location is indicated on the Site Plan (TP03) and the design of the pylon sign is shown on the Signage Elevation Plan (TP10).

In the circumstances of the subject site (which is more than 1.00ha in area), and given only one pylon sign is proposed, it is considered the proposed signage is consistent with the objectives of LPP 5.

### 4.5.3 Local Planning Policy 24 "Designing Out Crime"

The objective of LPP 24 is to ensure that new developments are to be designed with regard to the principles of surveillance, access control, territorial reinforcement measures, security and management, and maintenance.

The proposed development has been designed with active frontages to facilitate passive surveillance of adjacent roads and internal car parking areas. Further, the 24/7 operation of the Service Station will allow for 'round the clock' passive surveillance, also through the use of security and CCTV cameras. The proposed development complies with the intentions of LPP 24.

### 4.5.4 Local Planning Policy 53 "George Street Construction Costs"

The objective of LPP 53 is to guide the contribution of funding for the construction of George Street from Pitman Way to Larsen Road in a coordinated manner by detailing the costs, method of apportionment and method of collecting contributions.

We are aware that George Street is already constructed along the entire frontage of the subject site, but may require upgrading at a future time.

We are aware that the Policy requires the developers of Lot 104 to contribute 10.22% of the cost of the George Street upgrade (based on the length of the sites' frontage).

We will be guided by the Shire as to the requirements for George Street in its assessment of this Application. In the interim, vehicles will be able to continue to use the constructed part of George Street in its current form.

## 4.6 WAPC Development Control Policies

### 4.6.1 DC Policy 5.1 Regional Roads (Vehicular Access)

The objectives of DC Policy 5.1 seek to ensure that vehicle access to regional roads and the type of abutting developments is controlled and conforms with sound town planning principles, and to improve traffic flow and safety on all regional roads by minimising the number of junctions or driveways.

The proposed development will use an existing crossover from South Western Highway for the creation of a new formalised crossover that will operate as "entry-only".

The proposed development is therefore, consistent with the objectives of DC Policy 5.1.

## 4.7 Deemed Provisions

Clause 67 - Part 2 - Schedule 2 (Deemed Provisions) of the *Planning and Development (Local Planning Schemes) Regulations 2015* (Regulations) outlines matters to be given due regard by local government when considering development applications. **Table 4** below provides an assessment against matters relevant to this proposal.

| **Relevant Matters to be Considered** | **Comment** |
|---|---|
| (a) The aims and provisions of this Scheme and any other local planning scheme operating within the Scheme area; | The propose use and development is consistent with the aims and provisions of the Shire's LPS2 for the following reasons:<br>• The proposal seeks approval for land uses which are "P" (Permitted) and "SA" (Discretionary) within the Showroom/Warehouse zone and are therefore capable of approval.<br>• The proposed development is in general compliance with the provisions of LPS 2.<br>• The proposed development will improve the amenity of the site. |
| (b) The requirements of orderly and proper planning including any proposed local planning scheme or amendment to this Scheme that has been advertised under the *Planning and Development (Local Planning Schemes) Regulations 2015* or any | This report demonstrates the proposed development is in general compliance with the local planning framework applicable to the subject site. |

| | |
|---|---|
| other proposed planning instrument that the local government is seriously considering adopting or approving; | |
| (g) any local planning policy for the Scheme area; | This report demonstrates the proposed development is in general compliance with the local planning policies applicable to the subject site. |
| (m) the compatibility of the development with its setting including the relationship of the development to development on adjoining land or on other land in the locality including, but not limited to, the likely effect of the height, bulk, scale, orientation and appearance of the development; | The proposed development is entirely compatible with its setting for the following reasons:<br>• The proposed development has been designed to provide a high quality, attractive interface to South Western Highway;<br>• The proposal presents an attractive, high quality built form which enhances the appearance of the subject site and its impact on adjoining properties and the streetscape;<br>• The amenity of the subject site and surrounds will be improved through the redevelopment of the subject site;<br>• Extensive landscaping areas are proposed over the site, including the retention of 26 mature trees.<br>Having regard to the above, the nature of the proposed development is entirely compatible with its surroundings, and substantially improves amenity of the locality. |
| (n) the amenity of the locality including the following –<br>(i) Environmental impacts of the development;<br>(ii) The character of the locality;<br>(iii) Social impact of the development; | <u>Environmental Impacts:</u><br>The proposed development is not anticipated to result in any adverse environmental impacts.<br><u>Character of the Locality:</u><br>The proposed land uses and building design are compatible with the surrounding amenity including other new developments in Byford. The proposal is consistent with the local statutory and strategic planning requirements for the subject site, which sets out the desired built form and character of the locality.<br><u>Social Impacts:</u><br>The proposed development will not have any adverse social impacts on the surrounding locality, but will provide a positive social impact through the creation of jobs through construction and operation of the proposed |

| | |
|---|---|
| | development. |
| (s) the adequacy of –<br>(i) the proposed means of access to and egress from the site; and<br>(ii) arrangements for the loading, unloading, manoeuvring and parking of vehicles; | As outlined in this Report and the supporting Transport Impact Assessment (TIA) prepared by i3 Consultants **(Annexure 3)**, the proposed access arrangements to and from the site are satisfactory.<br><br>A turn path analysis has been undertaken for 19.0m trucks/tankers, which shows that these vehicles can enter the site from South Western Highway via a left turn, circulate within the site and turn right out onto Larsen Road satisfactorily. |
| (t) the amount of traffic likely to be generated by the development, particularly in relation to the capacity of the road system in the locality and the probable effect on traffic flow and safety; | The Transport Impact Assessment prepared by i3 Consultants **(Annexure 3)** provides an assessment on traffic generation and measures to improve the road network. |

***Table 4 Matters to be considered by local government***

## 4.8 Transport Impact Assessment

i3 Consultants have been engaged to prepare a Transport Impact Assessment (TIA) in support of the proposed development (see **Annexure 3**).

i3 Consultants were commissioned to undertake a traffic impact assessment to address the adequacy of the vehicle access arrangements, vehicle and truck turning requirements and on-site parking. The internal turning requirements for a 19.0m semi/tanker entering/exiting the site have been checked and confirm that the proposed crossover arrangements are satisfactory.

The parking dimensions have also been reviewed and confirm that the parking bays are in accordance with *AS 2890.1:2004 Parking Facilities Part 1: Off Street Car Parking for a User Class 3A for Short Term*.

A referral to Main Roads WA (MRWA) for comments and recommendations will occur once the Application is progressed. The TIA has raised some issue with the intersection of Larsen Road and South Western Highway. Further discussion with MRWA will occur during the assessment of the Application. The Proponent has already met with MRWA (on 7 May 2018) to briefly discuss the proposed development and flag the issue concerning the intersection and road upgrades.

## 5.0 CONCLUSION

The proposed Service Station, Car Wash, Tyre Centre and Showroom development will provide a complete redevelopment of Lot 104, including its improvement through quality building design and extensive areas of landscaping. The development will also fit seamlessly into adjacent future developments, by ensuring vehicular and site connectivity.

The information provided in this report provides comprehensive planning and design justification for the proposed development, addresses the existing planning framework, relevant technical considerations, built form outcomes, landscaping, and key safety and vehicle movement considerations.

For these reasons, and in light of the assessment contained within this report, we respectfully request that the Shire of Serpentine-Jarrahdale have regard to the merits and broader benefits of the proposal when undertaking its assessment of the application, and to recommend approval to the Metro-Central JDAP, subject to reasonable conditions.

**Peter Webb & Associates**

# ANNEXURES

# ANNEXURE 1

*Certificate of Title*

# ANNEXURE 2

*Development Plans (TRG) &*
*Feature Survey (JBA Surveys)*

# ANNEXURE 3

*Transport Impact Assessment*
*(i3 Consultants)*

# ANNEXURE 4

*Tree Survey Report*
*(Paperbark Technologies Pty Ltd)*

# ANNEXURE 5

*Landscaping Plan*
*(Urban Retreat Garden Design)*

# ANNEXURE 6

*Stormwater Management Plan*
*(Procon Developments)*

# 4.0 PLANNING ASSESSMENT

## 4.1 Metropolitan Region Scheme

The subject land is zoned "Urban" under the Metropolitan Region Scheme (MRS). The land fronts South Western Highway which is reserved under the MRS as a "Primary Regional Road".

## 4.2 Local Planning Scheme No. 2

### 4.2.1 Zoning

The subject land is zoned "Showroom/Warehouse" under the Shire of Serpentine-Jarrahdale Local Planning Scheme No. 2 (LPS 2). The subject land is adjacent to a Local Scheme Reserve for "Public and Community Purposes". An extract of the Scheme Map is included at **Figure 2**.

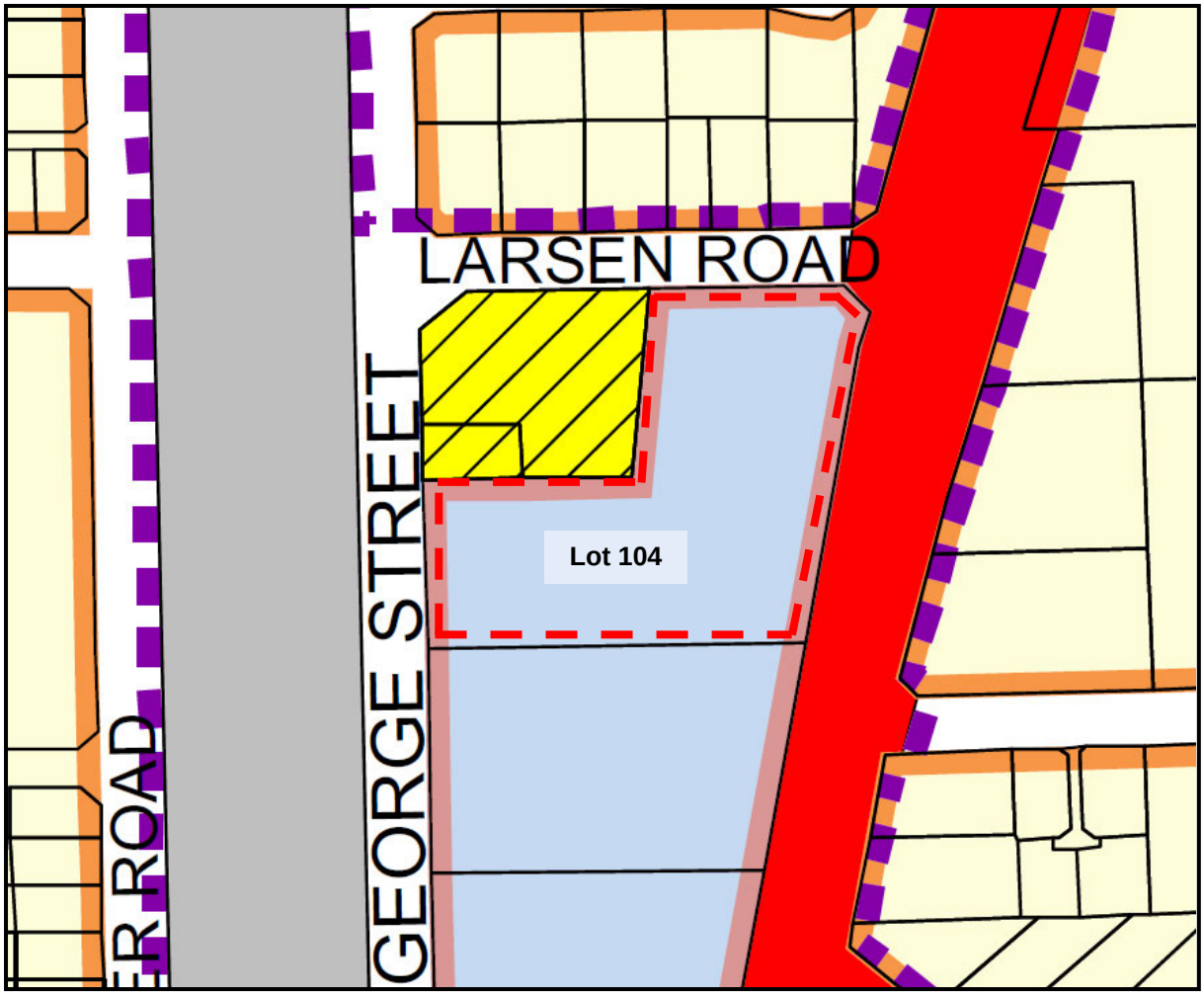



**Figure 2: LPS 2 Scheme Map Extract**

Clause 5.7.1 of LPS 2 states that, *"The purpose and intent of the Showroom Warehouse Zone is to provide for a range of commercially oriented uses with low traffic generating characteristics and dealing in goods of a bulky nature."*

Under LPS 2, the proposed uses fall under the following land use classifications:

PROCON DEVELOPMENTS

# SITE BASED STORMWATER MANAGEMENT PLAN

**PROJECT:** Proposed Mixed Use Development
3 Larsen Road
Byford, WA 6122

**JOB NO.** -

**CLIENT:** Procon Developments

**DESIGN ENGINEER:** Darren Griffiths
BE(Hons), MIE (Aust), CP Eng,
NER (Civil/Structural), RPEQ, RBP

**DATE:** June 2018

*Procon Developments (Australia) Pty Ltd as Trustee for*
***Procon Developments Unit Trust***
*ABN: 94 364 564 982*
*P.O. Box 522 Kilsyth, Victoria 3137*
*820 Mountain Hwy Bayswater VIC 3153*
***Telephone (03) 9720 0817 Facsimile (03) 9720 0827***

# *Table of Contents*



# *List of Figures*

# 1.0 Introduction

This Stormwater Management Plan (SMP) has been developed to support the proposed mixed use development at 3 Larsen Road, Byford.

The purpose of this SMP is to identify the stormwater quality detention options required to be implemented within the site.

The objectives of this SMP are as follows:

- Consider suitable stormwater quality improvement devices to achieve effective hydrocarbon management;
- Ensure the development achieves non-worsening of stormwater flows downstream of the site; and,
- Ensure the proposed development does not worsen the environmental value of the stormwater flows through the construction phase.

## 1.1 Site Characteristics

The location of the proposed development site is shown in Figure 1-1.

The previous land use was a light industrial allotment to the south with a residential property to the north.

To the north, the site is bounded by Larsen Road with the South Western Highway to the east and George Street to the west. An existing light industrial allotment is located on the south boundary.

The site grades from east to west with elevations ranging from 55.5m to 52.4m (AHD).

There are no external catchments affecting the existing development area.

The proposed development layout is provided in Appendix A.

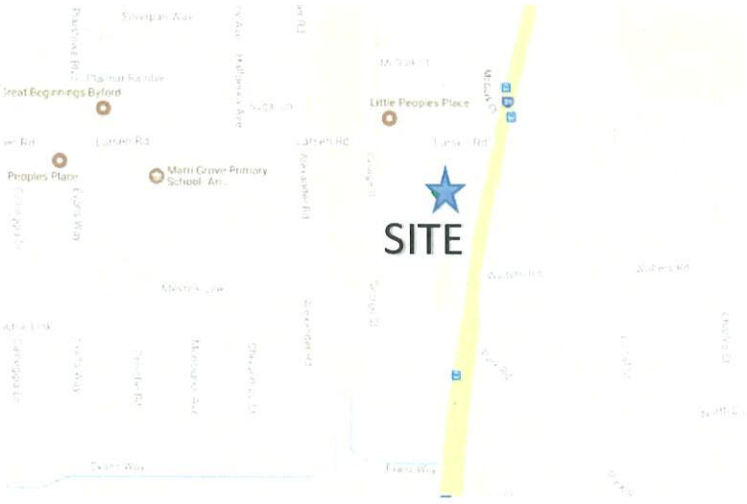



Figure 1-1: Locality Plan (Source: Nearmap)

### *1.2 Soakwells*

The geotechnical investigation undertaken by STATS notes that, due to the very low permeability clayey soils underlying the site, disposal of stormwater via soakwells is NOT appropriate for this development.

Stormwater runoff shall be directed off-site via an orifice pit as noted in Section 3.

The comments on stormwater drainage from the geotechnical investigation report are provided in Appendix B.

## *2.0 Stormwater Quality Management*

### *2.1 'Best Practice'*

Procon Developments actively undertakes 'Best Practice' Management with respect to stormwater quality management across all our fuel development sites.

The following stormwater quality improvement devices (SQID's) are proposed to be installed as part the of stormwater drainage system for this development:

- 2 No. 58,000L above ground rainwater harvesting tanks. The collected rainwater will be used for toilet flushing (4 No. toilets – shop & tenancies) and tree watering. This will reduce potable water demand for the development. The Water by Design - Deemed to Comply Solution (CI1/2) specifies a minimum tank size per toilet of 1,500L. This will provide up to 26,300L of rainwater for tree watering (83,700L is reserved for flood storage).

As a member of the Australasian Convenience and Petroleum Marketers Association (ACAPMA), Procon Developments are committed to ensuring that all our fuel development sites are designed to minimize the risk of pollutants being washed from the forecourt and into urban waterways.

The design of the fuel canopy (with a 10 degree inset of the drip line) and fuel hose lines within the canopy drip line is in accordance with the ACAPMA 'Best Practice' guidelines for management of stormwater pollution at service stations.

ACAPMA also note the hydrocarbon separator should provide full containment of at least the capacity of a fuel tanker compartment (approximately 8,000L). Tank Solutions Aquator is a tried and proven solution for the capture separation of hydrocarbons.

### *2.2 Hydrocarbon Management*

The Western Australia Water Quality Guidelines require the prevention of hydrocarbons from entering the stormwater system or internal watercourses that discharge from the site. In accordance with this criteria, the following hydrocarbon management device is proposed;

- Tank Solutions Aquator – A full retention separator which has both containment and coalescer chambers. Total suspended solids, silt, sediments, sludge and gross pollutants settle on the chamber floor while light liquids are contaminated and separated to 5mg/litre or less prior to discharge. All liquid is treated. There is no by-pass operation. An automatic closure device is fitted which is sensitive to any changes in water density. This prevents pollutants from discharging from the site.

The Tank Solutions Aquator also reduces average annual loads as per below which allows safe discharge to the stormwater drain in George Street:

- Total suspended solids (TSS)
- Gross pollutant solids (GP)
- Light liquids (TPH)
- Phosphorus & Nitrogen (particulates)

The Tank Solutions Aquator is proposed to be installed in series to ensure all stormwater run-off from the pavement containment zones are treated prior to discharging from the site.

Refer to Appendix C for the Aquator specification and Water Corporation approval certificate.

## *3.0 Stormwater Quantity Management*

### *3.1 Existing Scenario*

From looking at historical Nearmap data, the site was previously a light industrial allotment to the south (between South Western Highway and George Street). A residential property was located to the north end. The site has a total area of 11,630m$^2$.

Hence, the parameters for the permissible site discharge (PSD) are adopted as follows:

- Runoff coefficient = 0.45 (low density urban);
- 5 year ARI storm event; and,
- Time of concentration = 6 mins.

The site drains generally west overland to George Street and the adjoining property on Larsen Road (which is currently relatively greenfield).

## *3.2 Developed Scenario*

Runoff from the proposed development site will be collected internally and directed to the north-west corner of the site. It will then be detained via an orifice pit which will reduce the outlet flow to less than the PSD (up to the 10 year ARI storm event).

The calculated maximum orifice plate outlet diameter is 200mm for this site (assuming a non-drowned orifice condition).

Underground on-site stormwater detention has been provided for the site up to the calculated minimum storage volume for the 10 year ARI storm. Hence, the calculated on-site detention volume for this development is 57.2m$^3$. This detention volume is proposed to be provided via oversized underground stormwater drainage pipes & pits.

For the 100 year ARI storm event, run-off from the site will be via overland flow to the railway reserve.

Refer to Appendix E for the stormwater drainage plan which has been marked-up to show the stormwater flow paths and contributing catchment areas.

The forecourt pavements, crossovers and pedestrian pathways are all proposed to be reinforced concrete in accordance with Procon Developments 'Best Practice' Management across all our fuel development sites.

After consideration of the on-site underground storage capacity any the minor and major flow paths, the impact of the development is not considered to cause any nuisance or annoyance to upstream or downstream properties.

## *3.3 Lawful Point of Discharge*

The lawful point of discharge for this development is proposed to be the existing grated stormwater pit within the George Street road reserve. This drain outfalls to the railway reserve to the west of the site.

Refer to the attached marked-up stormwater drainage plan for details.

# 5.0 Conclusion

This report has aimed to satisfactorily address the requirements of the material change of use for service station development, with respect to addressing stormwater quality and quantity over the site at 3 Larsen Road, Byford.

It is proposed for the development to implement a detention system within the site in order to achieve the intent of the Shire of Serpentine Jarrahdale Planning Scheme. An orifice pit is also proposed to be included to limit the outlet flows into Council's stormwater drainage system to the permissible site discharge. This will achieve a non-worsening criteria for the site up to and including the 1 in 10 year ARI storm event for the underground stormwater drainage system (including the on-site stormwater detention) & 1 in 100 year ARI storm event for the overland flow. This is in accordance with the Western Australia Stormwater Management Manual.

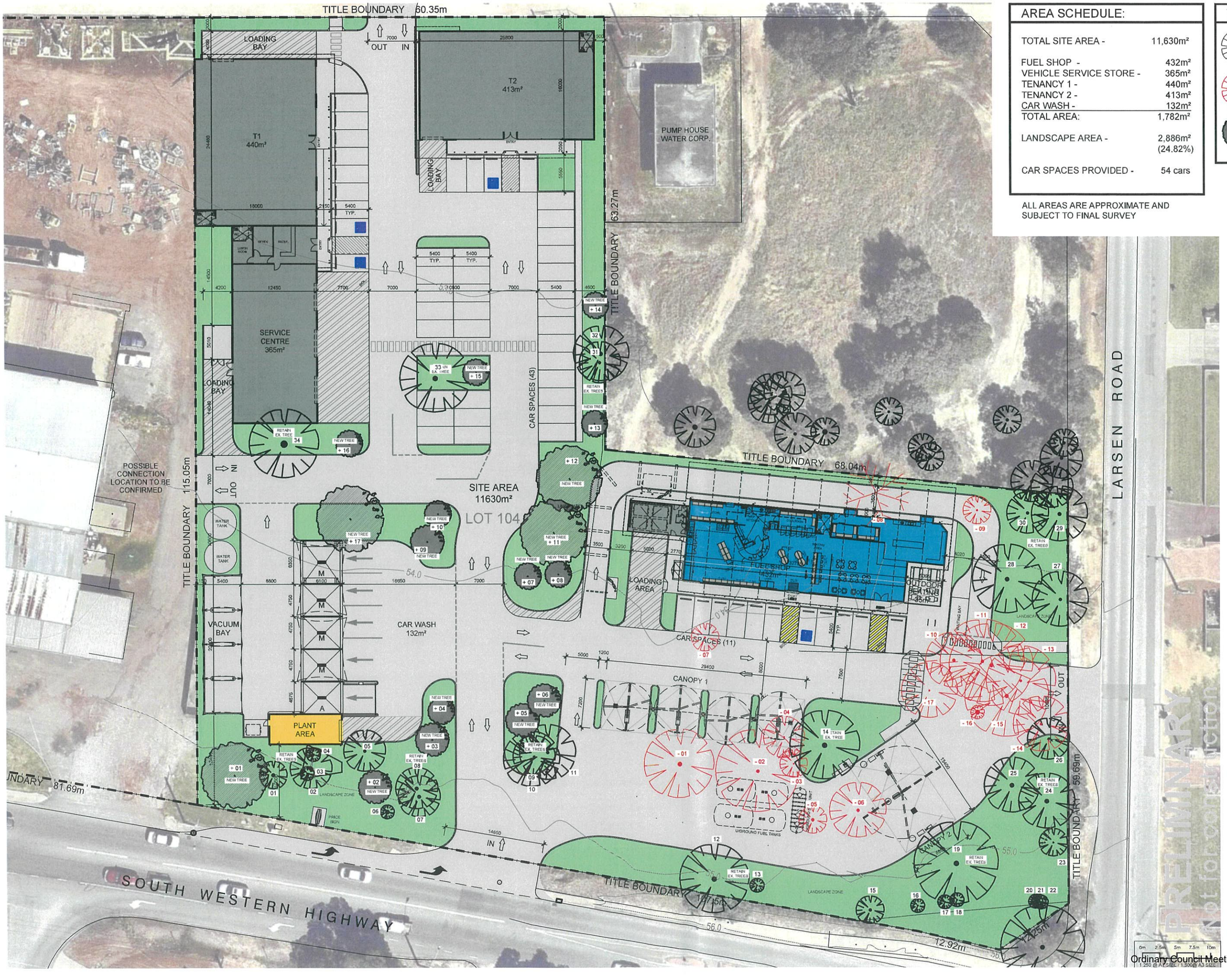
This stormwater management plan demonstrates that effective treatment of stormwater at the proposed development can be achieved through non-worsening principles.

# 6.0 References


- Shire of Serpentine Jarrahdale, Planning Scheme
- Western Australia Government, State Planning Policy
- Department of Water and Environmental Regulation, Stormwater Management Manual for Western Australia, 2004 - 2007
- Water by Design, Deemed to Comply Solutions – Stormwater Quality Management, 2010
- Australasian Convenience and Petroleum Marketers Association, Managing Stormwater Pollution at Service Station Sites.

# *Appendix A*

Site Layout (TRG)




## AREA SCHEDULE:

| | |
|---|---|
| TOTAL SITE AREA - | 11,630m² |
| FUEL SHOP - | 432m² |
| VEHICLE SERVICE STORE - | 365m² |
| TENANCY 1 - | 440m² |
| TENANCY 2 - | 413m² |
| CAR WASH - | 132m² |
| TOTAL AREA: | 1,782m² |
| LANDSCAPE AREA - | 2,886m² (24.82%) |
| CAR SPACES PROVIDED - | 54 cars |

ALL AREAS ARE APPROXIMATE AND SUBJECT TO FINAL SURVEY

## TREE SCHEDULE:

EXISTING TREE RETAINED
34

EXIST. TREE REMOVED
17

NEW TREE ADDED
17

| REV | AMENDMENT DETAILS | BY | DATE |
|---|---|---|---|
| P2 | CARWASH LAYOUT REVISED | JS | 17-04-18 |
| P1 | PRELIMINARY ISSUE | KM | 10-04-18 |

PROCON DEVELOPMENTS
www.procon.net.au

trg
BRISBANE + MELBOURNE

concept + design + interiors + project management

Level 3, Suite 37, 799 Springvale Road, Mulgrave, Victoria 3170 Australia
T +61 3 9542 9000 F +61 3 9542 9010
www.trgaus.com
The Retail Group Pty Ltd ABN 85 050 134 686
RBP No. DP-AD1689



PROJECT
PROPOSED MIXED USE DEVELOPEMENT

PROJECT ADDRESS
3 LARSEN ROAD

BYFORD
WA 6122

DRAWING TITLE
PROPOSED SITE PLAN

CLIENT
PROCON DEVELOPMENTS PTY LTD

| DATE | SCALE @ A1 | NORTH |
|---|---|---|
| APR.'18 | 1:250 | |
| DRAWN: KM | CHECKED: AB | |
| ISSUE: PRELIMINARY | | |

| PROJECT No. | DRAWING No. | REVISION No. | SHEET |
|---|---|---|---|
| 15316 | TP 103 | P2 | 03 of 12 |

PRELIMINARY
Not for construction

0m 2.5m 5m 7.5m 10m
1:250 @ A3 SIZE | 1:500 @ A3 SIZE

# *Appendix B*

Extract from Geotechnical Investigation Report

STATS

# PROPOSED MIXED USE DEVELOPMENT AT LOT 104 (#3) LARSEN RD, BYFORD

## Geotechnical Investigation Work

Prepared for

PROCON DEVELOPMENTS

ABN: 90 016 537 577
Perth T: +61 (0) 8 9455 3654
Unit 1/24 Baile Road, Canning Vale, WA 6155
www.statswa.com.au

ABN: 90 016 537 577
Karratha T: +61 (0) 8 9144 4637
1938 Pyramid Rd Karratha WA 6714
www.statswa.com.au

*Table 4: Compaction Requirements for Fill (DCP & PSP)*

| Depth intervals | DCP Blows (cumulative) | PSP Blows (cumulative) |
|---|---|---|
| 0 - 150 | Seat | Seat |
| 150 – 450 | 9 | 8 |
| 450 – 750 | 14 | 11 |
| 750 – 1050 | 19 | 15 |

## 8.7 Drainage

8.7.1 If construction works were to take place during the rainy seasons, the perimeter around the site and areas of proposed earthworks should be constructed with a shallow gradient to allow drainage to a sump and to allow water to be discharged from the site. It is important that the conditions under the footings remain relatively dry. Where required, drains should be constructed to divert water from the site and to ensure no erosion or premature saturation occurs around the footings.

8.7.2 Based on the type of clayey soils encountered on site, we recommend that stormwater shall be discharged off site.

8.7.3 Based on the Falling Head Permeability laboratory test result, we obtain a Permeability of 0.00041m/d. In accordance to AS/NZS 1547:2012, this falls under a Soil Category of 6 out of 6, under a soil texture described as Medium to Heavy Clays.

## 8.8 Cut and Fill Batters

8.8.1 Cut and fill batters will be generally stable at 1: 2 (V: H), however batters constructed at 1:3 will enable re-establishment of vegetation and be less prone to damage from wetting, drying and erosion.

## 8.9 Suitability of Site Materials

8.9.1 The Filling gravelly SANDS / GRAVELS, up to a shallow depth of 0.5m are suitable as General Backfill material, provided they are screened off to remove organics and rubbles. For building pads, clean imported sands shall be used.

# 9.0 EFFECTS OF SITE WORKS ON CLASSIFICATION

9.1 Any earthworks required in preparing the building platform should be carried out in a controlled manner in accordance with the recommendations given in Australian Standard AS 3798-2007, "Guidelines on earthworks for commercial and residential developments".

9.2 The type of fill material used and the depth of fill may also affect the site classification.

9.3 In the event that the site conditions encountered have a different soil profile/materials from that provided in this report, this office should be contacted immediately. This also applies in the event the site has a fill layer greater than 0.5m in height, to raise the site finished level.

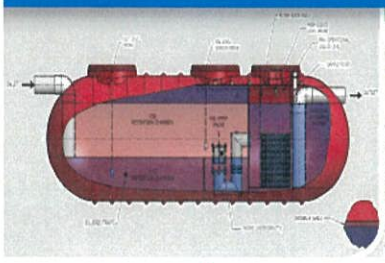
# *Appendix C*

Hydrocarbon Separator Specification

TANK SOLUTIONS
FUEL · CHEMICALS · WATER

# 4 Compelling Reasons to Choose Aquator as your Oil-Water Separator at Retail Service Stations for the Capture of Fuel Spills.

## AQUATOR®



1

Aquator is designed, engineered and manufactured by Tank Solutions Pty Ltd, Australia's leading manufacturer of Double Wall Fibreglass Underground Fuel Storage Tanks for Retail Service Stations. Our business is focused on Retail Service Stations. We understand that hydrocarbon management is not the same as water management. Aquator can be manufactured as a double wall tank – an Oil-Water Separator is designed to contain an environmentally disastrous hydrocarbon spill, not just a non-hazardous water spill. You need to ask your existing Oil-Water Separator supplier if their tank is:

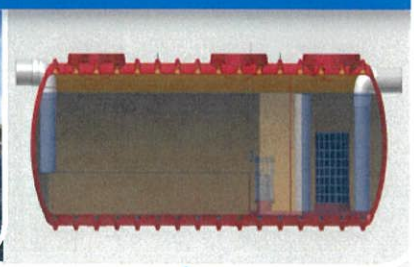
a. Providing a double wall tank to mitigate your risk to the environment of a major hydrocarbon spill
b. Has a means of knowing if their Oil Water Separator is leaking – are you certain that your tank is fully containing hydrocarbons
c. Is an ISO 9001 approved manufacturer
d. Is UL authorized to ensure consistent quality of product
e. Knows how to manage hazardous liquids – especially hydrocarbons

2

Aquator can be ordered from the same company that provides your fuel tanks – Tank Solutions. It provides the Installer and site owner a one stop shop. It allows the Installer to more easily plan the underground phase of the construction program. Aquator can potentially be shipped to site at the same time as the fuel tank ancillary components – providing very significant freight savings depending on site location.

3

Aquator can be installed below pavement. This allows the site owner to increase the footprint of paved area to maximize forecourt returns. Aquator can even be installed in the same excavation as the fuel tanks. You may not have to engage a separate Plumber for installation of the Oil-Water Separator.



4

Tank Solutions is the most cost effective Full retention Oil Water Separator available today.

- Meets EN858-1
- Triple Alarm
- Sized to site needs

## The perfect solution for your Oil-Water Separator

513 Tomago Road,
Tomago NSW 2322
**Ph:** 02 4964 8270
**F:** 02 4964 8522
**Email sales@tanksolutions.com.au**
**www.tanksolutions.com.au**

**John Watson**
M: 0410 556 770

**Robert Butterfield**
M: 0413 310 172

Unit 3, 40 Ingleston Road
Wakerley, QLD 4154
**Ph:** 07 3390 4800
**F:** 07 3390 4667
**Email sales@tanksolutions.com.au**
**www.tanksolutions.com.au**

TANK SOLUTIONS
FUEL · CHEMICALS · WATER

# AQUATOR Commercial Oil Water Separator

## Technical Data Sheet

F 998 REV A

## AQUATOR DOUBLE WALL OR SINGLE WALL DUAL CHAMBER FIBREGLASS OIL WATER SEPARATOR

Tank Solutions Pty Ltd is the market leader in the manufacture of Double Wall and Single Wall Fibreglass Storage Tanks. Our Double Wall Fibreglass Tanks offer a full 360-degree secondary containment with a variety of monitoring devices, which can be installed in the interstitial space between the two walls. Due to Tank Solutions' unique integral rib design, Double Wall Fibreglass Tanks are the strongest, most robust underground tanks available. They are rust-proof, maintenance free and formulated to be compatible with all petroleum fuel products, alcohols and alcohol-gasoline mixtures. By choosing a Tank Solutions Double Wall Fibreglass Tank, you can be assured of maximum protection in the unlikely event of a leak in the primary wall therefore preventing ground water contamination. Total Capacities range from 3,500 litres to 150,000 litres. Flow rates processing abilities from 1.5LPS up to 500LPS.

Double Wall and Single Wall Dual Chamber AQUATOR Commercial Oil Water Separators are also available in a wide variety of sizes and feature a choice of two or three completely separate compartments within one tank. This enables Hydrocarbon & Silt capture and storage in the first chamber, Hydrocarbon Filtration in the second chamber, with the option of a third Pump Out chamber within the same tank.

Fibreglass Tanks

## SINGLE WALL FIBREGLASS TANK FEATURES

Suitable for a wide range of liquids:

- Petroleum, Petrochemical and Chemical applications

Strength, Durability and Safety:

- All Tank Solutions Fibreglass Tanks are constructed of virgin resin and glass fibre reinforcement
- All Tank Solutions Tanks incorporate integral ribs for maximum strength
- All Tank Solutions Fibreglass Tanks undergo stringent testing during manufacture
- All Tank Solutions Tanks carry a one year warranty against structural failure, internal and external corrosion

A standard of consistent quality:

- Manufactured to meet or exceed industry and statutory requirements:
  - UL 1316
  - AS1692

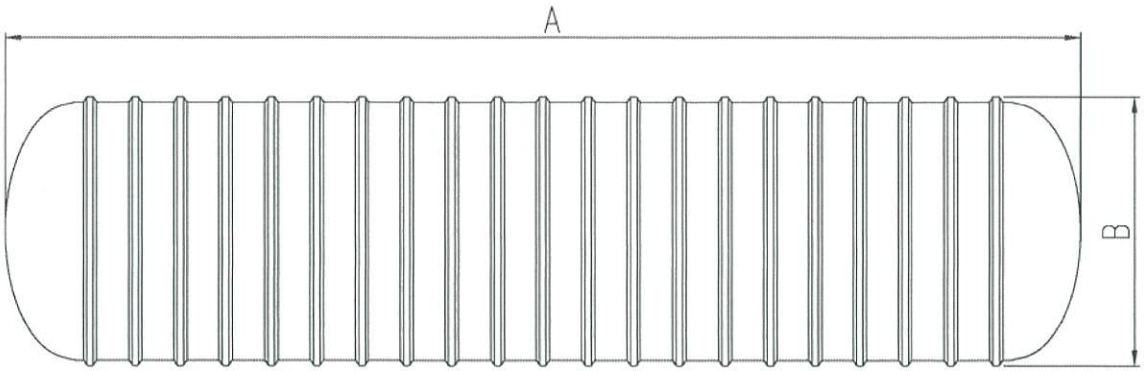
## COMPANY FEATURES

- Australian owned and operated
- Application and installation technical support
- Extensive manufacturing experience
- Full range of optional equipment and accessories to suit the complete project

TANK SOLUTIONS
FUEL · CHEMICALS · WATER

# AQUATOR Commercial Oil Water Separator

## DIMENSIONS AND CAPACITIES




| Type | Overall Total Capacity Litres | Spill Capture Capacity Litres | Silt Capture Capacity Litres | Length Overall 'A' mm | External Diameter 'B' mm | Single Wall Shipping Weight Kg | No. of Straps |
|---|---|---|---|---|---|---|---|
| SW T3.5 | 3,500 | 1,700 | 400 | 2,600 | 1,470 | 1,000 | 2 |
| SW T20 | 20,000 | 10,000 | 4,000 | 7,395 | 2,140 | 1,600 | 4 |
| SW T30 | 30,000 | 15,000 | 6,000 | 9,950 | 2,140 | 2,000 | 4 |
| SW T35 | 35,000 | 17,500 | 7,000 | 7,970 | 2,600 | 2,200 | 4 |
| SW T40 | 40,000 | 20,000 | 8,000 | 8,820 | 2,600 | 2,400 | 4 |
| SW T50 | 50,000 | 25,000 | 10,000 | 10,945 | 2,600 | 2,900 | 6 |
| SW T100 | 100,000 | 50,000 | 20,000 | 14,194 | 3,275 | 3,500 | 6 |
| SW T150 | 150,000 | 75,000 | 30,000 | 20,074 | 3,275 | 6,000 | 13 |

Weights, Capacities & Dimensions are nominal only

***Custom manufactured tanks can be supplied upon request***

**Aquator Tanks are supplied as standard with:**

- Driveway Covers, Inlet and Outlet Points, Stop Valve, Oil – Silt – Water Alarms, Coalescer Insert
- Lifting Lugs, Hold Down Straps, Concrete Anchors and Hold Down Hardware for bottom anchoring
- Manholes, Collars, Risers and Standard Covers

**Options and accessories available on request include:**

- Water Tight Riser Cover ▪ Driveway Covers
- Pump Out Third Chamber option with Guide Rails, etc.
- Manhole Fabricated Steel Cover complete with 5 Sockets

Tank Solutions Pty Ltd
ABN 59 142 807 949
e sales@tanksolutions.com.au w www.tanksolutions.com.au
**New South Wales:** 513 Tomago Road, Tomago, NSW 2322. PO Box 623, Raymond Terrace, NSW 2324. p **61 2 4964 8270** f 61 2 4964 8522
**Queensland:** Unit 3, 40 Ingleston Road, Wakerly, Qld 4154. p **61 7 3390 4800** f 61 7 3390 4667

# Approval certificate

## Trade waste pre-treatment product


**Applicant:** Tank Solutions Pty Ltd
**Postal address:** PO Box 623 Raymond Terrace, NSW, 2324

**Attention:** Trevor Clarke
**Web:** tanksolutions.com.au
**Email:** sales@tanksolutions.com.au

**Manufacturer:** Tank Solutions Pty Ltd
**Address:** PO Box 623 Raymond Terrace, NSW, 2324


## Product/device description

The Tank Solutions AQUATOR Class 1 oil water separator is a full retention separator that can contain and prevent light liquid pollutants from discharging into sewers. It has two chambers, a coalescing unit and is fitted with an automatic closure device designed to treat and contain significant oil spills.

Treatable flow rates range from 6 L/s to 60 L/s. Above and below ground installations are possible.

The approval certificate applies to the pre-treatment products of the following sizes:

| Approval Number | Model | Max Flow (L/s) | Max Silt Litres | Max Oil Litres | Total Litres | Working Litres | Inlet / Outlet Diameter (mm) | Inlet Height (mm) | Outlet Height (mm) |
|---|---|---|---|---|---|---|---|---|---|
| AN-082-01 | Aquator T3.5 | 6 | 100 | 1,700 | 4,100 | 3,200 | 150 / 150 | 1,283 | 1,183 |
| AN-082-02 | Aquator T20 | 60 | 6,000 | 9,000 | 20,800 | 21,000 | 300 / 300 | 1,869 | 1.779 |

## Special conditions of approval

1. The product shall be *supplied* with manufacturer's following installation instructions and recommended procedures for operation and maintenance:
   a. AQUATOR Commercial OWS Operating, Installation & Maintenance Manual (TD IM 009, Rev 3).
   b. Fibreglass Single & Double Wall Tanks – Installation Manual (Form F 935, Rev B).
2. The product shall be *installed* strictly in accordance with the manufacturer's written instructions and the *Plumbing Standards*, with particular emphasis on the following:
   a. Waste must not be pumped directly into the tank. Waste needs to be gravity fed.
   b. A Trade Waste Sampling Point (TWSP) must be installed according to the Corporation's typical drawings.
   c. Expansion joints must be used. Loop joints are not permitted.
3. A maintenance contract is to be in place to ensure the ongoing reliability of the product.
4. Water Corporation must be notified within fourteen (14) days upon installation of the product
5. The use of emulsifying agents upstream of the product must not occur. Such instructions must be noted on operating documentation.
6. The product chosen must be suitably sized to avoid surge conditions.
7. Clear access for the purposes of maintenance or servicing of the pre-treatment device must be maintained at all times.
8. This approval certificate is not an endorsement of the product by Water Corporation, and no claim shall be made in advertising, promotion or other manner to the effect.
9. Water Corporation accepts no responsibility for the effective operation, performance or efficiency of the product. This approval is not an engineering approval or structural endorsement.
10. The proponent of the approved product must formally seek a request for re-approval of the product no later than three (3) months before the assigned **Validity Period** has expired from the **Date Issued** of this approval certificate.
11. Water Corporation reserves the right to vary any requirements at any time. Any application of this condition normally occurs after consultation with the manufacturer, supplier and end business user connected to Water Corporation's sewer.
12. Water Corporation shall be notified in writing if the pre-treatment device is withdrawn from sale.
13. The proponent of the approved product accepts that the information provided in this document shall be made publically available.

# Approval certificate

## Trade waste pre-treatment product

### General conditions of approval

Approval shall be **suspended** where any of the following conditions are not met:

1. If there is a breach of the Special Conditions.
2. The assigned **Validity Period** has expired from the **Date Issued** of this approval certificate.
3. The product shall be manufactured in accordance with Water Corporation's requirements at the time of approval.
4. The product shall be manufactured to comply according to the details noted in the drawings below, in addition to any further details provided by the proponent when seeking this approval.
5. The product supplied for use in Water Corporation's area of operations shall comply with the requirements shown on this approval certificate. Sizes, classes, lengths or other product variables which are available with the product but which are not approved as listed on this approval certificate shall not be offered by the supplier for use in Water Corporation's area of operations.
6. All discharges to sewer associated with this product must not exceed Water Corporation's *Trade Waste Acceptance Criteria*.
7. Prior to any business (which is connected to Water Corporation's sewer) installing this product the business must apply to Water Corporation for a *Trade Waste Permit* for approval to discharge.
8. If this certificate has been issued to the manufacturer of this product then it is the responsibility of the manufacturer to ensure all current and future suppliers / vendors of this product are provided a copy of this approval certificate.

Approval shall be **reviewed** where any of the following conditions occur:

1. The product is manufactured with either different materials, methods of manufacture, location of manufacture, source of raw materials, component subcontractors or models to that at the time of approval.
2. The ownership of the primary manufacturer or any subcontractors is varied from that at time of approval.
3. The standards and/or specifications to which the product was required to comply with at the time of approval have been amended or revised.
4. The product has been found to sustain damage or provide unsatisfactory performance on occasions of number considered excessive by Water Corporation, when handled, stored, assembled or installed in accordance with the supplier's or manufacturer's written instructions.

| | |
|---|---|
| **Approved drawing(s):** | T3.5 6LPS (drawing number SEP-0025, Rev C, dated 31 July 2017)<br>T3.5 6LPS (drawing number SEP-0027, Rev A, dated 16 November 2017)<br>T20 60LPS (drawing number SEP-0016, Rev E, dated 18 October 2016)<br>T20 60LPS (drawing number SEP-0017, Rev A, dated 10 October 2017) |
| **Authorising person:** | Stephen Jerkovic (Teal Leader – Investigations) |
| **Date issued** | 06 December 2017 |
| **Validity period:** | Two (2) years |

# *Appendix D*

Rational Method Calculations

PROCON DEVELOPMENTS

# STORMWATER DRAINAGE COMPUTATIONS

**PROJECT:** Proposed Mixed Use Development
3 Larsen Road
Byford, WA 6122

**JOB NO.** J0217

**CLIENT:** Procon Developments

**DESIGN ENGINEER:** Darren Griffiths
BE(Hons), MIE (Aust), CP Eng,
NER (Civil/Structural), RPEQ, RBP

**DATE:** 08 May 2018

Note:
These computations have been prepared to indicate design intent. Where appropriate and necessary, shop drawings describing the detailed construction proposals shall be prepared and submitted to the Design Engineer for approval.

*Procon Developments (Australia) Pty Ltd as Trustee for*
***Procon Developments Unit Trust***
*ABN: 94 364 564 982*
*P.O. Box 522 Kilsyth, Victoria 3137*
*820 Mountain Hwy Bayswater VIC 3153*
***Telephone (03) 9720 0817 Facsimile (03) 9720 0827***

[PRICON DEVELOPMENTS]

| JOB No. J0217 | PAGE No. 1 |
|---|---|
| PROJECT BYFORD SWD | |
| BY DC | DATE 7/5/18 |

PSD : 5 YR ARI

$t_c$ = 6 MINS, $^5I_6$ = 101 MM/HR

$A_{TOT.}$ = 11,630 $m^2$

C = 0.45 (RESIDENTIAL)

$Q_{OUT} \Rightarrow 0.45 \times \frac{101}{3600} \times 11,630$

= 146.8 L/S

---

ADOPT ϕ225 ORIFICE

$C_d$ = 0.6

$\Delta H$ = 1.0m (T.B.C.)

$A_o$ = 0.0397 $m^2$

$Q_{CAP} \Rightarrow 0.6 \times 0.0397 \times (2 \times 9.81 \times 1.0)^{\frac{1}{2}}$

= 105.5 L/S.

< 146.8 o.k!

CHECK ORIFICE NOT DROWNED.

$Q_{CAP} \Rightarrow 105.5 \times \frac{1.0}{0.6}$ = 175.8 L/S.

TOO HIGH

ADOPT ϕ200 ORIFICE IN PIT W/ BAFFLE.

$Q_{OUT}$ = 139 L/S.

[PRICON] DEVELOPMENTS

| JOB No. 30217 | PAGE No. 2 |
|---|---|
| PROJECT BYFORD SWD | |
| BY DC | DATE 7/5/18 |

ADOPT 60,000 L TANK STORAGE x 2

= 120,000 L x 0.67 = 85,000 L

W/ 35,000 L FOR TOILETS & TREE WATERING

AROOFS = 2,523 $m^2$

ADOPT 10 YR, 3 HR MAX. STORM

$$Q_{IN} \Rightarrow 1.0 \times \frac{15.1}{3600} \times 2{,}523$$

= 10.6 L/S.

$$V_{IN} \Rightarrow \frac{10.6 \times 180 \times 60}{1000}$$

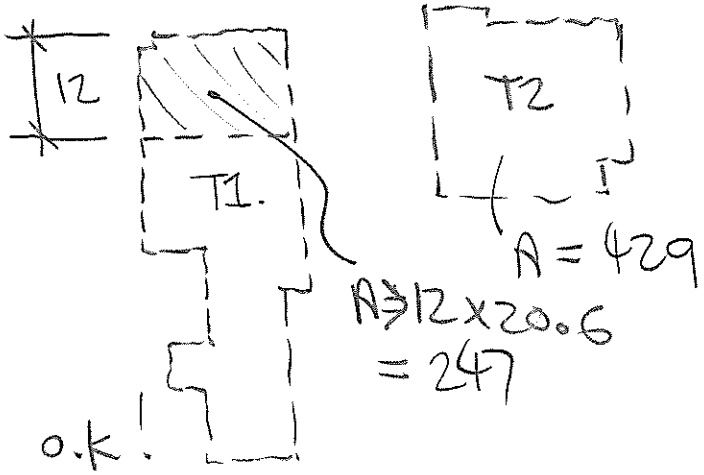
= 114 $m^3$ > 80 $m^3$ N.G.

REDUCE ROOF AREA BY REMOVING T2 & PART OF T1.

AREDUCED = 1,847 $m^2$

$Q_{IN}$ = 7.8 L/S

$V_{IN}$ = 83.7 $m^3$ < 85 $m^3$ o.k!



[PROCON] DEVELOPMENTS

| JOB No. | J0217 | PAGE No. | 3 |
|---|---|---|---|
| PROJECT | BYFORD | | |
| | SWD | | |
| BY DG | DATE 7/5/18 | | |

DRAINAGE CONCEPT : $A_{TOTAL} = 11,630\ m^2$

APPROX. LANDSCAPE : $38 \times 25 + 69 \times 20 + 4 \times 75 = 2,630.$

APPROX. ROOFS – SHOP $38.4 \times 19 = 730\ m^2$

T1 $20.7 \times 25 + 14 \times 29 = 924$

T2 $26.4 \times 18.6 = 492$

CAR-WASH $11 \times 7 = 77$

TRUCK CANOPY $13.6^2 \times \pi/4 = 146$

CAR CANOPY $4 \times 7^2 \times \pi/4 = 154$

TOTAL : $2,523\ m^2$

FROM IFD CHART : $^{100}I_5 = 216$ mm/hr

$^{5}I_6 = 101$ mm/hr.

$^{10}I_5 = 126$ mm/hr

| | |
|---|---|
| 10 | = 91.5 |
| 20 | = 61.5 |
| 30 | = 47.8 |
| 60 | = 30.6 |
| 120 | = 19.6 |
| 180 | = 15.1 |

∴ ROOF RUN-OFF TO ABOVE GROUND RAINWATER TANKS, PAVEMENT TO U/GROUND PIPEWORK.

[PROCON DEVELOPMENTS]

| JOB No. J0217 | PAGE No. 4 |
|---|---|
| PROJECT BYFORD SWD | |
| BY DC | DATE 7/5/18 |

CHECK 1 in 10 YR ARI U/GROUND STORAGE:

$A_{ROOFS} \Rightarrow 2,523 - 1847$ $(C=1.0) = 676\ m^2$

$A_{LANDSCAPE}$ $(C=0.35) = 2,630\ m^2$

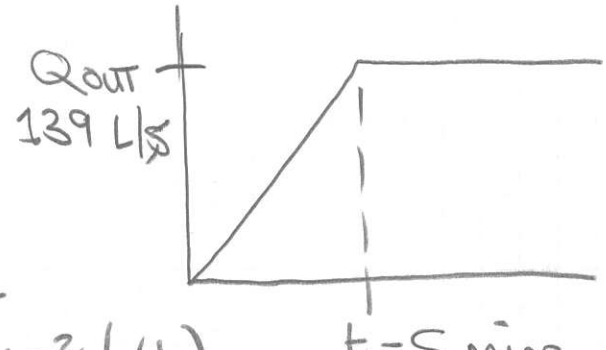
$A_{PAVEMENT} \Rightarrow 11,630 - 2,523 - 2,630$

$(C=0.9) = 6,477\ m^2$

| t | 10 It | $Q_{IN}$ | $V_{IN}$ | $V_{OUT}$ t=5 | $V_{OUT}$ t=t$-5 | V$ |
|---|---|---|---|---|---|---|
| 5 | 126 | 260 | 78 | 20.8 | – | 57.2 |
| 6 | 117 | 211 | 76 | 20.8 | 8.3 | 46.9 |
| 10 | 91.5 | 189 | 113 | 20.8 | 41.7 | 50.5 |
| 20 | 61.5 | 127 | 152 | 20.8 | 125.1 | 6.1 |
| 30 | 47.8 | 99 | 178 | 20.8 | 208.5 | – |
| 60 | 30.6 | 64 | 230 | 20.8 | | – |
| 120 | 19.6 | 41 | 295 | 20.8 | | – |
| 180 | 15.1 | 32 | 345 | 20.8 | | – |

$\Sigma CA \Rightarrow 676 \times 1.0 + 2,630 \times 0.35 + 6,477 \times 0.9$

$= 7,426\ m^2$.




ADOPT $\phi$450 U/GROUND STORAGE PIPE

$L_{PIPE\ REQD} \Rightarrow \frac{57.2}{(\pi \times 0.45^2/4)}$

$= 360\ m$

[PRICOIN] DEVELOPMENTS

| | |
|---|---|
| JOB No. J0217 | PAGE No. 5 |
| PROJECT BYFORD SWD | |
| BY DG | DATE 7/5/18 |

ALT. U/GROUND STORAGE PIPE CONFIG. :

ADOPT ~~50~~ 100 m $\phi$ 600 (0.283) $V_s$ = ~~16.96~~ 28.3 $m^3$

$\therefore$ $\phi$450 (0.159) $\Rightarrow$ ~~40.3~~ 28.9 / 0.159 = ~~253~~ 182 m REQD.

ie ~~313~~ 282 m TOTAL PIPE LENGTH.

[PRICON] DEVELOPMENTS

| JOB No. | J0217 | PAGE No. | 6 |
|---|---|---|---|
| PROJECT | BYFORD SWD | | |
| BY | DG | DATE | 7/5/18 |

CHECK PIPEWORK TO TANKS:

ADOPT $\phi$ 225 mm, 1 in 200 Fall.

$Q_{CAP}$ = 48.2 L/s, $v$ = 1.2 m/s

$Q_{IN}$ ⇒ A ⇒ 730 + 146 + 154 = 1,030 $m^2$

$^{100}I_5$ = 216 mm/hr

C = 1.0

$Q_{IN}$ = 61.8 L/s

> 48.2 N.G.

SHOP ONLY ⇒ $Q_{IN}$ = 43.8 L/s

ADOPT $\phi$300 uPVC, 1 in 200

$\phi$ CAP. = 102 L/s. > 61.8 o.k!

Australian Government
Bureau of Meteorology

LOCATION 32.225 S 116.000 E * NEAR.. Byford WA

LIST OF COEFFICIENTS TO EQUATIONS OF THE FORM

$$ln(I) = A + B \times (ln(T)) + C \times (ln(T))^2 + D \times (ln(T))^3 + E \times (ln(T))^4 + F \times (ln(T))^5 + G \times (ln(T))^6$$

T = TIME IN HOURS AND I = INTENSITY IN MILLIMETRES PER HOUR

| RETURN PERIOD | A | B | C | D | E | F | G |
|---|---|---|---|---|---|---|---|
| 1 | 2.856591 | -0.61453E+0 | -0.12856E-1 | 0.74336E-2 | -0.11231E-2 | -0.83986E-4 | 0.57480E-5 |
| 2 | 3.104695 | -0.62113E+0 | -0.10450E-1 | 0.70348E-2 | -0.11972E-2 | 0.71488E-5 | -0.83005E-5 |
| 5 | 3.306305 | -0.63654E+0 | -0.53755E-2 | 0.61334E-2 | -0.13563E-2 | 0.18440E-3 | -0.33261E-4 |
| 10 | 3.421955 | -0.64641E+0 | -0.23705E-2 | 0.60194E-2 | -0.15119E-2 | 0.23754E-3 | -0.36675E-4 |
| 20 | 3.568968 | -0.65412E+0 | 0.47850E-3 | 0.51498E-2 | -0.15560E-2 | 0.38310E-3 | -0.59208E-4 |
| 50 | 3.747839 | -0.66466E+0 | 0.37339E-2 | 0.48445E-2 | -0.17055E-2 | 0.46658E-3 | -0.68375E-4 |
| 100 | 3.874993 | -0.67110E+0 | 0.55678E-2 | 0.40525E-2 | -0.16489E-2 | 0.58695E-3 | -0.89900E-4 |

RAINFALL INTENSITY IN mm/h FOR VARIOUS DURATIONS AND RETURN PERIODS

RETURN PERIOD (YEARS)

| DURATION | 1 | 2 | 5 | 10 | 20 | 50 | 100 |
|---|---|---|---|---|---|---|---|
| 5 mins | 63.9 | 83.7 | 108. | 126. | 150. | 185. | 216. |
| 6 mins | 59.6 | 78.1 | 101. | 117. | 139. | 173. | 201. |
| 10 mins | 47.6 | 62.2 | 79.5 | 91.5 | 109. | 134. | 155. |
| 20 mins | 33.3 | 43.1 | 54.0 | 61.5 | 72.1 | 87.6 | 100. |
| 30 mins | 26.4 | 34.0 | 42.2 | 47.8 | 55.7 | 67.2 | 76.8 |
| 1 hour | 17.4 | 22.3 | 27.3 | 30.6 | 35.5 | 42.4 | 48.2 |
| 2 hours | 11.3 | 14.5 | 17.5 | 19.6 | 22.6 | 26.8 | 30.4 |
| 3 hours | 8.79 | 11.2 | 13.6 | 15.1 | 17.4 | 20.6 | 23.3 |
| 6 hours | 5.72 | 7.29 | 8.78 | 9.76 | 11.2 | 13.3 | 14.9 |
| 12 hours | 3.72 | 4.75 | 5.72 | 6.36 | 7.30 | 8.64 | 9.73 |
| 24 hours | 2.40 | 3.07 | 3.72 | 4.14 | 4.78 | 5.67 | 6.41 |
| 48 hours | 1.51 | 1.94 | 2.37 | 2.66 | 3.09 | 3.69 | 4.19 |
| 72 hours | 1.12 | 1.44 | 1.77 | 2.00 | 2.34 | 2.80 | 3.20 |

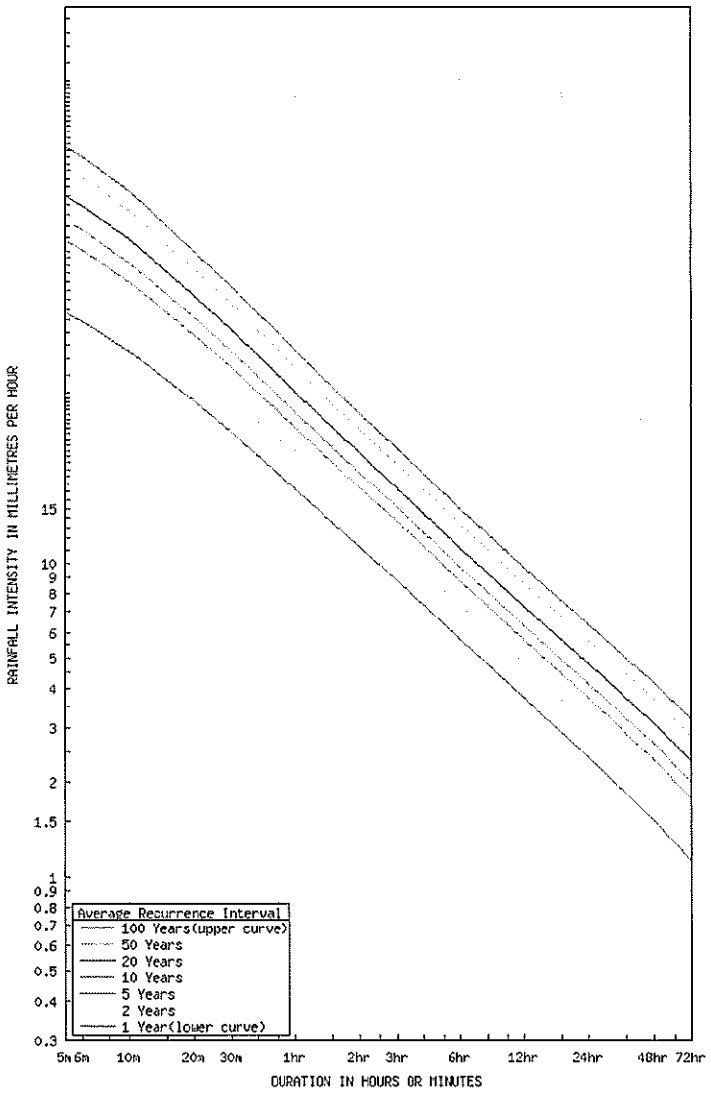
(Raw data. 22.85, 4.89, 1.49, 37.47, 7.76, 2.51,skew= 0.680)

**HYDROMETEOROLOGICAL ADVISORY SERVICE**



* ENSURE THE COORDINATES ARE THOSE REQUIRED SINCE DATA IS BASED ON THESE AND NOT LOCATION NAME

BYFORD




Help

[View Documentation: Opens new window]

Try another

This page was created at **on**

BYFORD

VINIDEX STORMPRO CHARTS

| Gradient | Velocity/ Discharge | DN 150 Di = 0.148 m | | | |
|---|---|---|---|---|---|
| H/L | k (mm) | 0.003 | 0.006 | 0.015 | 0.03 |
| 1/10 | m/s | 4.8 | 4.7 | 4.6 | 4.4 |
| | L/s | 82.2 | 81 | 78.4 | 75.3 |
| 1/20 | m/s | 3.3 | 3.2 | 3.2 | 3 |
| | L/s | 56.4 | 55.8 | 54.3 | 52.5 |
| 1/30 | m/s | 2.6 | 2.6 | 2.5 | 2.5 |
| | L/s | 45.2 | 44.8 | 43.7 | 42.4 |
| 1/40 | m/s | 2.2 | 2.2 | 2.2 | 2.1 |
| | L/s | 38.6 | 38.3 | 37.5 | 36.4 |
| 1/50 | m/s | 2 | 2 | 1.9 | 1.9 |
| | L/s | 34.2 | 33.9 | 33.2 | 32.4 |
| 1/60 | m/s | 1.8 | 1.8 | 1.8 | 1.7 |
| | L/s | 30.9 | 30.7 | 30.1 | 29.4 |
| 1/70 | m/s | 1.7 | 1.6 | 1.6 | 1.6 |
| | L/s | 28.4 | 28.2 | 27.7 | 27 |
| 1/80 | m/s | 1.5 | 1.5 | 1.5 | 1.5 |
| | L/s | 26.4 | 26.2 | 25.8 | 25.2 |
| 1/90 | m/s | 1.4 | 1.4 | 1.4 | 1.4 |
| | L/s | 24.7 | 24.6 | 24.2 | 23.6 |
| 1/100 | m/s | 1.4 | 1.3 | 1.3 | 1.3 |
| | L/s | 23.3 | 23.2 | 22.8 | 22.3 |
| 1/120 | m/s | 1.2 | 1.2 | 1.2 | 1.2 |
| | L/s | 21.1 | 21 | 20.7 | 20.3 |
| 1/140 | m/s | 1.1 | 1.1 | 1.1 | 1.1 |
| | L/s | 19.4 | 19.3 | 19 | 18.6 |
| 1/160 | m/s | 1 | 1 | 1 | 1 |
| | L/s | 18 | 17.9 | 17.7 | 17.3 |
| 1/180 | m/s | 1 | 1 | 1 | 0.9 |
| | L/s | 16.9 | 16.8 | 16.6 | 16.3 |
| 1/200 | m/s | 0.9 | 0.9 | 0.9 | 0.9 |
| | L/s | 15.9 | 15.8 | 15.6 | 15.4 |
| 1/250 | m/s | 0.8 | 0.8 | 0.8 | 0.8 |
| | L/s | 14 | 14 | 13.8 | 13.6 |
| 1/300 | m/s | 0.7 | 0.7 | 0.7 | 0.7 |
| | L/s | 12.7 | 12.6 | 12.5 | 12.3 |
| 1/400 | m/s | 0.6 | 0.6 | 0.6 | 0.6 |
| | L/s | 10.8 | 10.8 | 10.7 | 10.5 |
| 1/500 | m/s | 0.6 | 0.6 | 0.5 | 0.5 |
| | L/s | 9.5 | 9.5 | 9.4 | 9.3 |

1IN. IPE RADE.

| Gradient | Velocity/ Discharge | DN 225 Di = 0.226 m | | | |
|---|---|---|---|---|---|
| H/L | k (mm) | 0.003 | 0.006 | 0.015 | 0.03 |
| 1/10 | m/s | 6.2 | 6.2 | 5.9 | 5.7 |
| | L/s | 250.7 | 246.9 | 238.3 | 228.6 |
| 1/20 | m/s | 4.3 | 4.2 | 4.1 | 4 |
| | L/s | 172.4 | 170.4 | 165.5 | 159.6 |
| 1/30 | m/s | 3.5 | 3.4 | 3.3 | 3.2 |
| | L/s | 138.4 | 137 | 133.5 | 129.2 |

BYFORD

J0217 10

| Gradient | Velocity/ Discharge | DN 225 Di = 0.226 m | | | |
|---|---|---|---|---|---|
| 1/40 | m/s | 3 | 2.9 | 2.9 | 2.8 |
| | L/s | 118.4 | 117.3 | 114.6 | 111.1 |
| 1/50 | m/s | 2.6 | 2.6 | 2.5 | 2.5 |
| | L/s | 104.8 | 104 | 101.7 | 98.8 |
| 1/60 | m/s | 2.4 | 2.3 | 2.3 | 2.2 |
| | L/s | 94.9 | 94.2 | 92.3 | 89.7 |
| 1/70 | m/s | 2.2 | 2.2 | 2.1 | 2.1 |
| | L/s | 87.2 | 86.6 | 84.9 | 82.7 |
| 1/80 | m/s | 2 | 2 | 2 | 1.9 |
| | L/s | 81.1 | 80.5 | 79.1 | 77.1 |
| 1/90 | m/s | 1.9 | 1.9 | 1.8 | 1.8 |
| | L/s | 76 | 75.5 | 74.2 | 72.4 |
| 1/100 | m/s | 1.8 | 1.8 | 1.7 | 1.7 |
| | L/s | 71.8 | 71.3 | 70.1 | 68.4 |
| 1/120 | m/s | 1.6 | 1.6 | 1.6 | 1.5 |
| | L/s | 64.9 | 64.6 | 63.5 | 62.1 |
| 1/140 | m/s | 1.5 | 1.5 | 1.5 | 1.4 |
| | L/s | 59.7 | 59.3 | 58.5 | 57.2 |
| 1/160 | m/s | 1.4 | 1.4 | 1.4 | 1.3 |
| | L/s | 55.5 | 55.2 | 54.4 | 53.3 |
| 1/180 | m/s | 1.3 | 1.3 | 1.3 | 1.2 |
| | L/s | 52 | 51.7 | 51 | 50 |
| 1/200 | m/s | 1.2 | 1.2 | 1.2 | 1.2 |
| | L/s | 49.1 | 48.8 | 48.2 | 47.3 |
| 1/250 | m/s | 1.1 | 1.1 | 1.1 | 1 |
| | L/s | 43.4 | 43.2 | 42.7 | 41.9 |
| 1/300 | m/s | 1 | 1 | 1 | 0.9 |
| | L/s | 39.2 | 39.1 | 38.6 | 38 |
| 1/400 | m/s | 0.8 | 0.8 | 0.8 | 0.8 |
| | L/s | 33.5 | 33.3 | 33 | 32.5 |
| 1/500 | m/s | 0.7 | 0.7 | 0.7 | 0.7 |
| | L/s | 29.6 | 29.5 | 29.2 | 28.8 |

MIN GRADE!

| Gradient | Velocity/ Discharge | DN 300 Di = 0.3 m | | | |
|---|---|---|---|---|---|
| H/L | k (mm) | 0.003 | 0.006 | 0.015 | 0.03 |
| 1/10 | m/s | 7.5 | 7.3 | 7.1 | 6.8 |
| | L/s | 527.7 | 519.1 | 500.1 | 479.4 |
| 1/20 | m/s | 5.1 | 5.1 | 4.9 | 4.7 |
| | L/s | 363.6 | 359 | 348 | 335.2 |
| 1/30 | m/s | 4.1 | 4.1 | 4 | 3.8 |
| | L/s | 292.1 | 288.9 | 281.1 | 271.6 |
| 1/40 | m/s | 3.5 | 3.5 | 3.4 | 3.3 |
| | L/s | 250 | 247.5 | 241.4 | 233.8 |
| 1/50 | m/s | 3.1 | 3.1 | 3 | 2.9 |
| | L/s | 221.5 | 219.5 | 214.4 | 208 |
| 1/60 | m/s | 2.8 | 2.8 | 2.8 | 2.7 |
| | L/s | 200.6 | 198.9 | 194.6 | 189 |
| 1/70 | m/s | 2.6 | 2.6 | 2.5 | 2.5 |
| | L/s | 184.5 | 183 | 179.2 | 174.3 |
| 1/80 | m/s | 2.4 | 2.4 | 2.4 | 2.3 |

| Gradient | Velocity/ Discharge | DN 300 Di = 0.3 m | | | |
|---|---|---|---|---|---|
| | L/s | 171.5 | 170.2 | 166.9 | 162.5 |
| 1/90 | m/s | 2.3 | 2.3 | 2.2 | 2.2 |
| | L/s | 160.9 | 159.7 | 156.7 | 152.7 |
| 1/100 | m/s | 2.1 | 2.1 | 2.1 | 2 |
| | L/s | 151.9 | 150.8 | 148.1 | 144.4 |
| 1/120 | m/s | 1.9 | 1.9 | 1.9 | 1.9 |
| | L/s | 137.5 | 136.6 | 134.3 | 131.1 |
| 1/140 | m/s | 1.8 | 1.8 | 1.7 | 1.7 |
| | L/s | 126.4 | 125.6 | 123.6 | 120.8 |
| 1/160 | m/s | 1.7 | 1.7 | 1.6 | 1.6 |
| | L/s | 117.5 | 116.8 | 115 | 112.5 |
| 1/180 | m/s | 1.6 | 1.6 | 1.5 | 1.5 |
| | L/s | 110.2 | 109.6 | 107.9 | 105.7 |
| 1/200 | m/s | 1.5 | 1.5 | 1.4 | 1.4 |
| | L/s | 104 | 103.4 | 102 | 99.9 |
| 1/250 | m/s | 1.3 | 1.3 | 1.3 | 1.3 |
| | L/s | 92 | 91.6 | 90.4 | 88.7 |
| 1/300 | m/s | 1.2 | 1.2 | 1.2 | 1.1 |
| | L/s | 83.2 | 82.9 | 81.9 | 80.4 |
| 1/400 | m/s | 1 | 1 | 1 | 1 |
| | L/s | 71.1 | 70.8 | 70 | 68.9 |
| 1/500 | m/s | 0.9 | 0.9 | 0.9 | 0.9 |
| | L/s | 62.8 | 62.6 | 62 | 61.1 |

MIN. GRADE

| Gradient | Velocity/ Discharge | DN 375 Di = 0.374 m | | | |
|---|---|---|---|---|---|
| H/L | k (mm) | 0.003 | 0.006 | 0.015 | 0.03 |
| 1/10 | m/s | 8.6 | 8.4 | 8.1 | 7.8 |
| | L/s | 940.8 | 924.8 | 889.8 | 852.4 |
| 1/20 | m/s | 5.9 | 5.8 | 5.6 | 5.4 |
| | L/s | 649 | 640.3 | 619.9 | 596.7 |
| 1/30 | m/s | 4.7 | 4.7 | 4.6 | 4.4 |
| | L/s | 521.8 | 515.7 | 501.1 | 483.8 |
| 1/40 | m/s | 4.1 | 4 | 3.9 | 3.8 |
| | L/s | 446.8 | 442.1 | 430.6 | 416.6 |
| 1/50 | m/s | 3.6 | 3.6 | 3.5 | 3.4 |
| | L/s | 396 | 392.2 | 382.7 | 370.8 |
| 1/60 | m/s | 3.3 | 3.2 | 3.2 | 3.1 |
| | L/s | 358.8 | 355.6 | 347.4 | 337.1 |
| 1/70 | m/s | 3 | 3 | 2.9 | 2.8 |
| | L/s | 330 | 327.2 | 320.1 | 311 |
| 1/80 | m/s | 2.8 | 2.8 | 2.7 | 2.6 |
| | L/s | 307 | 304.5 | 298.1 | 289.9 |
| 1/90 | m/s | 2.6 | 2.6 | 2.5 | 2.5 |
| | L/s | 287.9 | 285.7 | 280 | 272.5 |
| 1/100 | m/s | 2.5 | 2.5 | 2.4 | 2.3 |
| | L/s | 271.9 | 269.9 | 264.7 | 257.8 |
| 1/120 | m/s | 2.2 | 2.2 | 2.2 | 2.1 |
| | L/s | 246.2 | 244.6 | 240.1 | 234.2 |
| 1/140 | m/s | 2.1 | 2 | 2 | 2 |
| | L/s | 226.4 | 225 | 221.1 | 215.9 |

[PROCON DEVELOPMENTS]

| JOB No. | J0217 | PAGE No. | 12 |
|---|---|---|---|
| PROJECT | BYFORD, WA | | |
| | SWD | | |
| BY | DC | DATE | 9/5/19 |

CALCULATE U/GROUND STORAGE:

$57.2\ m^3$ REQD

$V_{PIPE} \Rightarrow 2.54 + 0.52 = 3.1\ m^3$

$V_{TOTAL}$ (ϕ600 PIPES + PITS) $= 39.8\ m^3$

$A = 0.275$

S2.20

S60.

ϕ600.

TOP OF BAFFLE IN 002

$A = 0.227\ m^2$

450

S1.75

CP14

1 in 1000

$\Delta = 110.$

$L = 102\ m$

$C_{AVE.}$

002 → CP14

CP3 → CP6.

$V_{STORAGE\,①} \Rightarrow 0.251 \times 102 = 25.6\ m^3$

$V_{STORAGE\,②} \Rightarrow 0.251 \times 44.4 = 11.1\ m^3$

S1.64

002

[PROCON DEVELOPMENTS]

| JOB No. | J0217 | PAGE No. | 13 |
|---|---|---|---|
| PROJECT | BYFORD, WA | | |
| | SWD | | |
| BY | DC. | DATE | 9/5/18 |

REMAINDER OF STORAGE VIA Φ450 PIPES

AVAIL = 197 m.

$V_R \Rightarrow 0.159 \times 0.75 \times 197$ (NOT ALL IN 4)

$= 23.5\ m^3$

$\Rightarrow 9.6$ REQ'D.

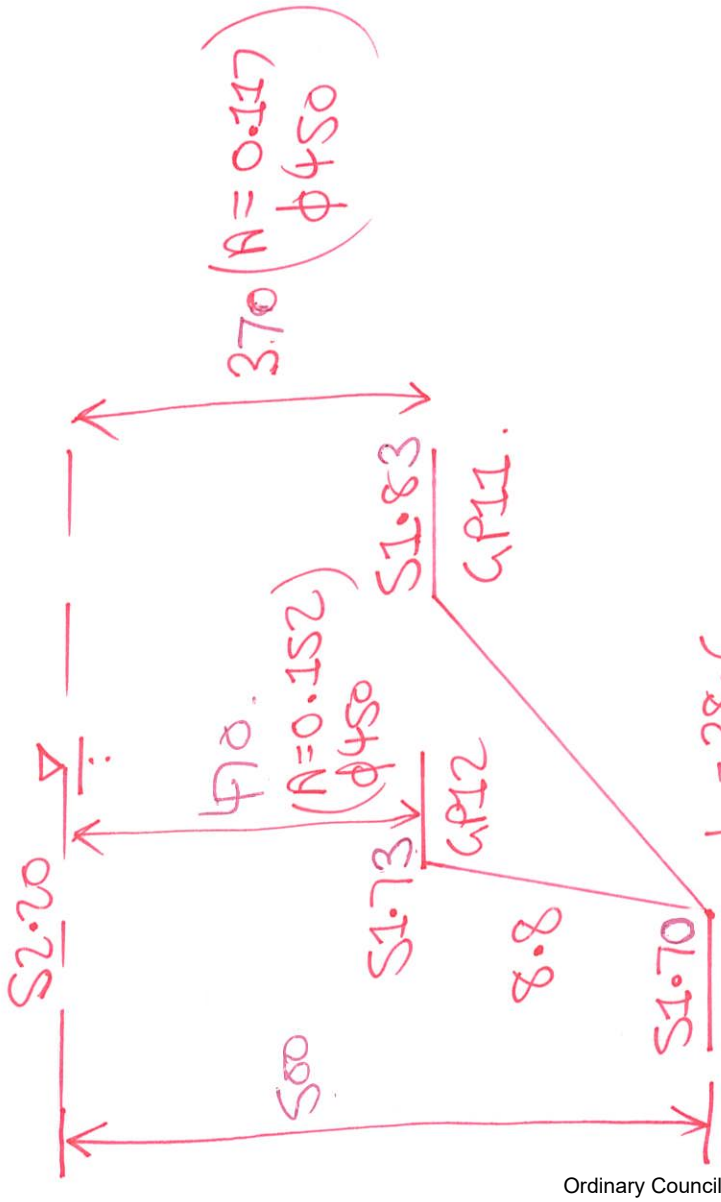
ADOPT. $5.3m$ @ Φ450 $= 6.4\ m^3$

$143.2m$ @ Φ300 $= 7.5\ m^3$

$V_R$ TOT. $= 13.9\ m^3$

$\Sigma$ 13

U/GROUND STORAGE CALC (CONT.):




$V_R \Rightarrow 0.159 \times 8.8 \times 0.157 \times 38.6 + 0.159 \times 0.6 \times 0.6 \times 0.375 \times 3$

$= 7.4\ m^3$

$V_R \Rightarrow 0.6 \times 0.6 \times 0.375 \times 3 = 0.40\ m^3$

# *Appendix E*

Stormwater Drainage Plan

RAILWAY RESERVE.

ORIFICE PIT.
$Q_{OUT}$ = 139 L/S
(< PSD = 146 L/S)

LPOD - EXISTING PIT IN GEORGE ST

GENERALLY, UNDERGROUND PIPES ARE OVERSIZED TO PROVIDE FLOOD STORAGE.
$V_{STORAGE}$ = 57.2 m³.

2 No. WATER TANKS
$V_{STORAGE}$ = 116.0 m³

← DENOTES DIRECTION OF FLOW.

20,000 L HYDRO CARBON SEPARATOR

WARNING
BEWARE OF UNDERGROUND SERVICES
THE LOCATIONS OF UNDERGROUND SERVICES ARE APPROXIMATE ONLY AND THEIR EXACT SIZE, DEPTH AND LOCATION MUST BE PROVEN ON SITE. NO GUARANTEE IS GIVEN THAT ALL EXISTING SERVICES ARE SHOWN.

EXISTING Ø375 REINFORCED CONCRETE PIPE. DISCHARGE TO RAILWAY RESERVE.
Ø300 uPVC OUTLET PIPE CONNECT TO EXISTING PIT
EXISTING 750 x 600 R.C. PIT.
TOP OF EXIST PIT 52.40
EXP1
TITLE BOUNDARY
EX 52.64
EX 52.35
Ø150 uPVC
Ø150 uPVC, TYP
GP2
DP
2000 x 1200 ORIFICE PIT WITH Ø200mm ORIFICE IN CENTRAL BAFFLE WALL
T1
FFL 52.75
T2
FFL 52.70
Ø600 STORMPRO
GP3
GP4
GP5
GP6
GP7
GP8
JP9
Ø150 HDPE, TYP.
Ø150 HDPE
Ø150 uPVC TYP.
Ø300 uPVC
SERVICE CENTRE
FFL 54.10
Ø225 HDPE
EX 53.85
Ø100 uPVC RAINWATER TANK OVERFLOW TO PAVEMENT, TYP.
EX 54.04
WATER TANK
WATER TANK
Ø150 uPVC
Ø300 HDPE
2 No. 58,000L RHINO CORRUGATED STEEL ABOVE GROUND RAINWATER TANKS (Ø5.83m x 2.2m HIGH). NOTE: TANKS TO BE FITTED WITH AUTOMATIC LEVEL CONTROL TO ENSURE AVAILABLE STORAGE VOLUME FOR STORM EVENT RETENTION IS AT LEAST 84,000L AT ALL TIMES (IE. WITHIN 24 HOURS OF MAJOR STORM EVENTS)
GP10
GP11
GP12
GP13
Ø450 STORMPRO
Ø525 STORMPRO
50mm HIGH CONCRETE BUND
Ø150 uPVC
Ø300 INLET/ OUTLET
EX 53.58
TITLE BOUNDARY
GP17
GP18
GP19
GP20
JP16
GP15
GP14
GP21
GP22
GP23
JP31
JP32
JP33
JP34
20,000L PURACEPTOR
Ø100 UPP
Ø150 HDPE
SHOP
FFL 54.60
Ø150 HDPE, TYP.
EX 53.60
EX 54.32
LARSEN ROAD

C02

KEY PLAN - 1/2000

[PROCON DEVELOPMENTS]

820 Mountain Hwy
Bayswater, Victoria 3153
Phone: 03 9720 0817
Fax: 03 9720 0827
Web: www.procon.net.au

| Rev. | Reason | Date | Appr. |
|---|---|---|---|
| P1 | PRELIMINARY | 10.05.18 | DG |



Client.

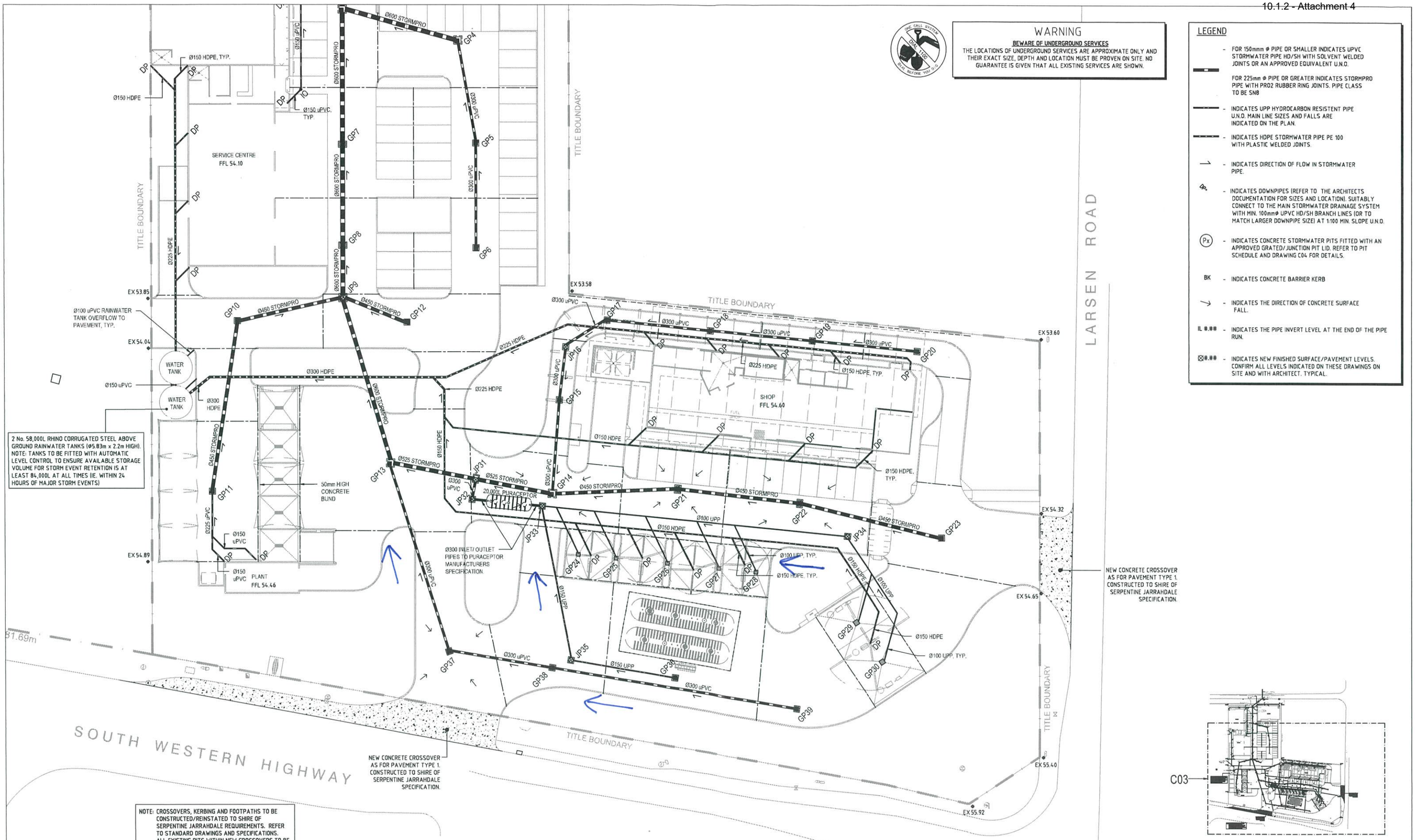
Project.
PROPOSED MIXED USE DEVELOPMENT
3 LARSEN ROAD
BYFORD, WA

Drawing.
STORMWATER DRAINAGE PLAN
SHEET 1

North.

PRELIMINARY

| Designed. | Date. |
|---|---|
| D.GRIFFITHS | MAY 2018 |
| Drawn. | Scale. |
| D.TRIEU | 1:250 @ A1 |
| Job No. | Drawing No. | Revision. |
| J0217 | C02 | P1 |




WARNING

**BEWARE OF UNDERGROUND SERVICES**

THE LOCATIONS OF UNDERGROUND SERVICES ARE APPROXIMATE ONLY AND THEIR EXACT SIZE, DEPTH AND LOCATION MUST BE PROVEN ON SITE. NO GUARANTEE IS GIVEN THAT ALL EXISTING SERVICES ARE SHOWN.

LEGEND

- FOR 150mm ø PIPE OR SMALLER INDICATES UPVC STORMWATER PIPE HD/SH WITH SOLVENT WELDED JOINTS OR AN APPROVED EQUIVALENT U.N.O.
  FOR 225mm ø PIPE OR GREATER INDICATES STORMPRO PIPE WITH PRO2 RUBBER RING JOINTS. PIPE CLASS TO BE SN8
- INDICATES UPP HYDROCARBON RESISTENT PIPE U.N.O. MAIN LINE SIZES AND FALLS ARE INDICATED ON THE PLAN.
- INDICATES HDPE STORMWATER PIPE PE 100 WITH PLASTIC WELDED JOINTS.
- INDICATES DIRECTION OF FLOW IN STORMWATER PIPE.
- 4x - INDICATES DOWNPIPES (REFER TO THE ARCHITECTS DOCUMENTATION FOR SIZES AND LOCATION). SUITABLY CONNECT TO THE MAIN STORMWATER DRAINAGE SYSTEM WITH MIN. 100mmø UPVC HD/SH BRANCH LINES (OR TO MATCH LARGER DOWNPIPE SIZE) AT 1:100 MIN. SLOPE U.N.O.
- (Px) - INDICATES CONCRETE STORMWATER PITS FITTED WITH AN APPROVED GRATED/JUNCTION PIT LID. REFER TO PIT SCHEDULE AND DRAWING C04 FOR DETAILS.
- BK - INDICATES CONCRETE BARRIER KERB
- INDICATES THE DIRECTION OF CONCRETE SURFACE FALL.
- IL #.## - INDICATES THE PIPE INVERT LEVEL AT THE END OF THE PIPE RUN.
- ⊠#.## - INDICATES NEW FINISHED SURFACE/PAVEMENT LEVELS. CONFIRM ALL LEVELS INDICATED ON THESE DRAWINGS ON SITE AND WITH ARCHITECT. TYPICAL.




KEY PLAN - 1/2000

[PROCON DEVELOPMENTS]
820 Mountain Hwy
Bayswater, Victoria 3153
Phone: 03 9720 0817
Fax: 03 9720 0827
Web: www.procon.net.au

| Rev. | Reason. | Date. | Appr. |
|---|---|---|---|
| P1 | PRELIMINARY | 10.05.18 | DG |



Client.

Project.
PROPOSED MIXED USE DEVELOPMENT
3 LARSEN ROAD
BYFORD, WA

Drawing.
STORMWATER DRAINAGE PLAN
SHEET 2

North.

PRELIMINARY

| Designed. | Date. |
|---|---|
| D.GRIFFITHS | MAY 2018 |
| Drawn. | Scale. |
| D.TRIEU | 1:250 @ A1 |
| Job No. | Drawing No. | Revision. |
| J0217 | C03 | P1 |

# *Appendix C*

Hydrocarbon Separator Specification

# Tree Survey – 3 Larsen Road (Lot 104 South West Hwy) Byford

## Prepared for

**Procon Developments**


Paperbark Technologies Pty Ltd
Zana Sheary & Steven Edwards
Arboricultural Consultant
*ISA Certified Arborist - AU0039A/AU0341A*
*Quantified Tree Risk Assessor, Licensed user 1082/3442*
*Diploma of Horticulture/Arboriculture*
PO Box 1116
Scarborough WA 6922
Mobile: 0401 817 551/0403805084
www.paperbarktechnologies.com.au
zana@paperbarktechnologies.com.au

***Tree Survey – 3 Larsen Rd, (Lot 104 South West Hwy) Byford***

## TABLE OF CONTENTS

*Tree Survey – 3 Larsen Rd, (Lot 104 South West Hwy) Byford*

**BRIEF:**

This consultant has been commissioned by Procon Developments to inspect and submit a report in respect of 48 trees within 3 Larsen Road, (Lot 104 South West Highway), Byford in relation to the proposed development site.

The survey scope requires:

- the identification of tree species
- measurement of the height & canopy spread of the trees
- measurement of trunk diameters
- a description of the trees current health and structural condition
- Advice regarding the suitability or otherwise of trees to be retained within the development
- Recommended remedial pruning or other works that may be required.

A total of 48 trees located within the site have been inspected, assessed and photographed for this report. All trees audited are over 80mm in trunk diameter.

Trees were tagged to facilitate locating individual trees and numbers have been placed upon aerial images of the site.

A photo of each tree is also included in this report.

This consultant confirms tree inspections were carried out on the 16th and 17th of April 2018.

**FORM AND APPROACH:**

Below are the definitions for the captured information provided:

## Botanical name Information:

Botanical names are listed detailing the generic name followed by the specific epithet. The variety is named where applicable. Only the scientific and botanical names should be accepted to identify an exact tree species.

The botanical name is predominantly used within this report and the common name provided for your reference within the summary.

## Tree health:

**Good**
The tree is demonstrating good or exceptional growth for the species. The tree should exhibit a full canopy of foliage and have only minor pest or diseases problems. Foliage colour, size and density should be typical of a healthy specimen of that species.

**Fair**
The tree is in reasonable condition and growing well for the species. The tree should exhibit an adequate canopy of foliage. There may be some dead wood present in the crown, some grazing by insects or animals may be evident and/or foliage colour, size or density may be atypical for a healthy specimen of that species.

**Poor**
The tree is not growing to its full capacity; extension growth of the laterals may be minimal. The canopy may be thinning or sparse. Large amounts of dead wood may be evident throughout the crown. Significant pest and disease problems may be evident or symptoms of stress indicating tree decline.

**Very poor**
The tree appears to be in a state of decline and the canopy may be very thin and sparse. A significant volume of deadwood may be present in the canopy or pest and disease problems may be causing a severe decline in tree health.

**Dead**
The tree is dead.

## Tree Structure:

Each tree surveyed was examined in detail to ascertain its overall structural condition and then placed into one of five categories:

***Good:*** The tree has a well-defined and balanced crown. Branch unions appear to be strong, with no defects evident in the trunk or the branches. Major limbs are well defined. The tree would be considered a good example of the species. Probability of significant failure is highly unlikely.

***Fair:*** The tree has some minor problems in the structure of the crown. The crown may be slightly out of balance, and some branch unions or branches may be exhibiting minor structural faults. If the tree is single trunked, this may be on a slight lean or be exhibiting minor defects. Probability of significant failure is low.

***Poor:*** The tree may have a poorly structured crown. The crown may be unbalanced or exhibit large gaps. Major limbs may not be well defined. Branches may be rubbing or crossing over. Branch unions may be poor or faulty at the point of attachment. The tree may have suffered major root damage. Probability of significant failure is moderate.

***Very Poor:*** The tree has a poorly structured crown. The crown is unbalanced or exhibits large gaps. Major limbs are not well defined. Branch unions may be poor or faulty at the point of attachment. A section of the tree has failed or is in imminent danger of failure. Active failure may be present or failure is probable in the immediate future.

***Has Failed:*** A significant section of the tree or the whole tree has failed.

**Tree Survey Details over leaf.**

***Tree Survey – 3 Larsen Rd, (Lot 104 South West Hwy) Byford***

| Tree No. | Botanical Name | Height | Spread | DBH | Health & condition | Suitable to retain Yes/No & why | Recommendations |
|---|---|---|---|---|---|---|---|
| 101 | *Eucalyptus robusta* | 13.5 | 9.5 | 500 | Displaying good health and fair structural condition, major limb forks appear sound with no separation or cracking visible, sporadic minor deadwood throughout, some excessive limb load noted over adjacent footpath. | Suitable to be retained within a garden bed. Ensure minimal root disturbance during construction. | Remove deadwood and excessive limb load over path |
| 102 | *Melia azedarach* | 8 | 7 | 480 | Displaying good health and fair structural condition with adjacent suckering growth, limb forks appear sound, sporadic minor deadwood held throughout canopy. | Invasive weed species, not suitable for retention | Remove Tree |
| 103 | *Melia azedarach* | 5.5 | 5 | 180 | Displaying good health and poor structural condition, multi stemmed form with numerous suckers located around the base. | Invasive weed species, not suitable for retention | Remove Tree |
| 104 | *Ficus elastica* | 11 | 8.5 | 550 | Displaying good health and poor structural condition, canopy consists of predominantly mature epicormic growth with multiple previous major limb failures evident. | Invasive species, not suitable for retention | Remove Tree |
| 105 | *Ficus elastica* | 5.5 | 7.5 | 430 | Displays good health and structural condition, previously heavily pruned resulting in canopy consisting of mature epicormic limbs, sporadic minor deadwood throughout. | Invasive species, not suitable for retention | Remove Tree |

***Tree Survey – 3 Larsen Rd, (Lot 104 South West Hwy) Byford***

| Tree No. | Botanical Name | Height | Spread | DBH | Health & condition | Suitable to retain Yes/No & why | Recommendations |
|---|---|---|---|---|---|---|---|
| 106 | *Corymbia calophylla* | 8.5 | 7 | 450 | Displays good health and fair structural condition, canopy suppressed by adjacent tree and leaning to the north west, limb forks sound, previous limb failures evident, major deadwood held in lower half of tree | Not suitable for retention due to being located within proposed bitumen hardstand | Remove tree |
| 107 | *Corymbia calophylla* | 10.5 | 9 | 460 | Displays good health and fair structural condition, limb forks appear sound with no separation or cracking visible, sporadic minor deadwood held throughout, excessive limb load on lower lateral limb. | Not suitable for retention due to being located within proposed bitumen hardstand | Remove tree |
| 108 | *Corymbia calophylla* | 9 | 9 | 450 | Displays good health and fair structural condition, canopy suppressed by adjacent trees and leaning in a westerly direction, sporadic minor deadwood throughout, root plate is firm. | Not suitable for retention due to being located within proposed bitumen hardstand | Remove tree |
| 109 | *Corymbia calophylla* | 12 | 8.5 | 470 | Displaying good health and fair structural condition, limb forks appear sound with no separation or cracking visible, sporadic minor deadwood held throughout. | Not suitable for retention due to being located within proposed bitumen hardstand | Remove tree |
| 110 | *Nuytsia floribunda* | 4 | 3.5 | 280 | Displaying good health and fair structural condition with a secondary stem. Minor deadwood visible, small sucker at base of tree. | Not suitable for retention due to being located within proposed bitumen hardstand | Remove tree |

***Tree Survey – 3 Larsen Rd, (Lot 104 South West Hwy) Byford***

| Tree No. | Botanical Name | Height | Spread | DBH | Health & condition | Suitable to retain Yes/No & why | Recommendations |
|---|---|---|---|---|---|---|---|
| 111 | *Corymbia calophylla* | 8.5 | 7.5 | 340 | Displaying good health and fair structural condition, limb forks appear sound with no separation or cracking visible, sporadic minor deadwood held throughout, tree is root firm. | Not suitable for retention due to being located within proposed bitumen hardstand | Remove tree |
| 112 | *Corymbia calophylla* | 5 | 0 | 780 | Main tree has died rendering only a trunk and one small sucker remaining. | Not suitable for retention. Displays very poor structure with active termites and longitudinal crack down the main stem indicating future failure imminent. | Remove tree |
| 113 | *Corymbia calophylla* | 11 | 11 | 690 | Displaying good health and fair structural condition, main limb cluster formed at 1m with resin exuding around the base, limb forks appear sound, sporadic minor deadwood held throughout. | Not suitable for retention due to being located within proposed bitumen hardstand | Remove tree |
| 114 | *Corymbia calophylla* | 11 | 8.5 | 530 | Displaying good health and fair structural condition with codominant stems formed at 1.8m, limb forks appear sound with no separation or cracking visible, sporadic minor deadwood held throughout. | Not suitable for retention due to being located within proposed bitumen hardstand | Remove tree |
| 115 | *Corymbia calophylla* | 6.5 | 6.5 | 350 | Displaying good health and fair structural condition, limb forks appear sound with no separation or cracking visible, sporadic minor deadwood visible within lower half of the tree. | Suitable to be retained within a garden bed. Ensure minimal root disturbance during construction. | Remove lower lateral branches up to 2m. Remove minor deadwood throughout. |

***Tree Survey – 3 Larsen Rd, (Lot 104 South West Hwy) Byford***

| Tree No. | Botanical Name | Height | Spread | DBH | Health & condition | Suitable to retain Yes/No & why | Recommendations |
|---|---|---|---|---|---|---|---|
| 116 | *Corymbia calophylla* | 8.5 | 11 | 460 | Displaying fair health and structural condition with a slight north westerly lean, limb forks appear sound with no separation or cracking visible, sporadic major deadwood held within the lower canopy. | Suitable to be retained within a garden bed. Ensure minimal root disturbance during construction. | Remove major deadwood throughout. |
| 117 | *Corymbia calophylla* | 9.5 | 8.5 | 650 | Displaying good health and fair structural condition, codominant stems formed at 0.7m, limb forks appear sound with no separation or cracking visible, small amount of minor deadwood visible. | Suitable to be retained within a garden bed. Ensure minimal root disturbance during construction. | Remove lower lateral branches up to 2.5m. Remove minor deadwood. |
| 118 | *Corymbia calophylla* | 9.5 | 3 | 180 | Found to be in good health and fair structural condition displaying a tall slender habit, limb forks appear sound with no separation or cracking visible, very minor deadwood evident. | Suitable to be retained within a garden bed. Ensure minimal root disturbance during construction. | No works required |
| 119 | *Corymbia calophylla* | 7 | 4.5 | 250 | Found to be in good health and fair structural condition, form displays secondary stems with suckering growth developed at the base, limb forks appear sound, small amount of minor deadwood visible. | Suitable to be retained within a garden bed. Ensure minimal root disturbance during construction. | Remove small secondary stems |
| 120 | *Eucalyptus camaldulensis* | 13.5 | 10 | 730 | Displaying good health and fair structural condition with codominant stems formed at 0.8m, major limb forks appear sound with no separation or cracking visible, very minor deadwood evident, root plate appears firm. | Suitable to be retained within a garden bed. Ensure minimal root disturbance during construction. | Remove minor deadwood, re-inspection recommended in 12 months |

***Tree Survey – 3 Larsen Rd, (Lot 104 South West Hwy) Byford***

| Tree No. | Botanical Name | Height | Spread | DBH | Health & condition | Suitable to retain Yes/No & why | Recommendations |
|---|---|---|---|---|---|---|---|
| 121 | *Corymbia calophylla* | 14 | 14.5 | 710 | Displaying good health and fair structural condition, major limb forks appear sound with no separation or cracking visible, sporadic major deadwood is visible with a dead branch hanging at 6m, multiple previous limb failures evident. | Suitable to be retained within a garden bed. Ensure minimal root disturbance during construction. | Remove hanging branch and major deadwood to sound growth points. |
| 122 | *Corymbia calophylla* | 7 | 4 | 190 | Displaying good health and fair structural condition, very minor deadwood held throughout, limb forks appear sound with no separation or cracking visible. | Suitable to be retained within a garden bed. Ensure minimal root disturbance during construction. | No works required |
| 123 | *Corymbia calophylla* | 5 | 4 | 170 | Displaying good health and fair structural condition, limb forks appear sound with no separation or cracking evident, small amount of minor deadwood visible. | Suitable to be retained within a garden bed. Ensure minimal root disturbance during construction. | No works required |
| 124 | *Corymbia calophylla* | 5.5 | 4 | 120 | Displaying good health and fair structural condition, limb forks appear sound with no separation or cracking visible, very minor deadwood held throughout | Suitable to be retained within a garden bed. Ensure minimal root disturbance during construction. | No works required |
| 125 | *Corymbia calophylla* | 7.5 | 5.5 | 270 | Found to be in good health and fair structural condition displaying a secondary stem, limb forks appear sound with no separation or cracking visible, small amount of minor deadwood evident. | Suitable to be retained within a garden bed. Ensure minimal root disturbance during construction. | No works required |

***Tree Survey – 3 Larsen Rd, (Lot 104 South West Hwy) Byford***

| Tree No. | Botanical Name | Height | Spread | DBH | Health & condition | Suitable to retain Yes/No & why | Recommendations |
|---|---|---|---|---|---|---|---|
| 126 | *Corymbia calophylla* | 8.5 | 13.5 | 560 | Displaying good health and fair structural condition with previous fire damage evident on main stem, major limb forks appear sound with no separation or cracking visible, major deadwood is sporadic held throughout to canopy. | Not suitable for retention due to being located within proposed bitumen hardstand | Remove tree |
| 127 | *Corymbia calophylla* | 10.5 | 5 | 510 | Tree is dead | Not suitable for retention due to being located within proposed bitumen hardstand | Remove tree |
| 128 | *Corymbia calophylla* | 8 | 11 | 550 | Displaying poor health and structural condition with the main stem having died, live growth remains on 1 x first order limb, major deadwood throughout. | Not suitable for retention due to poor health and structure | Remove tree |
| 129 | *Corymbia calophylla* | 6.5 | 6 | 320 | Displaying good health and fair structural condition with the canopy suppressed by adjacent tree, codominant stems have formed 1m with major limb forks appearing sound with no separation or cracking visible. | Not suitable for retention due to being located within proposed bitumen hardstand | Remove tree |
| 130 | *Corymbia calophylla* | 8.5 | 5 | 240 | Found to be in good health and fair structural condition displaying a tall slender habit due to reduced sun light levels and canopy suppression from adjacent trees, limb forks sound. | Not suitable for retention due to being located within proposed bitumen hardstand | Remove tree |

***Tree Survey – 3 Larsen Rd, (Lot 104 South West Hwy) Byford***

| Tree No. | Botanical Name | Height | Spread | DBH | Health & condition | Suitable to retain Yes/No & why | Recommendations |
|---|---|---|---|---|---|---|---|
| 131 | *Corymbia calophylla* | 11 | 9.5 | 420 | Displaying good health and fair structural condition with a small amount of fire damage on the main stem, major limb forks appear sound with no separation or cracking visible, sporadic minor deadwood is held throughout canopy. | Not suitable for retention due to being located within proposed bitumen hardstand | Remove tree |
| 132 | *Corymbia calophylla* | 13 | 14 | 690 | Displaying good health and fair structural condition with fire damage evident on the main stem, limb forks appear sound with no separation or cracking visible, previous major limb failures, sporadic minor deadwood throughout canopy. | Not suitable for retention due to being located within proposed bitumen hardstand | Remove tree |
| 133 | *Corymbia calophylla* | 13 | 11 | 910 | Displaying good health and fair structural condition with a small amount of fire damage at the base of the tree, codominant stems have formed at 2m, major limb forks appear sound with no separation or cracking visible, sporadic major deadwood is held throughout. | Suitable to be retained within a garden bed. Ensure minimal root disturbance during construction. | Remove deadwood |
| 134 | *Corymbia calophylla* | 2.5 | 1.4 | 80 | Small group of trees displaying good health and fair structural condition with the canopy suppressed by adjacent trees, codominant stems formed 1m | Suitable to be retained within a garden bed. Ensure minimal root disturbance during construction. | No works required |
| 135 | *Corymbia calophylla* | 11.5 | 5.5 | 410 | Displaying good health and fair structural condition with the canopy suppressed by adjacent tree and leaning in a northerly direction, major limb forks appear sound with no separation or cracking visible, minor deadwood evident. | Suitable to be retained within a garden bed. Ensure minimal root disturbance during construction. | No works required |

***Tree Survey – 3 Larsen Rd, (Lot 104 South West Hwy) Byford***

| Tree No. | Botanical Name | Height | Spread | DBH | Health & condition | Suitable to retain Yes/No & why | Recommendations |
|---|---|---|---|---|---|---|---|
| 136 | *Corymbia calophylla* | 12.5 | 7.5 | 620 | Found to be in good health and fair structural condition displaying a secondary stem and suckering growth at base, major limb forks appear sound with no separation or cracking visible, small amount of minor deadwood visible. | Suitable to be retained within a garden bed. Ensure minimal root disturbance during construction. | Remove small sucker and lower lateral branches up to 2m |
| 137 | *Corymbia calophylla* | 7 | 4.5 | 280 | Displaying good health and fair structural condition with the canopy suppressed by adjacent tree and leaning in a southerly direction, major limb forks appear sound, very small amount of minor deadwood visible, root plate appears firm. | Suitable to be retained within a garden bed. Ensure minimal root disturbance during construction. | Remove lower lateral branches up to 2m |
| 138 | *Corymbia calophylla* | 13 | 7.5 | 460 | Displaying good health and fair structural condition with codominant stems formed at 3m, major limb forks appear sound with no separation or cracking visible, located approximately 1m away from adjacent tree, very minor deadwood visible. | Suitable to be retained within a garden bed. Ensure minimal root disturbance during construction. | Remove small advertising sign |
| 139 | *Corymbia calophylla* | 11.5 | 7 | 630 | Displaying good health and fair structural condition with multiple stems formed at 0.3m, located approximately 1m away from adjacent tree, major limb forks appear sound with no separation or cracking visible, very minor deadwood visible | Suitable to be retained within a garden bed. Ensure minimal root disturbance during construction. | No works required |
| 140 | *Corymbia calophylla* | 9.5 | 6.5 | 350 | Displaying good health and fair structural condition with a small secondary stem, major limb forks appear sound with no separation or cracking visible, sporadic minor deadwood is held throughout. | Suitable to be retained within a garden bed. Ensure minimal root disturbance during construction. | Remove minor deadwood and stunted secondary stem |

***Tree Survey – 3 Larsen Rd, (Lot 104 South West Hwy) Byford***

| Tree No. | Botanical Name | Height | Spread | DBH | Health & condition | Suitable to retain Yes/No & why | Recommendations |
|---|---|---|---|---|---|---|---|
| 141 | *Corymbia calophylla* | 11.5 | 10 | 610 | Found to be in good health and fair structural condition with codominant stems formed at 3m displaying included bark, major limb forks appear sound with no separation or cracking visible, very minor deadwood visible, minor root girdling around base of trunk. | Suitable to be retained within a garden bed. Ensure minimal root disturbance during construction. | No works required |
| 142 | *Callistemon 'Kings Park Special'* | 4.5 | 5.5 | 430 | Found to be in good health and fair structural condition, displays a multi stemmed form and multiple inclusions with no separation or cracking visible at this time, very minor deadwood and suckering growth visible. | Suitable to be retained within a garden bed. Ensure minimal root disturbance during construction. | No works required |
| 143 | *Callistemon 'Kings Park Special'* | 5 | 5.5 | 410 | Found to be in good health and fair structural condition, the main stem is twisted and multiple unions display included bark with no separation or cracking visible at this time, small amount of minor deadwood, suckering growth visible at the base. | Suitable to be retained within a garden bed. Ensure minimal root disturbance during construction. | Remove suckering growth at base |
| 144 | *Corymbia calophylla* | 11.5 | 13 | 950 | Displaying good health and poor structural condition with a large amount of recent fire damage on the main trunk, a major limb has previously failed leaving a long stub, a column of decay has developed within the stub with active bees visible, major deadwood is held throughout, previously heavily pruned leaving long epicormic limbs. | Remove tree due to poor structure and high level or risk to new introduced targets | Remove tree |

***Tree Survey – 3 Larsen Rd, (Lot 104 South West Hwy) Byford***

| Tree No. | Botanical Name | Height | Spread | DBH | Health & condition | Suitable to retain Yes/No & why | Recommendations |
|---|---|---|---|---|---|---|---|
| 145 | *Corymbia calophylla* | 9 | 9.5 | 540 | Displaying good health and fair structural condition, major limb forks appear sound with no separation or cracking visible, lower growth starting to hang down, minor deadwood throughout with suckers developed at the base | Suitable to be retained within a garden bed. Ensure minimal root disturbance during construction. | Canopy lift required with some weight reduction pruning to lower branches which are hanging down, remove sucker and chain at base of tree. |
| 146 | *Corymbia calophylla* | 8 | 5 | 320 | Displaying good health and fair structural condition with the canopy suppressed by adjacent tree resulting in tree leaning in a south easterly direction, codominant stems have formed at 1.5m, major limb forks appear sound with no separation or cracking evident, minor deadwood visible throughout. | Suitable to be retained within a garden bed. Ensure minimal root disturbance during construction. | Remove small secondary stem and minor deadwood. |
| 147 | *Corymbia calophylla* | 13.5 | 10.5 | 680 | Displaying good health and fair structural condition with lower lateral branches hanging down, major limb forks appear sound with no separation or cracking visible, minor deadwood held throughout. | Suitable to be retained within a garden bed. Ensure minimal root disturbance during construction. | Remove lower branches hanging down to source and sound growth points. Remove deadwood throughout. |
| 148 | *Eucalyptus camaldulensis* | 5.5 | 4.5 | 160 | Found to be in good health and poor structural condition displaying a secondary stem with included bark, no separation or cracking is visible at this time however has the propensity to split out as it develops in size. | Not suitable for retention due to being located within proposed bitumen hardstand | Remove tree |

*Tree Survey – 3 Larsen Rd, (Lot 104 South West Hwy) Byford*

## Summary

This consultant confirms that the 48 trees within the proposed development site were found to be in predominately good health and fair structural condition at the time of inspection.

The trees within the site have had minimal tree surgery works carried out in previous times rendering some of the trees to experience large limb failures and poor structural condition. It was evident that a fire has damaged tree 144, rendering the trunk to display cracking and brittle wood from decay and damage.

The proposed design provided by the client has incorporated areas of green space for the retention of select trees in prominent areas and for the replanting of up to 17 additional trees to maintain a similar level of coverage. It is recommended to not change levels in these garden beds to minimise root disturbance and ensure the health of the retained trees is maintained.

**Species List**

The following seven species were identified by this consultant within the site:

**West Australian Native Species**

| **Botanical name** | **Common name** |
|---|---|
| *Callistemon 'Kings Park Special'* | Bottlebrush |
| *Corymbia calophylla* | Marri |
| *Eucalyptus camaldulensis* | River Red Gum |
| *Nuytsia floribunda* | WA Christmas Tree |

**Australian Native Species**

| **Botanical name** | **Common name** |
|---|---|
| *Eucalyptus robusta* | Swamp Mahogany |
| *Melia azedarach* | Cape Lilac |

**Exotic Species**

| | |
|---|---|
| *Ficus elastica* | Rubber Tree |

**The survey revealed:**

- The 48 trees inspected were found to be predominantly in good health and fair structural condition at this time.
- 22 trees are recommended for removal predominantly due to being located within proposed bitumen and hardstand areas according to the plan provided by Procon developments.
- 26 trees are recommended to be retained within garden beds and ensure that minimal disturbance to roots during construction is achieved.
- 16 trees are recommended for some minor remedial pruning works to remove dead wood and improve the structural condition, therefore reducing the risk to surrounding new targets.
- 10 trees require no work at this time.

*Tree Survey – 3 Larsen Rd, (Lot 104 South West Hwy) Byford*

## Tree Protection during development works

- More than 90% of trees' roots are located in the upper 1.0m of soil depth and tree roots generally extend well beyond the canopy spread of the tree.

- Machinery and vehicle movements in proximity to trees and the stock piling of building materials beneath trees can damage both tree roots and the lower sections of the canopy and need to be restricted.

- Where trees are being retained it is crucial that designers, contractors and sub-contractors are informed of the likely extent of tree roots and the potential damage to roots and lower branches from the construction of infrastructure too close to trees.

- It is therefore recommended that the identification of trees to be retained and appropriate tree protection and management measures are formulated following a more detailed consideration of the extent and proximity of proposed works in relation to the trees once the design for the POS is approved.

*Zana Sheary - Arboricultural Consultant*
*Paperbark Technologies Pty Ltd*
PO Box 1116
Scarborough WA 6922
Mob: 0401 817 551
zana@paperbarktechnologies.com.au
www.paperbarktechnologies.com.au
*ISA Certified Arborist AU-0341A*
*Quantified Tree Risk Assessor Lic-3442*
*Diploma of Horticulture/Arboriculture*



**Limitation of liability**
Trees can be managed, but they cannot be controlled. To live or work near a tree involves a degree of risk.
This report only covers identifiable defects present at the time of inspection. Paperbark Technologies accepts no responsibility and cannot be held liable for any structural defect or unforeseen event/situation or adverse weather conditions that may occur after the time of inspection.
Paperbark Technologies cannot guarantee that the tree/s contained within this report will be structurally sound under all circumstances, and is not able to detect every condition that may possibly lead to the structural failure of a tree. Paperbark Technologies cannot guarantee that the recommendations made will categorically result in the tree being made safe.
Unless specifically mentioned this report will only be concerned with above ground inspections, as such all observations have been visually assessed from ground level. Trees are living organisms and as such cannot be classified as safe under any circumstances. Trees fail in ways that the arboriculture industry does not fully understand.
The recommendations are made on the basis of what can be reasonably identified at the time of inspection therefore Paperbark Technologies accepts no liability for any recommendations made.
All care has been taken to obtain information from reliable sources, however Paperbark Technologies can neither guarantee nor be responsible for the accuracy of information provided by others.
In the event that re-inspection of the tree/s is recommended it is the client's responsibility to make arrangements with Paperbark Technologies.

## References

Mattheck, C & Breloer H, (1994) *The body language of trees, a handbook for failure analysis.* London TSO (The Stationery Office)

Lonsdale David, (1999) *Principles of Tree Hazard Assessment and Management.* London TSO (The Stationery Office).

Hayes, Ed (2007) *Evaluating Tree Defects, second edition.* Safetrees Rochester.

Australian Standard 4373-2007 *Pruning of amenity trees.*

Australian Standard 4970-2009 *Protection of trees on development sites.*

Urban, James (2008) *Up by Roots – Healthy Soils and Trees in the Built Environment* International Society of Arboriculture, Champaign, Illinois U

*Tree Survey – 3 Larsen Rd, (Lot 104 South West Hwy) Byford*

## Map indicating tree locations (Trees are tagged)

***Tree Survey – 3 Larsen Rd, (Lot 104 South West Hwy) Byford***

**Photos of trees**


Tree 101


Tree 102


Tree 103


Tree 104


Tree 105


Tree 106


Tree 107


Tree 108


Tree 109


Tree 110


Tree 111


Tree 112

***Tree Survey – 3 Larsen Rd, (Lot 104 South West Hwy) Byford***

Tree 113

Tree 114

Tree 115

Tree 116

Tree 117

Tree 118

Tree 119

Tree 120

Tree 121

Tree 122

Tree 123

Tree 124

***Tree Survey – 3 Larsen Rd, (Lot 104 South West Hwy) Byford***


Tree 125


Tree 126


Tree 127


Tree 128


Tree 129


Tree 130


Tree 131


Tree 132


Tree 133


Tree 134


Tree 135


Tree 136

***Tree Survey – 3 Larsen Rd, (Lot 104 South West Hwy) Byford***

Tree 137

Tree 138

Tree 139

Tree 140

Tree 141

Tree 142

Tree 143

Tree 144

Tree 145

Tree 146

Tree 147

Tree 148

***Tree Survey – 3 Larsen Rd, (Lot 104 South West Hwy) Byford***

| Tree No. | Botanical Name | Height | Spread | DBH | Health & condition | Suitable to retain Yes/No & why | Recommendations |
|---|---|---|---|---|---|---|---|
| 145 | *Corymbia calophylla* | 9 | 9.5 | 540 | Displaying good health and fair structural condition, major limb forks appear sound with no separation or cracking visible, lower growth starting to hang down, minor deadwood throughout with suckers developed at the base | Suitable to be retained within a garden bed. Ensure minimal root disturbance during construction. | Canopy lift required with some weight reduction pruning to lower branches which are hanging down, remove sucker and chain at base of tree. |
| 146 | *Corymbia calophylla* | 8 | 5 | 320 | Displaying good health and fair structural condition with the canopy suppressed by adjacent tree resulting in tree leaning in a south easterly direction, codominant stems have formed at 1.5m, major limb forks appear sound with no separation or cracking evident, minor deadwood visible throughout. | Suitable to be retained within a garden bed. Ensure minimal root disturbance during construction. | Remove small secondary stem and minor deadwood. |
| 147 | *Corymbia calophylla* | 13.5 | 10.5 | 680 | Displaying good health and fair structural condition with lower lateral branches hanging down, major limb forks appear sound with no separation or cracking visible, minor deadwood held throughout. | Suitable to be retained within a garden bed. Ensure minimal root disturbance during construction. | Remove lower branches hanging down to source and sound growth points. Remove deadwood throughout. |
| 148 | *Eucalyptus camaldulensis* | 5.5 | 4.5 | 160 | Found to be in good health and poor structural condition displaying a secondary stem with included bark, no separation or cracking is visible at this time however has the propensity to split out as it develops in size. | Not suitable for retention due to being located within proposed bitumen hardstand | Remove tree |

**PLANT SCHEDULE**

All plants depicted are at estimated mature size as an indication of the future landscape.

Shrubs, grasses and ground cover to be planted at minimum 14cm pot size.

Trees to be planted at minimum 45ltr pot size.

**Trees**

| | |
|---|---|
| 12 x Callistemon hybrid 'Kings Park Special' | 5m x 4m |
| 4 x Corymbia calophylla | 15m x 8 |
| 2 x Eucalyptus camaldulensis | 40m x 12m |
| 4 x Eucalyptus lane-poolei 'Salmon White Gum' | 8m x 5m |

**Shrubs**

| | |
|---|---|
| 24 x Banksia attenuata 'Dwarf' | 2m x 2m |
| 57 x Darwinia citriodora | 1.5m x 1.5m |
| 36 x Grevillea johnsonii x wilsonii 'Bon Fire' | 2m x 1.5m |
| 72 x Hypocalymma angustifolium 'Coconut Ice' | 1m x 1m |
| 33 x Melaleuca nesophila 'Narrow Nessie' | 3m x 1m |
| 51 x Verticordia plumosa | 60cm x 1m |

**Climbing plants**

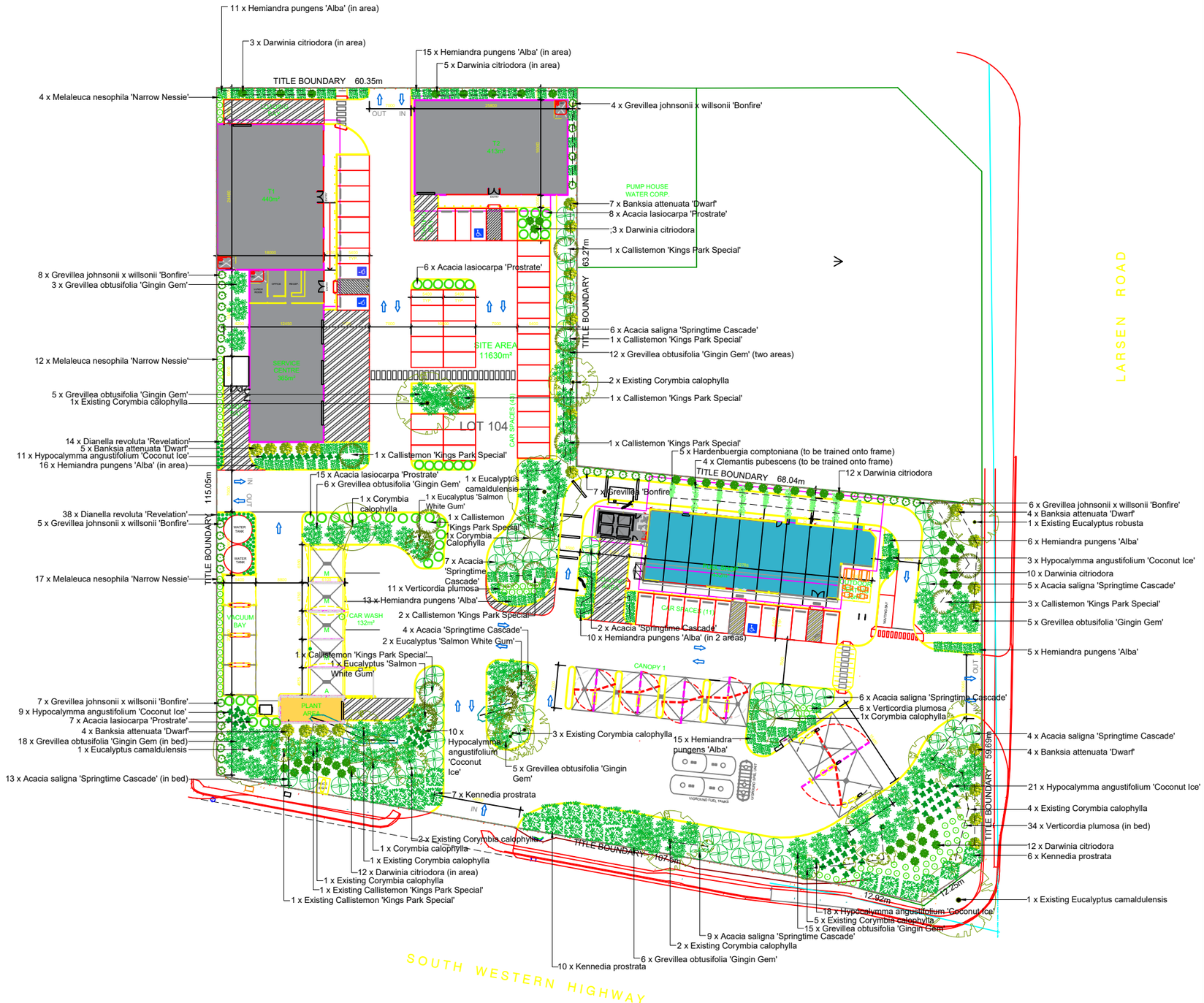
| | |
|---|---|
| 4 x Clematis pubescens | 5m x 5m |
| 5 x Hardenbergia comptoniana | 3m x 3m |

**Grasses**

| | |
|---|---|
| 52 x Dianella revoluta 'Revelation' | 50cm x 55cm |

**Ground cover**

| | |
|---|---|
| 42 x Acacia lasiocarpa 'Prostrate' | 40cm x 1.5m |
| 56 x Acacia saligna 'Springtime Cascade' | 25cm x 3m |
| 75 x Grevillea obtusifolia 'Gin Gin Gem' | 30cm x 3m |
| 91 x Hemiandra pungens 'Alba' | 20cm x 1.5m |
| 23 x Kennedia prostrata | 10cm x 3m |




DISCLAIMER

All symbols and elements depicted in this plan are artistic representations to illustrate conceptual ideas and are subject to approval by the relevant professionals or authority.

It is the client's responsibility to ensure the required certifications, licenses and approvals are held prior to installation.
Levels and measurements must be checked on site prior to construction.



CLIENT
Procon Developments

PROJECT
Proposed Development
3 Larsen Road
Byford

DRAWING Landscape Plan

DATE 02.05.2018

PROJECT NUMBER 1886

REVISION 02

DESIGNER Amelia Coleman

Scale @A3 1:750

NOTES

Landscape area measurement - 2886m2.

All planting areas to be mulched to a depth of 75mm with local stone mulch.

All landscape areas to be reticulated.

Watering schedule to be as per Water Corporation's Water Efficiency Measures guidelines.

URBAN Retreat GARDEN DESIGN

COMMERCIAL AND RESIDENTIAL
LANDSCAPE DESIGN SERVICES

E:amelia@urbanretreatgardens.com.au
M:0438 926 313 P/F:08 9242 2806
ABN: 31494997428

*Tree Survey – 3 Larsen Rd, (Lot 104 South West Hwy) Byford*

## Summary

This consultant confirms that the 48 trees within the proposed development site were found to be in predominately good health and fair structural condition at the time of inspection.

The trees within the site have had minimal tree surgery works carried out in previous times rendering some of the trees to experience large limb failures and poor structural condition. It was evident that a fire has damaged tree 144, rendering the trunk to display cracking and brittle wood from decay and damage.

The proposed design provided by the client has incorporated areas of green space for the retention of select trees in prominent areas and for the replanting of up to 17 additional trees to maintain a similar level of coverage. It is recommended to not change levels in these garden beds to minimise root disturbance and ensure the health of the retained trees is maintained.

**Species List**

The following seven species were identified by this consultant within the site:

**West Australian Native Species**

| **Botanical name** | **Common name** |
|---|---|
| *Callistemon 'Kings Park Special'* | Bottlebrush |
| *Corymbia calophylla* | Marri |
| *Eucalyptus camaldulensis* | River Red Gum |
| *Nuytsia floribunda* | WA Christmas Tree |

**Australian Native Species**

| **Botanical name** | **Common name** |
|---|---|
| *Eucalyptus robusta* | Swamp Mahogany |
| *Melia azedarach* | Cape Lilac |

**Exotic Species**

| | |
|---|---|
| *Ficus elastica* | Rubber Tree |

**The survey revealed:**

- The 48 trees inspected were found to be predominantly in good health and fair structural condition at this time.
- 22 trees are recommended for removal predominantly due to being located within proposed bitumen and hardstand areas according to the plan provided by Procon developments.
- 26 trees are recommended to be retained within garden beds and ensure that minimal disturbance to roots during construction is achieved.
- 16 trees are recommended for some minor remedial pruning works to remove dead wood and improve the structural condition, therefore reducing the risk to surrounding new targets.
- 10 trees require no work at this time.

DEVELOPMENT ASSESSMENT PANEL
APPROVED
11-Dec-2018

i3 consultants WA

# PROPOSED MIXED USE DEVELOPMENT (SERVICE STATION + CONVENIENCE STORE + DRIVE-THRU COFFEE | VEHICLE SERVICE STORE | COMMERCIAL TENANCIES | SELF SERVICE + AUTOMATIC CAR WASH)

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

## TRANSPORT IMPACT ASSESSMENT


Final 3-0

Prepared by i3 consultants WA for

Peter Webb & Associates | Procon

Transport Impact Assessment
Proposed Mixed Use Development (Service Station + Convenience Store + Drive-Thru Coffee| Vehicle Service Store | Commercial Tenancies | Self Service + Automatic Car Wash), Lot 104 [illegible]tern Highway) Byford
Prepared for Peter Webb & Associates | Procon

DEVELOPMENT ASSESSMENT PANEL
APPROVED
11-Dec-2018

i3 consultants wa

## Project details

| | |
|---|---|
| Project | Proposed Mixed Use Development (Service Station + Convenience Store + Drive-Thru Coffee\| Vehicle Service Store \| Commercial Tenancies \| Self Service + Automatic Car Wash) |
| Location | Lot 104 (SN3) Larsen Rd, (Cnr South Western Highway) Byford |
| Project ID | 02904 |
| Client | Peter Webb & Associates \| Procon |
| Description | A Transport Impact Statement for a proposed Mixed-Use Development (Service Station + Convenience Store + Drive-Thru Coffee \| Vehicle Service Store \| Commercial Tenancies \| Self Service + Automatic Car Wash) on Lot 104 at 3 Larsen Rd on the southwest corner of South Western Hwy within the Shire of Serpentine-Jarrahdale suburb of Byford prepared in accordance with the WAPC 2016 Transport Impact Assessment Guidelines. |

## Document control

| | |
|---|---|
| Author | David Wilkins TMIEAust |
| Status | Final 3-0 |
| File name | 02904 Lot 104 SWH_Larsen_George Service TIA (F3-0) |

| Distribution & Publication Record | | | | | | Final | | |
|---|---|---|---|---|---|---|---|---|
| | 12/04/18 | 17/04/18 | 08/11/18 | 04/05/18 | 07/05/18 | 20/09/18 | 09/11/18 | |
| Recipient \| Document version | D1-0 | D2-0 | D3-0 | F1-0 | F1-1 | F2-0 | F3-0 | F3-1 |
| nik@webbplan.com.au | ☑ | ☑ | ☑ | ☑ | ☑ | ☑ | ☑ | ☐ |
| Garrick@procon.net.au | ☑ | ☑ | ☐ | ☑ | ☑ | ☑ | ☑ | ☐ |
| leon@procon.net.au | ☐ | ☐ | ☑ | ☑ | ☑ | ☑ | ☑ | ☐ |
| Dominic@procon.net.au | ☐ | ☐ | ☐ | ☐ | ☐ | ☑ | ☑ | ☐ |

Revision status comments: D1-0 incomplete report issued for review of background information by client. D2-0 includes revised access and land uses: issued for review by client. F1-0 Final Issue with SIDRA data and completed WAPC checklist. F1-0 Section 14 amended to reflect changed parking bay numbers. F2-0 completely revised to reflect revised layout with no access to or from South Western Hwy, dualling of South Western Hwy including right and left turn lanes into Larsen Rd, largest vehicle restricted to 19 m ST and associated internal layout changes. D3-0 revised and updated to reflect revised plans and comments from the October JDAP process. F3-0 issued as Final with no changes other than adding cover image.

This is not an approved document unless certified here.

Digitally signed by David Wilkins
Date: 2018.11.09 12:06:03 +08'00'



PO Box 1638 Subiaco WA 6904 | T 08 9467 7478 | dwilkins@i3consultants.com | www.i3consultants.com | ABN 53 745 566 923

## CONTENTS

## FIGURES

## ABOUT THE AUTHOR

David Wilkins is an RTA NSW Certified Level 3 Lead Auditor (RSA-08-0178) and Main Roads Western Australia (MRWA) accredited Senior Road Safety Auditor (SRSA 0101). In addition to this, David is an MRWA accredited Crash Investigation Team Leader and Roadworks Traffic Manager (MRWA-RTM-10-RTM20). David has undertaken 104 road safety audits in the last five years and 236 road safety audits since 2001 across the full range of stages from feasibility through to pre-opening, including roadworks, existing roads, schools and mine sites.

David's specialist skills are in the management and development of transport infrastructure and planning, particularly with respect to road safety engineering, roadworks traffic management, traffic engineering, crash investigation, road safety audits, alternative transport systems (TravelSmart, shared paths, cycle facilities), transport statements, transport assessments, parking demand management, local area traffic management, speed management, accessible environments and innovation.

David specialises in undertaking and preparing traffic impact assessments in accordance with either the WAPC document 'Transport Impact Assessment Guidelines' (1) or Austroads 'Guide to Traffic Management Part 12: Traffic Impacts of Developments' (2) and has personally prepared over 160 of these in the last 10 years.

# 1 INTRODUCTION & BACKGROUND

This Transport Impact Assessment report has been prepared for Peter Webb & Associates | Procon (the applicant) by David Wilkins from i3 consultants WA (the consultant) in accordance with the WAPC publication Transport Impact Assessment Guidelines (1). These guidelines indicate that a Transport Impact Assessment (TIA) is required for developments that are likely to generate more than 100 vehicle trips in the development's peak hour and therefore would have a high impact on the surrounding land uses and transport networks, as shown in Figure 1 below.

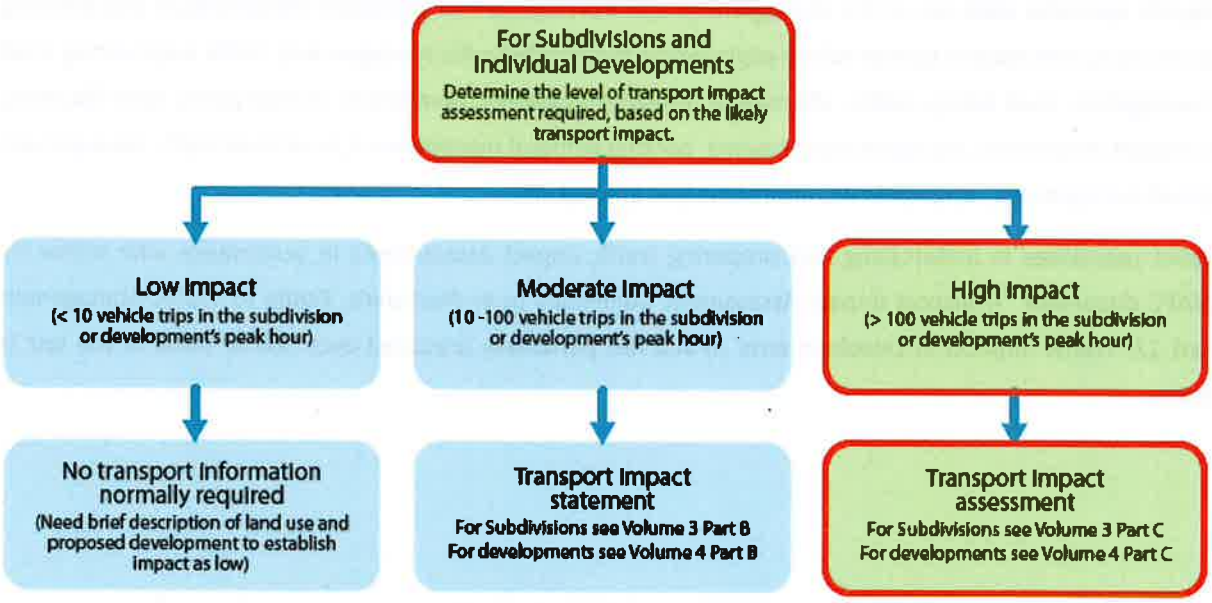



Figure 1 - Level of TIA required (Figure 2: WAPC Guidelines Vol 4)

Preliminary assessments indicate that this mixed-use development is likely to generate around 200 trips during its peak hour, mainly due to service station, drive-thru coffee and car wash land uses. More specific trip generation details are included in **Section 7**.

The location of the subject site in the context of the road and public transport network, 400 m (5-minute walk) and 800 m (10-minute walk) radii is shown in Figure 2 on the following page.

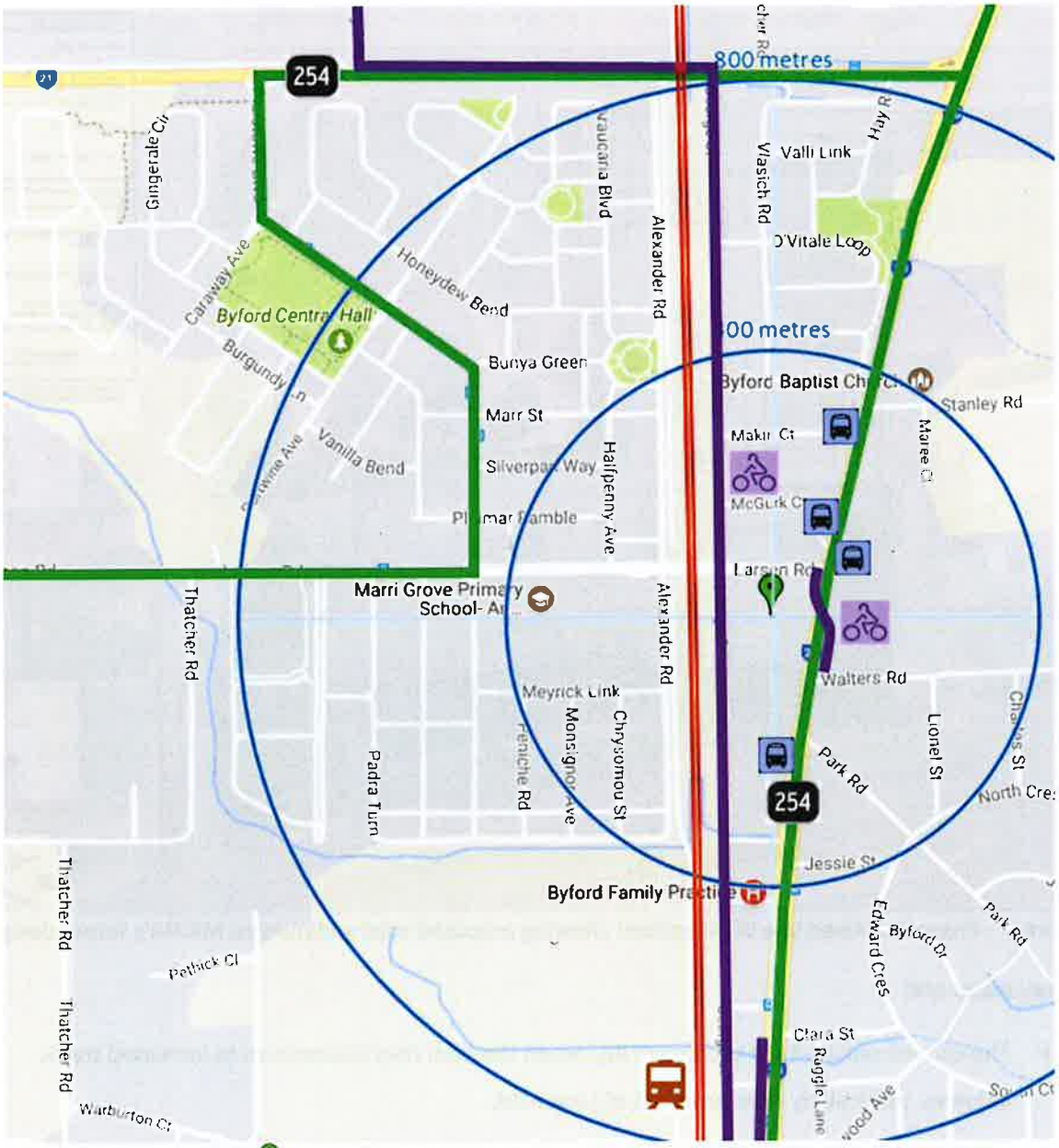



Figure 2 – Site location, road network, bus, train, cycle routes & 400 m/ 800 m walk/ cycle radii

The proposed Mixed-Use Development consists of an 8 fuelling point Service Station with a Convenience Store + Drive thru coffee, a Self Service Car wash with 4 manual bays and 1 automatic bay, a vehicle service store and two commercial tenancies, as described in Table 1 below and shown in Figure 3 on the following page.

| Land Use | GLA ($m^2$) | Number | Fuel Points |
|---|---|---|---|
| Restricted Retail | 630 | 1 | |
| Vehicle Service Centre | 400 | 1 | |
| Self Service Car Wash | 132 | 5 | |
| Service Station + Convenience Store + Drive-Thru Coffee | 400 | 1 | 8 |

Table 1 – Proposed Land Use Schedule

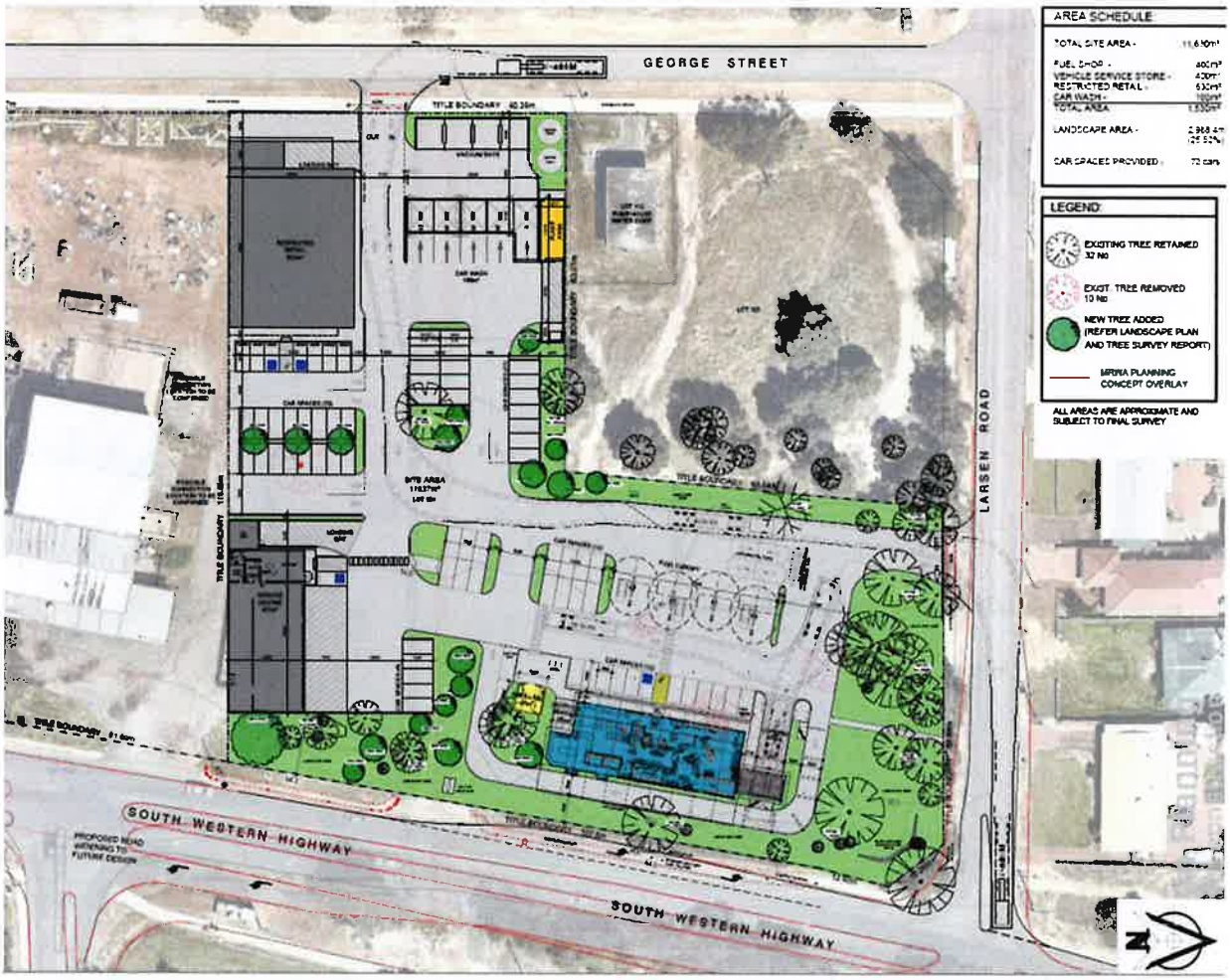



Figure 3 – Proposed Mixed Use Development showing proposed road widening to MRWA's future designs

The key issues are:

- The current sensitivity of the Larsen Rd/ South Western Hwy intersection to increased traffic volumes, particularly right turns out of Larsen Rd;
- The proposed closure of Larsen Rd at the railway level crossing just west of the subject site; and
- Accessibility by the 19 m ST fuel tanker.

In addition to the above, the Shire of Serpentine-Jarrahdale has identified its key concerns since issue of the previous version (F-2) of this TIA. These are listed and addressed in **Section 15** of this TIA.

# 2 EXISTING SITUATION

## 2.1 EXISTING SITE

The existing site is a cleared brownfield site as shown in Photograph 1 and Photograph 2 below.


Photograph 1 – Existing site conditions

Photograph 2 – Panoramic view of subject site from George St (Western Boundary)

## 2.2 EXISTING ROAD NETWORK AND HIERARCHY

A schematic representation of the existing road network, including Functional Hierarchy and traffic control on the main intersections, is provided as Figure 4 below. This shows that the site can currently be accessed from all directions and from Larsen Rd, South Western Highway and George St. It should be noted however that there are proposals to change the road network and controls, including relocating (i.e. closing) the Larsen Rd railway level crossing and this will impact on these access routes. Refer **Section 4.2** for more details.


Figure 4 – Functional Hierarchy, traffic control, subject site access points and access routes

The road classifications shown in Figure 4 on the previous page are defined in the Main Roads Functional Road Hierarchy as follows:

**Primary Distributor (South Western Highway)** *(Managed by Main Roads WA)*

These provide for major regional and inter-regional traffic movement and carry large volumes of generally fast-moving traffic. Some are strategic freight routes, and all are State roads.

**Regional Distributor (Soldiers Rd, Nettleton Rd)** *(Managed by Main Roads WA)*

These carry traffic between regional industrial, commercial and urban areas and generally connect to Primary Distributors. These are likely to carry larger volumes of generally fast-moving traffic than Local Distributors and be heavy truck routes.

**District Distributor A (Thomas Rd)** *Managed by Local Government*

These carry traffic between industrial, commercial and residential areas and generally connect to Primary Distributors. These are likely to be truck routes and provide only limited access to adjoining property.

**Local Distributors (Larsen Rd, Walters Rd, Abernethy Rd, Beenyup Rd, Briggs Rd)** *Managed by Local Government*

Carry traffic within a cell and link District/ Regional Distributors at the boundary to access roads. The route of the Local Distributor discourages through traffic so that the cell formed by the grid of Regional/District Distributors only carries traffic belonging to or serving the area. In Built Up Areas, these roads should accommodate buses, but discourage trucks.

**Access Roads** *Managed by Local Government*

Provide access to abutting properties with amenity, safety and aesthetic aspects having priority over the vehicle movement function. In Built Up Areas, these roads are bicycle and pedestrian friendly.

Based on the assessed road hierarchy and access routes, the key roads and intersection, in terms of impact of the proposed development, are Larsen Rd and South Western Hwy and its intersection.

## 2.3 EXISTING RESTRICTED ACCESS VEHICLE NETWORK

South Western Highway is classified as RAV Network 2, 3 and 4 and connects with other roads classified as RAV Network 2, 3 and 4 including Thomas Road to the north. RAV Networks 2, 3 and 4 all permit access by various heavy vehicle combinations up to 27.5m long. Larsen Rd and George St are not part of the RAV Network and hence the largest design vehicle that is permitted to use these roads and access the site, is the 19 m Semi Trailer.

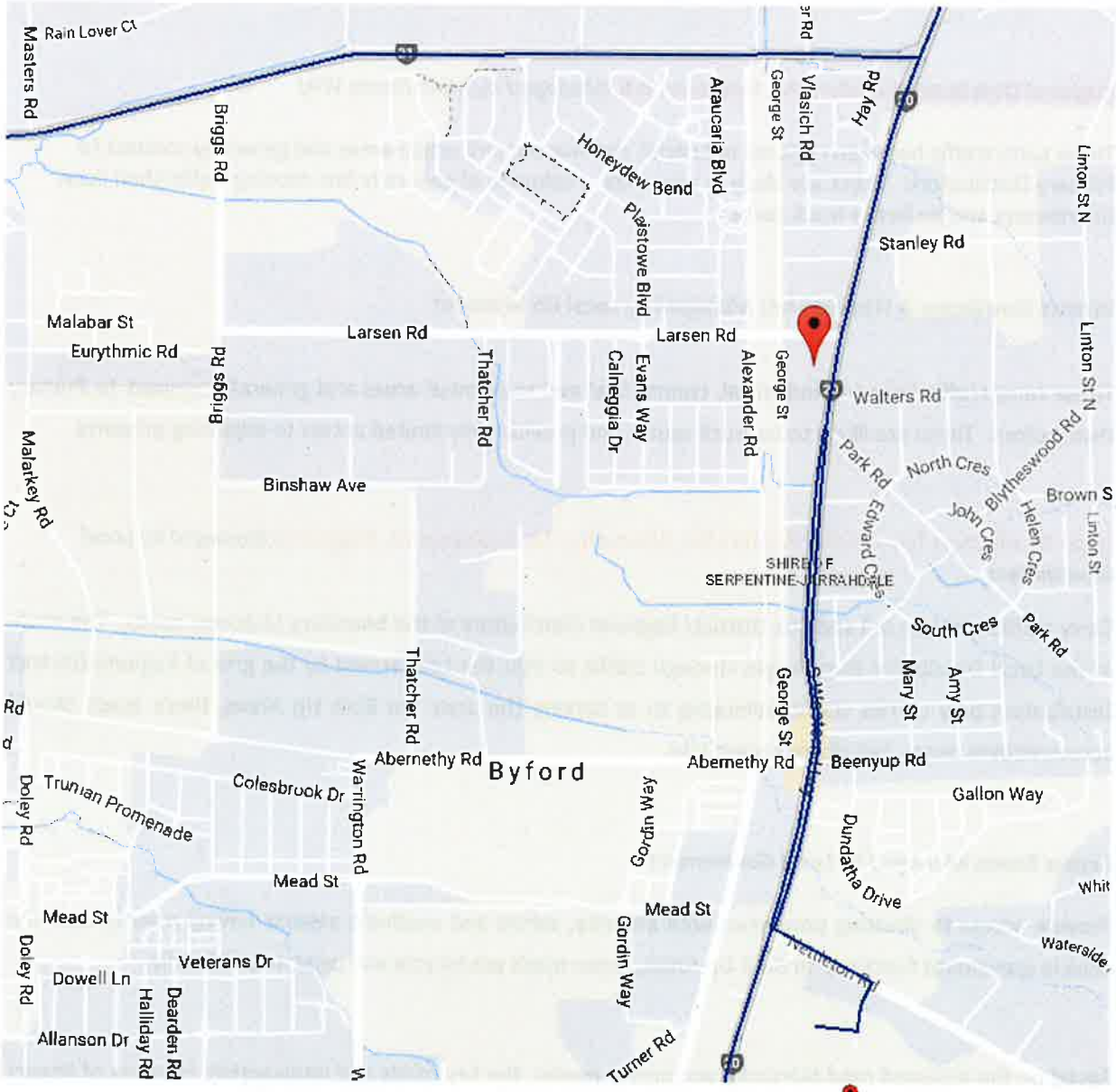



Figure 5 – RAV access routes in vicinity of the subject site ( )

## 2.4 KEY ROADS & INTERSECTIONS

### 2.4.1 South Western Highway

South Western Highway is a major north-south road connecting Byford with Bunbury and Busselton and other areas in the southwest of the state with Perth, via either Albany Highway or Tonkin Hwy.

South Western Highway is designated as National Highway 1 and is located on the eastern boundary of the subject site. It consists of single sealed and kerbed carriageway with one lane in each direction although this changes to a median separated dual carriageway with two lanes in each direction just south of the subject site, i.e. between Park Road and Nettleton Rd. South Western Highway is classified as a "Primary Distributor" road under the Main Roads Functional Hierarchy (3) and is subject to a posted speed limit of 60 km/h and a variable speed limit of 50 km/h between Abernethy Rd and Larsen Rd*. The 50 km/h variable speed limit signs at the northern end are shown in Photograph 3 below. A typical cross section in the vicinity of the subject site is shown in Photograph 4 on the following page, along with the latest available traffic volume data for South Western Highway south of Thomas Rd, i.e. Figure 6 (Mon-Fri) and Figure 7 (Sat). The traffic volumes are taken from SCATS data obtained from the traffic signals at South Western Hwy/ Thomas Rd (TCS 876) as they are more up-to-date than the latest midblock counts undertaken in September 2016 and include weekend data.

There is a short section of cycle path that travels between Larson Rd and Walters Rd that starts on the west (development) side and finishes on the east side via a refuge island as shown in Figure 2 on page 9 and Photograph 4 on the following page.


Photograph 3 – Looking south on South Western Hwy to 50 km/h variable speed limit signs before Larsen Rd

* The 50km/h speed limit operates between 7.30 am and 10 pm seven days a week. The 60 km/h applies outside these hours.

Photograph 4 – Looking south on South Western Hwy south of Larsen Rd (subject site on right)

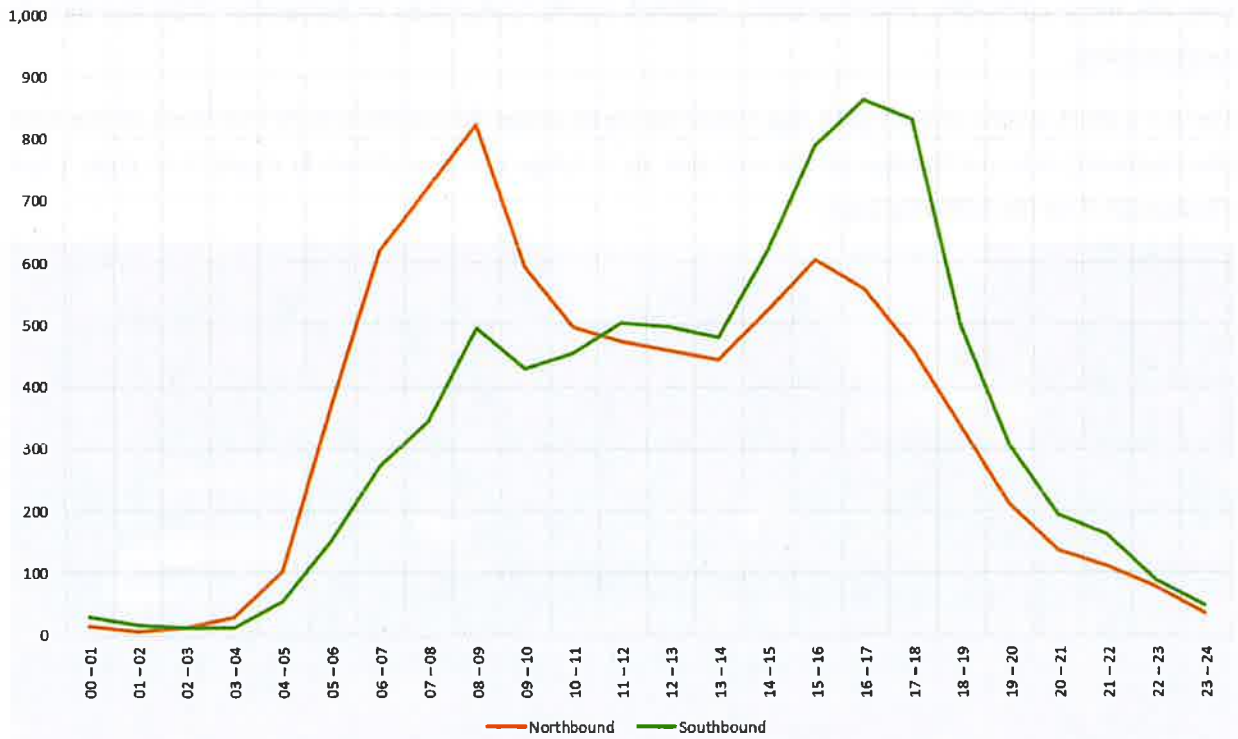



Figure 6 – Mon-Fri hourly traffic volume data for South Western Hwy south of Thomas Rd (March 2018)

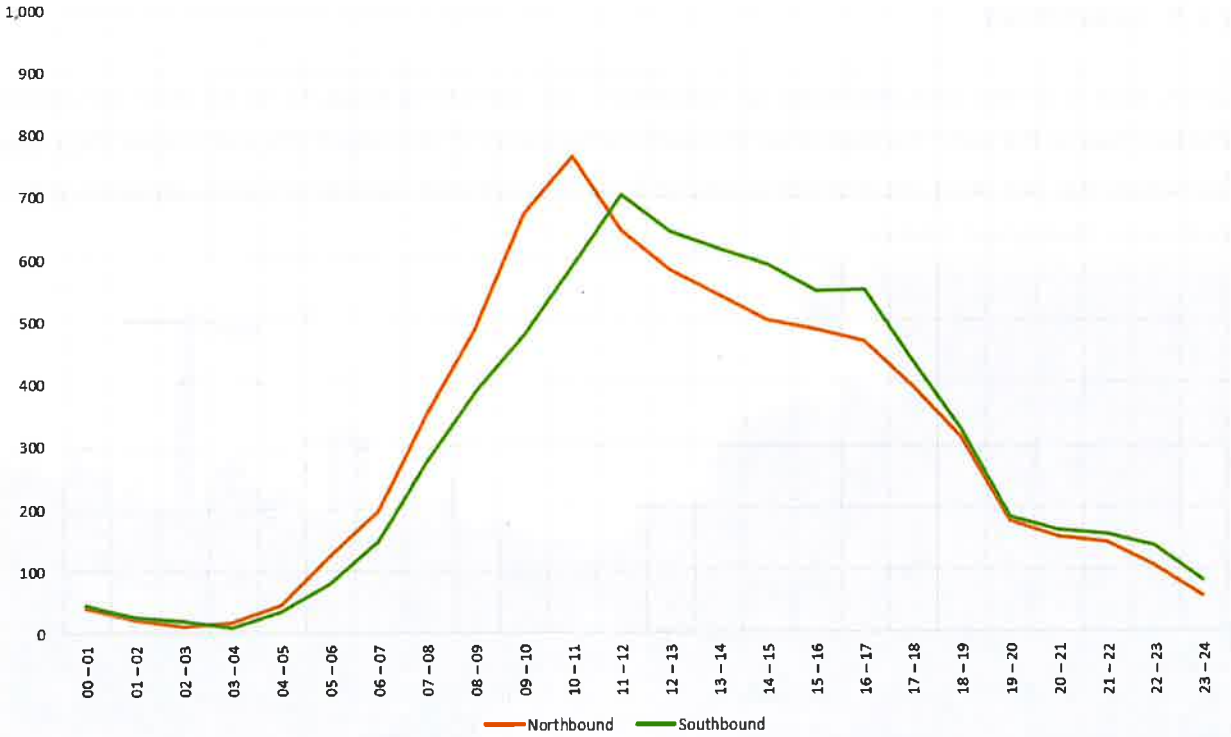



Figure 7 – Saturday hourly traffic volume data for South Western Hwy south of Thomas Rd (March 2018)

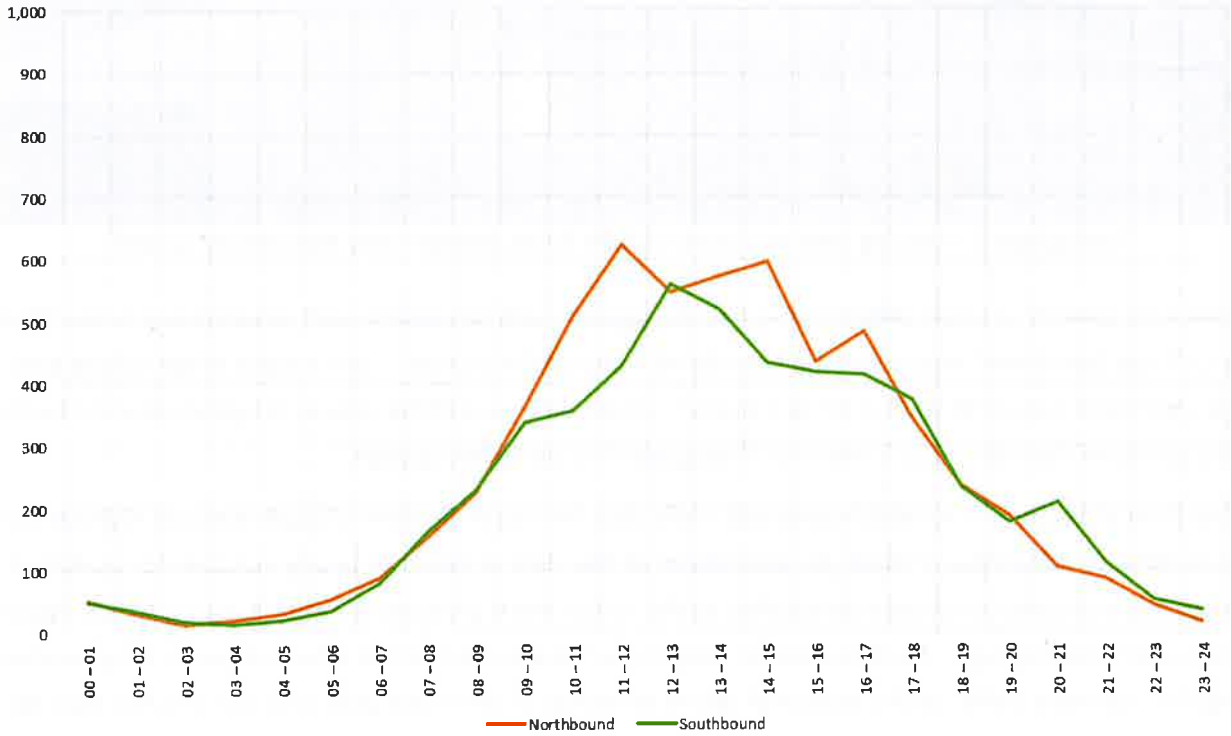



Figure 8 – Sunday hourly traffic volume data for South Western Hwy south of Thomas Rd (March 2018)

Existing midweek PM and Saturday mid-day peak hour turning volumes are included in **Section 2.3**.

Refer **Section 4.3** for proposed changes to South Western Highway.

### 2.4.2 Larsen Road

Larson Road is an east-west distributor (or connector) road connecting Briggs Rd to the west with South Western Hwy to the east. It is located on the northern boundary of the subject site and crosses the single line railway that runs along the west side of George St via an active level crossing with lights and boom gates, as shown in Photograph 5 below.

Photograph 5 – Looking west on Larsen Rd from South Western Hwy (subject site on left)

Larsen Rd consists of single sealed and kerbed carriageway with one lane in each direction and is classified as a "Local Distributor" road under the Main Roads Functional Hierarchy (3). It is subject to the default built-up area speed limit of 50 km/h and has a 40 km/h school zone west of the railway. A typical cross section in the vicinity of the subject site is shown in Photograph 6 on the following page.

The Shire of Serpentine-Jarrahdale provided traffic data for Larsen Rd west of South Western Highway for June 2014 on November 7th2018. An assessment of this data in terms of hourly volumes for weekdays, Saturdays and Sundays has been undertaken by the author and is provided as Figure 9, Figure 10 and Figure 11 on the following page. This data does not support the Shire's view that the school on Larsen Rd generates significantly more traffic on this section of Larsen Rd during its afternoon peak hour (i.e. 3-4 PM) than the adopted road network PM peak hour of 4-5 PM. The 4-5 PM peak hour was selected by the author based on the recorded March 2018 South Western Hwy peak hour.

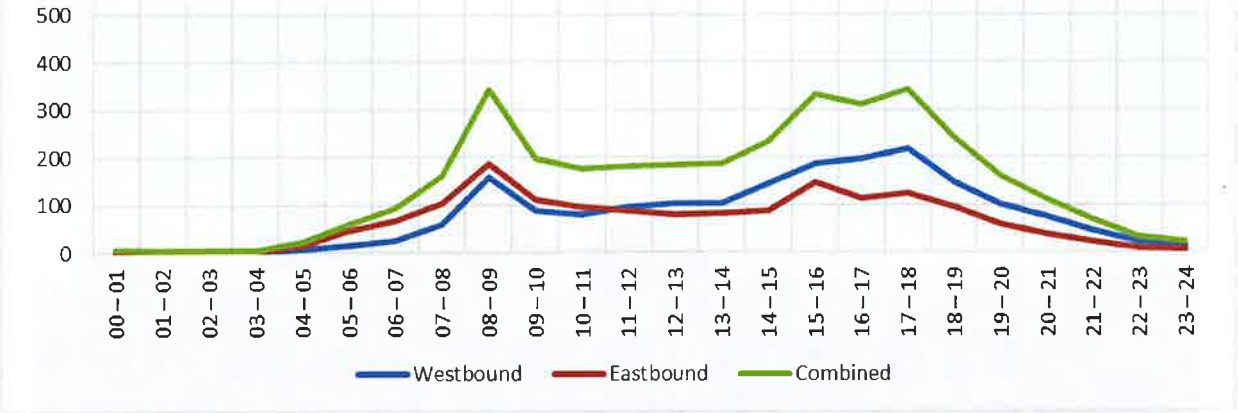



Figure 9 – Larsen Rd west of South Western Hwy Midweek volumes June 2014

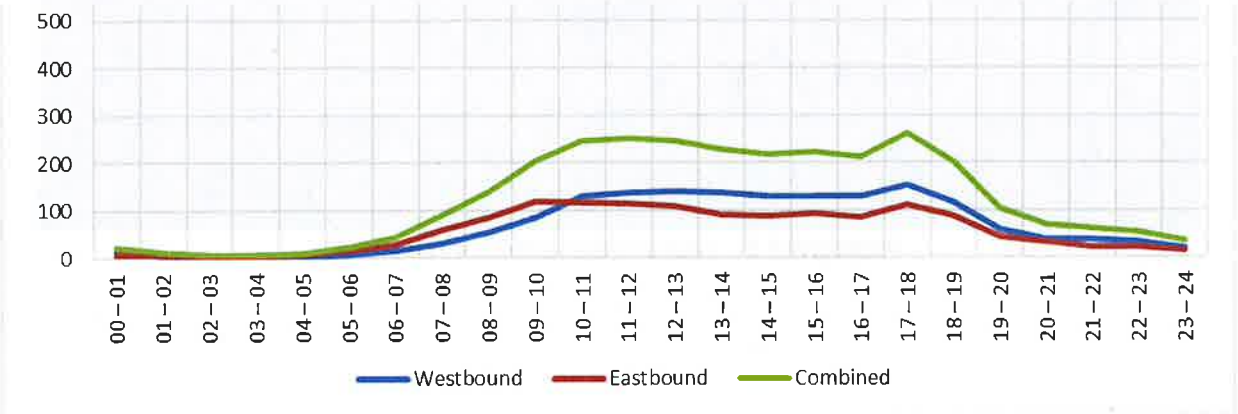



Figure 10 – Larsen Rd west of South Western Hwy Saturday volumes June 2014

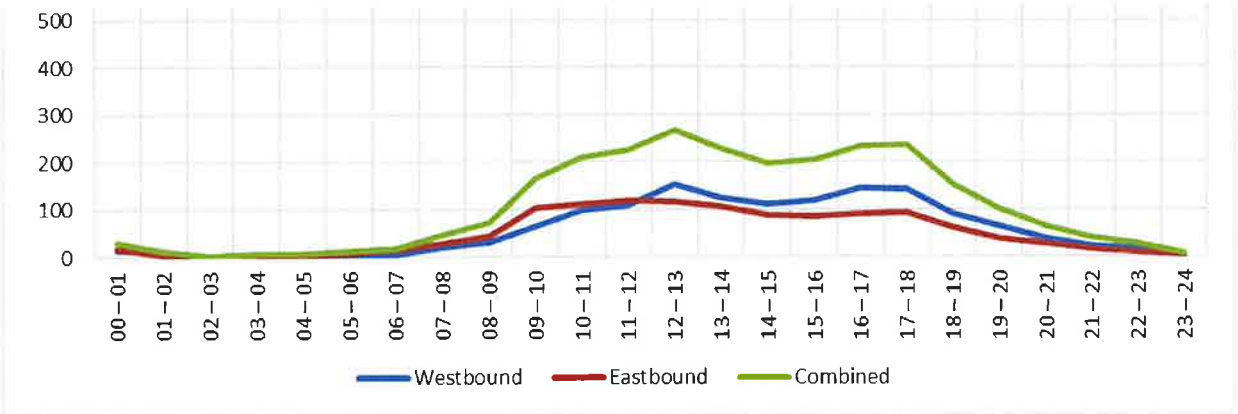



Figure 11 – Larsen Rd west of South Western Hwy Sunday volumes June 2014

More up-to-date (i.e. 2018) midweek PM and Saturday mid-day peak hour volumes are included in **Section 2.5**.

There are no existing or proposed designated cycle paths along Larsen Rd (refer **Section 14**). Cyclist were observed to use the road and the paths on either side.


Photograph 6 – Typical cross section of Larsen Rd

### 2.4.3 George Street

George St is a north-south local access road that currently terminates approximately 250 m south of Larsen Rd and is located on the western boundary of the subject site. It is proposed to construct George St for the full length of its road reserve sometime in the future (refer **Sections 4.2** and **4.4**).

George St consists of a single sealed carriageway for approximately 250 m south of Larsen Rd where it then becomes an unsealed road with pedestrian but not vehicular access to the south. It has a kerb on the east (development) side and is classified as an "Access Road" under the Main Roads Functional Hierarchy (3). It is subject to the default built-up area speed limit of 50 km/h. A typical cross section in the vicinity of the subject site is shown in Photograph 7 below.

Existing midweek PM and Saturday mid-day peak hour volumes (low due to lack of existing development south of Larsen Rd) are shown in **Section 2.3**.

There is an existing cycle path along the east (development) side of George St (refer **Section 14**).

Local Planning Policy No 53: George Street Construction Costs allows for "the contribution of funding for the construction of George Street from Pitman Way to Larsen Road in a coordinated manner by detailing the costs, method of apportionment and method of collecting contributions."

Lot 104 Larsen Road (the subject site) has an indicated percentage of construction cost liability of 10.22% based on a 61.1 m frontage to George St.

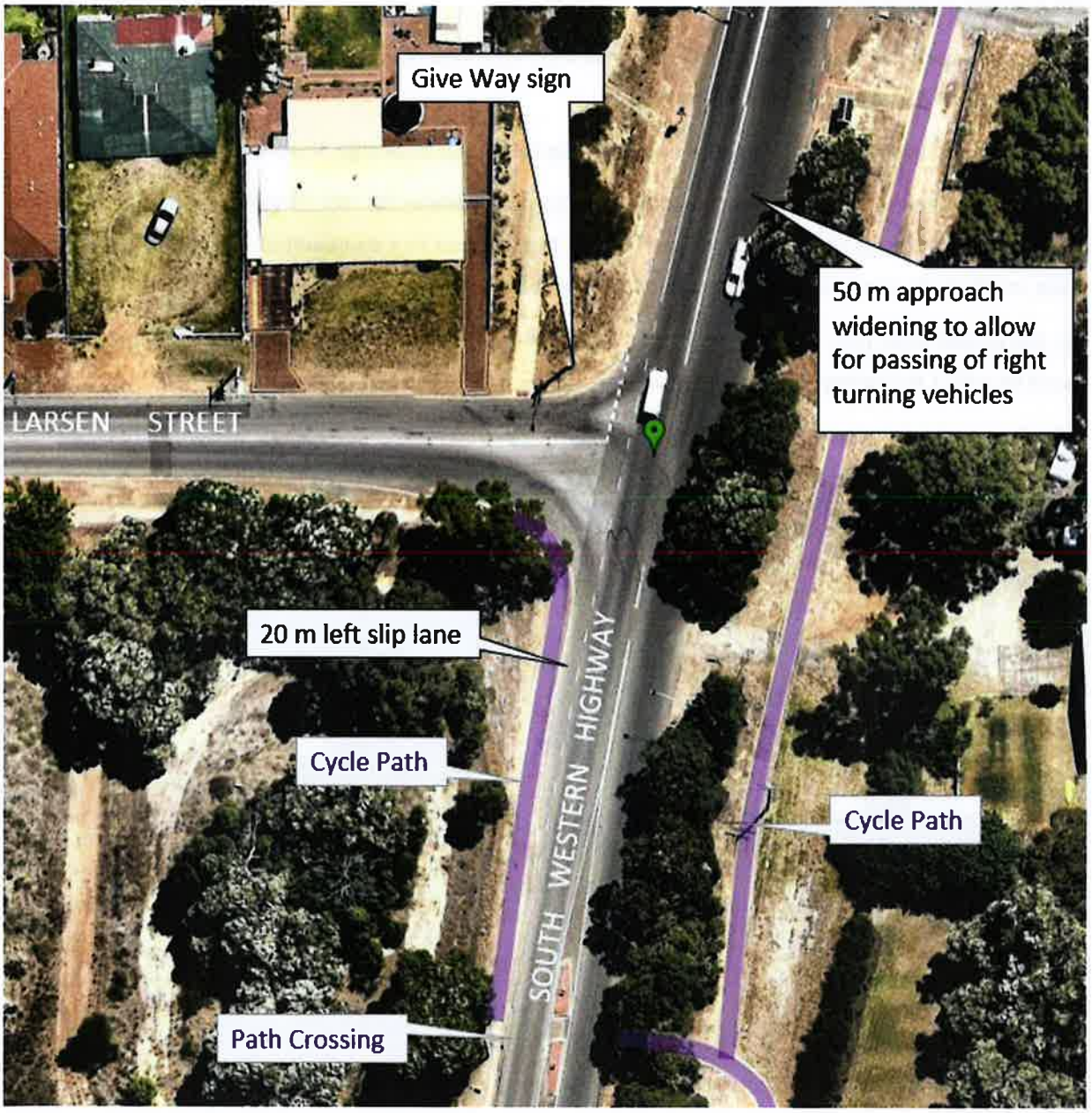
Refer **Section 4.4** for proposed changes to George St.


Photograph 7 – Typical cross section of George St

### 2.4.4 Key intersection 1 (Ki1): Larsen Rd/ South Western Hwy

This intersection has been identified as a Key intersection as the majority of traffic likely to be generated by the proposed development will perform right turn movements at this intersection.

The layout of this Give Way controlled 'T' intersection is best described through the annotated aerial photograph dated 14 February 2018 provided as Photograph 8 below. A street view of the Larsen Rd approach to South Western Hwy is provided as Photograph 9 on the following page. Existing midweek PM and Saturday mid-day peak hour turning and through volumes are included in **Section 2.3**.




Photograph 8 – Layout of Key intersection 1 as at 14 February 2018


Photograph 9 – Larsen Rd approach to South Western Hwy (peak hour conditions)

As shown in Photograph 9 above, drivers currently find it difficult to turn right into South Western Hwy during peak times. This is described and assessed in more detail in **Section 9**.

Refer **Section 4.3** for proposals to upgrade this intersection as part of the South Western Highway upgrade proposal.

### 2.4.5 Secondary intersection 1 (Si1): Larson Rd/ George St

This intersection has been identified as a Secondary intersection as it may experience a high proportion of right turning volumes associated with the development compared to existing volumes.

The layout of this Give Way controlled '4-way' intersection is best described through the annotated aerial photograph dated 14 February 2018 provided as Photograph 10 below. A street view of the railway level crossing is shown in Photograph 5 on page 18. Existing midweek PM and Saturday mid-day peak hour turning and through volumes are included in **Section 2.3**.


Photograph 10 – Layout of Secondary intersection 1 as at 14 February 2018

## 2.5 EXISTING PEAK HOUR TRAFFIC VOLUMES

Peak hour traffic volumes around the site and through the identified Key and Secondary intersections were compiled by the author for a Thursday (4 PM – 5 PM) and a Saturday (11 AM – 12 noon) in March 2018 with adjustments made for the Easter Holiday traffic. The assessment of this data in the draft report indicated that the key intersection of Larsen Rd and South Western Hwy was very sensitive to any increases in right turning traffic and it was therefore determined that further detailed traffic turning surveys for a weekday between 1 and 2 PM and 4 and 5 PM as well as a Saturday between 12 noon and 1 PM in April was warranted. Video surveys were undertaken by i3 on 13th and 14th April 2017 in order to develop the existing (2018) traffic volume diagrams provided as Figure 12 below and Figure 13 and Figure 14 on the following page.

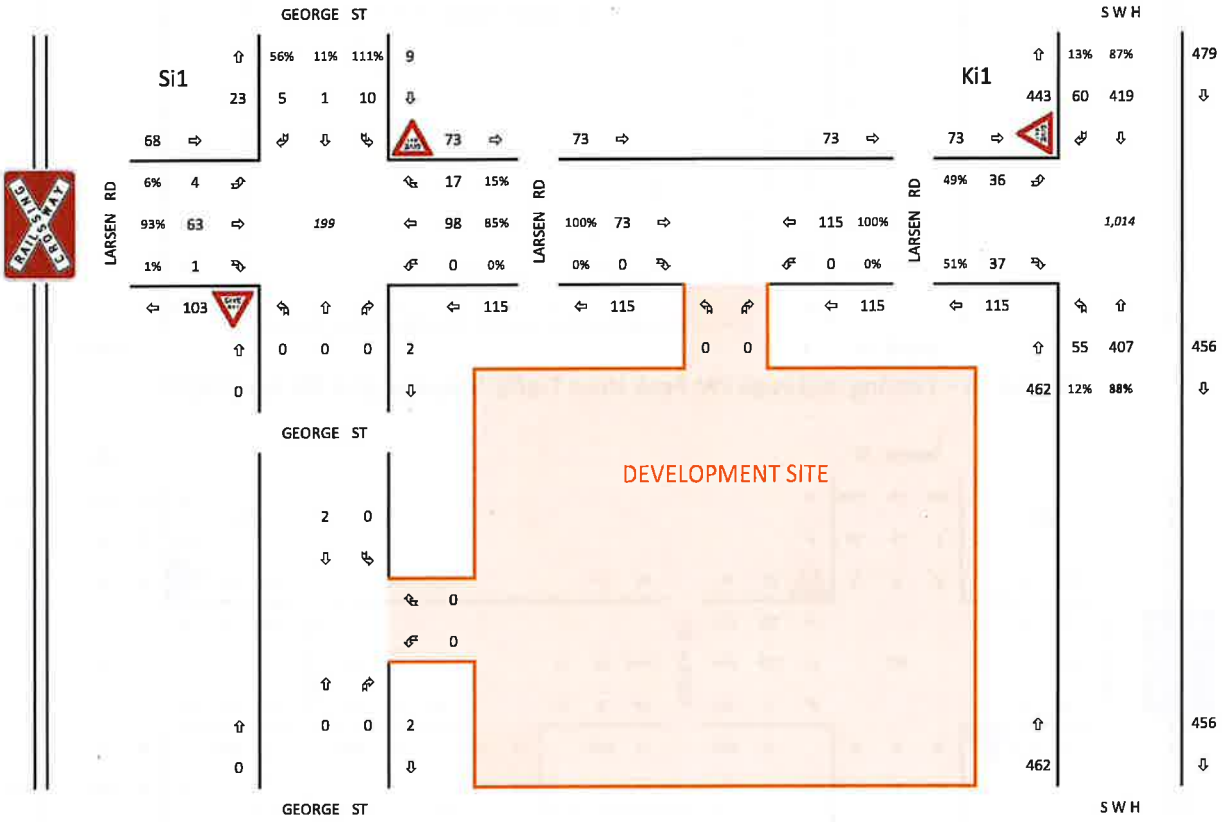



Figure 12 – Existing midweek PM Peak Hour Traffic Volumes (1-2 PM April 2018)

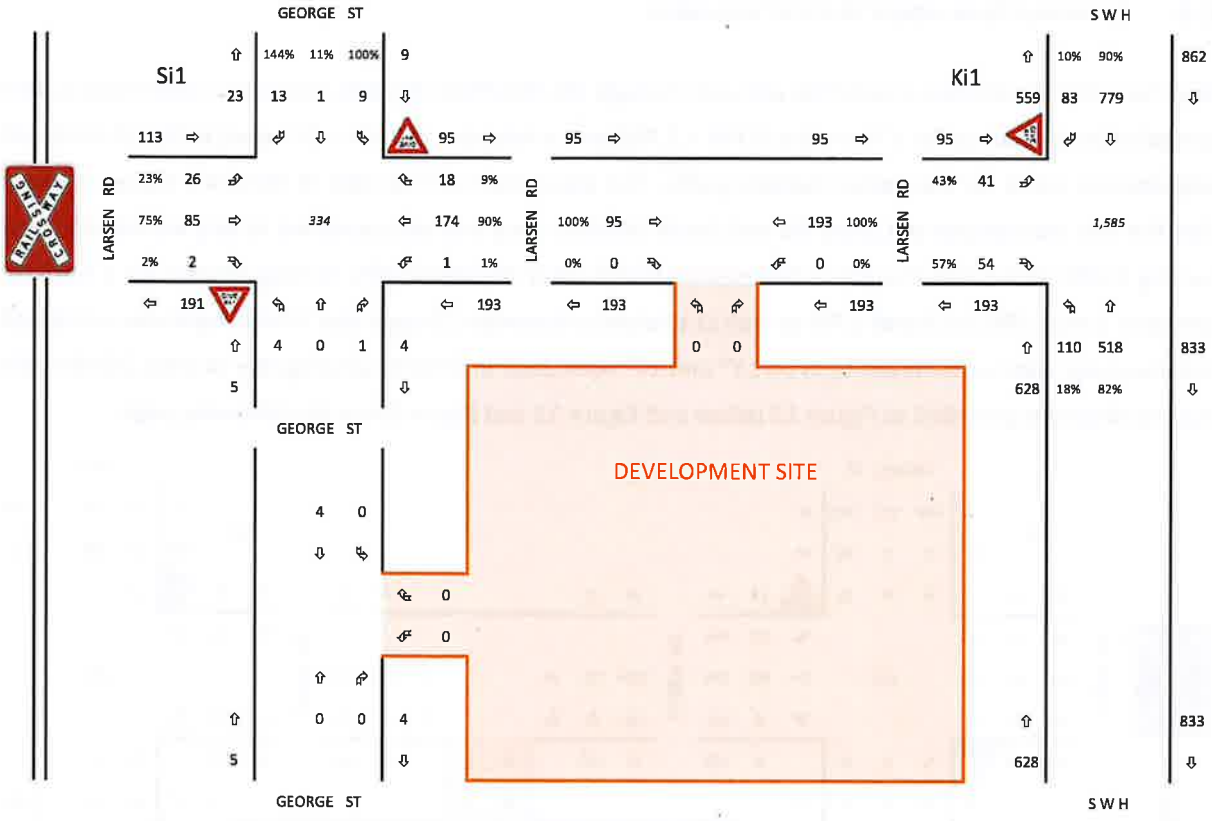



Figure 13 – Existing midweek PM Peak Hour Traffic Volumes (4-5 PM April 2018)

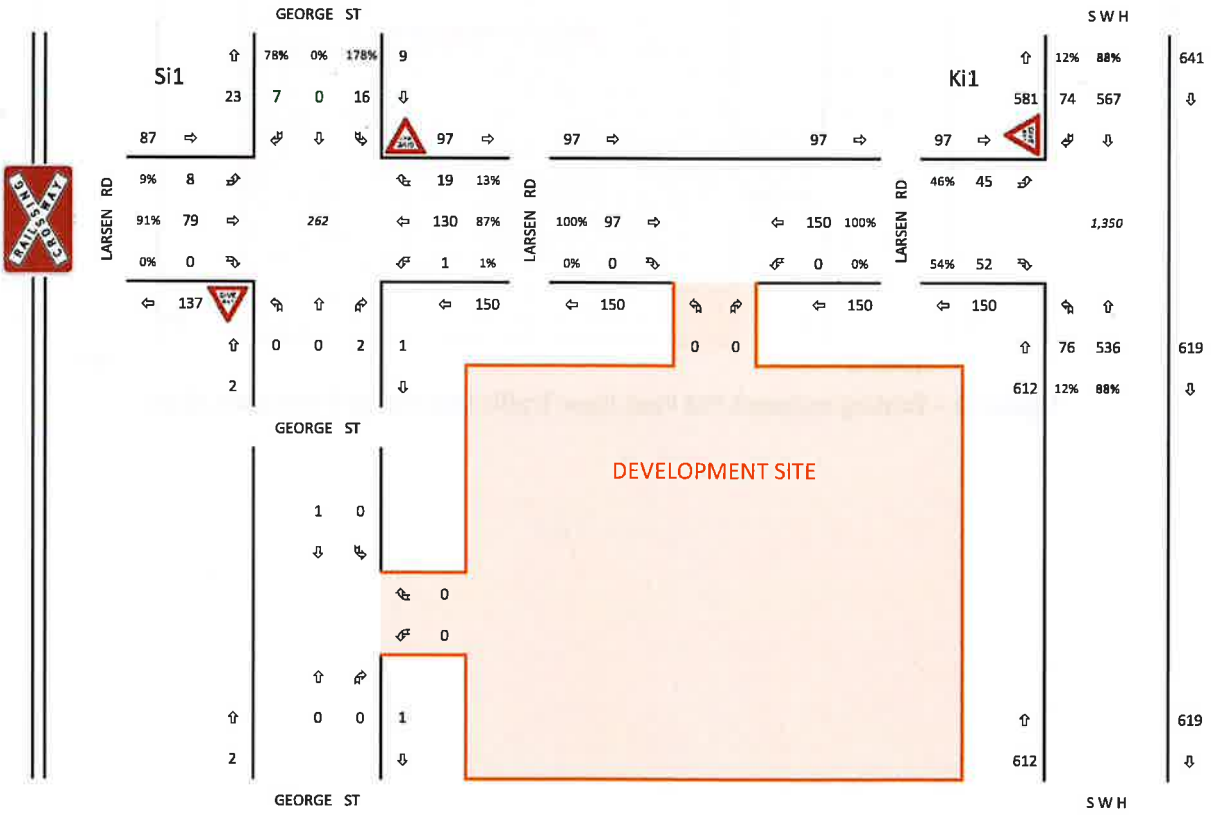



Figure 14 – Existing Saturday mid-day Peak Hour Traffic Volumes (12 noon – 1 PM April 2018)

# 3 DEVELOPMENT PROPOSAL

It is proposed to demolish all existing buildings on site and construct 4 buildings with parking and service areas throughout as shown in Figure 3 on page 10. The site will comprise of 630 $m^2$ Gross Floor Area of Restricted Retail, 400 $m^2$ Gross Floor Area of Vehicle Service Centre, a self-service car wash with 4 manual wash bays and 1 automatic wash bay and an 8 fuel-point service station with a Convenience Store + Drive-Thru Coffee. The car park comprises of 71 standard bays, 3 ACROD bays, 1 waiting bay and 3 loading bays.

The proposed development will not have fuel facilities for large vehicles. As such, the largest vehicles expected to access and egress the site is the 19 m Semi Trailer Fuel Tanker servicing the site at intervals of 2-3 times per week for a maximum duration of 1 hour for each service. The 12.5 m Heavy Rigid Vehicle will be the typical delivery and service vehicle for waste collection and stock deliveries to all tenancies.

It is proposed to provide full vehicular access off Larsen Rd and George St, i.e. no direct access off South Western Highway, in accordance with the agreed Main Roads WA/ Shire of Serpentine-Jarrahdale Access Strategy, as discussed in **Section 4.3**.

# 4 DEVELOPMENT + TRANSPORT PROPOSALS

## 4.1 PROPOSED DEVELOPMENTS

There is a current proposal for a Service Station and takeaway food outlet on Lots 30 & 31 (SN 801 & 803) on the west side of South Western Hwy approximately 250 m south of the subject site, as shown in Figure 15 below.

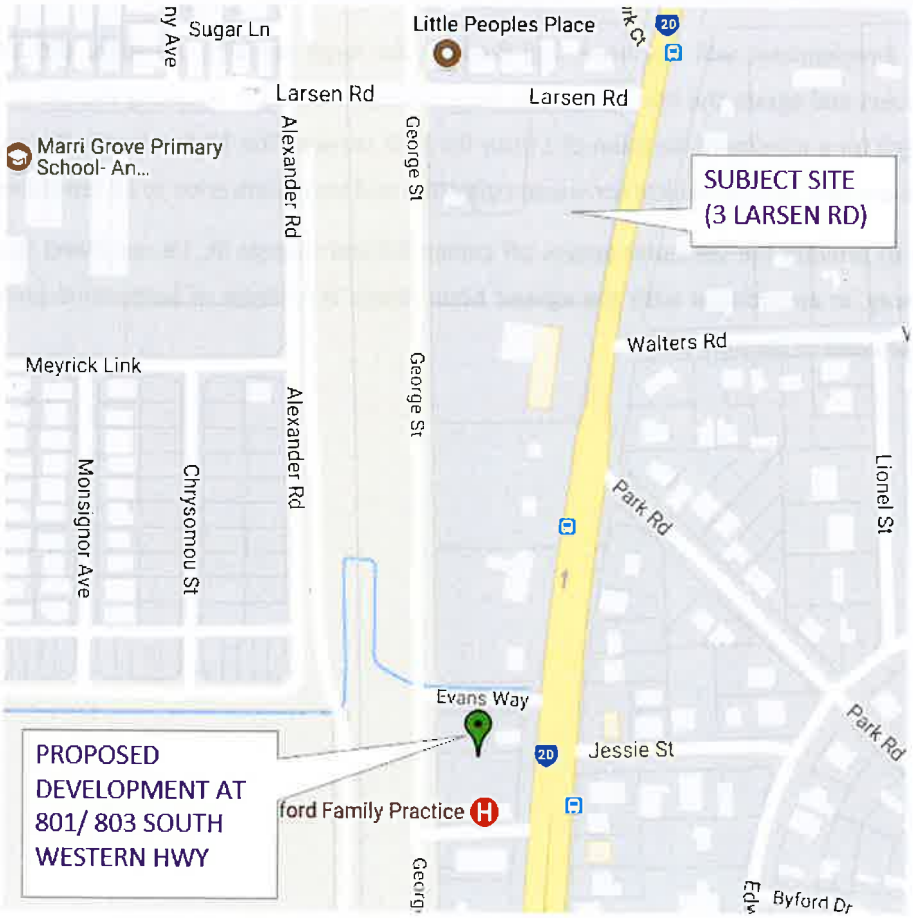



Figure 15 – Proposed development in vicinity of subject site

A Transport Impact Assessment report was prepared by Transcore for this development (Report No t17.170-3). The TIA for the subject site at 3 Larson Rd, i.e. this TIA, considers the cumulative traffic impacts associated with the proposed development at 801 and 803 based on the findings within the Transcore TIA.

An Aldi supermarket is nearing completion at 845 South Western Hwy which is approximately 900 m south of the subject site. Trip generation associated with this has been accommodated by applying 1% per annum growth on George St and Larsen Rd. Increased traffic on South Western Hwy is included in the 1% per annum growth applied to this road.

Refer **Sections 4.2** and **4.3** for details regarding proposed changes to the road network and public transport network respectively.

## 4.2 Proposed Road Network Changes

A review of various planning documents and discussions with the Shire of Serpentine Jarrahdale's planning officer on 9th March 2018 has revealed that there are a number of proposed changes to the road and public transport network that need to be considered as part of this traffic impact assessment report. A summary of these changes has been prepared by the author and is provided as Figure 16 below. In addition to the network changes, there are proposals to upgrade South Western Hwy north of Park Rd, including upgrading the Larsen Rd intersection and proposals to upgrade George St. Refer **Sections 4.3** and **4.4** respectively for more details.


Figure 16 – Summary of road and public transport network proposals in vicinity of the subject site

It is important to note that all of the above are subject to approval and change and that there are no firm dates for implementation. The biggest impact on the subject site is considered to be the proposal to relocate the railway level crossing on Larsen Rd further south, which will necessitate the full construction of George St as well as the closure of Larsen Rd on both sides of the railway, effectively changing the existing 4-way intersection with Larsen Rd as the through road (Si1) to a 'T' intersection with George St as the through road.

## 4.3 SOUTH WESTERN HIGHWAY UPGRADE PROPOSAL

Main Roads WA has an agreed Vehicle Access Strategy for South Western Highway with the Shire of Serpentine-Jarrahdale, as confirmed in its formal submission to Local Planning Policy No 31 (LPP 31) – Byford Town Centre – Built Form Guidelines. This Access Strategy articulates that "no vehicle access is available from South Western Highway where there is an alternate access point."

The proponent has held extensive discussions with Main Roads WA officers which resulted in altering the initial design to remove all direct vehicular access off South Western Highway, as per the Development Drawings included in **Appendix A**. The proponent has secured support for the development subject to upgrading the intersection at Larsen Rd consistent with the conceptual layout shown on the Main Roads WA Access Strategy drawings as shown in the extract provided as Figure 17. The Development Drawings in **Appendix A** show the same outlines in red. The formal MRWA approval conditions are reproduced on the following page.


Figure 17 – Extract from Main Roads WA South Western Highway Access Strategy drawing

Main Roads WA Approval Conditions (sourced from Metro East JDAP Agenda 17 October 2018)

"Main Roads advises that it has no objection subject to the following conditions being imposed:

1. Redundant crossover on South Western Highway shall be removed and the verge reinstated at the applicant's cost. The applicant is to advise Main Roads when this has been completed.
2. Modifications to South Western Highway must be in accordance with Main Roads Supplement to Austroads Guide to Road Design - Part 4 and Part 4A dated 18 September 2018 and consistent with future widening to South Western Highway as depicted on Main Roads Plan 2012-0002 dated approved 4 April 2012 and overlayed on Draft Master Plan Revision P3 dated 22 August 2018 (both attached). In particular:
    a. Left and right turn auxiliary lanes from South Western Highway onto Larsen Road, as depicted on Drawing No. TP03.1 Revision dated 14 September 2018 (reproduced as Figure 18 on the following page) must be designed in accordance with Main Roads Supplement to Austroads - Part 4, Section 5 and Appendix A.6 Auxiliary Lane Turn Treatments.
    b. The median on Larsen Road, as depicted on Drawing No. TP03.1 Revision dated 14 September 2018 (attached) must be as per Main Road Supplement to Austroads - Part 4A, Section 6.

Advertising Signage

3. The type of signs, size, content and location must comply with all relevant by-laws and planning schemes made by Council.
4. The signs and sign structures are to be placed on private property and shall not over hang or encroach upon the road reserve.
5. For the signs that are illuminated, it must be of a low-level not exceeding 300cd/m2, not flash, pulsate or chase.
6. The device shall not contain fluorescent, reflective or retro reflective colours or materials.

**In accordance with the above conditions, the proponent has confirmed that these conditions will be met during the detailed design stage and in discussion with Main Roads WA. This TIA includes assessment of the development with the intersection upgraded in accordance with the above stated conditions.**

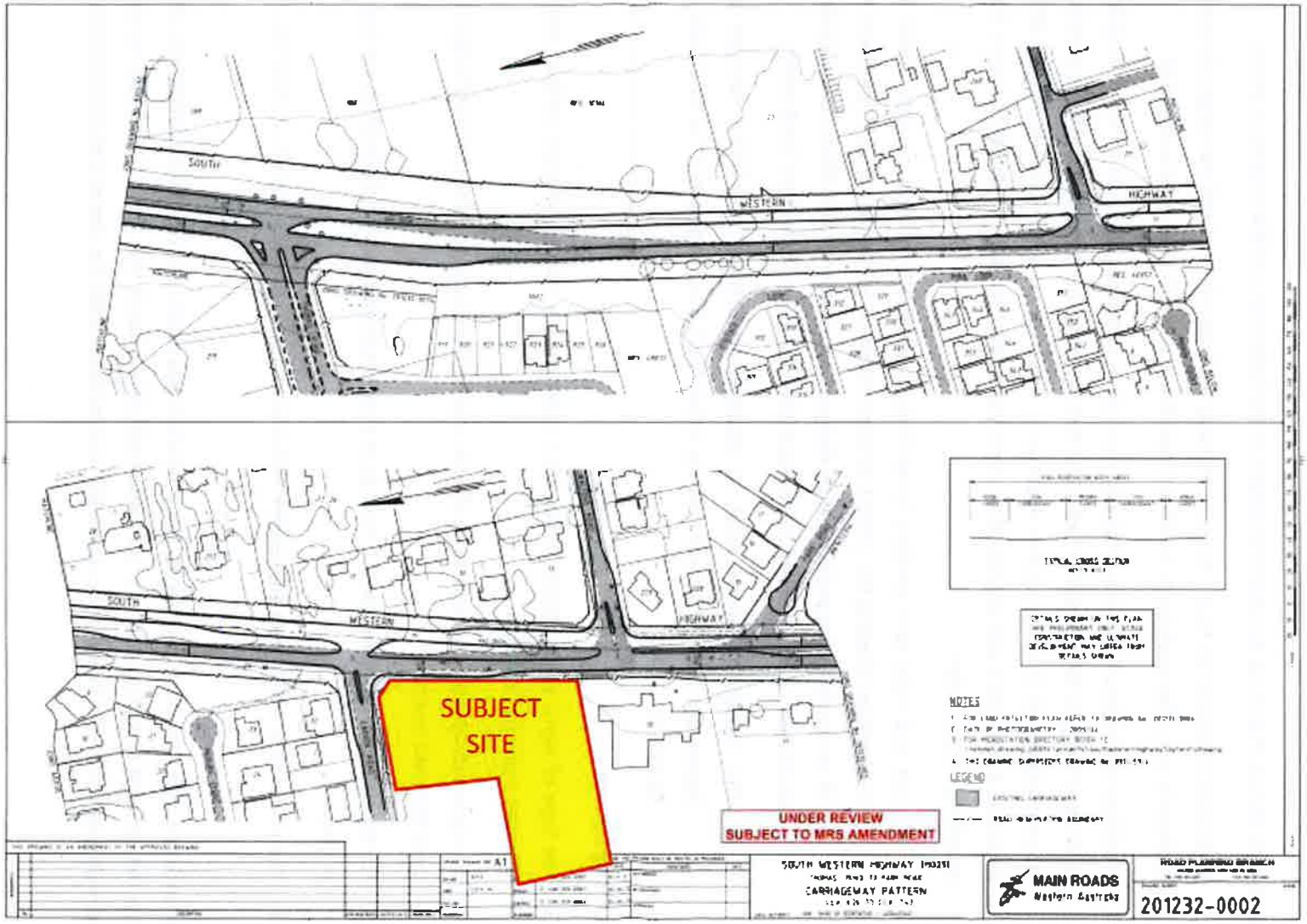



Figure 18 – Main Roads WA Drawing No. TP03.1 Revision dated 14 September 2018 (with 'Subject Site' overlaid)

DEVELOPMENT ASSESSMENT PANEL
APPROVED
11-Dec-2018

## 4.4 GEORGE STREET UPGRADE PROPOSAL

The Shire of Serpentine-Jarrahdale has advised, in an email dated 25 October 2018, that:

"George Street is planned to be the high street in Byford by the shire. Main roads recent access policy has been to discourage direct access to the highway and to favour access off George Street. Whilst George St is not line marked the shire does not consider it safe to have service vehicles sweeping across the total George street pavement when entering and exiting the development. George St is intended to be passenger vehicle and pedestrian in nature. Service Vehicles entering and exiting the development should be lane compliant when making turning manoeuvres on George St."

The above statement is not consistent with providing the required access for the adopted design vehicles as there are many properties between South Western Highway and George St that only have frontages to these streets. Main Roads WA has indicated that the Shire has agreed to restricting access off South Western Hwy which in turn requires that the majority of properties between George St and South Western Hwy will only have vehicular access off George Street. Many of these properties are zoned commercial and have a requirement for servicing by heavy vehicles up to the standard 19 m semi-trailer. To require that commercial vehicular access is provided off George St is not consistent with the statement that "George St is intended to be passenger vehicle and pedestrian in nature". It will be regularly used by commercial vehicles and requires to be designed in accordance with this function. The alternative is to provide commercial vehicular access off South Western Highway.

The Shire's statement that it "does not consider it safe to have service vehicles sweeping across the total George street pavement when entering and exiting the development" and that "Service Vehicles entering and exiting the development should be lane compliant when making turning manoeuvres on George St." is not consistent with currently approved developments along George St, as shown in Photograph 11 on the following page.

The practice of allowing service vehicles to enter and leave access driveways within the boundaries of the roadway, i.e. kerb lines, is permitted in Section 3.4.1(a) of Australian Standard AS 2890.2 (4), i.e.:

"On a minor public road, vehicles shall be able to enter and leave the access driveway without infringing the boundaries of the roadway. Local authorities may place further limits and controls on the extent to which movement across the centre-line of the roadway is allowed."

Refer further comment and assessment regarding the access to and from the site in **Section 15**.


Photograph 11 – Recently approved Aldi service area off George Street showing swept path of 19 m ST leaving the site and turning left or right into George St

## 4.5 PROPOSED PUBLIC TRANSPORT NETWORK

Planning work is underway to extend the Armadale Line approximately eight kilometres south to Byford.

This early planning and research takes into account a range of considerations, such as station location, precinct development opportunities, connections, constructability and community impact.

The METRONET Office is working closely with the Shire of Serpentine-Jarrahdale on developing a number of viable options for a transport solution which provides opportunities for urban development, however at this point there is no confirmed or preferred location for the station.

The intent of thorough planning is to identify the best location and alignment of the extension so that it supports plans for growth in the area, as well as creating an employment hub and boosting residential development.

Details on the construction method and timeframe will be developed during the planning phase. It is estimated the project business case and Project Definition Plan will be completed in late 2018.

The rail proposals are driven by population numbers, as shown in the following extract from the Perth and Peel @ 3.5 Million and Beyond publication.


Figure 19 – Public Transport Rail Network @3.5 Million and Beyond (showing Byford as No 5)

# 5 INTEGRATION WITH SURROUNDING AREA

Figure 2 on page 9, Figure 4 on page 12 and Figure 5 on page 14 all indicate that the proposed development is well connected to public transport, freight, cycling and walking facilities.

The provision of services such as the Service Station, Convenience Store, Drive-Thru Coffee, Car Wash, Vehicle Service Store and Retail are likely to be well patronised by passing traffic on South Western Highway (up to 70%) which in turn will reduce the overall impact of the development in terms of increased traffic volumes.

Byford is a town within the Shire of Serpentine-Jarrahdale community halls, two state schools, clubs, sporting oval, trotting complex, a range of shops and businesses, a flour mill, and farms in the surrounding rural areas.

In 1977, the local government responsibilities for Byford were transferred from the Shire of Armadale-Kelmscott (now the City of Armadale) to the Shire of Serpentine-Jarrahdale. Recently, Byford has become an extension of the Perth metropolitan area, connected to the Kwinana Freeway by Thomas Road, and has experienced a substantial rise in population. Historically, Byford's rural land supported sheep, beef and dairy cattle, orchards, and a vineyard (Sunrays, owned by the Vlasich family) but in recent decades there has been an increase in hobby farms geared to equine pursuits, and more recently housing estates with generous lot sizes.

# 6 ASSESSMENT YEARS AND TIME PERIODS

The WAPC Transport Impact Assessment Guidelines recommends that the appropriate assessment years include the year of opening of the development and 10 years after opening.

The subject site is expected to be fully developed and operational by 2020 and hence it is reasonable to adopt a 2020 'Operating Year' and 2030 'Horizon Year' (10 years later).

A review of historical traffic volume data for South Western Highway (Figure 20 below) has indicated that a Compound Annual Traffic Growth Rate (CATGR) of 1% is appropriate for this road up to the 'Horizon Year' of 2030 although there is a possibility of a reduction in this growth rate due to the provision of the Metronet rail extension to Byford, including a new train station (refer **Section 4.3**).

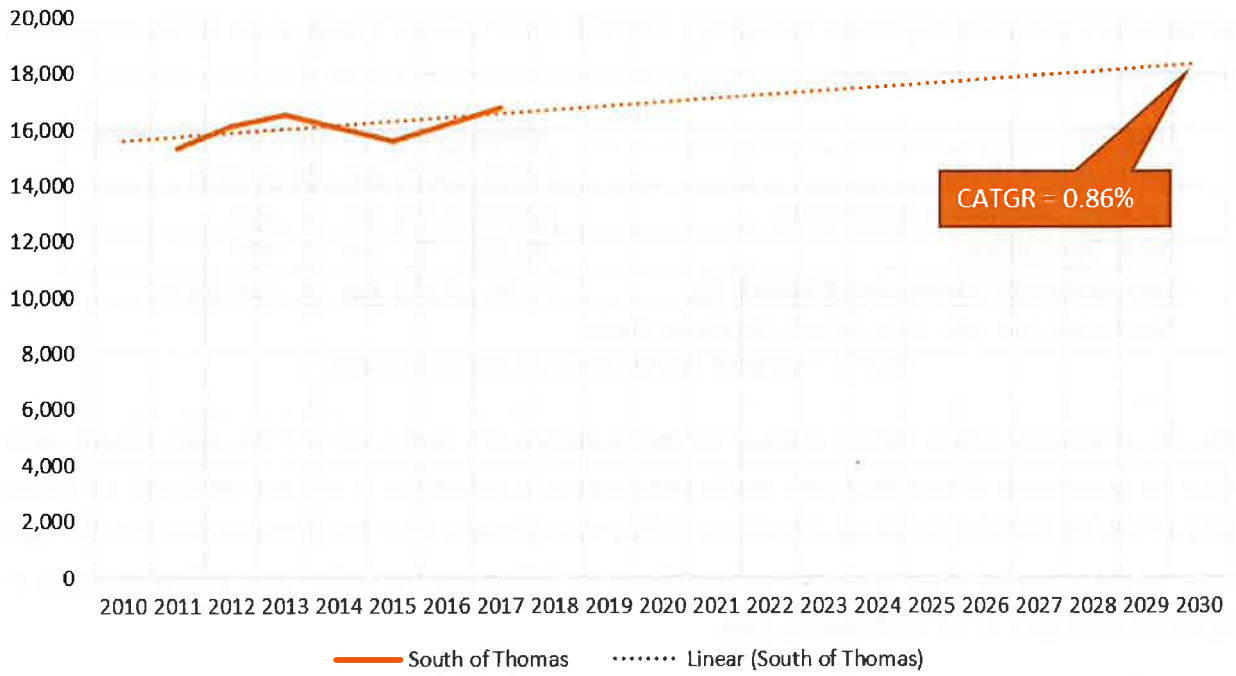



Figure 20 – Existing and forecast Annual Daily Traffic volumes on South Western Hwy past the subject site

Note that the above determination considers that South Western Hwy remains as a single lane in each direction mid-block and hence traffic volumes are constrained to around 20,000 vehicles per day (or 1,000 vehicles per lane per hour).

# 7 DEVELOPMENT GENERATION AND DISTRIBUTION

It is not considered appropriate to use standard trip generation rates for each element within developments with different land uses and then add these up as there can be significant differences in each land use's peak traffic generation times and days as well as a high likelihood of 'shared trips', i.e. a single trip to or from two or more different land uses.

Trip generation data for each of the proposed land uses, including source notes, are shown in Table 2 below. RMS refers to updated data to the Roads and Traffic Authority NSW document Guide to Traffic Generating Developments provided by the RTA's subsequent authority, i.e.: Roads and Maritime Services Guide to Traffic Generating Developments' Updated traffic surveys (4). ITE refers to the Institution of Transport Engineers (USA) (5) and SpackC refers to Spack Consulting, an open source trip generation service based on ITE and additional traffic surveys and data. Bitzios refers to a comprehensive trip generation study of 10 drive-thru coffee outlets undertaken by Bitzios Consulting in 2016. A mix of sources is used as not all sources contain trip generation data for all land uses.

| Land Use | Source | Adopted Trip Generation Rate* |
|---|---|---|
| Business Park (RMS) | RMS | 0.78 per 100 $m^2$ GFA |
| Car Wash (standalone automated) | SpackC | 17.00 per 1 stall |
| Drive-Thru Coffee | Bitzios | 70 per 1 site |
| Service Station + Convenience Store (ITE) | ITE | 13.51 per 1 Fuel Point |

*Development Peak - Refer Hourly Profiles for Road Network Peaks

Table 2 – Adopted Mixed Use Trip Generation Rates

The trip generation data in Table 2 is based on the development's peak hour, not the road network peak hour. An assessment of each land use's hourly patronage as a percentage of its peak use based on survey data of local similar land use developments (i.e. Caltex Service Station/ Car Wash/ Convenience store/ Tyre Store on the corner of South Western Hwy/ Nettleton Rd, Byford and the Coffee Club, Byford) is shown in Figure 21 and Figure 22 on the following page.

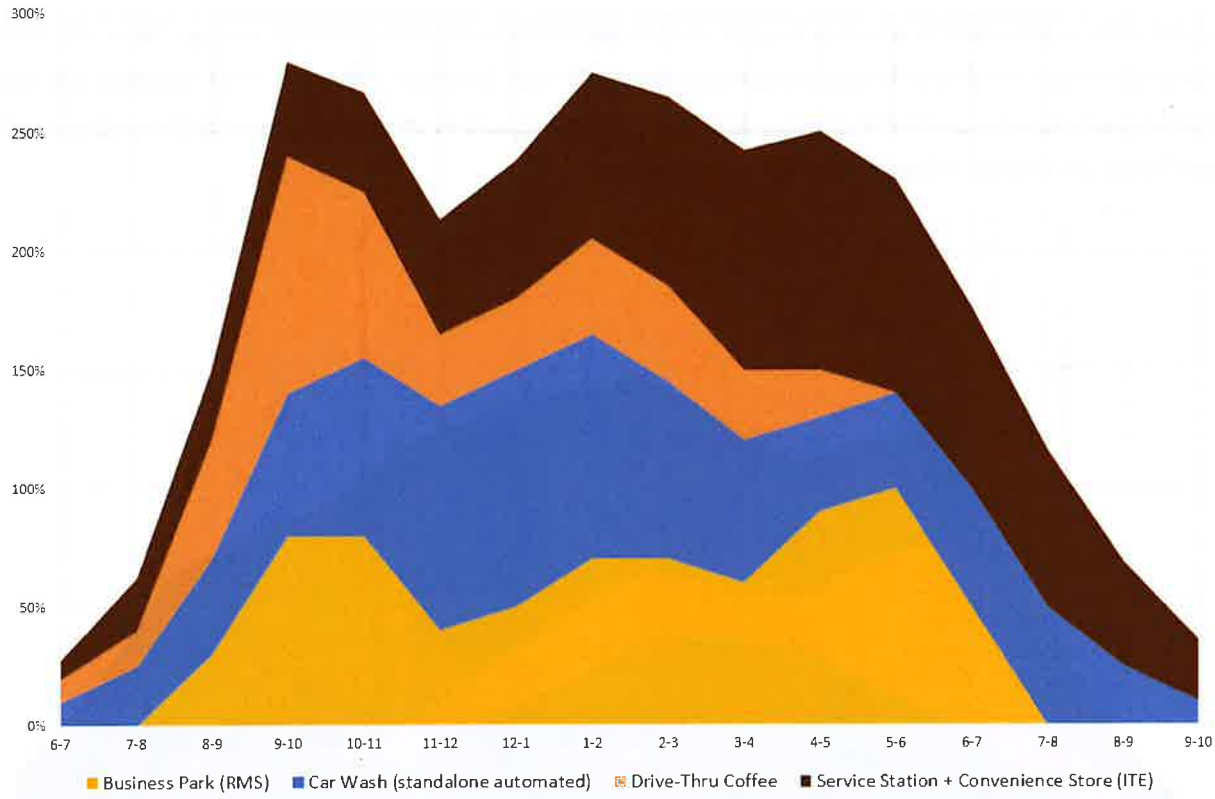



Figure 21 – Assessed weekday mixed-use development cumulative hourly trip generation profile

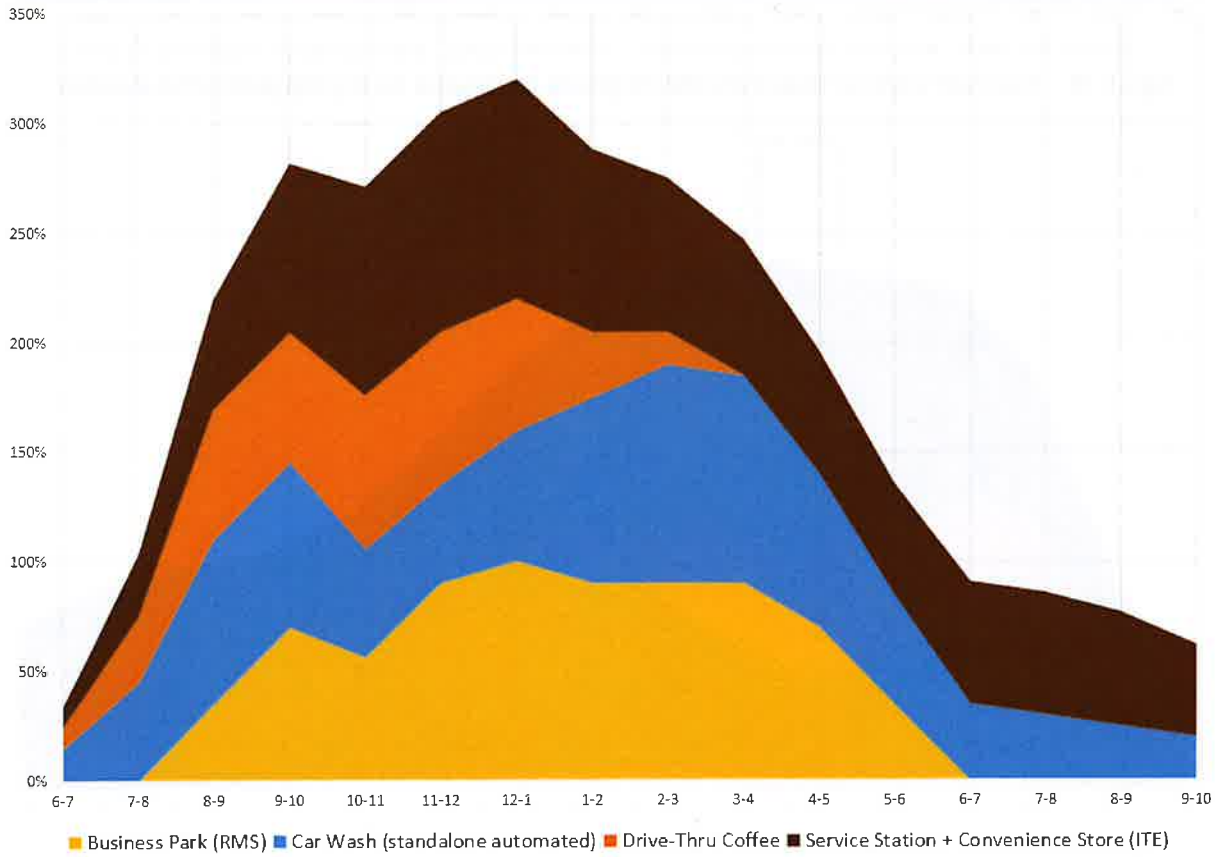



Figure 22 – Assessed Saturday mixed-use development cumulative hourly trip generation profile

Applying the profiles on the previous page to the trip generation indicated in Table 2 on page 38 results in an assessed forecast maximum hourly trip generation of **190** trips between 1 PM and 2 PM midweek and **209** trips between 12 noon and 1 PM on Saturdays. Full hourly assessment volumes, along with the road network peak hours, are shown in Figure 23 and Figure 24 below.

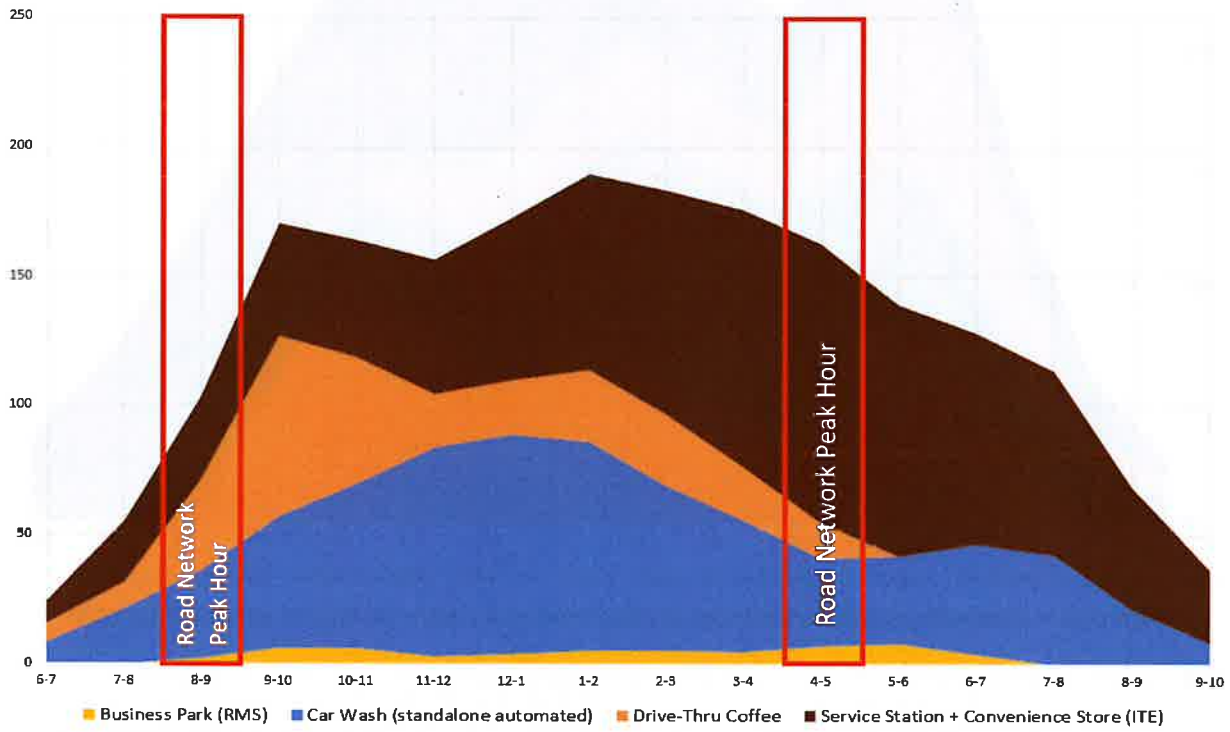



Figure 23 – Assessed weekday mixed-use development cumulative hourly trip generation volumes

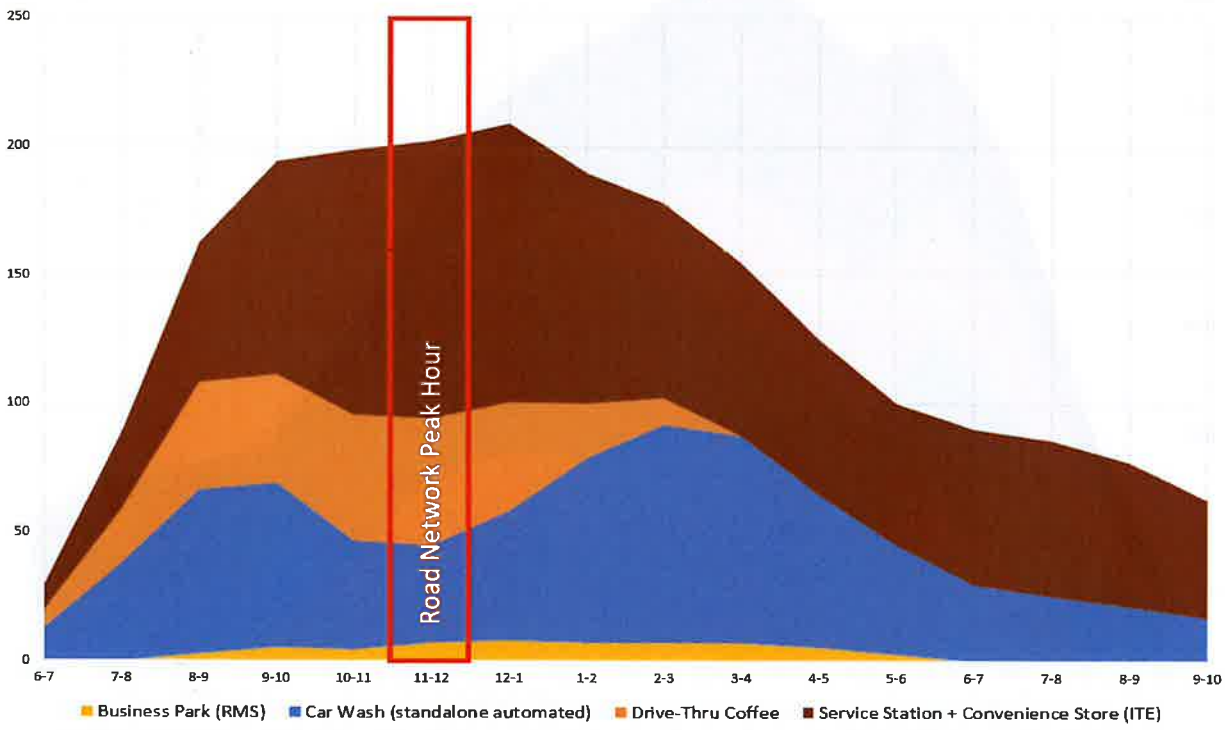



Figure 24 – Assessed weekend mixed-use development cumulative hourly trip generation volumes

In order to add value to the forecast data, the author undertook detailed surveys of traffic into and out of the existing Caltex Service St/ Convenience Store/ Car Wash and Tyre Outlet/ Repair Centre with additional commercial tenancies on the corner of South Western Hwy and Nettleton Rd which is located approximately 1.5 kms south of the subject site, as shown in Photograph 12 below.


Photograph 12 – Existing similar development on South Western Hwy 1.5 km south of subject site

A survey of all traffic in and out of this development site (including the car wash at the rear and the adjacent tyre shop) between 2 PM and 3 PM on Saturday 14th April indicated that 61 vehicles entered the site and 65 vehicles left the site during this time, a total of 126 vehicles. Using the adopted trip generation rates and hourly profiles in this TIA report, the forecast trip generation (minus the drive-thru coffee land use) would be 167 trips. On this basis, the adopted rates are a conservative estimate and hence appropriate.

# 8 DESIGN TRAFFIC FLOWS

The assessment in **Section 7** has indicated that the midweek development and road network peak hours are separated by 2-3 hours and have significantly different volumes. The Saturday development and road network peak hours are only an hour apart. Based on this it is considered appropriate to model and assess the following three peak hours:

- Midweek 1 PM- 2 PM (Development peak hour);
- Midweek 4 PM- 5 PM (Road Network peak hour); and
- Saturday 12 noon – 1 PM (Combined Development and Road Network maximum volumes).

The assessed trip generation, distribution (IN/ OUT split) and assignment for each of these peak hours is shown in Figure 25 below, and Figure 26 and Figure 27 on the following page.

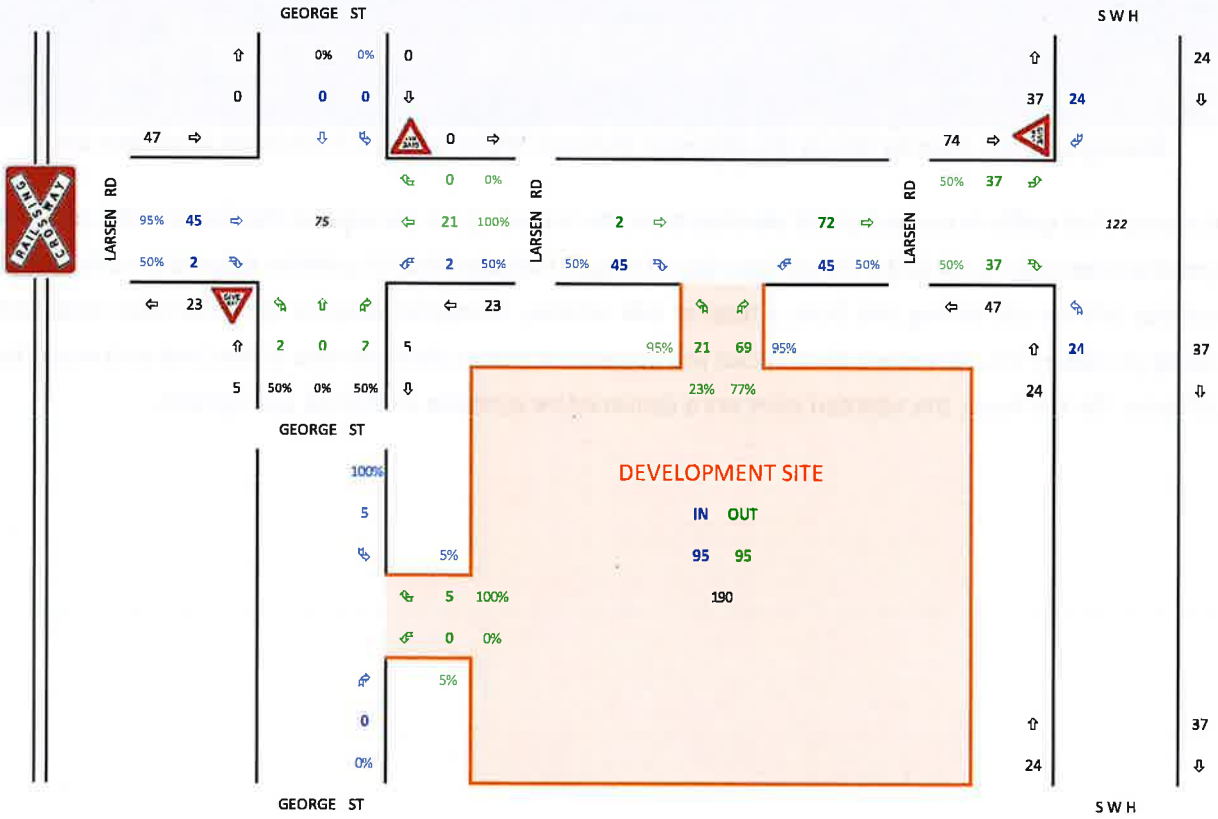



Figure 25 – Forecast 1 PM – 2 PM midweek Trip Generation, Distribution and Assignment

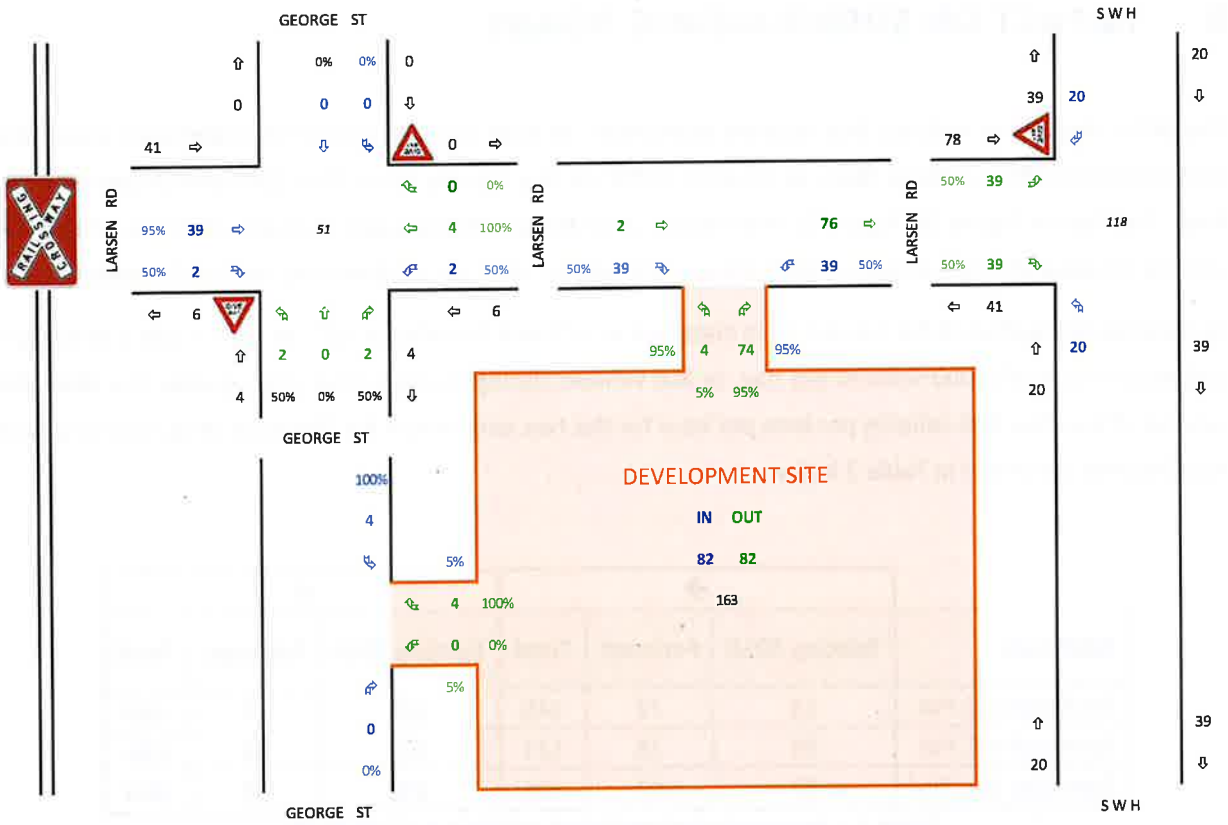



Figure 26 – Forecast 4 PM – 5 PM midweek Trip Generation, Distribution and Assignment

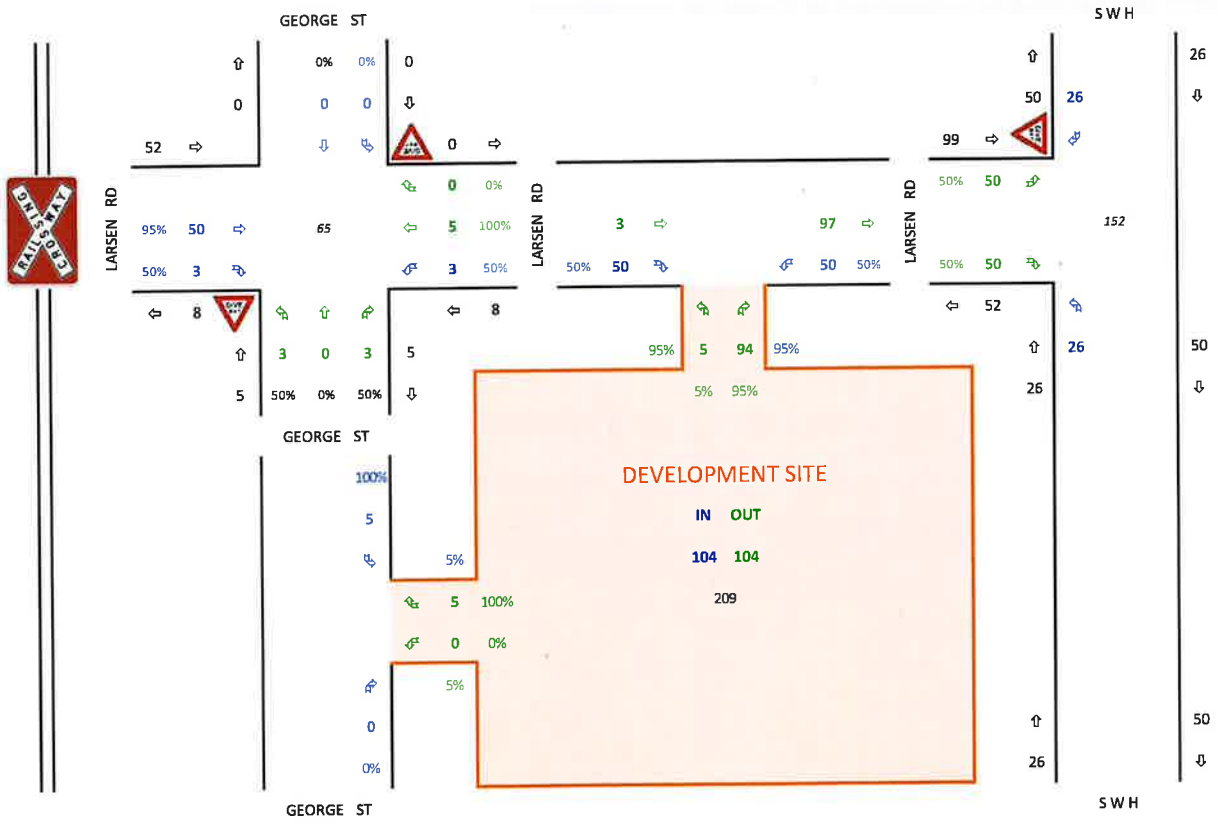



Figure 27 – Forecast 12 noon 1 PM Saturday Trip Generation, Distribution and Assignment

# 9 IMPACT ON SURROUNDING ROADS

The WAPC Guidelines indicate that detailed assessment of road sections should be undertaken where the development traffic would be likely to increase traffic on any lane by more than 100 vehicles per lane per hour. The data in Figure 25, Figure 26 and Figure 27 on the preceding pages indicates that this will be the case for eastbound traffic on Larsen Rd between the subject site's access driveway and South Western Hwy.

As indicated in **Section 2.2.2**, Larsen Rd is classified as a "Local Distributor Rd", as such it has a maximum desirable volume of 6,000 vehicles per day, or 600 vehicles during its peak hour. This equates to a desirable volume of less than 300 vehicles per lane per hour for the two-lane Larsen Rd. The total peak hour volume is less than this, as shown in Table 3 below.

| | → | | | ← | | |
|---|---|---|---|---|---|---|
| **Midblock** | **Existing 2018** | **Forecast** | **Total** | **Existing 2018** | **Forecast** | **Total** |
| Midweek 1-2 PM | 73 | 72 | 145 | 115 | 45 | 160 |
| Midweek 4-5 PM | 95 | 76 | 171 | 193 | 39 | 232 |
| Saturday 12-1 PM | 97 | 97 | 194 | 150 | 50 | 200 |

Table 3 – Assessed total mid-block volumes on Larsen Rd

Refer **Section 10.2** for assessment of impact on intersections.

# 10 IMPACT ON INTERSECTIONS

## 10.1 ASSESSED INTERSECTIONS AND TIMES

The WAPC Guidelines recommend that all intersections where flows are likely to increase by 10% should be assessed in detail. An assessment of increased flows through both of the assessed intersections has been undertaken and is shown in Table 4 and Table 5 below.

| Ki1 | Midweek | | Saturday |
|---|---|---|---|
| | 1 PM - 2 PM | 4 PM - 5 PM | 12 noon - 1 PM |
| Existing | 1,014 | 1,585 | 1,350 |
| Additional | 122 | 118 | 152 |
| Impact | 12.0% | 7.5% | 11.2% |

Table 4 – Assessed volume impacts at Ki1: Larsen Rd/ South Western Hwy

| Si1 | Midweek | | Saturday |
|---|---|---|---|
| | 1 PM - 2 PM | 4 PM - 5 PM | 12 noon - 1 PM |
| Existing | 199 | 334 | 262 |
| Additional | 75 | 51 | 65 |
| Impact | 37.8% | 15.2% | 24.8% |

Table 5 – Assessed volume impacts at Si1: Larsen Rd/ George St

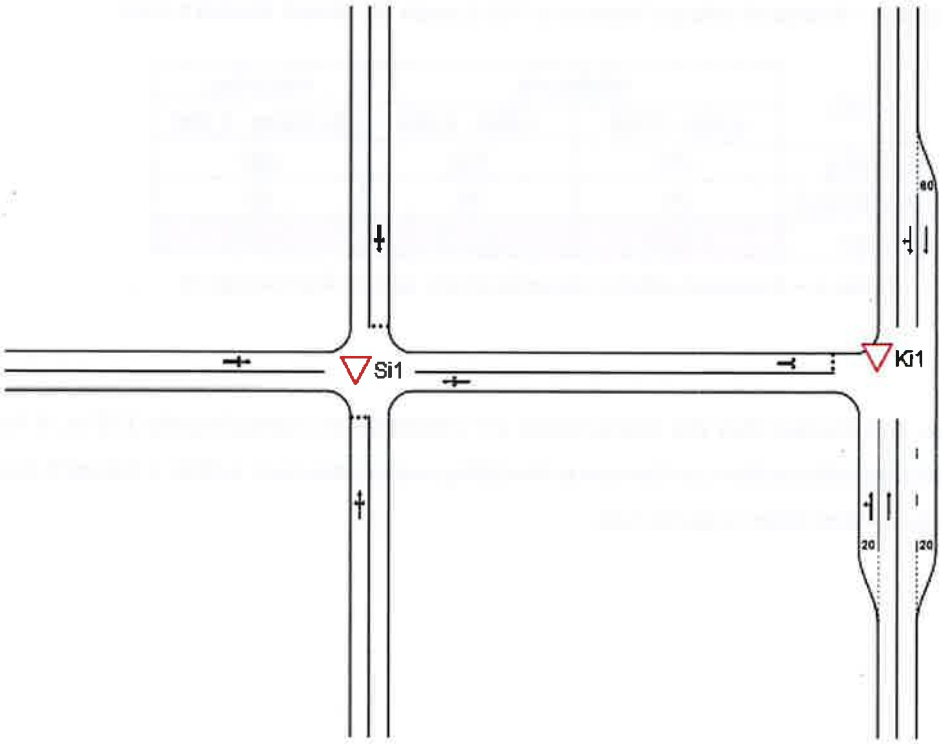
Based on the above, and the fact that the intersections are separated by approximately 150 m, it has been determined that detailed intersection performance modelling and assessment within a network model for each of the three assessment times is warranted.

## 10.2 NETWORK MODELLING

The existing traffic data has been used to develop a network model within SIDRA Intersection 6.1.

SIDRA Intersection is a "Signalised (and unsignalised) Intersection Design and Research Aid". The SIDRA Intersection software (older versions known as SIDRA and aaSIDRA) is an advanced lane-based micro-analytical tool for the design and evaluation of individual intersections and networks of intersections including modelling of separate Movement Classes (Light Vehicles, Heavy Vehicles, Buses, Bicycles, Large Trucks, Light Rail / Trams etc...). It provides estimates of capacity, level of service and a wide range of performance measures including delay, queue length and stops for vehicles and pedestrians, as well as fuel consumption, pollutant emissions and operating cost.

The SIDRA Intersection Network model is shown in Figure 28 below.




| SITES IN NETWORK | |
|---|---|
| Site ID | Site Name |
| Ki1 | Ki1: Larsen Rd/ South West Hwy Existing PM |
| Si1 | Si1: Larsen Rd/ George St Existing PM |

SIDRA INTERSECTION 6.1 | Copyright © 2000-2015 Akcelik and Associates Pty Ltd | sidrasolutions.com
Organisation: I3 CONSULTANTS WA | Created: Wednesday, 11 April 2018 20:05:57
Project: D:\Users\David\Documents\i3\i3c 2015_17 Projects\WIP\Peter Webb & Associates (029)\09204 Lot 104 SWH_Larsen Rd Byford TIS\Technical \SIDRA\09204 SN3 Larsen Rd Byford.sip6

Figure 28 – SIDRA Intersection 6.1 Si1 & Ki1 network model layout

An explanation of the various intersection performance criteria assessed and reported within this TIA is provided as Table 6 below.

| SIDRA v/c & colour code | LoS | Average Delay per vehicle (d) in seconds | | | | v/c Range | Performance Comments |
|---|---|---|---|---|---|---|---|
| | | Unsignalised intersections | Roundabouts | Signalised intersections | All (RTA) | | |
| <0.6 | A | d ≤ 10 | d ≤ 10 | d ≤ 10 | d ≤ 14.5 | ≤ 0.44 | **Good operation and plenty of spare capacity** *Stable free flow conditions where drivers are able to select desired speeds and to easily manoeuvre within the traffic stream.* |
| | B | 10 < d ≤ 15 | 10 < d ≤ 20 | 10 < d ≤ 20 | 14.5 < d ≤ 28.5 | | |
| | C | 15 < d ≤ 25 | 20 < d ≤ 35 | 20 < d ≤ 35 | 28.5 < d ≤ 42.5 | 0.45 - 0.64 | **Acceptable delays and spare capacity** *Stable flow but most drivers are restricted to some extent in their ability to select their desired speed and to manoeuvre within the traffic stream.* |
| 0.6 - 0.7 | D | 25 < d ≤ 35 | 35 < d ≤ 50 | 35 < d ≤ 55 | 42.5 < d ≤ 56.5 | 0.65 - 0.84 | **Acceptable delays** (Expected typical peak hour conditions) *Close to the limit of stable flow. All drivers are restricted in their ability to select their desired speed and to manoeuvre within the traffic stream. Small increases in traffic flow may cause operational problems.* |
| 0.7 - 0.8 | | | | | | | |
| 0.8 - 0.9 | E | 35 < d ≤ 50 | 50 < d ≤ 70 | 55 < d ≤ 80 | 56.5 < d ≤ 70.5 | 0.85 - 1.04 | **Near capacity and senstive to disturbances in flows** *Traffic volumes are close to capacity and there is virtually no freedom to select desired speeds. Flow is unstable and minor disturbances within the traffic stream will cause breakdown leading to long queues and delays.* |
| 0.9 - 1.0 | | | | | | | |
| >1.0 | F | 50 < d | 70 < d | 80 < d | 70.5 < d | >1.25 | **At Capacity** - Requires other control mode and/ or additional lanes *In the zone of forced flow where the amount of traffic approaching the point under consideration exceeds that which can pass. Flow breakdown occurs and extensive queues and delays result.* |

Table 6 – Assessed intersection performance criteria

### 10.2.1 Existing Performance

The existing Degree of Saturation of the two intersections during the midweek and Saturday road network peak hours is shown in Figure 29 below. Assessment of other intersection performance criteria is included in the SIDRA Intersection summary tables in **Appendix B.**

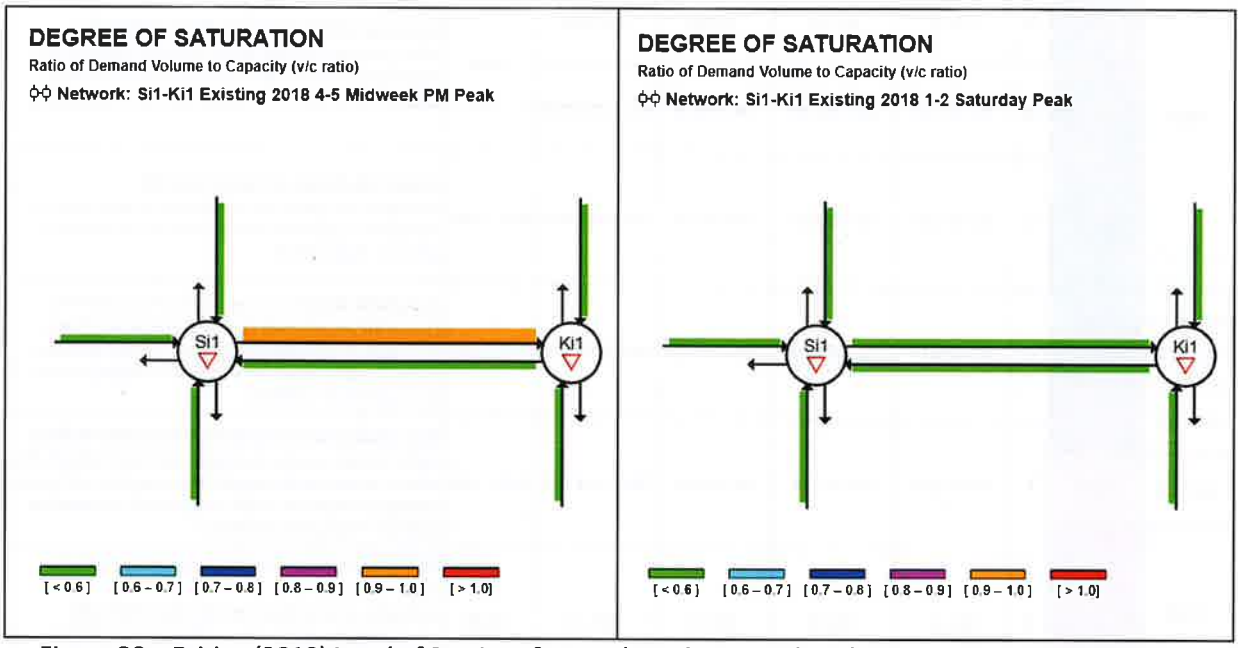



Figure 29 – Exiting (2018) Level of Service of Si1 and Ki1 during midweek PM and Saturday peak hours

Figure 29 indicates that both intersections currently perform with no delays to through movements on South Western Hwy and good operation of the Larsen Rd/ George St intersection with plenty of spare capacity. The Larsen Rd approach to South Western Hwy operates with acceptable delays and spare capacity during the Saturday peak hour but approaches capacity and is sensitive to disturbances in flows during the midweek afternoon peak hour. Any increased traffic flows through the intersection is therefore likely to result in capacity concerns.

### 10.2.2 Forecast 2020 Performance

The forecast Degree of Saturation of the two intersections during the midweek and Saturday road network and development peak hours is shown in Figure 30 below. Assessment of other intersection performance criteria is included in the SIDRA Intersection summary tables in **Appendix B.**

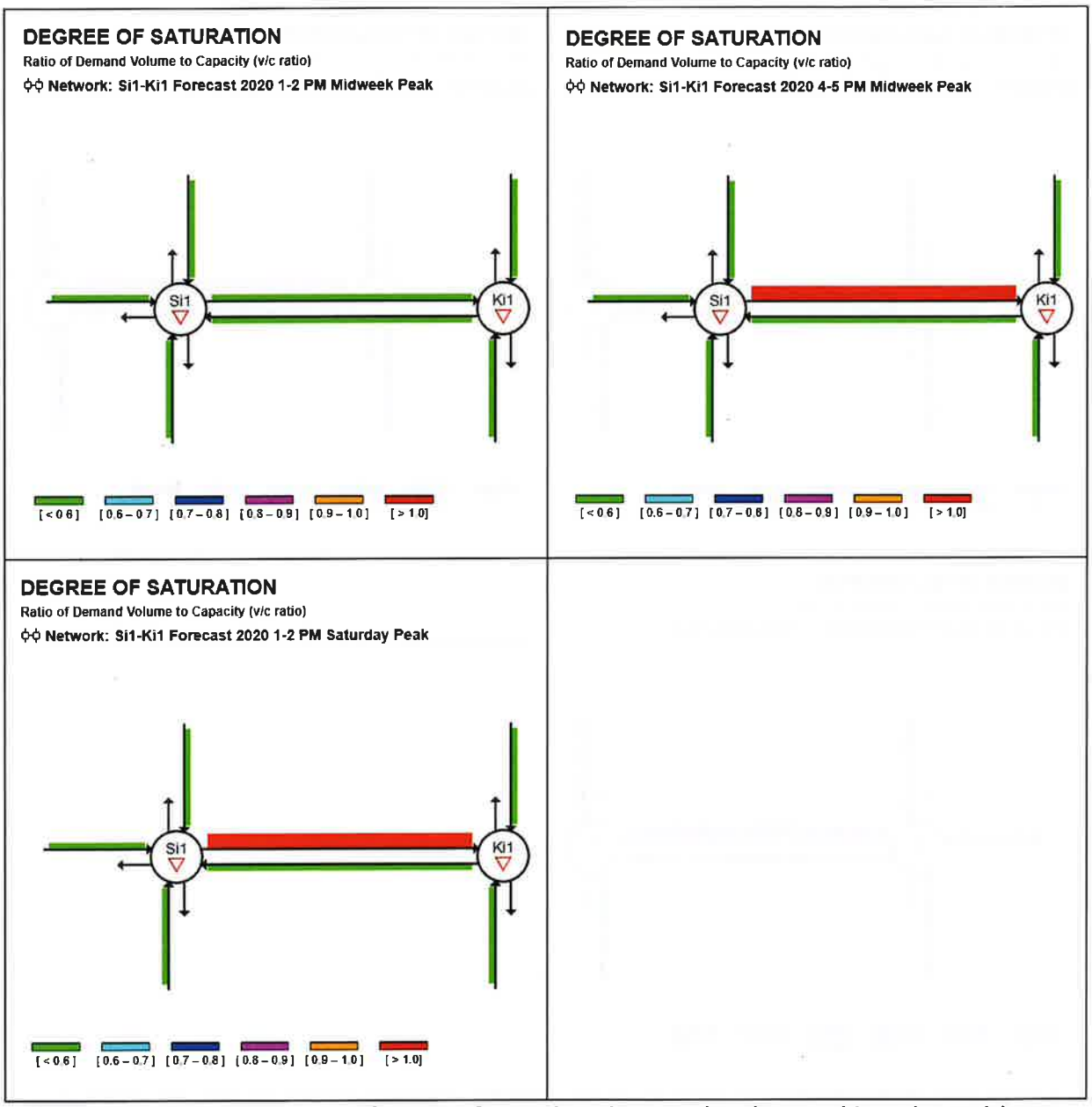



Figure 30 – Forecast 2020 Level of Service of Si1 and Ki1 during midweek PM and Saturday peak hours

Figure 30 indicates that the Larsen Rd approach to South Western Hwy is forecast to experience unacceptable delays during the midweek afternoon and Saturday road network peak hours. If not addressed, it is likely that drivers will avoid accessing the subject site and local and through traffic will experience significant delays resulting in frustrated drivers taking smaller gaps in traffic resulting in a poor safety performance.

### 10.2.3 Forecast 2030 Performance

The forecast Degree of Saturation of the two intersections during the midweek and Saturday road network and development peak hours is shown in Figure 31 below. Assessment of other intersection performance criteria is included in the SIDRA Intersection summary tables in **Appendix B.**

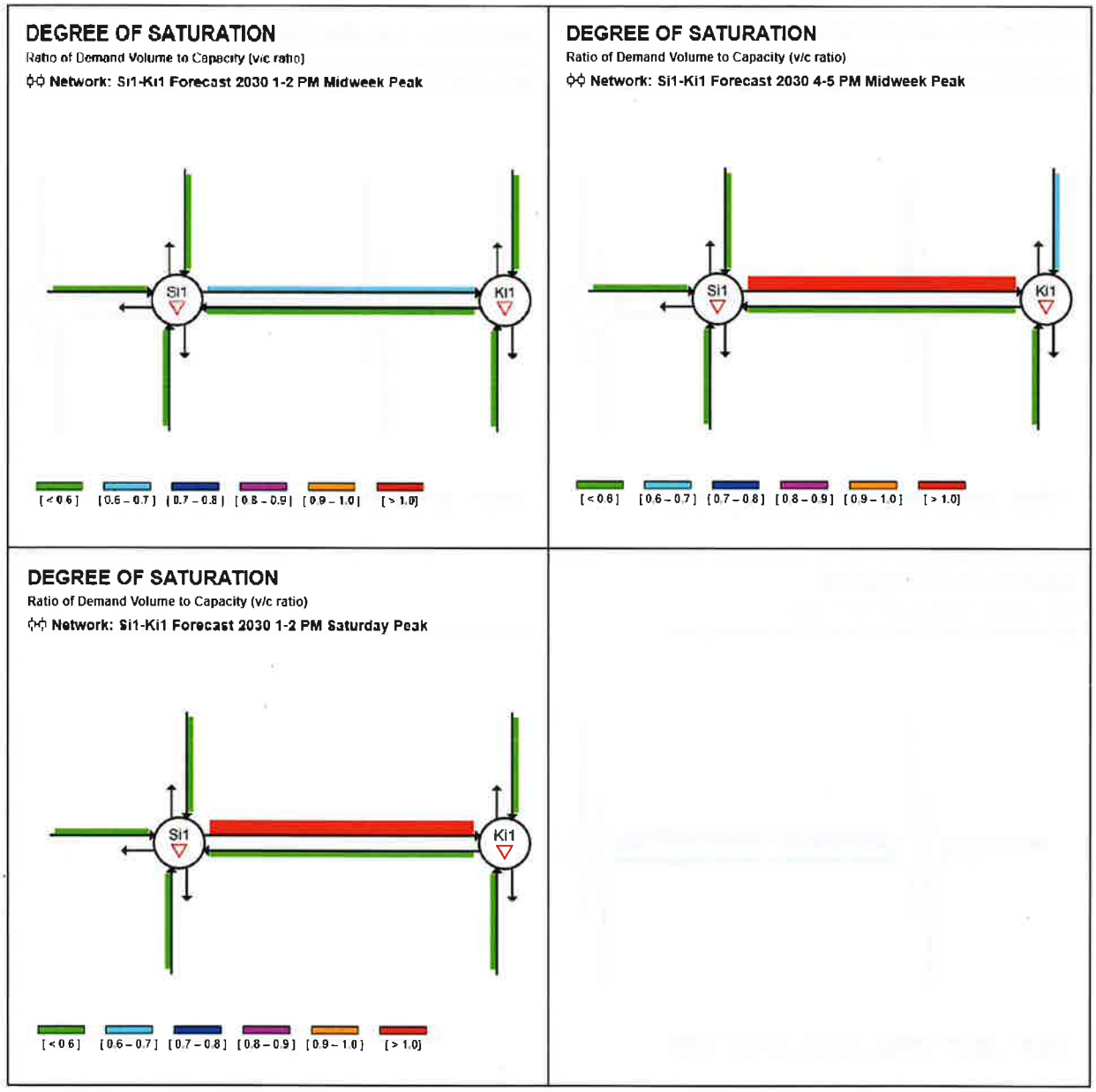



Figure 31 – Forecast 2030 Level of Service of Si1 and Ki1 during midweek PM and Saturday peak hours

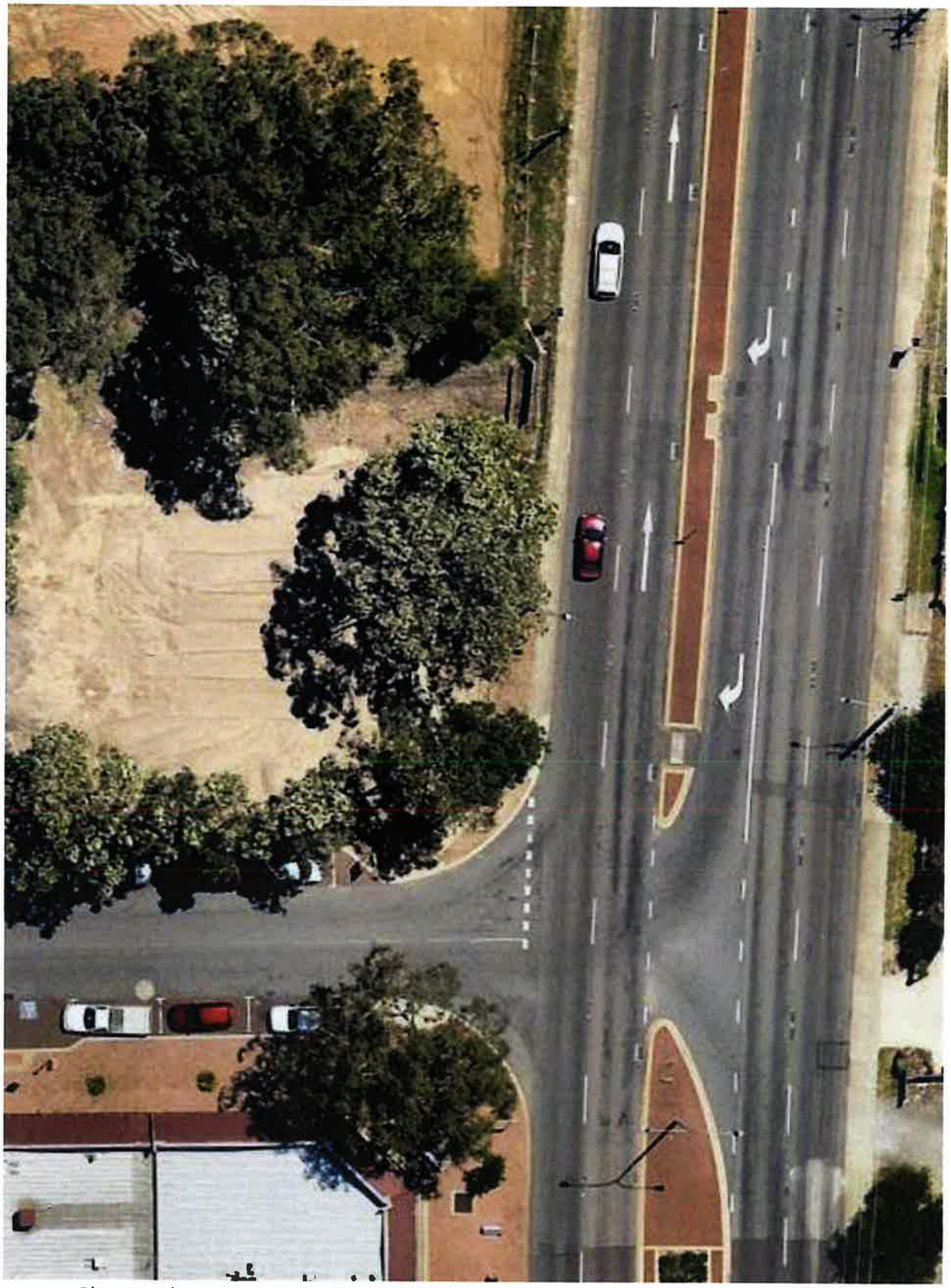
Figure 31 indicates that the Larsen Rd approach to South Western Hwy is forecast to experience unacceptable delays during the midweek afternoon and Saturday road network peak hours. If not addressed, it is likely that drivers will avoid accessing the subject site and local and through traffic will experience significant delays resulting in frustrated drivers taking smaller gaps in traffic resulting in a poor safety performance.

### 10.2.4 Remedial Measure

The previous sections have indicated that there are likely to be unacceptable delays on the Larsen Rd approach to South Western Highway as a result of the current sensitivity to increased traffic (refer Figure 29 on page 48).

Given the uncertainty with timing of the road closure, this TIA needs to identify and assess a suitable remedial measure that would address this concern without the closure of Larsen Rd.

The option of extending the existing dual lane dual carriageway on South Western Hwy south of Park Rd to just north of Larson Rd, including a median break and auxiliary right turn lane similar to that provided at Pitam Way (as shown in Photograph 13 on the following page) has been examined. The Development Drawings in **Appendix A** show two variants of this, one with a single lane Larsen Rd approach and the other with a dual lane, i.e. left and right turn lane, approach. For the purpose of this assessment these two layouts have been called Option 1 and Option 2. These two options have been assessed in SIDRA for the busiest period, i.e. 4-5 PM mid-week, and are forecast to operate at good levels, i.e., Degree of Saturation less than 0.6, as shown in Figure 32 and Figure 33 on page 53.



Photograph 13 – Example of dual lane dual carriageway with median break (Pitman/ SWH)

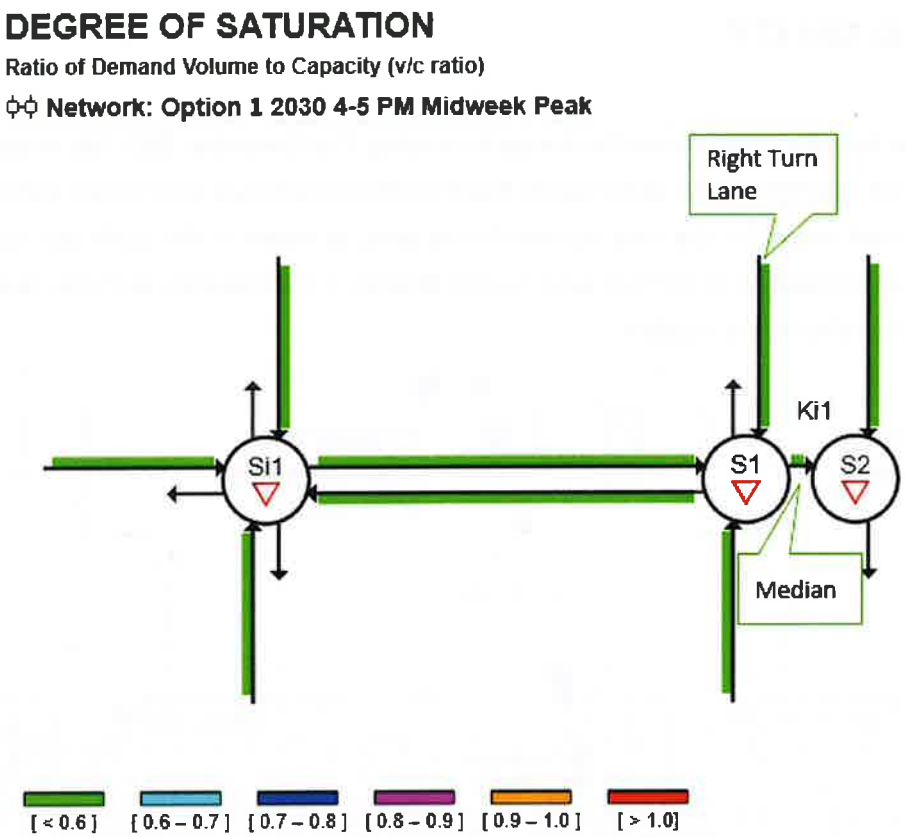



Figure 32 – Forecast 2030 Level of Service with Option 1 layout

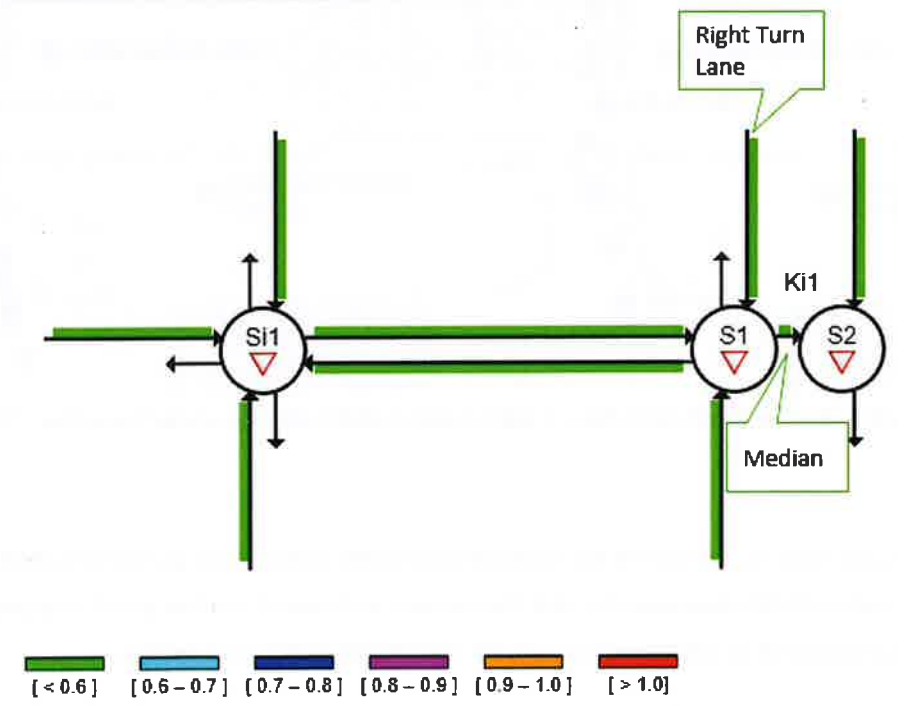



Figure 33 – Forecast 2030 Level of Service with Option 2 layout

# 11 ROAD SAFETY

A review of the five-year crash record for the period ending 31st December 2017 has revealed that there have been five (5) reported crashes at the Larsen Road/ South Western Hwy intersection and that this is fairly typical of the crash record for the road network in this area, as shown in the crash plot map provided as Figure 34 below. It should be noted that each marker denotes a crash location and may represent a single crash or several crashes at this location.

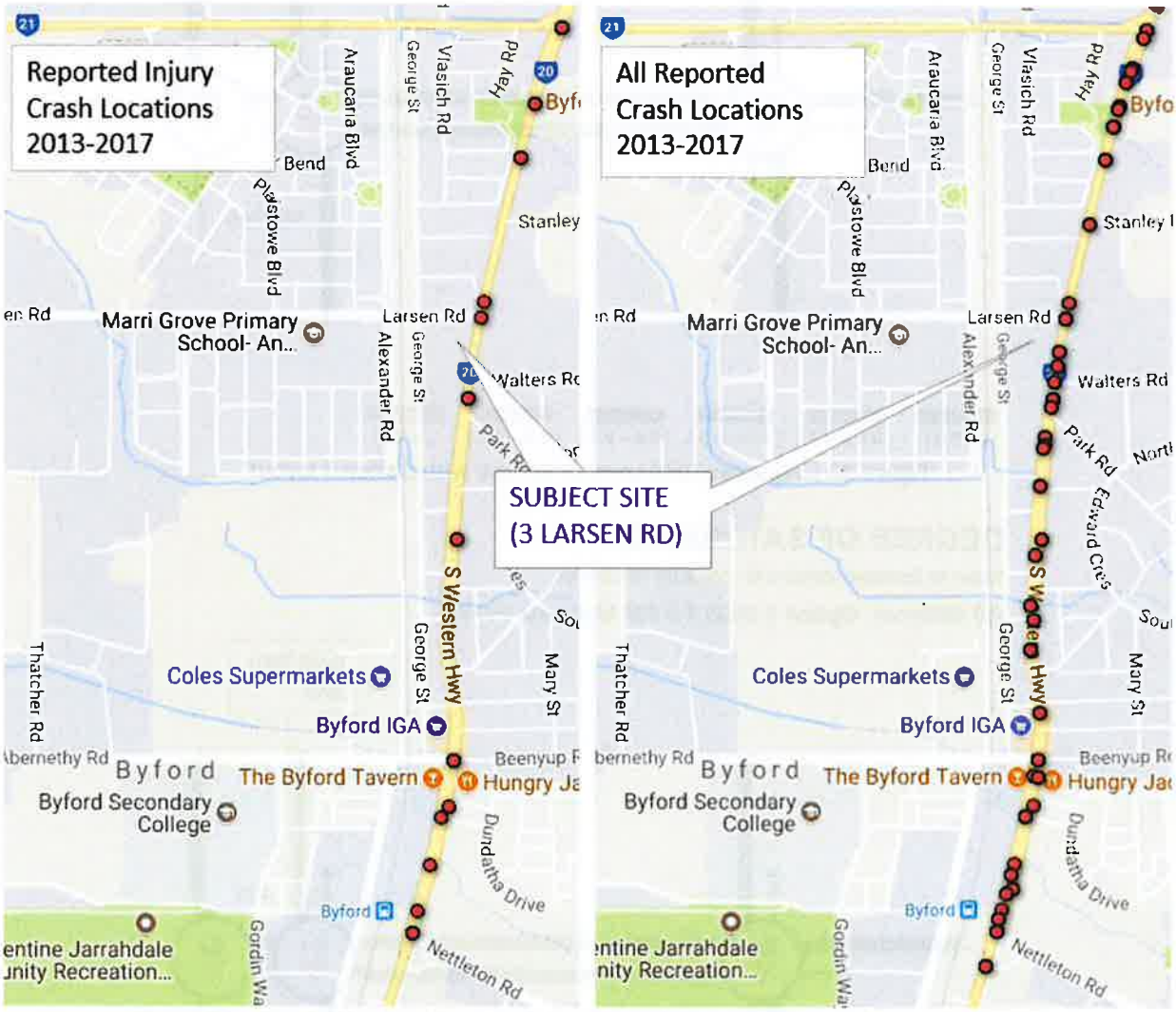



Figure 34 – South Western Hwy Crash Location plot map: 5 years to December 2017

Analysis of the crash data for the Larsen Rd/ South Western Hwy intersection using the MRWA Crash Analysis and Reporting System (CARS) has revealed that the number and type of crashes at this intersection is too low to allow for an assessment of the crash record to be undertaken within the system.

Prior to undertaking the crash review, the author, who is a MRWA accredited Senior Road Safety Auditor and Crash Investigation Team Leader, inspected the site and observed that sight lines are good in all directions but that there may be potential for some drivers to take smaller gaps in traffic that they normally would when there is a steady stream of traffic on South Western Hwy. The implementation of the variable 50 km/s speed limit assists in keeping impact forces low in the event of a crash, which is reflected in the crash severity data (i.e. 5 crashes, 0 Fatal, 0 Hospital, 1 Medical and 4 Property Damage Only). The medical injury resulted from a single car travelling south on South Western Hwy running off the road to the left out-of-control and hitting an electricity pole.

Subsequent crash analysis has revealed that there have not been more than 1 type of crash at the intersection in the five-year reporting period, as shown in the crash plot generated by CARS provided as Figure 35 below.

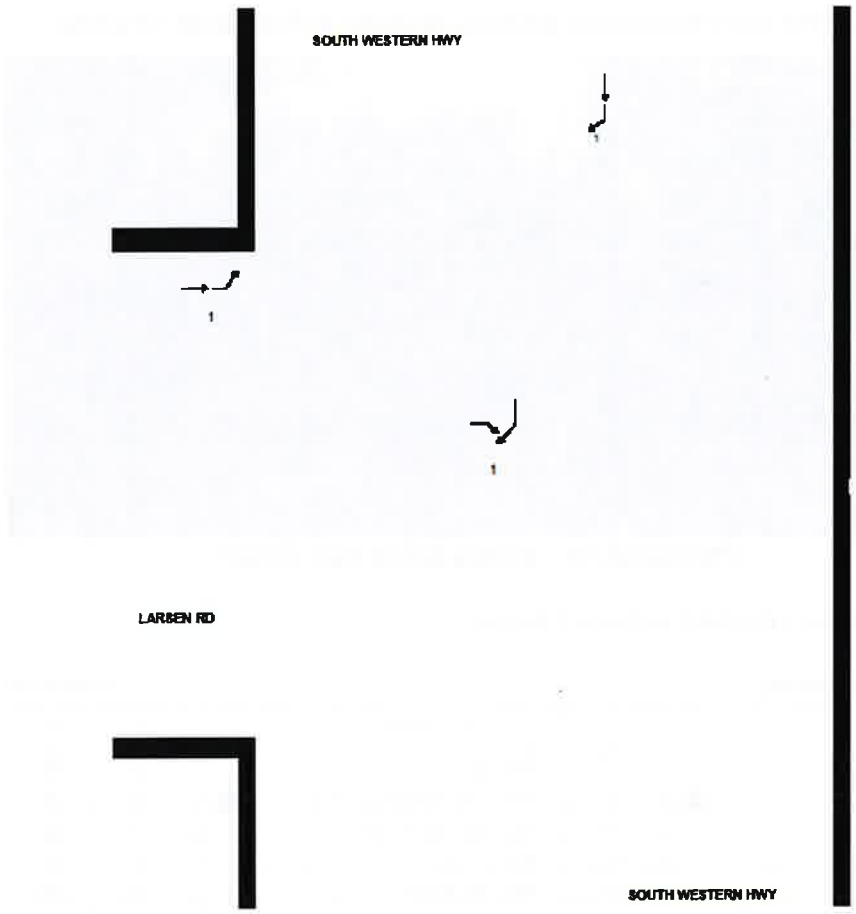



Figure 35 – Larsen Rd/ South Western Hwy Crash Plot (run-off road crashes not shown)

This road safety assessment has not identified any existing deficiency with the layout and control of South Western Hwy, Larsen Rd, George St or any of their intersections that warrants attention or raises concern with the proposed development. It is acknowledged however, that closing Larsen Rd at the railway level crossing will result in a significant reduction in traffic volumes on Larsen Rd at South Western Hwy which will result in reduced delays and the associated likelihood of drivers taking risks with identifying gaps in traffic.

# 12 PUBLIC TRANSPORT ACCESS

## 12.1 EXISTING TRAIN NETWORK

The closest metropolitan train station to the subject site is at Armadale, approximately 6.5 kms north.

As indicated in **Section 4.3**, it is intended to extend the Pert-Armadale line south to Byford, although at this stage the exact location of the new Byford Train station is yet to be determined.

A single line railway currently extends south from Armadale to Bunbury and is used by the Australind service. Passengers can board and alight at the existing Byford train station at the southern end of Byford near Nettleton Road but only if they give prior notice, otherwise the Australind train does not stop here. The existing train station is little more than a small platform, as shown in Photograph 14 below.


Photograph 14 – Existing Byford train station

The Australind Timetable is provided as Table 7 below.

**Perth to Bunbury** **Australind**

| From Perth | | 103 | 105 | From Bunbury | | 102 | 108 |
|---|---|---|---|---|---|---|---|
| | | Daily AM | Daily PM | | | Daily AM | Daily PM |
| **Perth Station** | ♿ Dep | 9:30 | **5:55** | **Bunbury Passenger Terminal** | ♿ Dep | 6:00 | **2:45** |
| **Armadale Station** | Dep | 9:56 | **6:25** | Brunswick Junction* | Dep | 6:17 | **3:02** |
| Byford* | Dep | 10:07 | **6:36** | Harvey* | Dep | 6:32 | **3:17** |
| Mundijong* | Dep | 10:14 | **6:43** | Cookernup** | Dep | 6:39 | **3:24** |
| Serpentine* | Dep | 10:21 | **6:50** | Yarloop** | Dep | 6:46 | **3:29** |
| North Dandalup** | Dep | 10:32 | **7:01** | Waroona* | Dep | 6:56 | **3:38** |
| Pinjarra* | Dep | **10:42** | **7:11** | Pinjarra* | Dep | 7:12 | **3:55** |
| Waroona* | Dep | **11:00** | **7:29** | North Dandalup** | Dep | 7:22 | **4:07** |
| Yarloop** | Dep | 11:11 | **7:40** | Serpentine* | Dep | 7:34 | **4:18** |
| Cookernup** | Dep | 11:15 | **7:44** | Mundijong* | Dep | 7:42 | **4:24** |
| Harvey* | Dep | 11:21 | **7:50** | Byford* | Dep | 7:49 | **4:32** |
| Brunswick Junction* | Dep | 11:36 | **8:05** | **Armadale Station** | Arr | 7:55 | **4:39** |
| **Bunbury Passenger Terminal** | ♿ Arr | 11:55 | **8:25** | **Perth Station** | ♿ Arr | 8:30 | **5:15** |

* Trains only stop at intermediate stations if advance bookings are made.

Table 7 – Australind Timetable

## 12.2 Existing Bus Network

There are two bus stops on either side of South Western Hwy that are within a 2-minute walk of the site. Each bus stop has a shelter, seat and tactile pavers and is serviced by Transport Bus Routes 251, 252 and 253, which run between Armadale Train Station to the north and Mundijong and Jarrahdale to the south via Byford. The location of the two bus stops, as well as photographs, are shown in Figure 36 below. The timetable is shown in Table 8 on the following page.

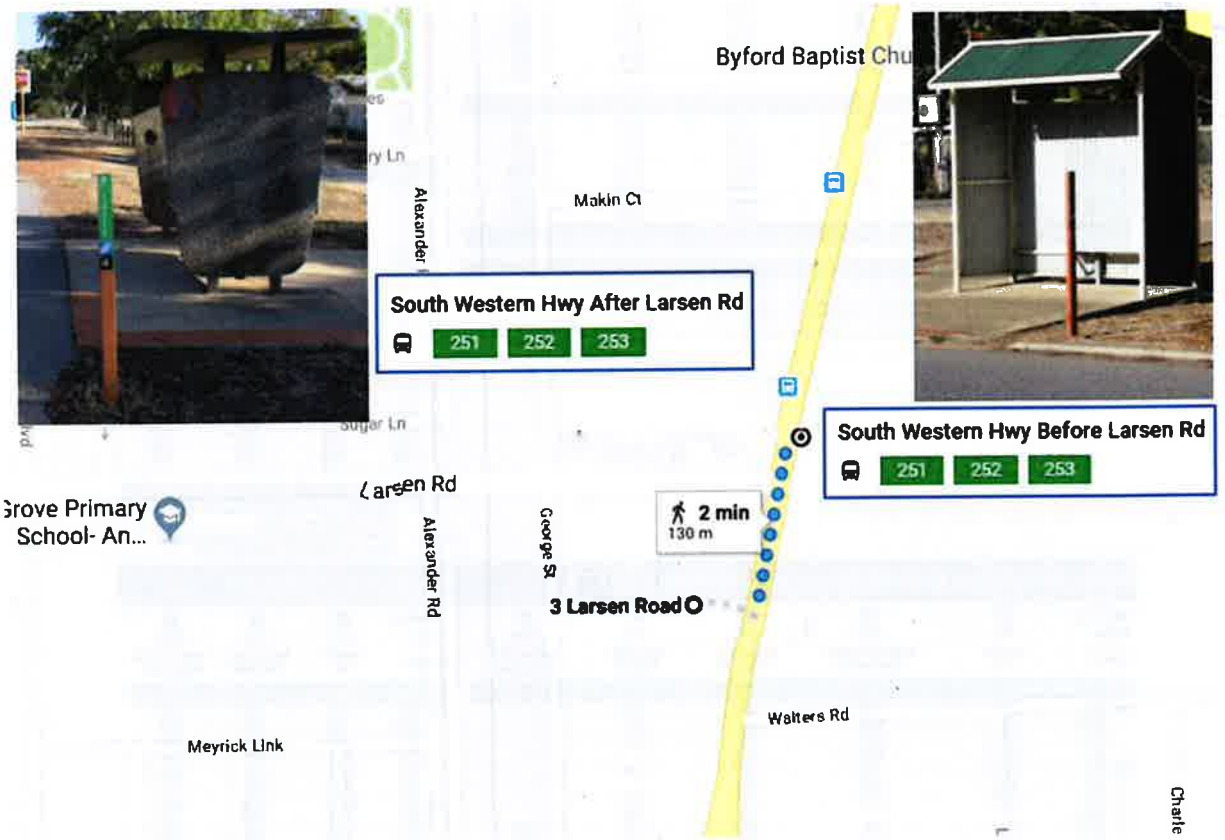



Figure 36 – Existing bus stops within a 2-minute walk of the subject site

## Route 251, 252, 253 - To Armadale

| Timed Stops | | | | | |
|---|---|---|---|---|---|
| Stop No. | 27109 | 23912 | 27650 | 13105 | 13192 |
| Route No. | Kingsbury Dr / Jacaranda Av | Paterson Rd / Whitby St | Benalla Cr / Limpet Wy | South Western Hwy / Blytheswood Av | Armadale Stn |
| **Monday to Friday** | | | | | |
| am 251 * | - | - | * 6:15 | 6:19 | 6:33 |
| 253 | 6:23 | 6:36 | 6:45 | 6:49 | 7:03 |
| 251 * | - | - | * 7:15 | 7:19 | 7:33 |
| 252 | - | 7:38 | 7:48 | 7:53 | 8:07 |
| 253 S | 7:33 | 7:48 | 7:59 | 8:08 | 8:23 |
| 253 H | 7:40 | 7:55 | 8:04 | 8:08 | 8:23 |
| 252 B | - | 8:09 | 8:20 | 8:30 | 8:46 |
| 252 | - | 8:57 | 9:06 | 9:10 | 9:24 |
| 251 * | - | - | * 9:36 | 9:40 | 9:54 |
| 252 | - | 10:27 | 10:36 | 10:40 | 10:54 |
| 251 * | - | - | * 11:36 | 11:40 | 11:54 |
| pm 252 | - | 1:27 | 1:36 | 1:40 | 1:54 |
| 252 A | - | 3:14 | 3:26 | 3:30 | 3:48 |
| 252 H | - | 3:18 | 3:26 | 3:30 | 3:48 |
| 252 | - | 5:08 | 5:16 | 5:20 | 5:34 |
| 252 | - | 6:28 | 6:36 | 6:40 | 6:54 |
| **Saturday** | | | | | |
| am 253 | 6:59 | 7:12 | 7:20 | 7:24 | 7:39 |
| 252 | - | 8:12 | 8:20 | 8:24 | 8:39 |
| 251 * | - | - | * 10:20 | 10:24 | 10:39 |
| pm 251 * | - | - | * 12:20 | 12:24 | 12:39 |
| 252 | - | 2:12 | 2:20 | 2:24 | 2:39 |
| 251 * | - | - | * 4:20 | 4:24 | 4:36 |
| 251 * | - | - | * 5:53 | 5:57 | 6:09 |

**No Sunday & Public Holidays service**

**Legend**

| | |
|---|---|
| 251 * | Time shown in Benalla Cr / Limpet Wy column is for timing point 25727 - Clondyke Dr after Burgess Dr. |
| 252 A | Operates on school days only and deviates via Serpentine Jarrahdale Grammar School. |
| 252 B | Operates on school days only and deviates via Byford Secondary College. |
| 253 S | Operates on school days only and deviates via Serpentine Jarrahdale Grammar School and Byford Secondary College. |
| H | Operates on school holidays only. |

## Route 254 - To Armadale

| Timed Stops | | | |
|---|---|---|---|
| Stop No. | 26510 | 26511 | 13192 |
| Route No. | Clifton St / South Western Hwy | Ballawarra Av / Fawcett Rd | Armadale Stn |
| **Monday to Friday** | | | |
| am 254 | 5:50 | 5:58 | 6:17 |
| 254 | 6:18 | 6:28 | 6:48 |
| 254 | 6:48 | 6:58 | 7:17 |
| 254 | 7:03 | 7:13 | 7:32 |
| 254 | 7:15 | 7:25 | 7:48 |
| 254 | 7:50 | 8:00 | 8:22 |
| 254 | 8:07 | 8:17 | 8:40 |
| 254 | 8:40 | 8:50 | 9:10 |
| 254 | 9:10 | 9:20 | 9:39 |
| 254 | 9:56 | 10:06 | 10:24 |
| 254 | 10:56 | 11:06 | 11:24 |
| 254 | 11:56 | 12:06 | 12:24 |
| pm 254 | 12:56 | 1:06 | 1:24 |
| 254 | 1:56 | 2:06 | 2:24 |
| 254 A | 3:10 | 3:30 | 3:55 |
| 254 S | 3:33 | 3:45 | 4:06 |
| 254 | 3:50 | 4:00 | 4:19 |
| 254 | 5:00 | 5:09 | 5:26 |
| 254 | 5:45 | 5:54 | 6:11 |
| 254 | 6:45 | 6:54 | 7:11 |
| **Saturday** | | | |
| am 254 | 6:42 | 6:50 | 7:09 |
| 254 | 7:42 | 7:50 | 8:09 |
| 254 | 8:42 | 8:50 | 9:09 |
| 254 | 9:42 | 9:50 | 10:09 |
| 254 | 10:42 | 10:50 | 11:11 |
| 254 | 11:42 | 11:50 | 12:11 |
| pm 254 | 12:42 | 12:50 | 1:11 |
| 254 | 1:42 | 1:50 | 2:09 |
| 254 | 2:42 | 2:50 | 3:09 |
| 254 | 3:42 | 3:50 | 4:09 |
| 254 | 4:42 | 4:50 | 5:09 |
| **Sunday and Public Holidays** | | | |
| am 254 | 8:58 | 9:06 | 9:26 |
| 254 | 10:58 | 11:06 | 11:26 |
| pm 254 | 12:58 | 1:06 | 1:26 |
| 254 | 2:58 | 3:06 | 3:26 |
| 254 | 4:58 | 5:06 | 5:26 |

**Legend**

| | |
|---|---|
| 254 A | Operates on school days only and deviates via Byford Secondary College. |
| 254 S | Departs from Serpentine Jarrahdale Grammer School at 3.25pm on school days only. |

## Route 251, 252, 253 - To Mundijong & Jarrahdale

| Timed Stops | | | | | |
|---|---|---|---|---|---|
| Stop No. | 13192 | 13138 | 25727 | 13165 | 27108 |
| Route No. | Armadale Stn | South Western Hwy / Blytheswood Av | Clondyke Dr / Burgess Dr | Paterson Rd / Whitby St | Kingsbury Dr / Jacaranda Av |
| **Monday to Friday** | | | | | |
| am 252 | 7:11 | 7:20 | 7:24 | 7:36 | - |
| 252 A | 8:12 | 8:23 | 8:27 | 8:41 | - |
| 252 | 9:56 | 10:06 | 10:10 | 10:21 | - |
| 251 | 10:56 | 11:06 | 11:14 | - | - |
| pm 252 | 12:55 | 1:05 | 1:09 | 1:20 | - |
| 251 | 1:56 | 2:06 | 2:14 | - | - |
| 252 | 2:40 | 2:51 | 2:55 | 3:06 | - |
| 252 B | - | - | 3:24 | 3:38 | - |
| 253 D | 3:05 | 3:17 | 3:28 | 3:40 | 3:59 |
| 253 S | 3:40 | 3:52 | 3:56 | 4:06 | 4:23 |
| 252 E | 4:11 | 4:23 | 4:27 | 4:40 | - |
| 252 | 4:40 | 4:51 | 4:55 | 5:06 | - |
| 253 | 5:13 | 5:25 | 5:29 | 5:37 | 5:52 |
| 252 | 5:54 | 6:05 | 6:09 | 6:20 | - |
| **Saturday** | | | | | |
| am 252 | 7:43 | 7:53 | 7:57 | 8:07 | - |
| 251 | 9:56 | 10:06 | 10:12 | - | - |
| 251 | 11:56 | 12:06 | 12:12 | - | - |
| pm 252 | 1:41 | 1:51 | 1:55 | 2:09 | - |
| 251 | 3:41 | 3:51 | 3:57 | - | - |
| 253 | 4:41 | 4:51 | 4:55 | 5:04 | 5:20 |
| 252 | 5:41 | 5:51 | 5:55 | 6:09 | - |

**No Sunday & Public Holidays service**

**Legend**

| | |
|---|---|
| 252 A | Deviates via Serpentine Jarrahdale Grammar School on school days only. |
| 252 B | Operates on school days only and departs Byford Secondary College at 3.17pm. |
| 252 E | Operates on school days only. |
| 253 D | Departs from Armadale Senior High School at 3.00pm, then deviates via Byford Secondary College and Serpentine Jarrahdale Grammar School on school days only. |
| 253 S | Deviates via Serpentine Jarrahdale Grammar School on school days only. |

## Route 254 - To Byford

| Timed Stops | | | | |
|---|---|---|---|---|
| Stop No. | 13192 | 26512 | 26510 |
| Route No. | Armadale Stn | Ballawarra Av / Fawcett Rd | Clifton St / South Western Hwy |
| **Monday to Friday** | | | |
| am 254 | 7:12 | 7:28 | 7:42 |
| 254 S | 7:53 | 8:14 | 8:30 |
| 254 | 8:27 | 8:44 | 8:58 |
| 254 | 9:25 | 9:41 | 9:54 |
| 254 | 10:26 | 10:42 | 10:54 |
| 254 | 11:26 | 11:42 | 11:54 |
| pm 254 | 12:25 | 12:42 | 12:54 |
| 254 | 1:25 | 1:42 | 1:54 |
| 254 | 2:26 | 2:43 | 3:00 |
| 254 A | 3:10 | 3:29 | 3:45 |
| 254 | 3:40 | 3:58 | 4:13 |
| 254 | 4:25 | 4:43 | 4:58 |
| 254 | 5:13 | 5:30 | 5:43 |
| 254 | 5:28 | 5:44 | 5:58 |
| 254 | 5:43 | 5:59 | 6:13 |
| 254 | 5:58 | 6:14 | 6:27 |
| 254 | 6:14 | 6:30 | 6:43 |
| 254 | 6:29 | 6:44 | 6:57 |
| 254 | 6:44 | 6:59 | 7:12 |
| 254 | 7:14 | 7:29 | 7:42 |
| **Saturday** | | | |
| am 254 | 8:13 | 8:28 | 8:40 |
| 254 | 9:11 | 9:26 | 9:39 |
| 254 | 10:11 | 10:26 | 10:39 |
| 254 | 11:11 | 11:26 | 11:40 |
| pm 254 | 12:11 | 12:26 | 12:40 |
| 254 | 1:11 | 1:26 | 1:40 |
| 254 | 2:11 | 2:26 | 2:40 |
| 254 | 3:11 | 3:26 | 3:40 |
| 254 | 4:11 | 4:26 | 4:40 |
| 254 | 5:11 | 5:26 | 5:39 |
| 254 | 6:11 | 6:26 | 6:39 |
| **Sunday and Public Holidays** | | | |
| am 254 | 8:28 | 8:43 | 8:56 |
| 254 | 10:28 | 10:43 | 10:56 |
| pm 254 | 12:28 | 12:43 | 12:56 |
| 254 | 2:28 | 2:43 | 2:56 |
| 254 | 4:28 | 4:43 | 4:56 |

**Legend**

| | |
|---|---|
| 254 A | Departs from Armadale Senior High School at 3.05pm on school days only. |
| 254 S | Extends to Serpentine Jarrahdale Grammar School on school days only. |

Table 8 – Transperth Routes 251, 252 and 253 Timetables

# 13 PEDESTRIAN AND CYCLE ACCESS/ AMENITY

As indicated in Figure 2 on page 9 and shown in Photograph 8 on page 22, there is an existing cycle route along George St and a short section of cycle path with associated crossing facility on South Western Hwy between Larsen Rd and Walters Rd. There are good paths along Larsen Rd and George St but the path on the development side of South Western Hwy south of the ped/ cycle crossing island is substandard and, in some locations, presents a hazard to people using wheeled devices such as skateboards, gophers, wheelchairs and prams as it can direct these devices into the path of vehicles on South Western Highway, as shown in the example provided as Photograph 15 below.

Photograph 15 – Example of South Western Hwy path on west side sloping towards traffic

There is a lack of continuous tactile ground surface indicators on the informal ped/ cycle crossing on South Western Hwy south of Larsen Rd as shown in Photograph 16 on the following page.

Photograph 16 – Existing ped/ cycle crossing on South Western Hwy south of Larsen Rd

A review of the paths around the recently developed Caltex Service Station on the corner of South Western Hwy and Nettleton Rd has revealed that paths and ramps in accordance with the latest standards have been provided to, from and around this site, as shown in the example provided as Photograph 17 below.


Photograph 17 – Caltex Service Station ped/ cycle facilities, South Western Hwy/ Nettleton Rd

# 14 PARKING AND SERVICING

As indicated in **Section 3**, it is proposed to provide a total of 71 standard car parking bays, 3 ACROD bays, 1 waiting bay and 3 loading bays on site.

The planning report assesses the statutory requirement and provision of parking bays. From a practical point of view, it is important to note that many of the trips to the site will be shared between the different land uses on the site, hence there is a high probability that each parking bay would be used for more than one land use trip. This was evidenced in the survey of the existing Caltex Service Station on the corner of South Western Hwy and Nettleton Rd.

The largest vehicle expected to service and the site is the 19 m Semi Trailer, as shown in Figure 37 below.

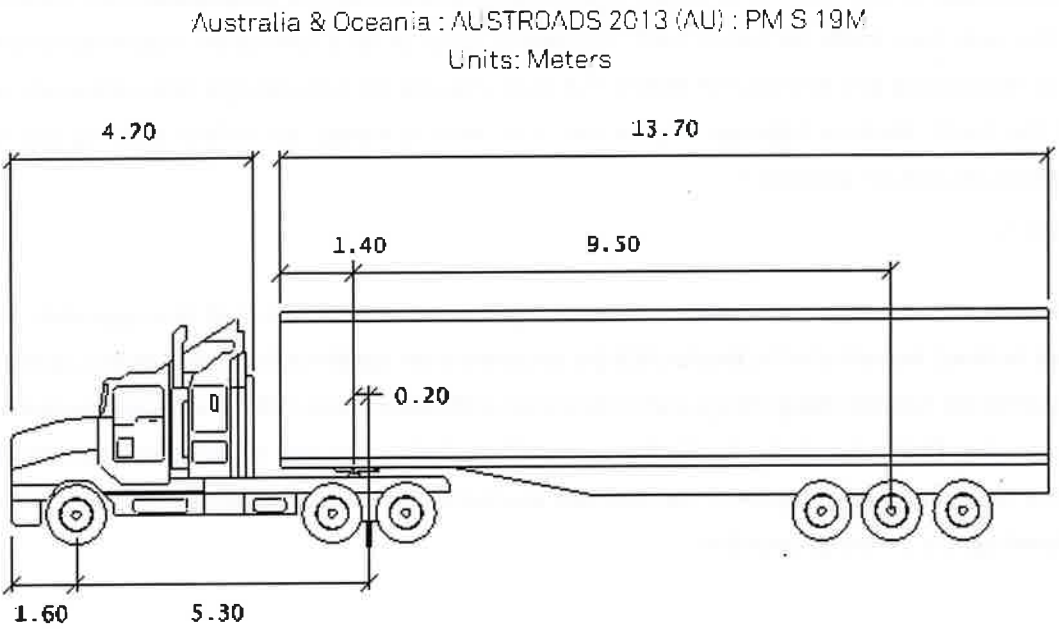



Figure 37 – 19 m Semi Trailer Design Vehicle

The assessed swept path of the above design vehicle, i.e. fuel tanker servicing the site, is shown in the Development Drawings included in **Appendix A**.

# 15 SITE SPECIFIC ISSUES

The Shire of Serpentine-Jarrahdale's Coordinator Subdivisions has provided a list of the Shire's concerns regarding the development proposal in the previously issued TIA (i.e. version 2.0) in an email dated 25th October 2018. In order to ensure that each of these issues is clearly addressed, this section reproduces those concerns and provides comment and assessment accordingly.

### ISSUE 1: LARSEN RD/ SOUTH WESTERN HIGHWAY INTERSECTION

"The shire is concerned by the midweek peak level of saturation on Larsen Road. This indicates we currently have unacceptable delays. The traffic impact Assessment indicates that the development will approximately double the peak hour traffic on Larsen road. To address issues around Saturation in addition to the works shown on the drawing and agreed with MRWA the shire requires the left and right channelisation on Larsen road at the South Western highway intersection. This work is shown on MRWA drawing 022 which is referenced In the MRWA decision."

### RESPONSE 1

The Development Drawings in **Appendix A** show it is proposed to provide a dual lane approach on Larsen Road (red outline). As indicated in **Section 4.3** the proponent has confirmed that the MRWA conditions will be met during the detailed design stage and in discussion with Main Roads WA. This TIA has assessed a single lane approach as Option 1 and the double lane approach as Option 2 as part of the assessment process. The proponent has indicated that Option 2, the dual lane approach, has been adopted and this has been included in the Development Drawings provided.

## Issue 2: Development Access from Larsen Road

"Larsen Road is a local distributer Road. While it is preferred to not have large vehicles on Local Distributor roads they can host 19m semi-trailers. It is unclear from the traffic impact assessment if it is proposed to have service facilities for large vehicles or if the 19m semi-trailers entering and exiting the site are purely service vehicles. The shire generally has adopted a policy of not supporting high-flo diesel or services for 19m semi-trailers on the south western highway in the Byford town site.

Concerning the service vehicle access the shire will not accept vehicles departing their lane to enter and exit the site. It is not considered safe at this location with proximity to the highway intersection and access driveways opposite creating an environment where uncertainty in decision making could occur. The shire also notes Larsen road has centre line road markings and therefore it is against the road traffic code for vehicles to not be lane compliant whilst performing turning manoeuvres.

The shire would like to see some assessment of the vehicle stacking on Larsen road related to the entry into the development to determine the necessary access arrangements. Noting there is around 90 vehicles per hour entering In the Saturday peak and plus 200 vehicles on Larsen road according to the 2014 count".

## Response 2

As indicated in **Section 3**, the proposed development will not have fuel facilities for large vehicles. As such, the largest vehicles expected to access and egress the site is the 19 m Semi Trailer (19 m ST) Fuel Tanker servicing the site. The 19 m ST is the design vehicle that all roads and intersections are designed for as it is the largest vehicle that is permitted to use all public roads without a permit. This also ensures that other large vehicles such as those associated with removalists, waste collection and emergency services can negotiate the road network.

The statement that "Concerning the service vehicle access, the shire will not accept vehicles departing their lane to enter and exit the site" is not consistent with currently approved developments along similar Local Distributor roads, as shown in Figure 38 and Photograph 18 on the following page. It is also not consistent with the Shire's reasoning, i.e. "It is not considered safe at this location with proximity to the highway intersection and access driveways opposite creating an environment where uncertainty in decision making could occur." The development access off Larsen Rd is the only access on this side of the road between the Highway and George St hence it will be very clear to other drivers where an indicating vehicle will be turning off Larsen Rd to access the site. The proposed access is located midway between the two intersections to minimise influence on movements at either of these intersections. It is also located as far away from the South Western Hwy intersection as is physically possible.

The Shire's statement that "Larsen road has centre line road markings and therefore it is against the road traffic code for vehicles to not be lane compliant whilst performing turning manoeuvres" is incorrect. Section 116 of the Road Traffic Code states that "a driver shall not permit any portion of the vehicle to travel on,

over, or to the right of, the dividing line except for the purpose of making a right turn or a U turn, where permissible." This is consistent with statements within AS 2890.1 that require left turns to be undertaken from the kerb lane but allow for the full width of the roadway to be used. The examples provided below show centre line road markings on Abernethy Road and the approved development that requires service vehicles to cross this line.

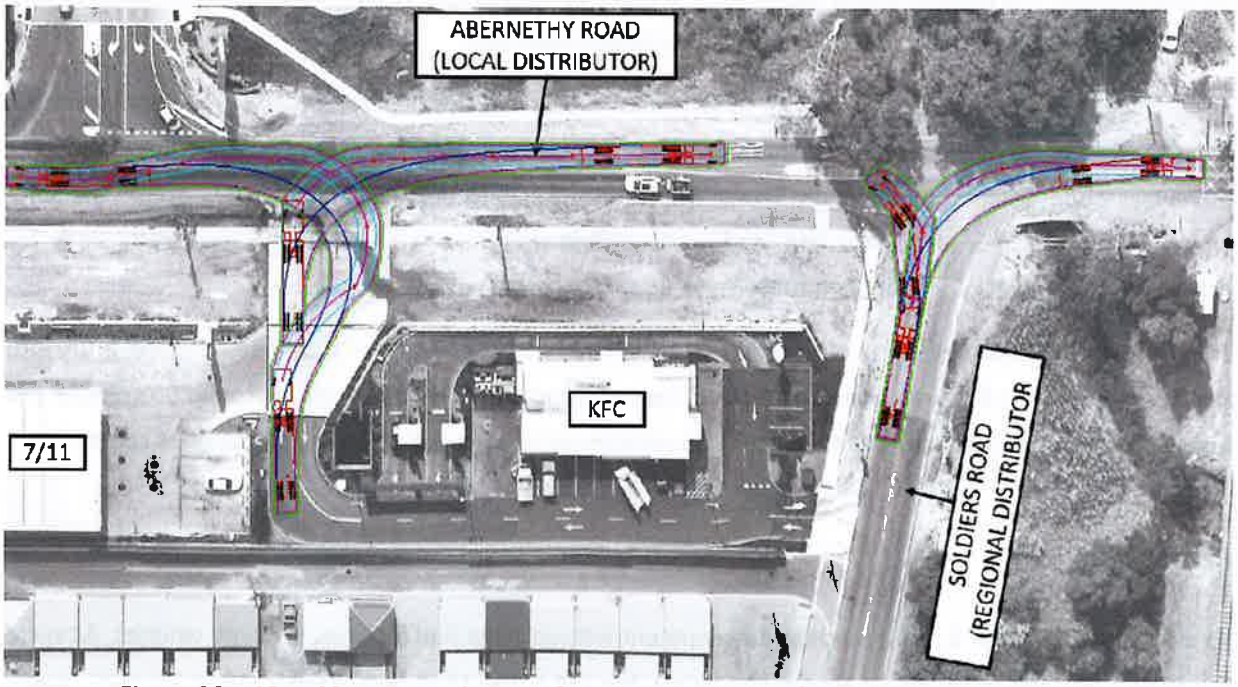



Figure 38 – 19 m ST swept paths out of Soldiers Rd and KFC/ 7eleven into Abernethy Rd


Photograph 18 – Looking west along Abernethy Rd (Local Distributor) to KFC/ 7eleven development on left

The practice of allowing service vehicles to enter and leave access driveways within the boundaries of the roadway, i.e. kerb lines, is permitted in Section 3.4.1(a) of Australian Standard AS 2890.2 (4), i.e.: "On a minor

public road, vehicles shall be able to enter and leave the access driveway without infringing the boundaries of the roadway. Local authorities may place further limits and controls on the extent to which movement across the centre-line of the roadway is allowed."

The shire has indicated that it would "like to see some assessment of the vehicle stacking on Larsen road related to the entry into the development to determine the necessary access arrangements. Noting there is around 90 vehicles per hour entering In the Saturday peak and plus 200 vehicles on Larsen road according to the 2014 count".

200 vehicles per hour is not a lot for a Local Distributor Rd and does not warrant assessment. Nevertheless, an assessment has been carried out as requested based on the forecast 2030 volumes and is shown in Figure 39 below and in Figure 40 and Figure 41 on the following page. Average and 95%ile back of queue lengths do not exceed more than 1 vehicle for any movement in any peak hour.

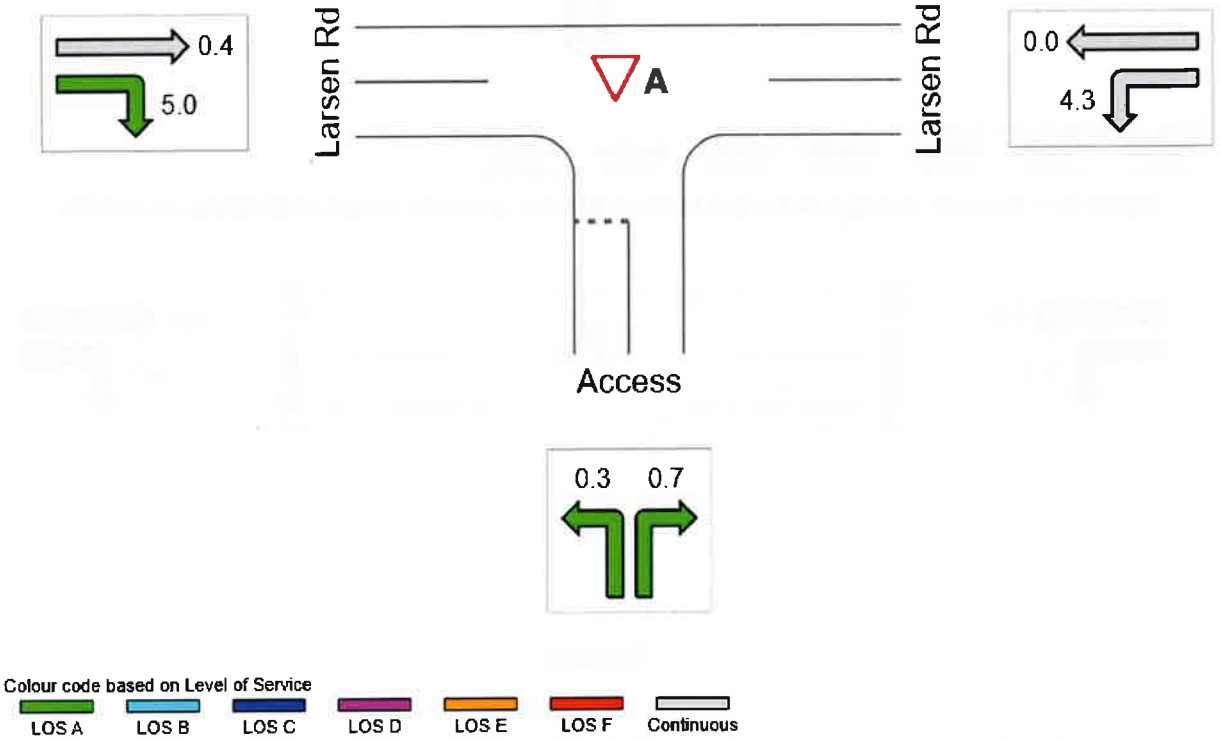



Figure 39 – Forecast Average Delay and Level of Service Larsen Rd Access 2030 Midweek 1-2 PM

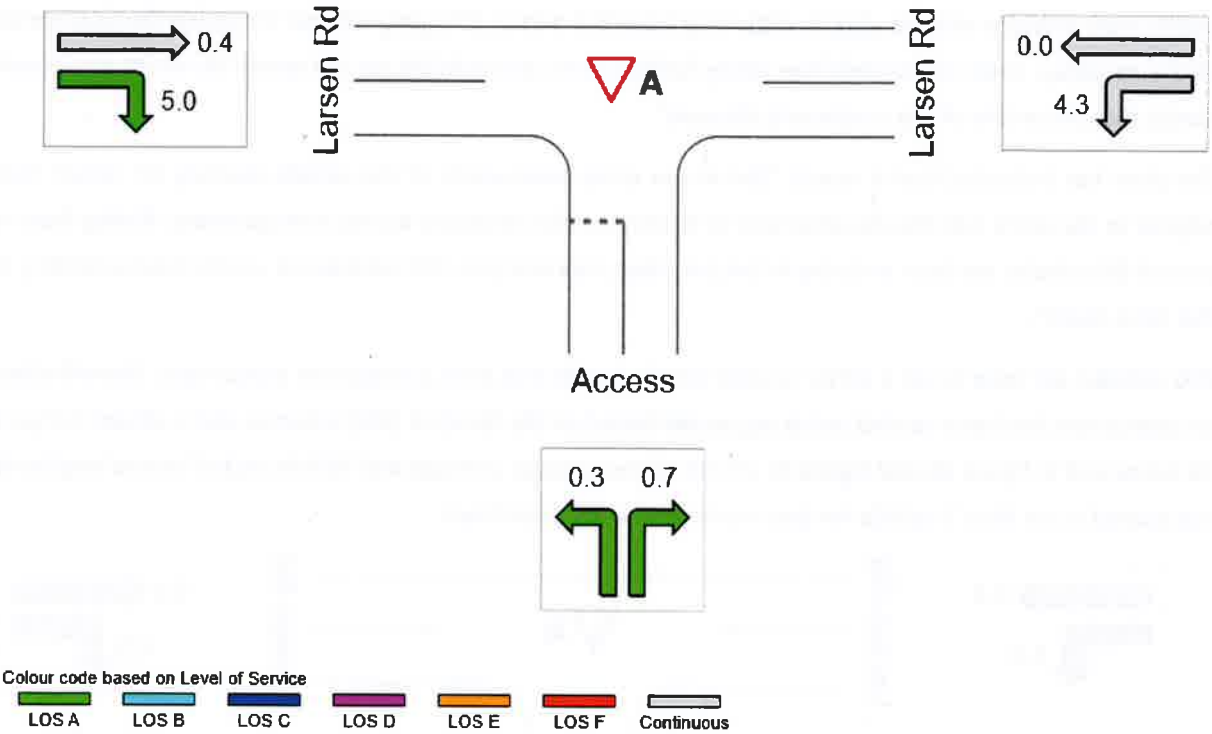



Figure 40 – Forecast Average Delay and Level of Service Larsen Rd Access 2030 Midweek 4-5 PM

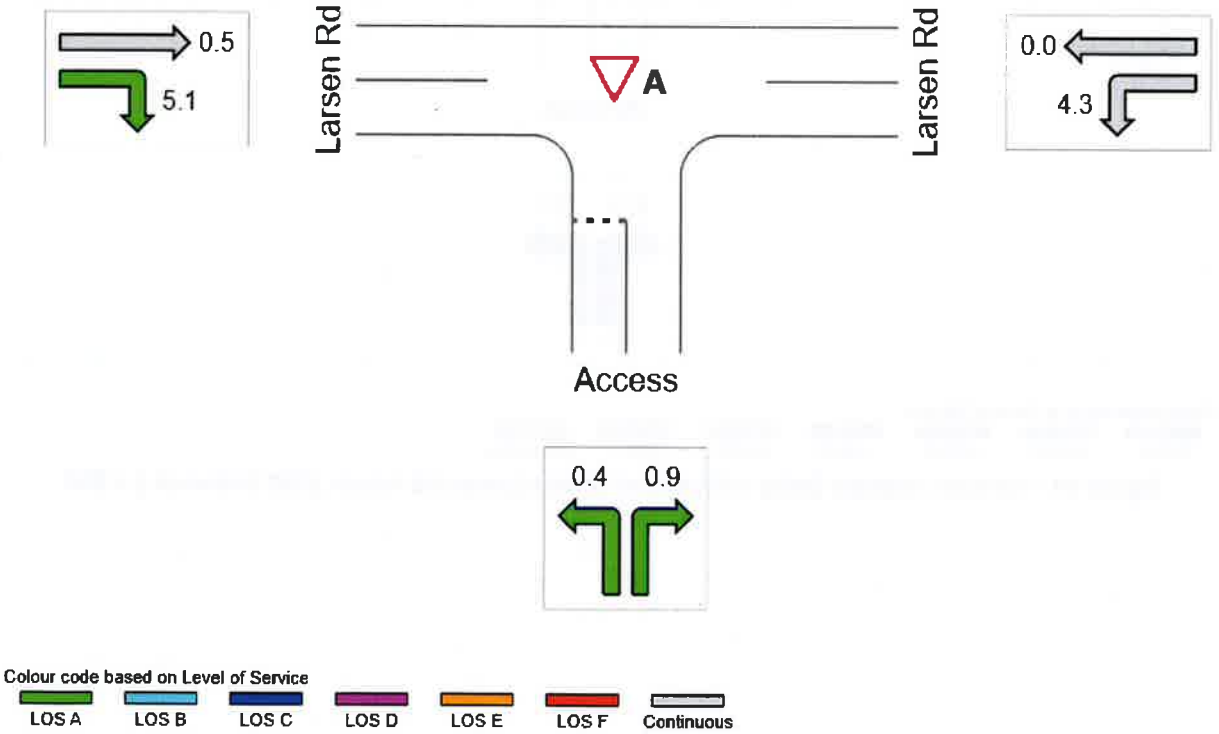



Figure 41 – Forecast Average Delay and Level of Service Larsen Rd Access 2030 Sat 12-1 PM

## Issue 3: Larsen Rd/ George St Intersection

"This intersection is a four way line marked intersection with priority to east – west traffic movements. The intersection is located 25m east of a rail level crossing. The TIA indicates that service vehicles will be moving through the Larsen road George Street intersection. No Swept path analysis of the service vehicle movements at this intersection have been presented. It will be necessary for all vehicles to remain lane compliant and to the left of the centre line at this intersection. Widening and upgrade works as necessary to support service vehicles using this intersection."

## Response 3

It is the Shire's and Main Roads WA's directive that servicing of all lots between George St and South Western Hwy must be via George St. It is therefore incumbent on the Shire to ensure that its road network supports these movements and/ or seek contributions for upgrades where required. As indicated in **Section 2.4.3**, the Shire has adopted Local Planning Policy No 53: George Street Construction Costs which allows for "the contribution of funding for the construction of George Street from Pitman Way to Larsen Road in a coordinated manner by detailing the costs, method of apportionment and method of collecting contributions."

Swept paths were not included in the TIA for this intersection as the largest service vehicle is the 19 m Semi Trailer which is the design vehicle for all intersections. Nevertheless, an assessment of the swept path of the 19 m ST turning into and out of George St is provided as Figure 42 below.

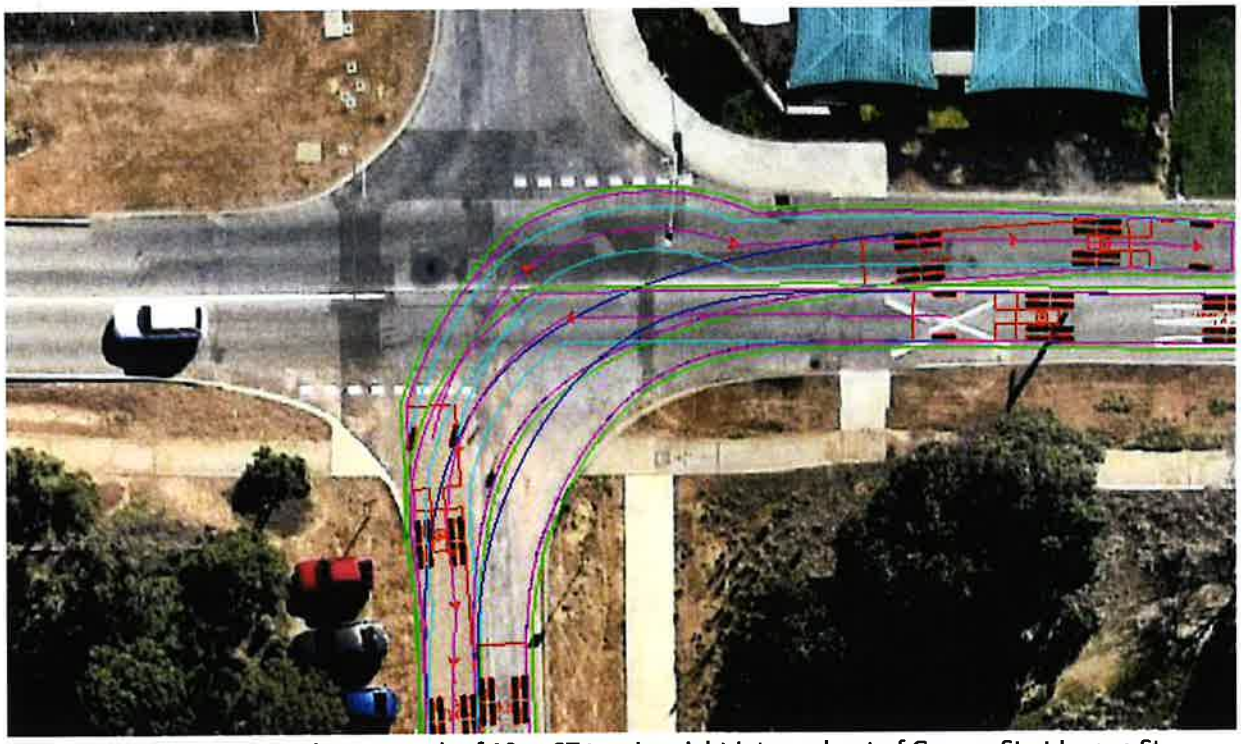


Figure 42 – Assessed swept path of 19 m ST turning right into and out of George St at Larsen St

The Shire's statement that "It will be necessary for all vehicles to remain lane compliant and to the left of the centre line at this intersection." Is not consistent with WAPC Operational Policy Liveable Neighbourhoods (7) which states, in Section R58 of Element 2, that "At intersections, turning vehicles must be accommodated using Standards Association of Australia Design Vehicles and turning templates, to enable turns to be made in a single forward movement as follows: ....**for turns between neighbourhood connector (i.e. Larsen Rd)...and an access street (i.e. George St), the design heavy rigid vehicle, using any part of the pavement**."

The assessment shown in Figure 42 is for the larger 19 m ST Design Vehicle as this is the largest service vehicle for all properties along George St and this larger vehicle has been shown to be able to complete all turn movements using any part of the pavement.

## Issue 4: George St Access Driveways

"George Street is planned to be the high street in Byford by the shire. Main roads recent access policy has been to discourage direct access to the highway and to favour access off George Street. Whilst George St is not line marked the shire does not consider it safe to have service vehicles sweeping across the total George street pavement when entering and exiting the development. George St is intended to be passenger vehicle and pedestrian in nature. Service Vehicles entering and existing the development should be lane complaint when making turning manoeuvres on George St."

## Response 4

Refer assessment **in Section 4.4**.

The Shire refers to Main Roads access policy. This access policy has been agreed with the Shire.

Subsequent to undertaking this assessment, the author requested and received from the Shire the latest "Movement Network Plan", provided as Figure 43 on the following page. Whilst this shows the intention for George St to be part of the Town Centre and hence a "High Street in Byford" it does not include the section of George St north of the indicated Town Centre which includes the section of George St adjacent to the development site.

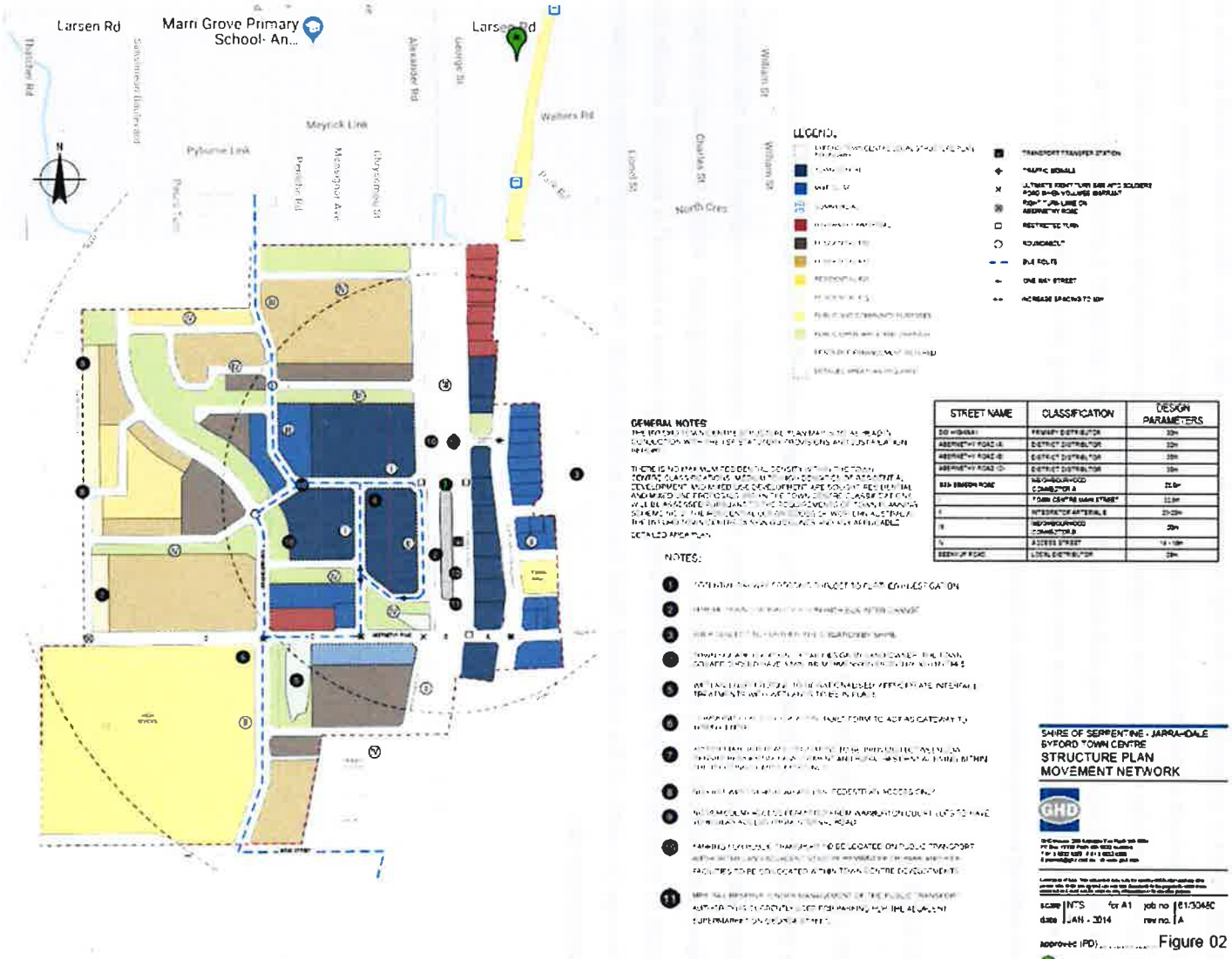



Figure 43 – SoSJ Byford Town Centre 'Movement Network Plan' with development site show as

DEVELOPMENT ASSESSMENT PANEL
APPROVED
11-Dec-2018

## Issue 5: Loading Bay Orientation and Access Arrangements

"The loading bays currently proposed running parallel to George St require vehicles entering and exiting the loading area to drive across the main access driveway and to reverse onto the access driveway. The shire considers the current proposed loading bay arrangements to be unsafe. The loading bays should be reconfigured to eliminate reversing of large vehicles where interaction with the public is possible. Vehicles entering and exiting the loading bays should be able to do so without moving across the driveway intersection. As an example of a preferred arrangement on George St please see below an aerial of the Aldi development. Aldi have separated the loading from the customer with an additional George St Access."

## Response 5

It appears that the Shire's officer may not be using the correct terminology for the elements of an off-street parking area as the development plans never showed a requirement for vehicles "to reverse onto the access driveway". For clarification, the terminology used in this TIA is the same as that used in the Australian Standards, as shown in Figure 44 below.

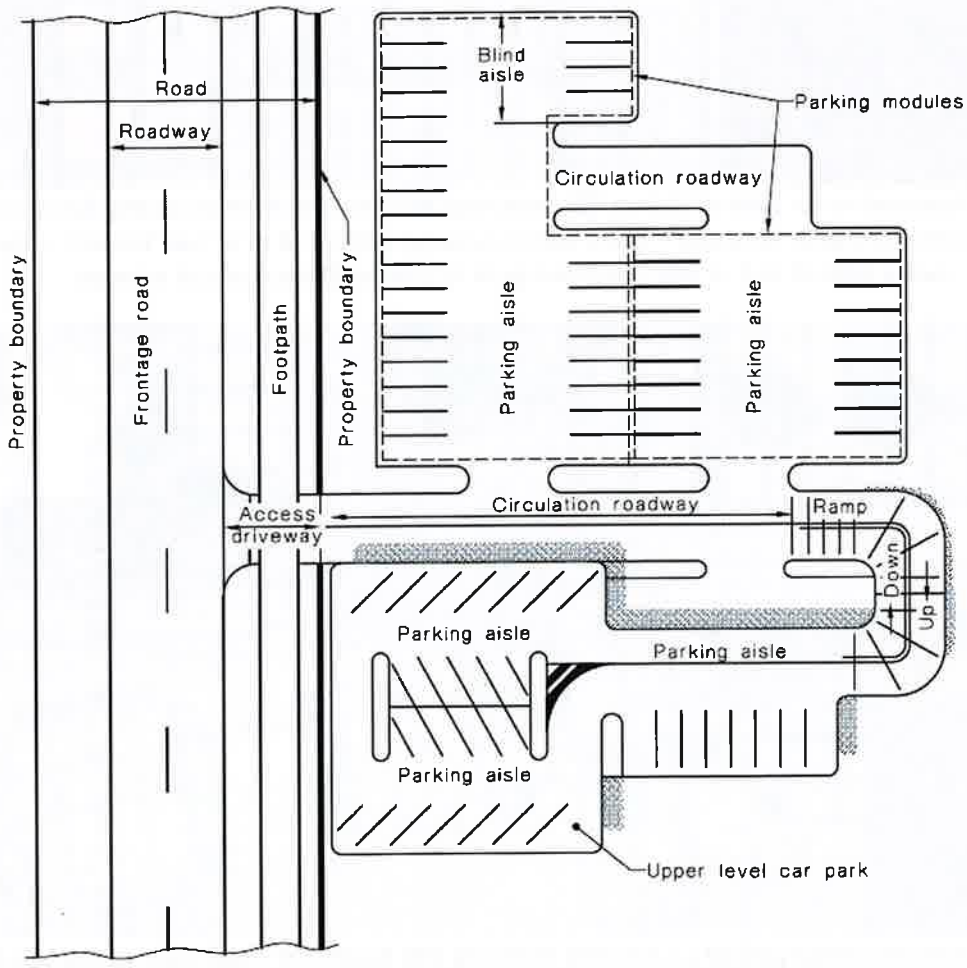



Figure 44 – Off-street car park elements and definitions

The development drawings have been amended since issue of the last version of the TIA (F2.0).

As indicated in **Section 3**, the 12.5 m Heavy Rigid Vehicles will be the typical delivery and service vehicle for waste collection and stock deliveries to all tenancies. An assessment of the swept paths of the 12.5 m HRV accessing and egressing each Loading Bay is shown in Figure 45 and Figure 46 below.

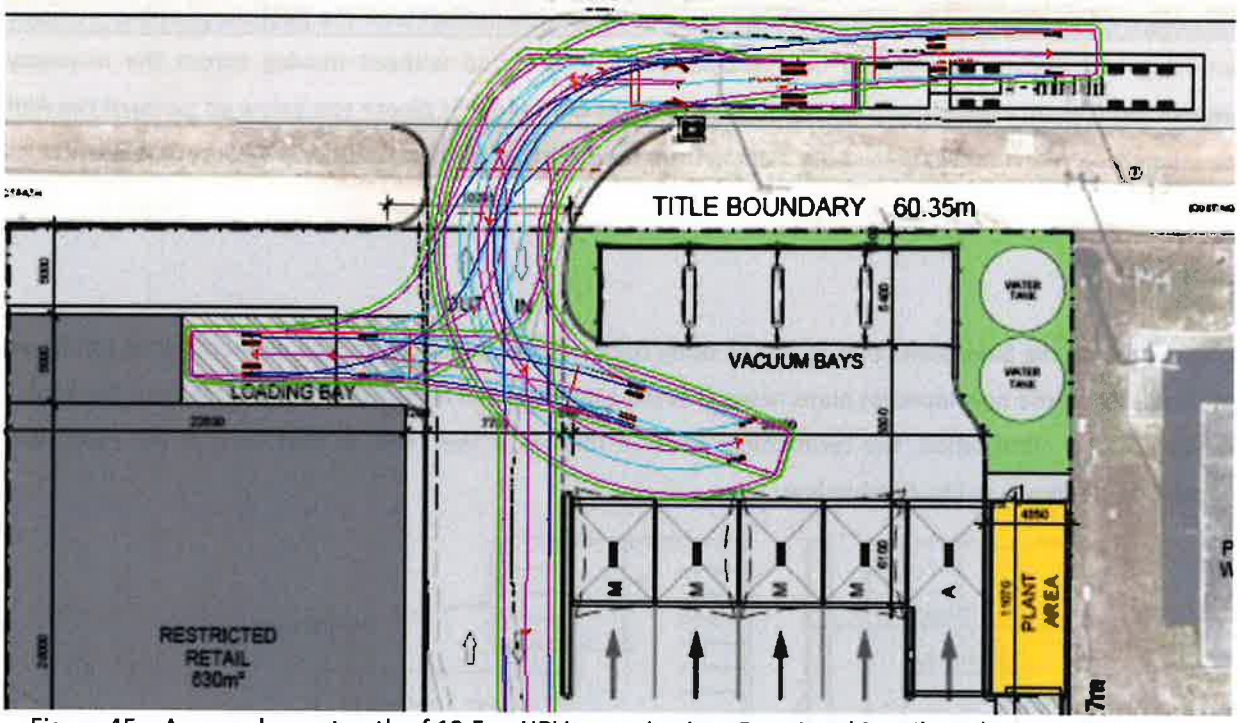



Figure 45 – Assessed swept path of 12.5 m HRV reversing into Restricted Retail Loading Bay and driving forward out onto George St (in colour – black outline is swept path of 19 m ST Fuel Tanker) – also shows swept path of 12.5 m HRV from George St to Loading Zone assessed in below

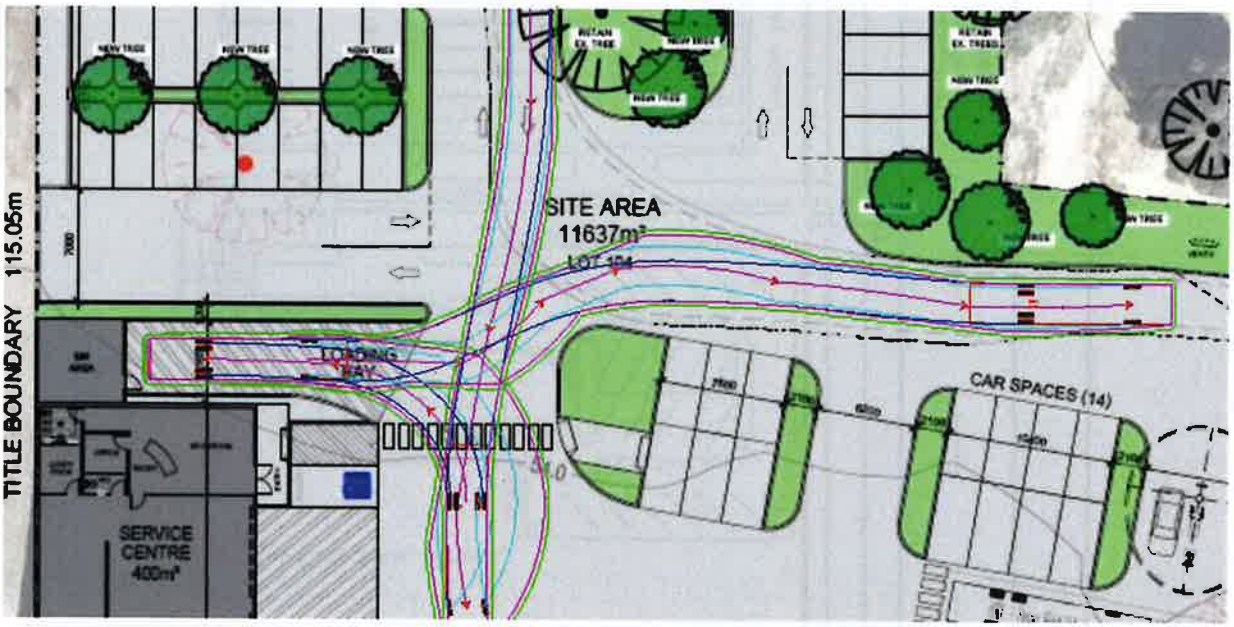



Figure 46 - Assessed swept path of 12.5 m HRV reversing into Restricted Retail Loading Bay and driving forward out onto George St (in colour – black outline is swept path of 19 m ST Fuel Tanker)

## Peak Hour Traffic on Larsen Rd

An assessment of the turning volume data collected on Wednesday 22nd August 2018 provided to the author by the Shire on 25th October 2018 has indicated maximum 'peak hour' volumes through this intersection occur between 3.15 and 4.15 PM as shown in Figure 47 below.

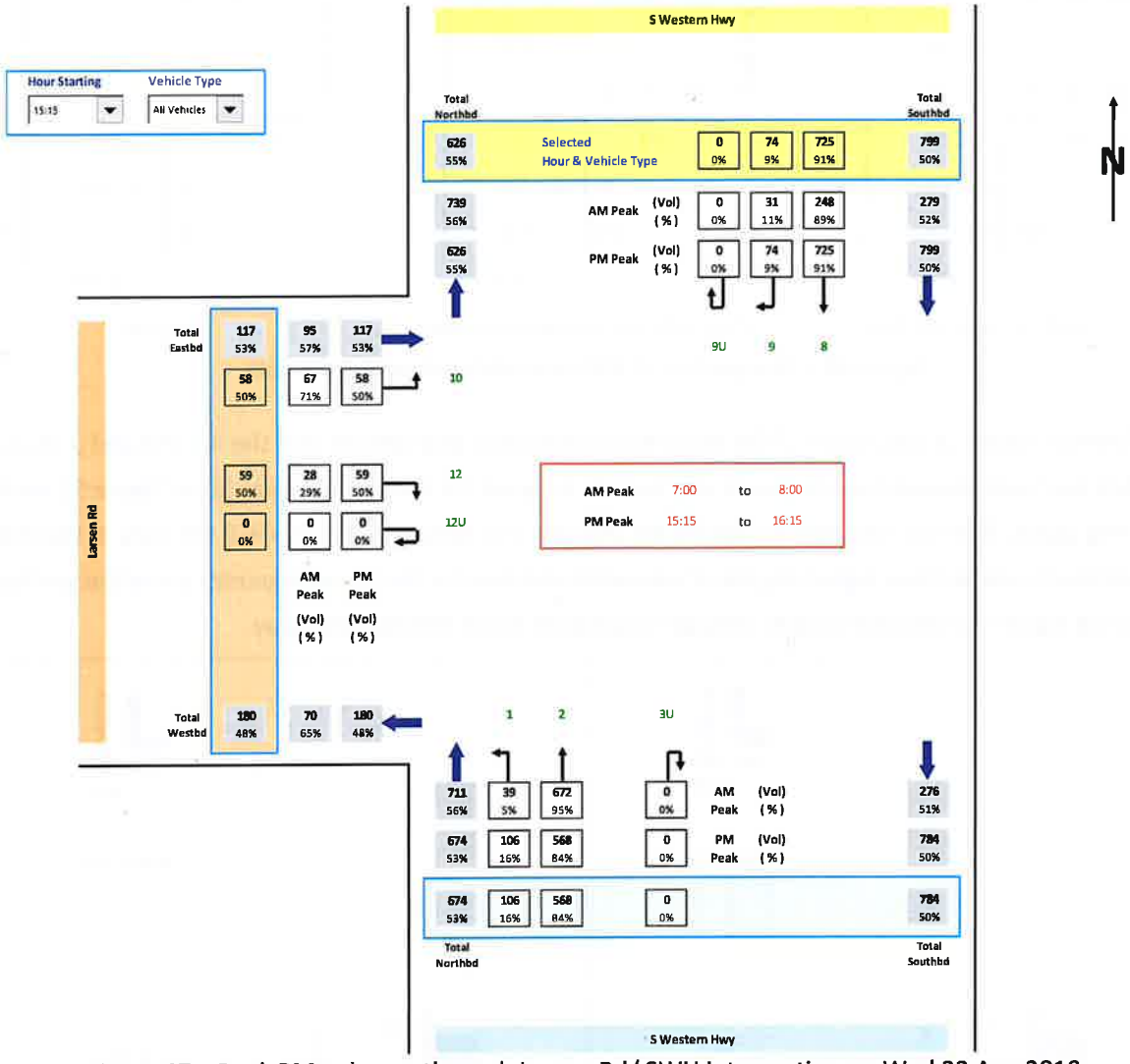



Figure 47 – Peak PM volumes through Larsen Rd/ SWH intersection on Wed 22 Aug 2018

A comparison between PM peak hour turning volume data collected on Wednesday 22nd August 2018 collected by the Shire and the PM peak hour data collected by the author in April 2018 and used for the assessment is provided as Figure 48 on the following page. This shows the total difference is 5 vehicles. There are higher volumes on Larsen Rd in the SoSJ data that may warrant assessment in order to provide stakeholders with confidence that the assessment is robust.

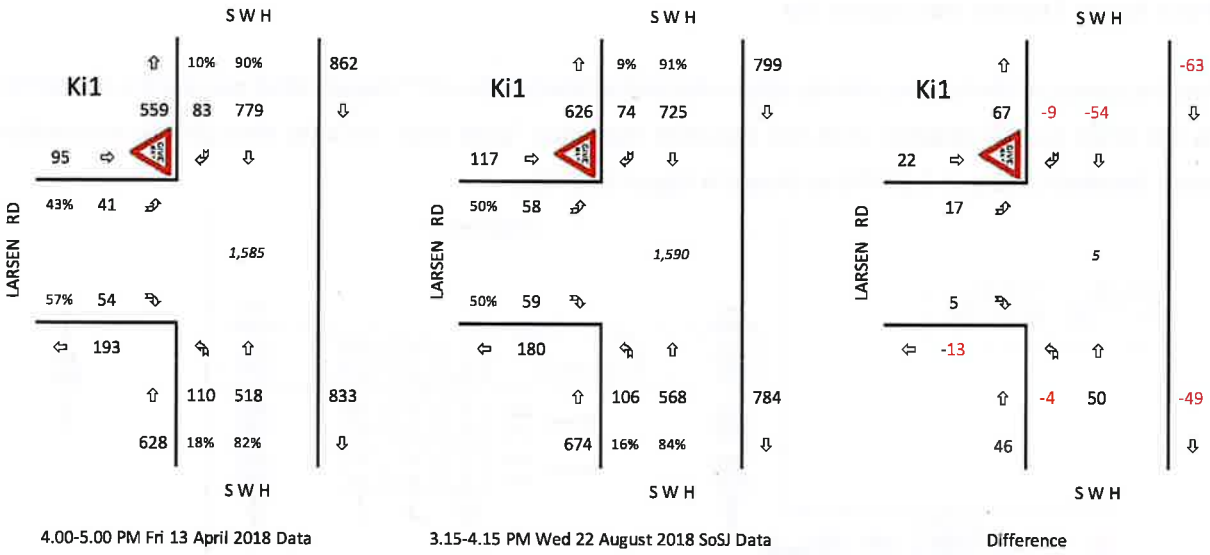



Figure 48 – Comparison of different midweek peak hour data

The forecast Degree of Saturation of the assessed intersections and options with the 4-5 PM and 3.15-4.15 PM data has been assessed and is shown side by side in Figure 49 below and Figure 50 to Figure 52 on the following pages. This has revealed no significant changes and indicates that the 4-5 PM data is the most appropriate to use as it has higher degree of saturation volumes for the key movements out of Larsen Road due to the higher northbound straight through volumes on South Western Highway.

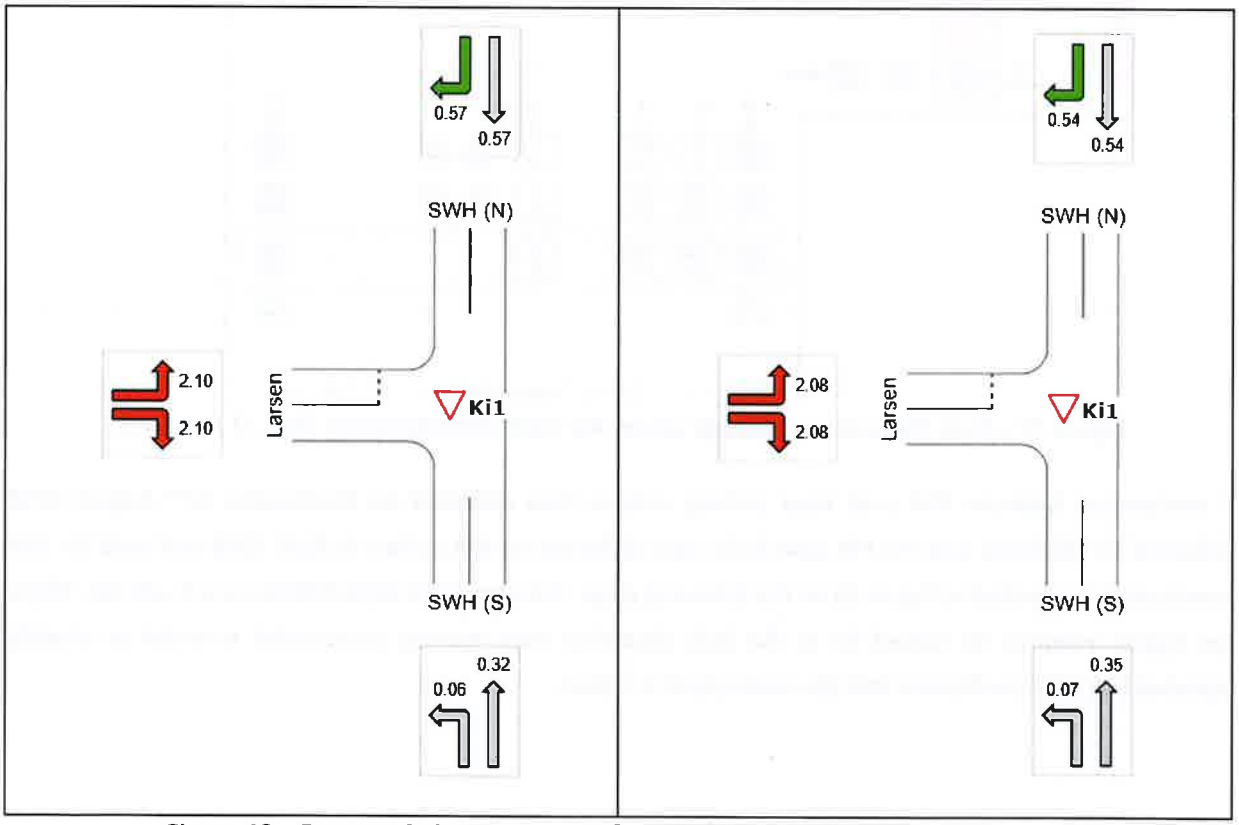



Figure 49 – Forecast 2020 Ki1 Degree of Saturation 4-5 PM v 3.15-4.15 PM data

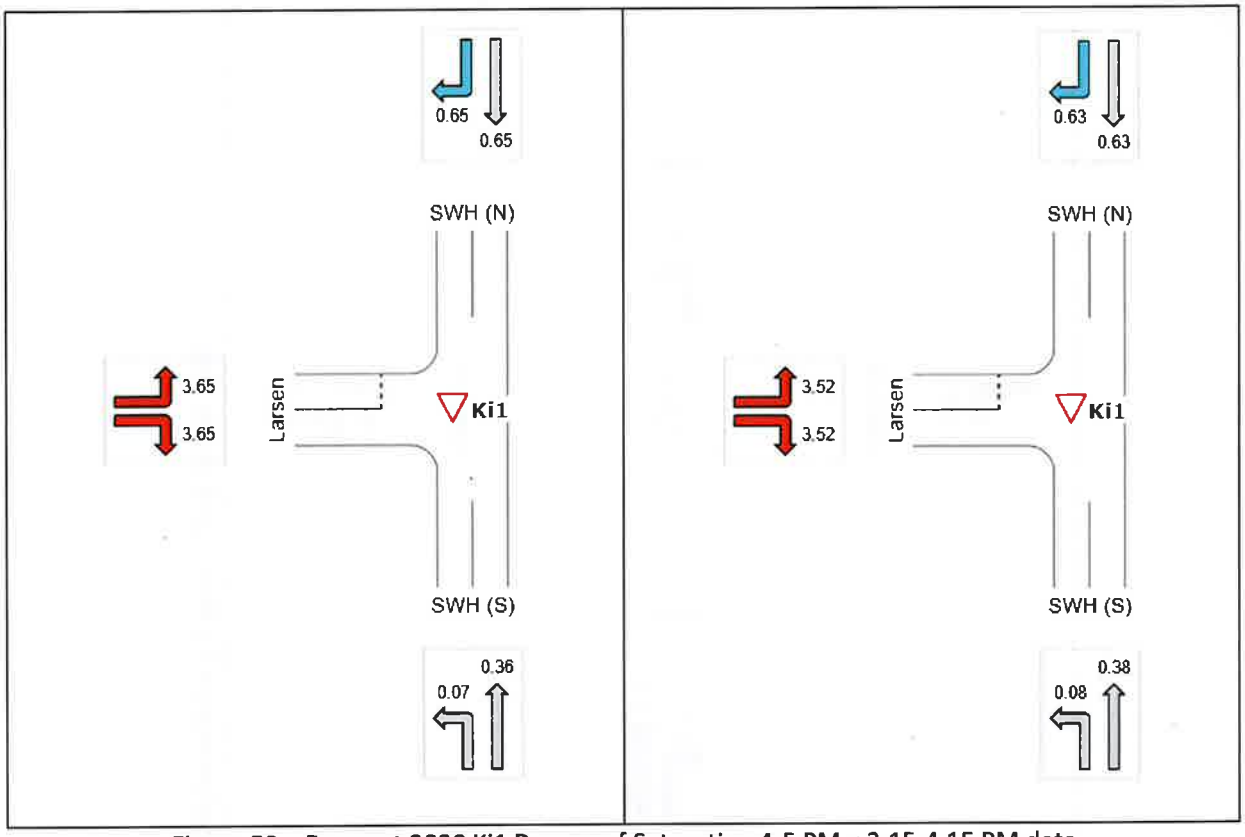



Figure 50 – Forecast 2030 Ki1 Degree of Saturation 4-5 PM v 3.15-4.15 PM data

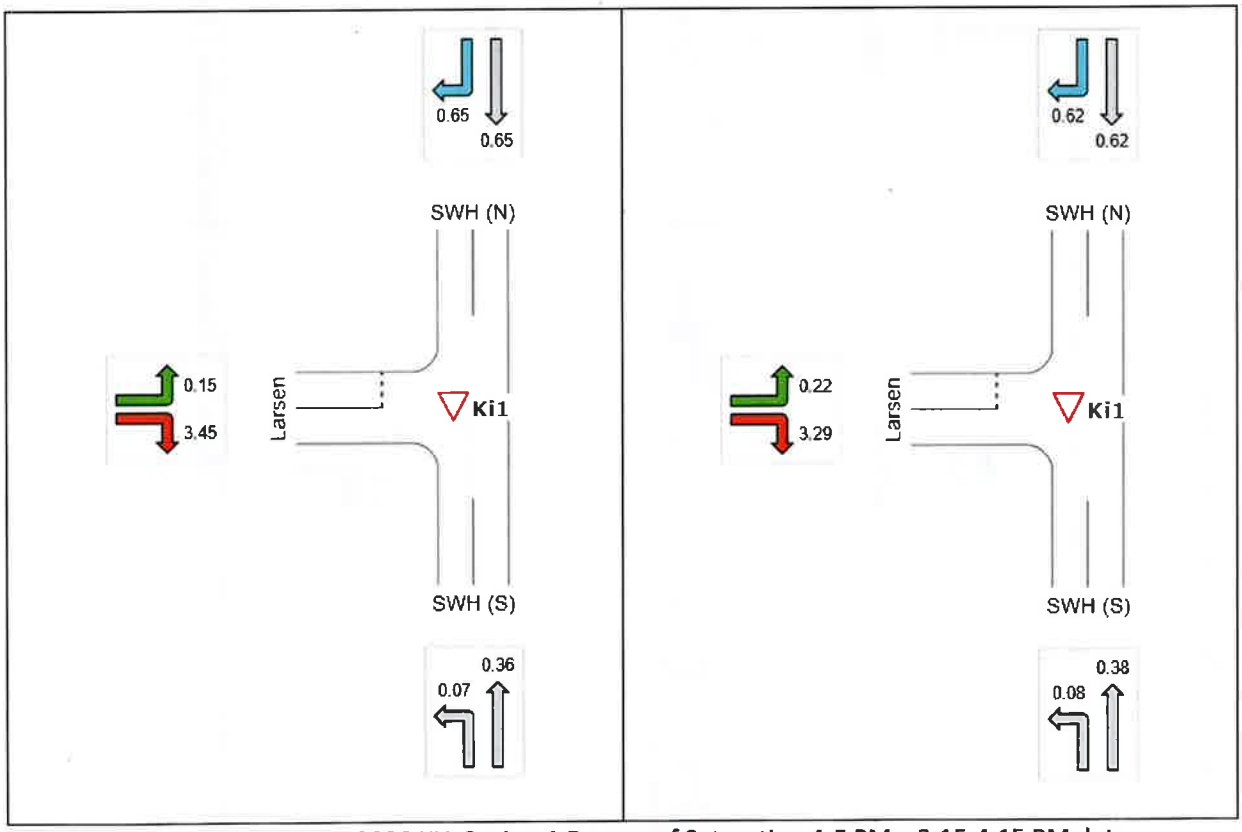



Figure 51 – Forecast 2030 Ki1 Option 1 Degree of Saturation 4-5 PM v 3.15-4.15 PM data

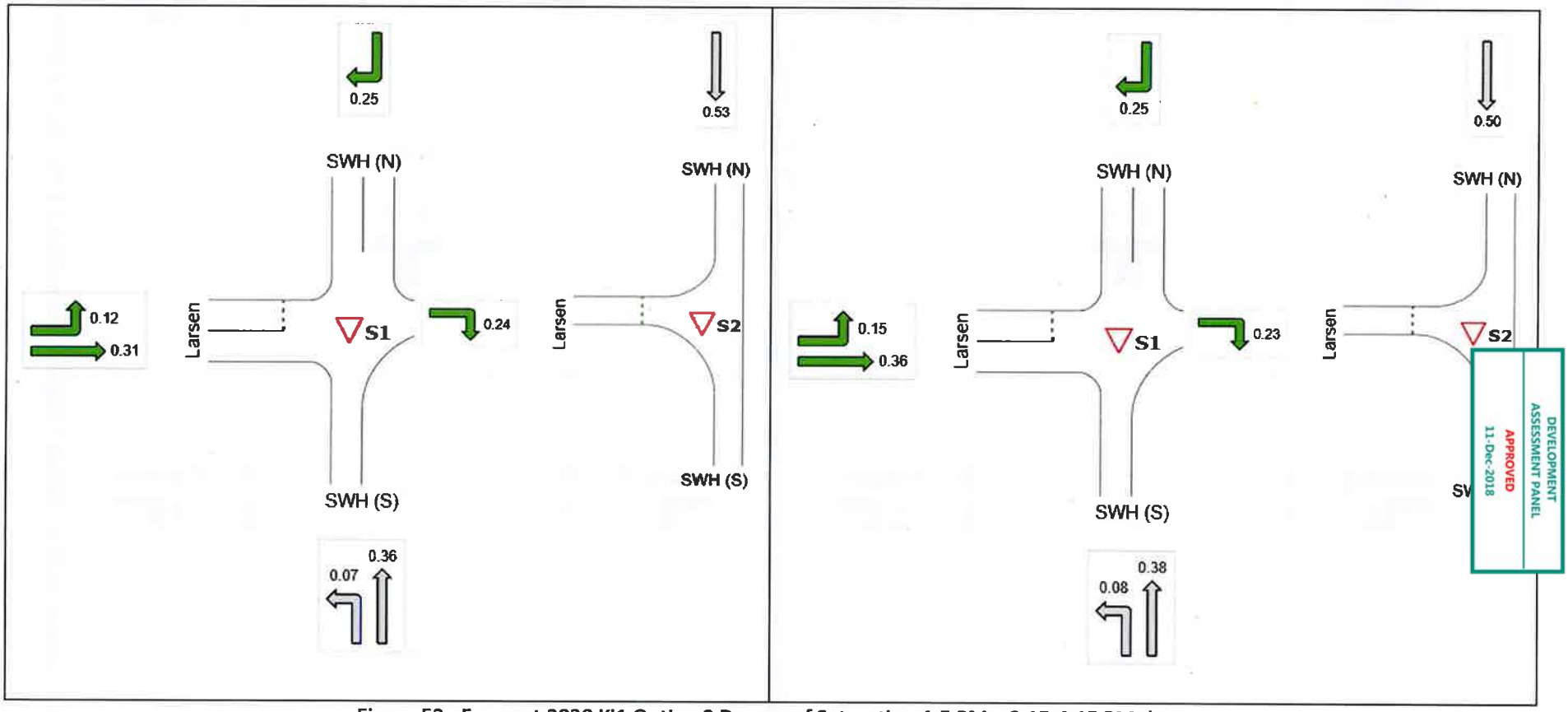



Figure 52– Forecast 2030 Ki1 Option 2 Degree of Saturation 4-5 PM v 3.15-4.15 PM data

# 16 CONCLUSIONS

This TIA has determined that the proposed development is likely to generate up to 200 trips during its busiest hours. Up to 70% of these trips are likely to be from passing traffic. The existing Larsen Rd approach to South Western Hwy is currently very close to capacity during the road network midweek PM and Saturday peak hours, hence any increase in traffic, including that associated with annual growth and other development in the area, is likely to push this to capacity unless changes are made to this intersection.

Two options to address the capacity concerns have been assessed and have demonstrated that the intersection is forecast to perform better than the existing layout despite the increased traffic. This is due to the improved intersection layout, i.e. a two-stage crossing for right turns out of Larsen Rd and protected right and left turn lanes into Larsen Rd.

# References

1. **Western Australian Planning Commission.** *Transport Impact Assessment Guidelines.* Department of Planning, Government of Western Australia. Perth, Western Australia : Western Australian Planning Commission, August 2016. p. 182, Revised August 2016. The current version of the TIA guidelines (August 2016) has been endorsed by the WAPC..

2. **Austroads.** *Guide to Traffic Management Part 12: Traffic Impacts of Developments.* [ed.] Gary Veith, et al. 1st edition. Sydney : Austroads, 2009. p. 115. Vol. 12. ISBN 978-1-921551-61-1.

3. **Main Roads Western Australia.** Perth Metropolitan Area Functional Road Hierarchy. [ed.] Asset & Network Information. Perth, WA, Australia : Main Roads Western Australia, August 1997.

4. **Standards Australia.** *AS 2890.2-2002 Parking facilities Part 2: Off-street commercial vehcile facilities.* Second. Sydney : Standards Australia International, 2002. p. 49. Vol. 2. ISBN 0 7337 4870 8.

5. **NSW Government.** *Guide to Traffic Generating Developments Updated traffic surveys.* Transport, Roads & Maritime Services. Sydney : NSW Government, August 2013. p. 22, Technical Direction. RMS.13.298.

6. **Institute of Transportation Engineers (USA).** *Trip Generation Manual, 9th Edition.* 9th Edition. Washington : Institute of Transportation Engineers (USA), September 2012. ISBN-13: 978-1-933452-64-7; ISBN-10: 1-933452-64-1.

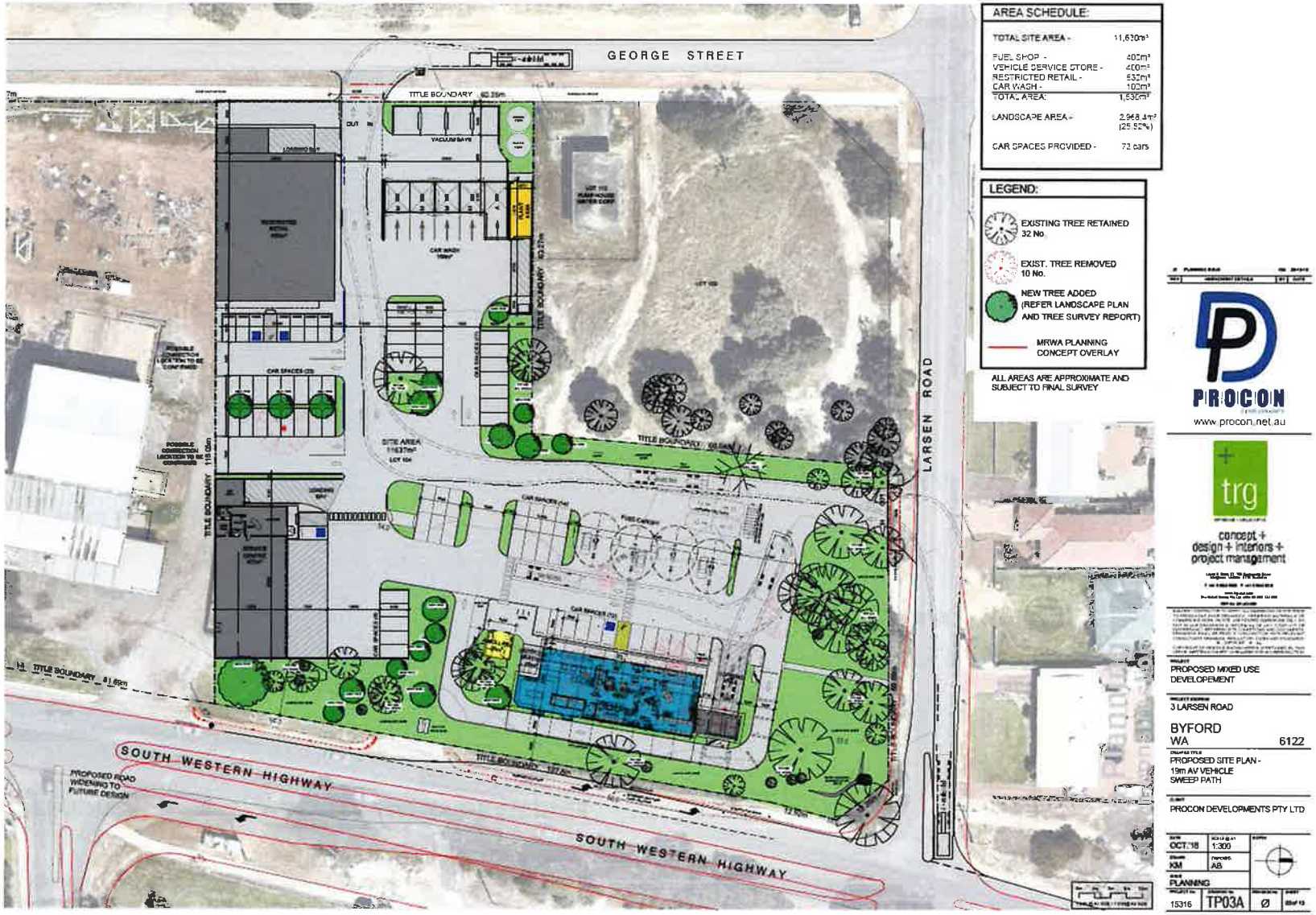
7. **Western Australian Planning Commisssion.** *Liveable Neighbourhoods.* Jan 2009 Update 02. Perth : Western Australian Planning Commisssion, 2009 Update. p. 178. ISBN 0 7309 9649 0.

8. **Standards Australia.** *AS/NZS 2890.1 - 2004 Parking facilities Part 1: Off-street car parking.* Sydney : Standards Australia/ Standards New Zealand, 2004. p. 77. (Incorporating Ammendment No 1). ISBN 0 7337 5742 1.

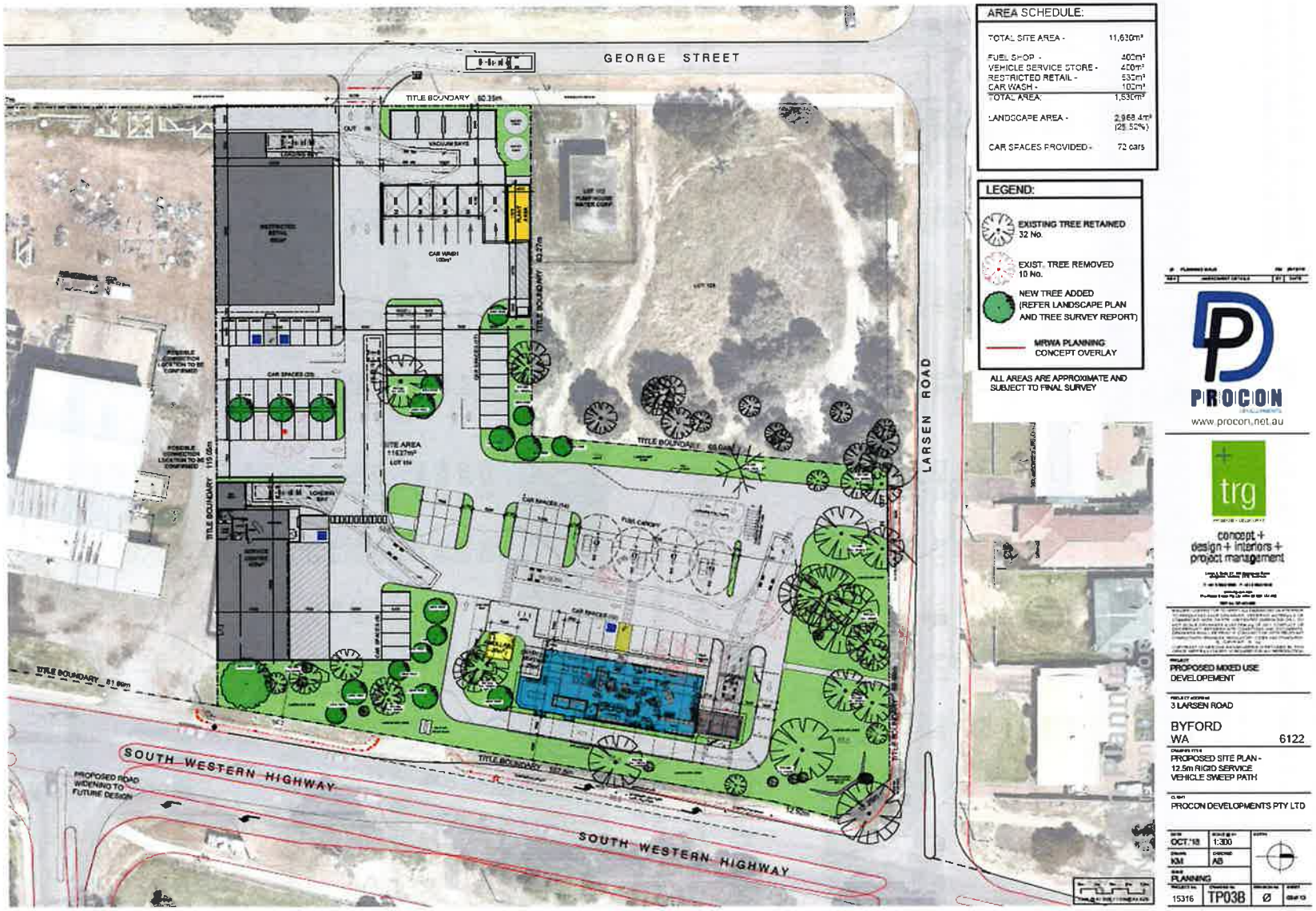
9. **Roads and Traffic Authority NSW.** *Guide to Traffic Generating Developments.* Transport Planning Section. Sydney : Roads and Traffic Authority NSW, October 2002. p. 174. Version 2.2. ISBN 0 7305 9080 1.

10. **Austroads.** *Guide to Traffic Management Part 3: Traffic Studies and Analysis.* Sydney : Austroads Incorporated, 2009. p. 196. Vol. 3. ISBN 978-1-921551-77-2.

# APPENDIX A DEVELOPMENT DRAWINGS




DEVELOPMENT ASSESSMENT PANEL
APPROVED
11-Dec-2018


GEORGE STREET
LARSEN ROAD
SOUTH WESTERN HIGHWAY
SOUTH WESTERN HIGHWAY
TITLE BOUNDARY
PROPOSED ROAD WIDENING TO FUTURE DESIGN
AREA SCHEDULE:
TOTAL SITE AREA - 11,630m²
FUEL SHOP - 400m²
VEHICLE SERVICE STORE - 400m²
RESTRICTED RETAIL - 53m²
CAR WASH - 100m²
TOTAL AREA: 1,530m²
LANDSCAPE AREA - 2,968.4m² (25.52%)
CAR SPACES PROVIDED - 72 cars
LEGEND:
EXISTING TREE RETAINED 32 No.
EXIST. TREE REMOVED 10 No.
NEW TREE ADDED (REFER LANDSCAPE PLAN AND TREE SURVEY REPORT)
MRWA PLANNING CONCEPT OVERLAY
ALL AREAS ARE APPROXIMATE AND SUBJECT TO FINAL SURVEY
PROCON
www.procon.net.au
trg
concept + design + interiors + project management
PROPOSED MIXED USE DEVELOPEMENT
3 LARSEN ROAD
BYFORD
WA 6122
PROPOSED SITE PLAN - 12.5m RIGID SERVICE VEHICLE SWEEP PATH
PROCON DEVELOPMENTS PTY LTD
OCT.'18
1:300
KM
AB
PLANNING
15316
TP03B
DEVELOPMENT ASSESSMENT PANEL
APPROVED
11-Dec-2018

## APPENDIX B SIDRA INTERSECTION DATA

# MOVEMENT SUMMARY

## Site: Ki1: Larsen Rd/ South West Hwy Existing PM

## Network: Si1-Ki1 Existing 2018 4-5 Midweek PM Peak


Giveway / Yield (Two-Way)

**Movement Performance - Vehicles**

| Mov ID | ODMov | Demand Flows Total veh/h | HV % | Arrival Flows Total veh/h | HV % | Deg. Satn v/c | Average Delay sec | Level of Service | 95% Back of Queue Vehicles veh | Distance m | Prop. Queued | Effective Stop Rate per veh | Average Speed km/h |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| South: SWH (S) | | | | | | | | | | | | | |
| 1 | L2 | 116 | 1.0 | 116 | 1.0 | 0.063 | 5.6 | LOS A | 0.0 | 0.0 | 0.00 | 0.58 | 49.1 |
| 2 | T1 | 545 | 13.0 | 545 | 13.0 | 0.303 | 0.0 | LOS A | 0.0 | 0.0 | 0.00 | 0.00 | 59.9 |
| Approach | | 661 | 10.9 | 661 | 10.9 | 0.303 | 1.0 | NA | 0.0 | 0.0 | 0.00 | 0.10 | 59.0 |
| North: SWH (N) | | | | | | | | | | | | | |
| 3 | T1 | 820 | 13.0 | 820 | 13.0 | 0.493 | 1.8 | LOS A | 2.9 | 22.3 | 0.26 | 0.08 | 57.6 |
| 4 | R2 | 87 | 1.0 | 87 | 1.0 | 0.493 | 13.4 | LOS B | 2.9 | 22.3 | 0.33 | 0.10 | 55.5 |
| Approach | | 907 | 11.8 | 907 | 11.8 | 0.493 | 3.0 | NA | 2.9 | 22.3 | 0.26 | 0.08 | 57.4 |
| West: Larsen | | | | | | | | | | | | | |
| 5 | L2 | 43 | 1.0 | 43 | 1.0 | 0.914 | 87.9 | LOS F | 5.9 | 41.8 | 0.95 | 1.47 | 18.8 |
| 6 | R2 | 57 | 1.0 | 57 | 1.0 | 0.914 | 144.3 | LOS F | 5.9 | 41.8 | 0.95 | 1.47 | 13.0 |
| Approach | | 100 | 1.0 | 100 | 1.0 | 0.914 | 120.0 | LOS F | 5.9 | 41.8 | 0.95 | 1.47 | 15.7 |
| All Vehicles | | 1668 | 10.8 | 1668 | 10.8 | 0.914 | 9.2 | NA | 5.9 | 41.8 | 0.20 | 0.17 | 52.4 |

# MOVEMENT SUMMARY

## Site: Si1: Larsen Rd/ George St Existing PM

## Network: Si1-Ki1 Existing 2018 4-5 Midweek PM Peak


Giveway / Yield (Two-Way)

**Movement Performance - Vehicles**

| Mov ID | ODMov | Demand Flows Total veh/h | HV % | Arrival Flows Total veh/h | HV % | Deg. Satn v/c | Average Delay sec | Level of Service | 95% Back of Queue Vehicles veh | Distance m | Prop. Queued | Effective Stop Rate per veh | Average Speed km/h |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| South: George (S) | | | | | | | | | | | | | |
| 1 | L2 | 4 | 0.0 | 4 | 0.0 | 0.005 | 6.1 | LOS A | 0.0 | 0.1 | 0.28 | 0.54 | 51.0 |
| 2 | T1 | 1 | 0.0 | 1 | 0.0 | 0.005 | 5.4 | LOS A | 0.0 | 0.1 | 0.28 | 0.54 | 52.1 |
| 3 | R2 | 1 | 0.0 | 1 | 0.0 | 0.005 | 6.9 | LOS A | 0.0 | 0.1 | 0.28 | 0.54 | 42.7 |
| Approach | | 6 | 0.0 | 6 | 0.0 | 0.005 | 6.1 | LOS A | 0.0 | 0.1 | 0.28 | 0.54 | 50.6 |
| East: Larsen (E) | | | | | | | | | | | | | |
| 4 | L2 | 1 | 0.0 | 1 | 0.0 | 0.107 | 5.9 | LOS A | 0.1 | 0.9 | 0.05 | 0.06 | 54.5 |
| 5 | T1 | 183 | 1.0 | 183 | 1.0 | 0.107 | 0.0 | LOS A | 0.1 | 0.9 | 0.05 | 0.06 | 58.9 |
| 6 | R2 | 19 | 0.0 | 19 | 0.0 | 0.107 | 5.8 | LOS A | 0.1 | 0.9 | 0.05 | 0.06 | 56.1 |
| Approach | | 203 | 0.9 | 203 | 0.9 | 0.107 | 0.6 | NA | 0.1 | 0.9 | 0.05 | 0.06 | 58.5 |
| North: George (N) | | | | | | | | | | | | | |
| 7 | L2 | 9 | 0.0 | 9 | 0.0 | 0.024 | 5.8 | LOS A | 0.1 | 0.6 | 0.23 | 0.58 | 51.0 |
| 8 | T1 | 1 | 0.0 | 1 | 0.0 | 0.024 | 5.4 | LOS A | 0.1 | 0.6 | 0.23 | 0.58 | 52.0 |
| 9 | R2 | 14 | 0.0 | 14 | 0.0 | 0.024 | 7.0 | LOS A | 0.1 | 0.6 | 0.23 | 0.58 | 53.0 |
| Approach | | 24 | 0.0 | 24 | 0.0 | 0.024 | 6.5 | LOS A | 0.1 | 0.6 | 0.23 | 0.58 | 52.4 |
| West: Larsen (W) | | | | | | | | | | | | | |
| 10 | L2 | 27 | 0.0 | 27 | 0.0 | 0.062 | 5.6 | LOS A | 0.0 | 0.1 | 0.02 | 0.15 | 57.3 |
| 11 | T1 | 89 | 1.0 | 89 | 1.0 | 0.062 | 0.0 | LOS A | 0.0 | 0.1 | 0.02 | 0.15 | 57.3 |
| 12 | R2 | 2 | 0.0 | 2 | 0.0 | 0.062 | 6.0 | LOS A | 0.0 | 0.1 | 0.02 | 0.15 | 55.4 |
| Approach | | 119 | 0.8 | 119 | 0.8 | 0.062 | 1.4 | NA | 0.0 | 0.1 | 0.02 | 0.15 | 57.2 |
| All Vehicles | | 353 | 0.8 | 353 | 0.8 | 0.107 | 1.4 | NA | 0.1 | 0.9 | 0.06 | 0.13 | 57.3 |

# MOVEMENT SUMMARY

## Site: Ki1: Larsen Rd/ South West Hwy Existing SAT

## Network: Si1-Ki1 Existing 2018 1-2 Saturday Peak


Giveway / Yield (Two-Way)

**Movement Performance - Vehicles**

| Mov ID | ODMov | Demand Flows Total veh/h | HV % | Arrival Flows Total veh/h | HV % | Deg. Satn v/c | Average Delay sec | Level of Service | 95% Back of Queue Vehicles veh | 95% Back of Queue Distance m | Prop. Queued | Effective Stop Rate per veh | Average Speed km/h |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| South: SWH (S) | | | | | | | | | | | | | |
| 1 | L2 | 80 | 1.0 | 80 | 1.0 | 0.060 | 5.6 | LOS A | 0.0 | 0.0 | 0.00 | 0.43 | 51.3 |
| 2 | T1 | 564 | 13.0 | 564 | 13.0 | 0.298 | 0.0 | LOS A | 0.0 | 0.0 | 0.00 | 0.02 | 59.7 |
| Approach | | 644 | 11.5 | 644 | 11.5 | 0.298 | 0.7 | NA | 0.0 | 0.0 | 0.00 | 0.07 | 59.3 |
| North: SWH (N) | | | | | | | | | | | | | |
| 3 | T1 | 597 | 13.0 | 597 | 13.0 | 0.375 | 1.6 | LOS A | 2.0 | 15.1 | 0.25 | 0.09 | 57.7 |
| 4 | R2 | 78 | 1.0 | 78 | 1.0 | 0.375 | 11.8 | LOS B | 2.0 | 15.1 | 0.32 | 0.12 | 55.7 |
| Approach | | 675 | 11.6 | 675 | 11.6 | 0.375 | 2.8 | NA | 2.0 | 15.1 | 0.26 | 0.09 | 57.5 |
| West: Larsen | | | | | | | | | | | | | |
| 5 | L2 | 47 | 1.0 | 47 | 1.0 | 0.510 | 16.9 | LOS C | 2.1 | 15.0 | 0.87 | 1.06 | 37.2 |
| 6 | R2 | 55 | 1.0 | 55 | 1.0 | 0.510 | 45.3 | LOS E | 2.1 | 15.0 | 0.87 | 1.06 | 29.8 |
| Approach | | 102 | 1.0 | 102 | 1.0 | 0.510 | 32.2 | LOS D | 2.1 | 15.0 | 0.87 | 1.06 | 33.8 |
| All Vehicles | | 1421 | 10.8 | 1421 | 10.8 | 0.510 | 4.0 | NA | 2.1 | 15.1 | 0.18 | 0.15 | 56.4 |

# MOVEMENT SUMMARY

## Site: Si1: Larsen Rd/ George St Existing SAT

## Network: Si1-Ki1 Existing 2018 1-2 Saturday Peak


Giveway / Yield (Two-Way)

**Movement Performance - Vehicles**

| Mov ID | ODMov | Demand Flows Total veh/h | HV % | Arrival Flows Total veh/h | HV % | Deg. Satn v/c | Average Delay sec | Level of Service | 95% Back of Queue Vehicles veh | 95% Back of Queue Distance m | Prop. Queued | Effective Stop Rate per veh | Average Speed km/h |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| South: George (S) | | | | | | | | | | | | | |
| 1 | L2 | 1 | 0.0 | 1 | 0.0 | 0.004 | 5.9 | LOS A | 0.0 | 0.1 | 0.28 | 0.55 | 51.2 |
| 2 | T1 | 1 | 0.0 | 1 | 0.0 | 0.004 | 5.0 | LOS A | 0.0 | 0.1 | 0.28 | 0.55 | 52.2 |
| 3 | R2 | 2 | 0.0 | 2 | 0.0 | 0.004 | 6.6 | LOS A | 0.0 | 0.1 | 0.28 | 0.55 | 43.0 |
| Approach | | 4 | 0.0 | 4 | 0.0 | 0.004 | 6.1 | LOS A | 0.0 | 0.1 | 0.28 | 0.55 | 49.3 |
| East: Larsen (E) | | | | | | | | | | | | | |
| 4 | L2 | 1 | 0.0 | 1 | 0.0 | 0.084 | 5.8 | LOS A | 0.1 | 0.9 | 0.06 | 0.08 | 54.1 |
| 5 | T1 | 137 | 1.0 | 137 | 1.0 | 0.084 | 0.1 | LOS A | 0.1 | 0.9 | 0.06 | 0.08 | 58.5 |
| 6 | R2 | 20 | 0.0 | 20 | 0.0 | 0.084 | 5.7 | LOS A | 0.1 | 0.9 | 0.06 | 0.08 | 55.9 |
| Approach | | 158 | 0.9 | 158 | 0.9 | 0.084 | 0.8 | NA | 0.1 | 0.9 | 0.06 | 0.08 | 58.1 |
| North: George (N) | | | | | | | | | | | | | |
| 7 | L2 | 17 | 0.0 | 17 | 0.0 | 0.020 | 5.8 | LOS A | 0.1 | 0.5 | 0.18 | 0.55 | 51.4 |
| 8 | T1 | 1 | 0.0 | 1 | 0.0 | 0.020 | 5.1 | LOS A | 0.1 | 0.5 | 0.18 | 0.55 | 52.3 |
| 9 | R2 | 7 | 0.0 | 7 | 0.0 | 0.020 | 6.6 | LOS A | 0.1 | 0.5 | 0.18 | 0.55 | 53.2 |
| Approach | | 25 | 0.0 | 25 | 0.0 | 0.020 | 6.0 | LOS A | 0.1 | 0.5 | 0.18 | 0.55 | 52.2 |
| West: Larsen (W) | | | | | | | | | | | | | |
| 10 | L2 | 8 | 0.0 | 8 | 0.0 | 0.048 | 5.6 | LOS A | 0.0 | 0.1 | 0.01 | 0.06 | 58.0 |
| 11 | T1 | 83 | 1.0 | 83 | 1.0 | 0.048 | 0.0 | LOS A | 0.0 | 0.1 | 0.01 | 0.06 | 58.8 |
| 12 | R2 | 1 | 0.0 | 1 | 0.0 | 0.048 | 5.9 | LOS A | 0.0 | 0.1 | 0.01 | 0.06 | 56.3 |
| Approach | | 93 | 0.9 | 93 | 0.9 | 0.048 | 0.6 | NA | 0.0 | 0.1 | 0.01 | 0.06 | 58.6 |
| All Vehicles | | 280 | 0.8 | 280 | 0.8 | 0.084 | 1.3 | NA | 0.1 | 0.9 | 0.06 | 0.12 | 57.4 |

# MOVEMENT SUMMARY

## Site: Ki1: Larsen Rd/ South West Hwy 2030 1-2 PM

**Network: Si1-Ki1 Forecast 2030 1-2 PM Midweek Peak**


Giveway / Yield (Two-Way)

**Movement Performance - Vehicles**

| Mov ID | OD Mov | Demand Flows Total veh/h | HV % | Arrival Flows Total veh/h | HV % | Deg. Satn v/c | Average Delay sec | Level of Service | 95% Back of Queue Vehicles veh | Distance m | Prop. Queued | Effective Stop Rate per veh | Average Speed km/h |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| South: SWH (S) | | | | | | | | | | | | | |
| 1 | L2 | 89 | 1.0 | 89 | 1.0 | 0.056 | 5.6 | LOS A | 0.0 | 0.0 | 0.00 | 0.50 | 50.2 |
| 2 | T1 | 520 | 13.0 | 520 | 13.0 | 0.281 | 0.0 | LOS A | 0.0 | 0.0 | 0.00 | 0.01 | 59.8 |
| Approach | | 609 | 11.2 | 609 | 11.2 | 0.281 | 0.8 | NA | 0.0 | 0.0 | 0.00 | 0.09 | 59.2 |
| North: SWH (N) | | | | | | | | | | | | | |
| 3 | T1 | 534 | 13.0 | 534 | 13.0 | 0.376 | 2.0 | LOS A | 2.3 | 17.9 | 0.30 | 0.14 | 57.2 |
| 4 | R2 | 107 | 1.0 | 107 | 1.0 | 0.376 | 11.2 | LOS B | 2.3 | 17.9 | 0.40 | 0.18 | 54.6 |
| Approach | | 641 | 11.0 | 641 | 11.0 | 0.376 | 3.5 | NA | 2.3 | 17.9 | 0.32 | 0.14 | 56.9 |
| West: Larsen | | | | | | | | | | | | | |
| 5 | L2 | 81 | 1.0 | 81 | 1.0 | 0.670 | 20.9 | LOS C | 3.6 | 25.5 | 0.87 | 1.18 | 36.6 |
| 6 | R2 | 82 | 1.0 | 82 | 1.0 | 0.670 | 46.4 | LOS E | 3.6 | 25.5 | 0.87 | 1.18 | 29.2 |
| Approach | | 163 | 1.0 | 163 | 1.0 | 0.670 | 33.7 | LOS D | 3.6 | 25.5 | 0.87 | 1.18 | 33.4 |
| **All Vehicles** | | **1414** | **9.9** | **1414** | **9.9** | **0.670** | **5.8** | **NA** | **3.6** | **25.5** | **0.24** | **0.24** | **54.6** |

# MOVEMENT SUMMARY

## Site: Si1: Larsen Rd/ George St 2030 1-2 PM

**Network: Si1-Ki1 Forecast 2030 1-2 PM Midweek Peak**


Giveway / Yield (Two-Way)

**Movement Performance - Vehicles**

| Mov ID | OD Mov | Demand Flows Total veh/h | HV % | Arrival Flows Total veh/h | HV % | Deg. Satn v/c | Average Delay sec | Level of Service | 95% Back of Queue Vehicles veh | Distance m | Prop. Queued | Effective Stop Rate per veh | Average Speed km/h |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| South: George (S) | | | | | | | | | | | | | |
| 1 | L2 | 2 | 0.0 | 2 | 0.0 | 0.020 | 5.9 | LOS A | 0.1 | 0.5 | 0.33 | 0.60 | 50.7 |
| 2 | T1 | 1 | 0.0 | 1 | 0.0 | 0.020 | 5.3 | LOS A | 0.1 | 0.5 | 0.33 | 0.60 | 51.8 |
| 3 | R2 | 15 | 0.0 | 15 | 0.0 | 0.020 | 6.9 | LOS A | 0.1 | 0.5 | 0.33 | 0.60 | 42.0 |
| Approach | | 18 | 0.0 | 18 | 0.0 | 0.020 | 6.7 | LOS A | 0.1 | 0.5 | 0.33 | 0.60 | 45.2 |
| East: Larsen (E) | | | | | | | | | | | | | |
| 4 | L2 | 14 | 0.0 | 14 | 0.0 | 0.091 | 5.8 | LOS A | 0.2 | 1.1 | 0.08 | 0.11 | 53.3 |
| 5 | T1 | 137 | 1.0 | 137 | 1.0 | 0.091 | 0.1 | LOS A | 0.2 | 1.1 | 0.08 | 0.11 | 57.9 |
| 6 | R2 | 20 | 0.0 | 20 | 0.0 | 0.091 | 5.8 | LOS A | 0.2 | 1.1 | 0.08 | 0.11 | 55.4 |
| Approach | | 171 | 0.8 | 171 | 0.8 | 0.091 | 1.2 | NA | 0.2 | 1.1 | 0.08 | 0.11 | 57.3 |
| North: George (N) | | | | | | | | | | | | | |
| 7 | L2 | 12 | 0.0 | 12 | 0.0 | 0.016 | 5.9 | LOS A | 0.1 | 0.4 | 0.23 | 0.56 | 51.2 |
| 8 | T1 | 1 | 0.0 | 1 | 0.0 | 0.016 | 5.3 | LOS A | 0.1 | 0.4 | 0.23 | 0.56 | 52.1 |
| 9 | R2 | 6 | 0.0 | 6 | 0.0 | 0.016 | 6.8 | LOS A | 0.1 | 0.4 | 0.23 | 0.56 | 53.1 |
| Approach | | 19 | 0.0 | 19 | 0.0 | 0.016 | 6.2 | LOS A | 0.1 | 0.4 | 0.23 | 0.56 | 52.1 |
| West: Larsen (W) | | | | | | | | | | | | | |
| 10 | L2 | 4 | 0.0 | 4 | 0.0 | 0.067 | 5.8 | LOS A | 0.0 | 0.2 | 0.02 | 0.03 | 58.2 |
| 11 | T1 | 121 | 1.0 | 121 | 1.0 | 0.067 | 0.0 | LOS A | 0.0 | 0.2 | 0.02 | 0.03 | 59.2 |
| 12 | R2 | 3 | 0.0 | 3 | 0.0 | 0.067 | 5.9 | LOS A | 0.0 | 0.2 | 0.02 | 0.03 | 56.6 |
| Approach | | 128 | 0.9 | 128 | 0.9 | 0.067 | 0.3 | NA | 0.0 | 0.2 | 0.02 | 0.03 | 59.0 |
| **All Vehicles** | | **336** | **0.8** | **336** | **0.8** | **0.091** | **1.5** | **NA** | **0.2** | **1.1** | **0.08** | **0.13** | **57.0** |

# MOVEMENT SUMMARY

## Site: Ki1: Larsen Rd/ South West Hwy 2030 4-5 PM

**Network: Si1-Ki1 Forecast 2030 4-5 PM Midweek Peak**


Giveway / Yield (Two-Way)

**Movement Performance - Vehicles**

| Mov ID | OD Mov | Demand Flows Total veh/h | HV % | Arrival Flows Total veh/h | HV % | Deg. Satn v/c | Average Delay sec | Level of Service | 95% Back of Queue Vehicles veh | Distance m | Prop. Queued | Effective Stop Rate per veh | Average Speed km/h |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| South: SWH (S) | | | | | | | | | | | | | |
| 1 | L2 | 151 | 1.0 | 151 | 1.0 | 0.082 | 5.6 | LOS A | 0.0 | 0.0 | 0.00 | 0.58 | 49.1 |
| 2 | T1 | 651 | 13.0 | 651 | 13.0 | 0.362 | 0.0 | LOS A | 0.0 | 0.0 | 0.00 | 0.00 | 59.9 |
| Approach | | 801 | 10.7 | 801 | 10.7 | 0.362 | 1.1 | NA | 0.0 | 0.0 | 0.00 | 0.11 | 58.9 |
| North: SWH (N) | | | | | | | | | | | | | |
| 3 | T1 | 957 | 13.0 | 957 | 13.0 | 0.656 | 4.4 | LOS A | 6.9 | 52.6 | 0.44 | 0.12 | 55.2 |
| 4 | R2 | 131 | 1.0 | 131 | 1.0 | 0.656 | 19.2 | LOS C | 6.9 | 52.6 | 0.59 | 0.16 | 51.1 |
| Approach | | 1087 | 11.6 | 1087 | 11.6 | 0.656 | 6.2 | NA | 6.9 | 52.6 | 0.46 | 0.13 | 54.9 |
| West: Larsen | | | | | | | | | | | | | |
| 5 | L2 | 89 | 1.0 | 89 | 1.0 | 3.737 | 2506.4 | LOS F | 52.8 | 372.8 | 1.00 | 3.64 | 1.3 |
| 6 | R2 | 104 | 1.0 | 104 | 1.0 | 3.737 | 2661.5 | LOS F | 52.8 | 372.8 | 1.00 | 3.64 | 0.8 |
| Approach | | 194 | 1.0 | 194 | 1.0 | 3.737 | 2589.8 | LOS F | 52.8 | 372.8 | 1.00 | 3.64 | 1.0 |
| **All Vehicles** | | **2082** | **10.3** | **2082** | **10.3** | **3.737** | **244.6** | **NA** | **52.8** | **372.8** | **0.33** | **0.45** | **12.3** |

# MOVEMENT SUMMARY

## Site: Ki1: Larsen Rd/ South West Hwy 2030 4-5 PM

**Network: Si1-Ki1 Forecast 2030 4-5 PM Midweek Peak**

© i3 consultants WA | www.i3consultants.com
Giveway / Yield (Two-Way)

**Movement Performance - Vehicles**

| Mov ID | OD Mov | Demand Flows Total veh/h | HV % | Arrival Flows Total veh/h | HV % | Deg. Satn v/c | Average Delay sec | Level of Service | 95% Back of Queue Vehicles veh | Distance m | Prop. Queued | Effective Stop Rate per veh | Average Speed km/h |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| South: SWH (S) | | | | | | | | | | | | | |
| 1 | L2 | 151 | 1.0 | 151 | 1.0 | 0.082 | 5.6 | LOS A | 0.0 | 0.0 | 0.00 | 0.58 | 49.1 |
| 2 | T1 | 651 | 13.0 | 651 | 13.0 | 0.362 | 0.0 | LOS A | 0.0 | 0.0 | 0.00 | 0.00 | 59.9 |
| Approach | | 801 | 10.7 | 801 | 10.7 | 0.362 | 1.1 | NA | 0.0 | 0.0 | 0.00 | 0.11 | 58.9 |
| North: SWH (N) | | | | | | | | | | | | | |
| 3 | T1 | 957 | 13.0 | 957 | 13.0 | 0.656 | 4.4 | LOS A | 6.9 | 52.6 | 0.44 | 0.12 | 55.2 |
| 4 | R2 | 131 | 1.0 | 131 | 1.0 | 0.656 | 19.2 | LOS C | 6.9 | 52.6 | 0.59 | 0.16 | 51.1 |
| Approach | | 1087 | 11.6 | 1087 | 11.6 | 0.656 | 6.2 | NA | 6.9 | 52.6 | 0.46 | 0.13 | 54.9 |
| West: Larsen | | | | | | | | | | | | | |
| 5 | L2 | 89 | 1.0 | 89 | 1.0 | 3.737 | 2506.4 | LOS F | 52.8 | 372.8 | 1.00 | 3.64 | 1.3 |
| 6 | R2 | 104 | 1.0 | 104 | 1.0 | 3.737 | 2661.5 | LOS F | 52.8 | 372.8 | 1.00 | 3.64 | 0.8 |
| Approach | | 194 | 1.0 | 194 | 1.0 | 3.737 | 2589.8 | LOS F | 52.8 | 372.8 | 1.00 | 3.64 | 1.0 |
| **All Vehicles** | | **2082** | **10.3** | **2082** | **10.3** | **3.737** | **244.6** | **NA** | **52.8** | **372.8** | **0.33** | **0.45** | **12.3** |

# MOVEMENT SUMMARY

## Site: Ki1: Larsen Rd/ South West Hwy 2030 1-2 Sat

**Network: Si1-Ki1 Forecast 2030 1-2 PM Saturday Peak**


Giveway / Yield (Two-Way)

**Movement Performance - Vehicles**

| Mov ID | OD Mov | Demand Flows Total veh/h | HV % | Arrival Flows Total veh/h | HV % | Deg. Satn v/c | Average Delay sec | Level of Service | 95% Back of Queue Vehicles veh | 95% Back of Queue Distance m | Prop. Queued | Effective Stop Rate per veh | Average Speed km/h |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| South: SWH (S) | | | | | | | | | | | | | |
| 1 | L2 | 117 | 1.0 | 117 | 1.0 | 0.073 | 5.6 | LOS A | 0.0 | 0.0 | 0.00 | 0.51 | 50.1 |
| 2 | T1 | 672 | 13.0 | 672 | 13.0 | 0.364 | 0.0 | LOS A | 0.0 | 0.0 | 0.00 | 0.01 | 59.8 |
| Approach | | 788 | 11.2 | 788 | 11.2 | 0.364 | 0.9 | NA | 0.0 | 0.0 | 0.00 | 0.09 | 59.1 |
| North: SWH (N) | | | | | | | | | | | | | |
| 3 | T1 | 708 | 13.0 | 708 | 13.0 | 0.531 | 4.0 | LOS A | 4.8 | 36.8 | 0.42 | 0.15 | 55.6 |
| 4 | R2 | 126 | 1.0 | 126 | 1.0 | 0.531 | 16.2 | LOS C | 4.8 | 36.8 | 0.57 | 0.20 | 51.5 |
| Approach | | 835 | 11.2 | 835 | 11.2 | 0.531 | 5.8 | NA | 4.8 | 36.8 | 0.44 | 0.15 | 55.1 |
| West: Larsen | | | | | | | | | | | | | |
| 5 | L2 | 105 | 1.0 | 105 | 1.0 | 1.985 | 921.4 | LOS F | 52.8 | 372.8 | 1.00 | 4.44 | 3.3 |
| 6 | R2 | 114 | 1.0 | 114 | 1.0 | 1.985 | 992.9 | LOS F | 52.8 | 372.8 | 1.00 | 4.44 | 2.0 |
| Approach | | 219 | 1.0 | 219 | 1.0 | 1.985 | 958.5 | LOS F | 52.8 | 372.8 | 1.00 | 4.44 | 2.6 |
| **All Vehicles** | | **1842** | **10.0** | **1842** | **10.0** | **1.985** | **116.9** | **NA** | **52.8** | **372.8** | **0.32** | **0.63** | **20.9** |

# MOVEMENT SUMMARY

## Site: Si1: Larsen Rd/ George St 2030 1-2 Sat

**Network: Si1-Ki1 Forecast 2030 1-2 PM Saturday Peak**


Giveway / Yield (Two-Way)

**Movement Performance - Vehicles**

| Mov ID | OD Mov | Demand Flows Total veh/h | HV % | Arrival Flows Total veh/h | HV % | Deg. Satn v/c | Average Delay sec | Level of Service | 95% Back of Queue Vehicles veh | 95% Back of Queue Distance m | Prop. Queued | Effective Stop Rate per veh | Average Speed km/h |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| South: George (S) | | | | | | | | | | | | | |
| 1 | L2 | 3 | 0.0 | 3 | 0.0 | 0.048 | 29.9 | LOS D | 0.3 | 2.4 | 0.78 | 0.68 | 38.8 |
| 2 | T1 | 1 | 0.0 | 1 | 0.0 | 0.048 | 19.8 | LOS C | 0.3 | 2.4 | 0.78 | 0.68 | 40.6 |
| 3 | R2 | 18 | 0.0 | 18 | 0.0 | 0.048 | 22.2 | LOS C | 0.3 | 2.4 | 0.78 | 0.68 | 24.2 |
| Approach | | 22 | 0.0 | 22 | 0.0 | 0.048 | 23.2 | LOS C | 0.3 | 2.4 | 0.78 | 0.68 | 28.8 |
| East: Larsen (E) | | | | | | | | | | | | | |
| 4 | L2 | 16 | 0.0 | 16 | 0.0 | 0.104 | 5.9 | LOS A | 0.2 | 1.3 | 0.08 | 0.11 | 53.2 |
| 5 | T1 | 158 | 1.0 | 158 | 1.0 | 0.104 | 0.1 | LOS A | 0.2 | 1.3 | 0.08 | 0.11 | 57.9 |
| 6 | R2 | 22 | 0.0 | 22 | 0.0 | 0.104 | 6.0 | LOS A | 0.2 | 1.3 | 0.08 | 0.11 | 55.4 |
| Approach | | 196 | 0.8 | 196 | 0.8 | 0.104 | 1.2 | NA | 0.2 | 1.3 | 0.08 | 0.11 | 57.3 |
| North: George (N) | | | | | | | | | | | | | |
| 7 | L2 | 19 | 0.0 | 19 | 0.0 | 0.041 | 27.2 | LOS D | 0.5 | 3.3 | 0.80 | 0.55 | 35.9 |
| 8 | T1 | 1 | 0.0 | 1 | 0.0 | 0.041 | 17.3 | LOS C | 0.5 | 3.3 | 0.80 | 0.55 | 39.9 |
| 9 | R2 | 8 | 0.0 | 8 | 0.0 | 0.041 | 19.8 | LOS C | 0.5 | 3.3 | 0.80 | 0.55 | 42.7 |
| Approach | | 28 | 0.0 | 28 | 0.0 | 0.041 | 24.7 | LOS C | 0.5 | 3.3 | 0.80 | 0.55 | 38.7 |
| West: Larsen (W) | | | | | | | | | | | | | |
| 10 | L2 | 9 | 0.0 | 9 | 0.0 | 0.158 | 27.6 | LOS D | 0.7 | 4.9 | 0.22 | 0.04 | 53.7 |
| 11 | T1 | 145 | 1.0 | 145 | 1.0 | 0.158 | 4.1 | LOS A | 0.7 | 4.9 | 0.22 | 0.04 | 50.1 |
| 12 | R2 | 3 | 0.0 | 3 | 0.0 | 0.158 | 33.9 | LOS D | 0.7 | 4.9 | 0.22 | 0.04 | 50.6 |
| Approach | | 158 | 0.9 | 158 | 0.9 | 0.158 | 6.1 | NA | 0.7 | 4.9 | 0.22 | 0.04 | 50.5 |
| **All Vehicles** | | **404** | **0.8** | **404** | **0.8** | **0.158** | **6.0** | **NA** | **0.7** | **4.9** | **0.23** | **0.15** | **51.0** |

# MOVEMENT SUMMARY

## Site: Ki1: Option 1: Larsen Rd/ South West Hwy 2030 4-5 PM S1 - Copy

## Network: Option 1: 2030 4-5 PM Midweek Peak


Giveway / Yield (Two-Way)

**Movement Performance - Vehicles**

| Mov ID | OD Mov | Demand Flows Total veh/h | HV % | Arrival Flows Total veh/h | HV % | Deg. Satn v/c | Average Delay sec | Level of Service | 95% Back of Queue Vehicles veh | 95% Back of Queue Distance m | Prop. Queued | Effective Stop Rate per veh | Average Speed km/h |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **South: SWH (S)** | | | | | | | | | | | | | |
| 1 | L2 | 151 | 1.0 | 151 | 1.0 | 0.082 | 5.6 | LOS A | 0.0 | 0.0 | 0.00 | 0.58 | 49.3 |
| 2 | T1 | 651 | 13.0 | 651 | 13.0 | 0.362 | 0.0 | LOS A | 0.0 | 0.0 | 0.00 | 0.00 | 59.9 |
| Approach | | 801 | 10.7 | 801 | 10.7 | 0.362 | 1.1 | NA | 0.0 | 0.0 | 0.00 | 0.11 | 58.6 |
| **North: SWH (N)** | | | | | | | | | | | | | |
| 4 | R2 | 131 | 1.0 | 131 | 1.0 | 0.257 | 12.4 | LOS B | 1.0 | 7.2 | 0.71 | 0.91 | 47.3 |
| Approach | | 131 | 1.0 | 131 | 1.0 | 0.257 | 12.4 | NA | 1.0 | 7.2 | 0.71 | 0.91 | 47.3 |
| **West: Larsen** | | | | | | | | | | | | | |
| 5 | L2 | 89 | 1.0 | 89 | 1.0 | 0.436 | 11.7 | LOS B | 2.2 | 15.4 | 0.78 | 1.00 | 45.7 |
| 6 | T1 | 104 | 0.0 | 104 | 0.0 | 0.436 | 18.8 | LOS C | 2.2 | 15.4 | 0.78 | 1.00 | 23.2 |
| Approach | | 194 | 0.5 | 194 | 0.5 | 0.436 | 15.5 | LOS C | 2.2 | 15.4 | 0.78 | 1.00 | 39.2 |
| **All Vehicles** | | **1125** | **7.8** | **1125** | **7.8** | **0.436** | **4.9** | **NA** | **2.2** | **15.4** | **0.22** | **0.35** | **54.6** |

# MOVEMENT SUMMARY

## Site: Ki1: Option 1: Larsen Rd/ South West Hwy 2030 4-5 PM S2 - Copy

## Network: Option 1: 2030 4-5 PM Midweek Peak


Giveway / Yield (Two-Way)

**Movement Performance - Vehicles**

| Mov ID | OD Mov | Demand Flows Total veh/h | HV % | Arrival Flows Total veh/h | HV % | Deg. Satn v/c | Average Delay sec | Level of Service | 95% Back of Queue Vehicles veh | 95% Back of Queue Distance m | Prop. Queued | Effective Stop Rate per veh | Average Speed km/h |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **North: SWH (N)** | | | | | | | | | | | | | |
| 7 | T1 | 957 | 13.0 | 957 | 13.0 | 0.532 | 0.2 | LOS A | 0.0 | 0.0 | 0.00 | 0.00 | 59.8 |
| Approach | | 957 | 13.0 | 957 | 13.0 | 0.532 | 0.2 | NA | 0.0 | 0.0 | 0.00 | 0.00 | 59.8 |
| **West: Larsen** | | | | | | | | | | | | | |
| 3 | R2 | 104 | 1.0 | 104 | 1.0 | 0.243 | 9.5 | LOS A | 0.8 | 5.4 | 0.76 | 0.91 | 40.3 |
| Approach | | 104 | 1.0 | 104 | 1.0 | 0.243 | 9.5 | LOS A | 0.8 | 5.4 | 0.76 | 0.91 | 40.3 |
| **All Vehicles** | | **1061** | **11.8** | **1061** | **11.8** | **0.532** | **1.1** | **NA** | **0.8** | **5.4** | **0.07** | **0.09** | **58.7** |

# MOVEMENT SUMMARY

## Site: Ki1: Option 2: Larsen Rd/ South West Hwy 2030 4-5 PM S1

## Network: Option 2: 2030 4-5 PM Midweek Peak


Giveway / Yield (Two-Way)

| Movement Performance - Vehicles | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Mov ID | OD Mov | Demand Flows Total veh/h | HV % | Arrival Flows Total veh/h | HV % | Deg. Satn v/c | Average Delay sec | Level of Service | 95% Back of Queue Vehicles veh | Distance m | Prop. Queued | Effective Stop Rate per veh | Average Speed km/h |
| South: SWH (S) | | | | | | | | | | | | | |
| 1 | L2 | 151 | 1.0 | 151 | 1.0 | 0.082 | 5.6 | LOS A | 0.0 | 0.0 | 0.00 | 0.58 | 49.3 |
| 2 | T1 | 651 | 13.0 | 651 | 13.0 | 0.362 | 0.0 | LOS A | 0.0 | 0.0 | 0.00 | 0.00 | 59.9 |
| Approach | | 801 | 10.7 | 801 | 10.7 | 0.362 | 1.1 | NA | 0.0 | 0.0 | 0.00 | 0.11 | 58.6 |
| North: SWH (N) | | | | | | | | | | | | | |
| 4 | R2 | 131 | 1.0 | 131 | 1.0 | 0.257 | 12.4 | LOS B | 1.0 | 7.2 | 0.71 | 0.90 | 47.5 |
| Approach | | 131 | 1.0 | 131 | 1.0 | 0.257 | 12.4 | NA | 1.0 | 7.2 | 0.71 | 0.90 | 47.5 |
| West: Larsen | | | | | | | | | | | | | |
| 5 | L2 | 89 | 1.0 | 89 | 1.0 | 0.117 | 9.0 | LOS A | 0.4 | 3.0 | 0.57 | 0.80 | 50.3 |
| 6 | T1 | 104 | 0.0 | 104 | 0.0 | 0.319 | 17.3 | LOS C | 1.4 | 9.5 | 0.80 | 0.96 | 21.4 |
| Approach | | 194 | 0.5 | 194 | 0.5 | 0.319 | 13.4 | LOS B | 1.4 | 9.5 | 0.70 | 0.88 | 41.0 |
| All Vehicles | | 1125 | 7.8 | 1125 | 7.8 | 0.362 | 4.5 | NA | 1.4 | 9.5 | 0.20 | 0.33 | 55.0 |

# MOVEMENT SUMMARY

## Site: Ki1: Option 2: Larsen Rd/ South West Hwy 2030 4-5 PM S2

## Network: Option 2: 2030 4-5 PM Midweek Peak


Giveway / Yield (Two-Way)

| Movement Performance - Vehicles | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Mov ID | OD Mov | Demand Flows Total veh/h | HV % | Arrival Flows Total veh/h | HV % | Deg. Satn v/c | Average Delay sec | Level of Service | 95% Back of Queue Vehicles veh | Distance m | Prop. Queued | Effective Stop Rate per veh | Average Speed km/h |
| North: SWH (N) | | | | | | | | | | | | | |
| 7 | T1 | 957 | 13.0 | 957 | 13.0 | 0.532 | 0.2 | LOS A | 0.0 | 0.0 | 0.00 | 0.00 | 59.8 |
| Approach | | 957 | 13.0 | 957 | 13.0 | 0.532 | 0.2 | NA | 0.0 | 0.0 | 0.00 | 0.00 | 59.8 |
| West: Larsen | | | | | | | | | | | | | |
| 3 | R2 | 104 | 1.0 | 104 | 1.0 | 0.243 | 9.5 | LOS A | 0.8 | 5.4 | 0.76 | 0.91 | 40.3 |
| Approach | | 104 | 1.0 | 104 | 1.0 | 0.243 | 9.5 | LOS A | 0.8 | 5.4 | 0.76 | 0.91 | 40.3 |
| All Vehicles | | 1061 | 11.8 | 1061 | 11.8 | 0.532 | 1.1 | NA | 0.8 | 5.4 | 0.07 | 0.09 | 58.7 |

# MOVEMENT SUMMARY

## ▽ Site: Larsen Rd/ Access 2030 Midweek 1-2


Giveway / Yield (Two-Way)

| Movement Performance - Vehicles | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Mov ID | OD Mov | Demand Flows Total veh/h | HV % | Deg. Satn v/c | Average Delay sec | Level of Service | 95% Back of Queue Vehicles veh | Distance m | Prop. Queued | Effective Stop Rate per veh | Average Speed km/h |
| South: Access | | | | | | | | | | | |
| 1 | L2 | 22 | 2.0 | 0.081 | 0.3 | LOS A | 0.3 | 2.0 | 0.22 | 0.12 | 24.9 |
| 2 | R2 | 73 | 2.0 | 0.081 | 0.7 | LOS A | 0.3 | 2.0 | 0.22 | 0.12 | 22.6 |
| Approach | | 95 | 2.0 | 0.081 | 0.6 | LOS A | 0.3 | 2.0 | 0.22 | 0.12 | 23.1 |
| East: Larsen Rd | | | | | | | | | | | |
| 3 | L2 | 47 | 2.0 | 0.067 | 4.3 | LOS A | 0.0 | 0.0 | 0.00 | 0.19 | 42.1 |
| 4 | T1 | 87 | 2.0 | 0.067 | 0.0 | LOS A | 0.0 | 0.0 | 0.00 | 0.19 | 44.0 |
| Approach | | 135 | 2.0 | 0.067 | 1.5 | NA | 0.0 | 0.0 | 0.00 | 0.19 | 43.2 |
| West: Larsen Rd | | | | | | | | | | | |
| 5 | T1 | 15 | 2.0 | 0.037 | 0.4 | LOS A | 0.2 | 1.2 | 0.24 | 0.39 | 35.7 |
| 6 | R2 | 47 | 2.0 | 0.037 | 5.0 | LOS A | 0.2 | 1.2 | 0.24 | 0.39 | 26.4 |
| Approach | | 62 | 2.0 | 0.037 | 3.9 | NA | 0.2 | 1.2 | 0.24 | 0.39 | 27.8 |
| All Vehicles | | 292 | 2.0 | 0.081 | 1.7 | NA | 0.3 | 2.0 | 0.12 | 0.21 | 30.4 |

# MOVEMENT SUMMARY

## ▽ Site: Larsen Rd/ Access 2030 Midweek 4-5


Giveway / Yield (Two-Way)

| Movement Performance - Vehicles | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Mov ID | OD Mov | Demand Flows Total veh/h | HV % | Deg. Satn v/c | Average Delay sec | Level of Service | 95% Back of Queue Vehicles veh | Distance m | Prop. Queued | Effective Stop Rate per veh | Average Speed km/h |
| South: Access | | | | | | | | | | | |
| 1 | L2 | 4 | 2.0 | 0.074 | 0.3 | LOS A | 0.2 | 1.7 | 0.24 | 0.14 | 24.8 |
| 2 | R2 | 78 | 2.0 | 0.074 | 0.7 | LOS A | 0.2 | 1.7 | 0.24 | 0.14 | 22.5 |
| Approach | | 82 | 2.0 | 0.074 | 0.7 | LOS A | 0.2 | 1.7 | 0.24 | 0.14 | 22.7 |
| East: Larsen Rd | | | | | | | | | | | |
| 3 | L2 | 41 | 2.0 | 0.066 | 4.3 | LOS A | 0.0 | 0.0 | 0.00 | 0.17 | 42.6 |
| 4 | T1 | 92 | 2.0 | 0.066 | 0.0 | LOS A | 0.0 | 0.0 | 0.00 | 0.17 | 44.6 |
| Approach | | 133 | 2.0 | 0.066 | 1.3 | NA | 0.0 | 0.0 | 0.00 | 0.17 | 43.9 |
| West: Larsen Rd | | | | | | | | | | | |
| 5 | T1 | 15 | 2.0 | 0.033 | 0.4 | LOS A | 0.2 | 1.1 | 0.24 | 0.38 | 36.0 |
| 6 | R2 | 41 | 2.0 | 0.033 | 5.0 | LOS A | 0.2 | 1.1 | 0.24 | 0.38 | 26.5 |
| Approach | | 56 | 2.0 | 0.033 | 3.8 | NA | 0.2 | 1.1 | 0.24 | 0.38 | 28.1 |
| All Vehicles | | 271 | 2.0 | 0.074 | 1.6 | NA | 0.2 | 1.7 | 0.12 | 0.20 | 30.9 |

# MOVEMENT SUMMARY

## Site: Larsen Rd/ Access 2030 Sat 12-1


Giveway / Yield (Two-Way)

**Movement Performance - Vehicles**

| Mov ID | OD Mov | Demand Flows Total veh/h | HV % | Deg. Satn v/c | Average Delay sec | Level of Service | 95% Back of Queue Vehicles veh | Distance m | Prop. Queued | Effective Stop Rate per veh | Average Speed km/h |
|---|---|---|---|---|---|---|---|---|---|---|---|
| South: Access | | | | | | | | | | | |
| 1 | L2 | 5 | 2.0 | 0.097 | 0.4 | LOS A | 0.3 | 2.3 | 0.27 | 0.18 | 24.7 |
| 2 | R2 | 99 | 2.0 | 0.097 | 0.9 | LOS A | 0.3 | 2.3 | 0.27 | 0.18 | 22.4 |
| Approach | | 104 | 2.0 | 0.097 | 0.8 | LOS A | 0.3 | 2.3 | 0.27 | 0.18 | 22.5 |
| East: Larsen Rd | | | | | | | | | | | |
| 3 | L2 | 53 | 2.0 | 0.083 | 4.3 | LOS A | 0.0 | 0.0 | 0.00 | 0.17 | 42.5 |
| 4 | T1 | 114 | 2.0 | 0.083 | 0.0 | LOS A | 0.0 | 0.0 | 0.00 | 0.17 | 44.5 |
| Approach | | 166 | 2.0 | 0.083 | 1.4 | NA | 0.0 | 0.0 | 0.00 | 0.17 | 43.8 |
| West: Larsen Rd | | | | | | | | | | | |
| 5 | T1 | 16 | 2.0 | 0.042 | 0.5 | LOS A | 0.2 | 1.4 | 0.27 | 0.40 | 35.3 |
| 6 | R2 | 53 | 2.0 | 0.042 | 5.1 | LOS A | 0.2 | 1.4 | 0.27 | 0.40 | 26.2 |
| Approach | | 68 | 2.0 | 0.042 | 4.0 | NA | 0.2 | 1.4 | 0.27 | 0.40 | 27.6 |
| All Vehicles | | 339 | 2.0 | 0.097 | 1.7 | NA | 0.3 | 2.3 | 0.14 | 0.22 | 30.6 |

## APPENDIX C WAPC TRANSPORT IMPACT ASSESSMENT CHECKLIST

Checklist for a Transport Impact Assessment for individual development

- Tick the provided column for items for which information is provided.
- Enter N/A in the provided column if the item is not appropriate and enter reason in comment column.
- Provide brief comments on any relevant issues.
- Provide brief description of any proposed transport improvements, for example, new bus routes or signalisation of an existing intersection.

| ITEM | PROVIDED | COMMENTS/PROPOSALS |
|---|---|---|
| **Summary** | | |
| **Introduction/Background** | | |
| name of applicant and consultant | ✓ | Section 1 |
| development location and context | ✓ | Section 1 & Figure 2 |
| brief description of development proposal | ✓ | Section 1 & Table 1 |
| key issues | ✓ | Section 1 |
| background information | ✓ | Section 1 |
| **Existing situation** | | |
| existing site uses (if any) | ✓ | Section 2.1, Photograph 1 & Photograph 2 |
| existing parking and demand (if appropriate) | NA | Vacant site |
| existing access arrangements | ✓ | Off South Western Hwy (Photograph 1) |
| existing site traffic | NA | Vacant site |
| surrounding land uses | ✓ | Sections 4.1 and 5 |
| surrounding road network | ✓ | Section 2.4 |
| traffic management on frontage roads | ✓ | Section 2.4 |
| traffic flows on surrounding roads (usually AM and PM peak hours) | ✓ | Section 2.5, Figure 12, Figure 13 and Figure 14 |
| traffic flows at major intersections (usually AM and PM peak hours) | ✓ | Section 2.5, Figure 12, Figure 13 and Figure 14 |
| operation of surrounding intersections | ✓ | Section 10.2.1, Figure 29 & Appendix B |
| existing pedestrian/cycle networks | ✓ | Sections 1 & 14 & Figure 2 |
| existing public transport services surrounding the development | ✓ | Sections 1 & 13, Figure 2, Table 7 & Table 8 |
| crash data | ✓ | Section 11, Figure 34 and Figure 35. |

| ITEM | PROVIDED | COMMENTS/PROPOSALS |
|---|---|---|
| **Development proposal** | | |
| regional context | ✓ | Section 5 |
| proposed land uses | ✓ | Section 3, Table 1 & Appendix A |
| table of land uses and quantities | ✓ | Table 1 |
| access arrangements | ✓ | Section 3 & Appendix A |
| parking provision | ✓ | Section 14 & Appendix A |
| end of trip facilities | × | No end of cycle trip facilities shown |
| any specific issues | ✓ | Section 15 |
| road network | ✓ | Sections 2.2 & 4.2, Figure 4 & Figure 16 |
| intersection layouts and controls | ✓ | Sections 2.4.4 & 2.4.5 |
| pedestrian/cycle networks and crossing facilities | ✓ | Section 13, Figure 2 & Photograph 8 |
| public transport services | ✓ | Sections 1 & 13, Figure 2, Table 7 & Table 8 |
| **Integration with surrounding area** | | |
| surrounding major attractors/ generators | ✓ | Section 5 |
| committed developments and transport proposals | ✓ | Section 4 |
| proposed changes to land uses within 1200 metres | ✓ | Section 4 |
| travel desire lines from development to these attractors/ generators | ✓ | Section 13, Figure 2 & Photograph 8 |
| adequacy of existing transport networks | ✓ | Section 12 |
| deficiencies in existing transport networks | ✓ | Section 12 |
| remedial measures to address deficiencies | ✓ | Section 4.3 |
| **Analysis of transport networks** | | |
| assessment years | ✓ | Section 6 |
| time periods | ✓ | Section 8 |
| development generated traffic | ✓ | Section 8, Figure 25, Figure 26 & Figure 27. |
| distribution of generated traffic | ✓ | Section 8, Figure 25, Figure 26 & Figure 27. |
| parking supply and demand | ✓ | Section 14 |
| base and 'with development' traffic flows | ✓ | Sections 10.2.2 & 10.2.3 |
| analysis of development accesses | NA | Left-in only off South Western Hwy |
| impact on surrounding roads | ✓ | Section 9 & Table 3. |
| impact on intersections | ✓ | Section 10, Table 4 & Table 5 |

DEVELOPMENT ASSESSMENT PANEL
APPROVED
11-Dec-2018

| ITEM | PROVIDED | COMMENTS/PROPOSALS |
|---|---|---|
| **Analysis of transport networks (cont.)** | | |
| impact on neighbouring areas | ✓ | Sections 9 & 10 |
| road safety | ✓ | Section 11 |
| public transport access | ✓ | Section 12 |
| pedestrian access/amenity | ✓ | Section 13 |
| cycle access/amenity | ✓ | Section 13 |
| analysis of pedestrian/cycle networks | ✓ | Section 13 |
| safe walk/cycle to school (for residential and school site developments only) | NA | |
| traffic management plan (where appropriate) | NA | |
| **Conclusions** | ✓ | Section 16 |

**Proponent's name** .....

**Company** Procon Developments **Date** .....

**Transport assessor's name** David Wilkins

**Company** i3 consultants WA **Date** 09/11/18

WESTERN AUSTRALIA

| REGISTER NUMBER | |
|---|---|
| 104/DP169930 | |
| DUPLICATE EDITION | DATE DUPLICATE ISSUED |
| 6 | 2/12/2015 |

VOLUME 1843 FOLIO 126

# RECORD OF CERTIFICATE OF TITLE

UNDER THE TRANSFER OF LAND ACT 1893

The person described in the first schedule is the registered proprietor of an estate in fee simple in the land described below subject to the reservations, conditions and depth limit contained in the original grant (if a grant issued) and to the limitations, interests, encumbrances and notifications shown in the second schedule.

BGRoberts

REGISTRAR OF TITLES

REGISTRAR OF TITLES WESTERN AUSTRALIA

**LAND DESCRIPTION:**

LOT 104 ON DEPOSITED PLAN 169930

**REGISTERED PROPRIETOR:**
(FIRST SCHEDULE)

BYFORD DEVELOPMENT NO 3 PTY LTD OF 2 BILLING PLACE MOUNT RICHON
(T N709595 ) REGISTERED 1/9/2017

**LIMITATIONS, INTERESTS, ENCUMBRANCES AND NOTIFICATIONS:**
(SECOND SCHEDULE)

1. *N709598 MORTGAGE TO NATIONAL AUSTRALIA BANK LTD REGISTERED 1/9/2017.

Warning: A current search of the sketch of the land should be obtained where detail of position, dimensions or area of the lot is required.
* Any entries preceded by an asterisk may not appear on the current edition of the duplicate certificate of title.
Lot as described in the land description may be a lot or location.

----------END OF CERTIFICATE OF TITLE----------

**STATEMENTS:**

The statements set out below are not intended to be nor should they be relied on as substitutes for inspection of the land and the relevant documents or for local government, legal, surveying or other professional advice.

SKETCH OF LAND: 1843-126 (104/DP169930)
PREVIOUS TITLE: 1318-421
PROPERTY STREET ADDRESS: 3 LARSEN RD, BYFORD.
LOCAL GOVERNMENT AUTHORITY: SHIRE OF SERPENTINE-JARRAHDALE

NOTE 1: DUPLICATE CERTIFICATE OF TITLE NOT ISSUED AS REQUESTED BY DEALING N709598

Government of **Western Australia**
Development Assessment Panels

LG Ref: DA18/372
DAP Ref: DAP/18/01419
Enquiries: (08) 6551 9919

Mr Nik Hidding
Peter Webb & Associates
PO Box 920, Subiaco WA 6904

Dear Mr Hidding

**METRO EAST JDAP - SHIRE OF SERPENTINE JARRAHDALE - DAP APPLICATION - DA18/372 - DETERMINATION**

| | |
|---|---|
| Property Location: | Lot 104 (3) Larsen Road, Byford |
| Application Details: | Service station, car wash, vehicle service/tyre centre, showroom/restricted retail and carpark |

Thank you for your Form 1 Development Assessment Panel (DAP) application and plans submitted to the Shire of Serpentine Jarrahdale on 16 May 2018 for the above-mentioned development.

This application was considered by the Metro East JDAP at its meeting held on 11 December 2018, where in accordance with the provisions of the Shire of Serpentine Jarrahdale Town Planning Scheme No. 2, it was resolved to **approve** the application as per the attached notice of determination.

Should the applicant not be satisfied by this decision, an application may be made to amend or cancel this planning approval in accordance with regulation 17 and 17A of the *Planning and Development (Development Assessment Panels) Regulations 2011*.

Please also be advised that there is a right of review by the State Administrative Tribunal in accordance with Part 14 of the *Planning and Development Act 2005*. Such an application must be made within 28 days of the determination, in accordance with the *State Administrative Tribunal Act 2004*.

Should you have any queries with respect to the conditions of approval, please contact Ms Helen Maruta on behalf of the Shire of Serpentine Jarrahdale on 9526 1111.

Yours sincerely,

**DAP Secretariat**

24 December 2018

Encl. DAP Determination Notice
Approved Plans

Cc: Ms Helen Maruta
Shire of Serpentine Jarrahdale

Postal address: Locked Bag 2506 Perth WA Street address: 140 William Street Perth WA 6000
Tel: (08) 6551 9919 Fax: (08) 6551 9961 TTY: 6551 9007 Infoline: 1800 626 477
daps@dplh.wa.gov.au www.dplh.wa.gov.au
ABN 68 565 723 484

Government of **Western Australia**
Development Assessment Panels

***Planning and Development Act 2005***

**Shire of Serpentine Jarrahdale Town Planning Scheme No. 2**

**Metro East Joint Development Assessment Panel**

# Determination on Development Assessment Panel Application for Planning Approval

**Property Location:** Lot 104 (3) Larsen Road, Byford
**Application Details:** Service station, car wash, vehicle service/tyre centre, showroom/restricted retail and carpark

In accordance with regulation 8 of the *Planning and Development (Development Assessment Panels) Regulations 2011*, the above application for planning approval was **granted** on 11 December 2018, subject to the following:

**Approve** DAP Application reference DAP/18/01419 and accompanying plans TP01 – TP14 in accordance with clause 68 of the *Planning and Development (Local Planning Schemes) Regulations 2015* and the provisions of the Shire of Serpentine Jarrahdale Town Planning Scheme No.2, subject to the following conditions:

**Conditions**

1. The development is to be carried out in compliance with the plans and documentation listed below and endorsed with the Shire of Serpentine Jarrahdale stamp, except where amended by other conditions of this consent.

| | |
|---|---|
| Plans and Specifications | 1 – TP01 August 2018 – Revision E<br>2 – TP02 August 2018 – Revision A<br>3 – TP03 April 2018 – Revision M<br>4 – TP03A October 2018 – Revision A<br>5 – TP03B October 2018 – Revision A<br>6 – TP03C October 2018 – Revision A<br>7 – TP03D October 2018 – Revision A<br>8 – TP04 August 2018 – Revision C<br>9 – TP05 August 2018 – Revision B<br>10 – TP06 August 2018 – Revision D<br>11 – TP07 August 2018 – Revision C<br>12 – TP08 August 2018 – Revision B<br>13 – TP09 August 2018 – Revision D<br>14 – TP10 August 2018 – Revision D<br>15 – TP11 November 2018 – Revision A<br>16 – TP12 November 2018 – Revision A<br>17 – TP13 November 2018 – Revision A<br>18 – TP14 November 2018 – Revision A<br>received at the Shire Offices on 9 November 2018<br>Traffic Impact Assessment November 2018 |

Government of **Western Australia**
Development Assessment Panels

2. Prior to occupation, a monetary contribution of 1% being paid the Shire, for the establishment of public art or, alternatively, the provision of public art being provided in accordance with the Shire of Serpentine Jarrahdale Local Planning Policy 1.6 – Public Art for Major Developments to the satisfaction of the Shire.

3. Prior to commencement of works, detailed engineering drawings shall be submitted and approved by the Shire of Serpentine Jarrahdale in consultation with Main Roads Western Australia detailing the dual lane approach on Larsen Road with left and right channelisation at the South Western Highway intersection. The upgrade shall be carried out in accordance with the approved drawings prior to occupation at the applicant's cost.

4. Prior to occupation of the development, the applicant shall widen / upgrade the George Street / Larsen Road intersection to the satisfaction of the Shire of Serpentine Jarrahdale.

5. Prior to construction works, an updated Stormwater Management Plan, on advice from DWER shall be submitted and approved by the Shire of Serpentine Jarrahdale. Once approved, the Stormwater Management Plan shall be implemented and maintained thereafter. The Plan shall be prepared in accordance with the Byford Town Centre Local Water Management Strategy and Local Planning Policy 2.4 – Water Sensitive Design.

6. Prior to commencement of works, an updated Landscape and Vegetation Management Plan for the development, including all car parking areas, access roads and road verges shall be submitted and approved by the Shire of Serpentine Jarrahdale. Once approved, the Landscape and Vegetation Management Plan shall be implemented prior to occupation and maintained thereafter.

7. Prior to occupation, the applicant is required to submit an updated Noise Assessment from a suitably qualified person demonstrating that the development, particularly the mechanical services associated with the tyre and auto services, will not result in unacceptable impacts in relation to noise.

8. The pylon sign shall not exceed 6.5m in height and shall be in accordance with LPP4.11 – Advertising.

9. Prior to commencement of works, an updated site plan showing the revised location of the loading bay, adjacent to George Street entrance shall be submitted and approved by the Shire of Serpentine Jarrahdale. The loading bay shall then be constructed in accordance with the approved site plan thereafter.

10. All loading and unloading associated with the development must be undertaken within the subject property boundaries.

11. Prior to occupation, a lighting plan shall be submitted to and approved by the Shire of Serpentine Jarrahdale in consultation with Main Roads Western Australia. The approved lighting plan shall be implemented and maintained thereafter.

Government of **Western Australia**
Development Assessment Panels

12. Prior to occupation, shared paths, bicycle parking facilities shall be installed in accordance with Local Planning Policy 4.15 Bicycle Facilities to the satisfaction of the Shire of Serpentine Jarrahdale.

13. Prior to commencement of works, an amended drawing of the eastern elevation of the fuel shop, shall be submitted to and approved by the Shire of Serpentine Jarrahdale. The elevation shall include further design features addressing South Western Highway in accordance with the Byford Townsite Detailed Area Plan. The building shall be constructed in accordance with this approved drawing.

14. Service deliveries shall occur outside the hours of 4:00pm to 5:00pm Monday to Friday. Service vehicles shall enter from the George Street entrance and exit from the Larsen Road exit.

15. Prior to occupation, the redundant crossover on South Western Highway shall be removed and the verge reinstated at the applicant's cost to the satisfaction of Main Roads.

16. Prior to occupation, modifications to South Western Highway must be undertaken to the satisfaction of the Shire of Serpentine Jarrahdale at the applicant's cost and on advice from Main Roads Western Australia as follows:-

    i). The construction of left and right turn auxiliary lanes from South Western Highway onto Larsen Road, as depicted on Drawing No. TP03 Revision dated October 2018 at the expense of the applicant.

    ii.) The construction of a median on Larsen Road, as depicted on Drawing No. TP03 Revision dated October 2018 (attached) at the expense of the applicant.

17. Signage illumination shall not exceed the cd/m2 as per Main Roads Advertising Policy.

18. Vegetation within the road reserve must not be removed or trimmed to improve the visibility of the proposed advertising devices.

**Advice Notes**

1. A planning consent is not an approval to commence any works. A building permit must be obtained for all works. Any application for a building permit must satisfy the conditions specified in this decision notice.

2. Any food premises must comply with the Food Act 2008, Food Regulations 2009, Australian and New Zealand Food Safety Standards Code.

3. Any works within the South Western Highway Road Reserve may require the approval of Main Roads WA.

4. This decision constitutes planning approval only and is valid for a period of 2 years from the date of approval. If the subject development is not substantially commenced within the 2 year period, the approval shall lapse and be of no further effect.

Government of **Western Australia**
Development Assessment Panels

Where an approval has so lapsed, no development shall be carried out without further approval having first been sought and obtained, unless the applicant has applied and obtained Development Assessment Panel approval to extend the approval term under regulation 17(1)(a) of the *Planning and Development (Development Assessment Panels) Regulations 2011*.

PROPOSED MIXED USE DEVELOPMENT
AT
# 3 LARSEN ROAD, BYFORD, WA

## ARCHITECTURAL DRAWING LIST:

| | |
|---|---|
| TP.01 | TITLE PAGE AND SITE LOCALITY PLAN |
| TP.02 | EXISTING CONDITIONS SITE PLAN & DEMOLITION PLAN |
| TP.03 | PROPOSED SITE PLAN |
| TP03A | TANKER PATH |
| TP03B | DELIVERY TRUCK PATH SHEET 1 |
| TP03C | DELIVERY TRUCK PATH SHEET 2 |
| TP03D | DELIVERY TRUCK PATH SHEET 3 |
| TP.04 | PROPOSED FLOOR PLAN - FUEL SHOP |
| TP.05 | PROPOSED FLOOR PLANS - SERVICE CENTRE |
| TP.06 | PROPOSED FLOOR PLANS - CAR WASH & RETAIL |
| TP.07 | ELEVATIONS - FUEL SHOP & CANOPY |
| TP.08 | ELEVATIONS - SERVICE CENTRE |
| TP.09 | ELEVATIONS - CAR WASH & RETAIL |
| TP.10 | SIGNAGE PLAN |
| TP.11 | PERSPECTIVE VIEW 1 |
| TP.12 | PERSPECTIVE VIEW 2 |
| TP.13 | PERSPECTIVE VIEW 3 |
| TP.14 | PERSPECTIVE VIEW 4 |

DEVELOPMENT ASSESSMENT PANEL
APPROVED
11-Dec-2018


1 - TP01 - August 2018 - Revision E

## AREA SCHEDULE:

| | |
|---|---|
| TOTAL SITE AREA - | 11,630m² |
| FUEL SHOP - | 400m² |
| VEHICLE SERVICE STORE - | 400m² |
| RESTRICTED RETAIL - | 630m² |
| CAR WASH - | 100m² |
| TOTAL AREA: | 1,530m² |
| LANDSCAPE AREA - | 3,095m² (26.61%) |
| CAR SPACES PROVIDED - | 69 cars |

| REV | AMENDMENT DETAILS | BY | DATE |
|---|---|---|---|
| E | PLAN REVISED TO SUIT TP03 REV.M | JS | 09-11-18 |
| D | PLAN REVISED TO SUIT TP03 REV.L | JS | 08-11-18 |
| C | PLAN REVISED TO SUIT TP03 REV.G | KM | 24-08-18 |
| B | PLAN REVISED TO SUIT TP03 REV.B | JS | 06-07-18 |
| A | SITE KERB TO SOUTH WESTERN HIGHWAY MODIFIED | JP | 09-05-18 |
| Ø | PLANNING ISSUE | JP | 08-05-18 |
| P3 | LOCALITY PLAN REVISED, DRAWING LIST UPDATED | JP | 07-05-18 |
| P2 | LOCALITY PLAN REVISED TO MATCH TP03 REV. P2 | JS | 17-04-18 |
| P1 | PRELIMINARY ISSUE | KM | 10-04-18 |

PROCON DEVELOPMENTS
www.procon.net.au

trg
BRISBANE + MELBOURNE

concept + design + interiors + project management

Level 3, Suite 37, 799 Springvale Road, Mulgrave, Victoria 3170 Australia
T: +61 3 9542 9300 F: +61 3 9542 9310
www.trg-aus.com
The Retail Group Pty Ltd ABN 85 050 134 686
RBP No. DP-AD1689



PROJECT
PROPOSED MIXED USE DEVELOPEMENT

PROJECT ADDRESS
3 LARSEN ROAD
BYFORD
WA 6122

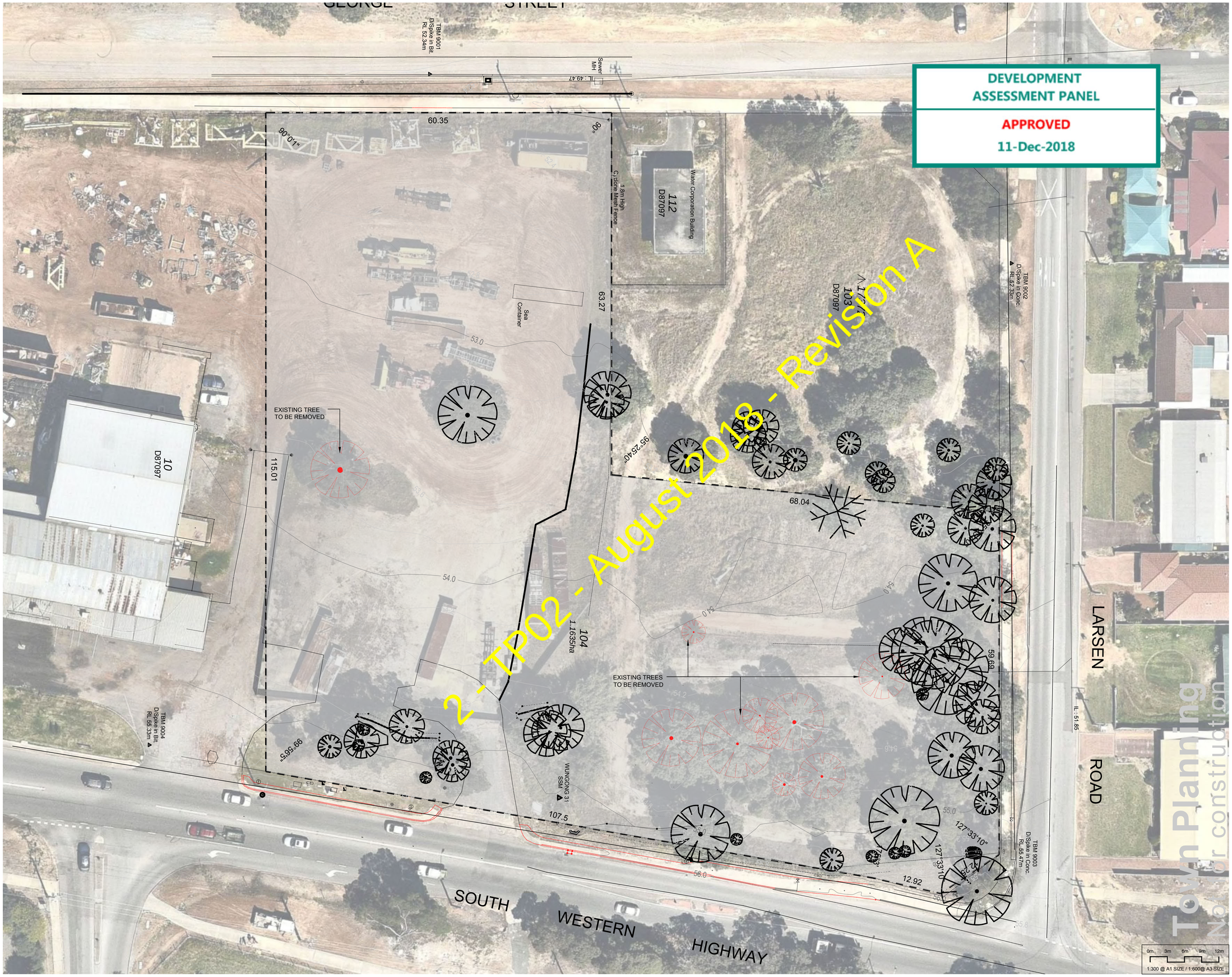
DRAWING TITLE
TITLE PAGE & LOCALITY PLAN

CLIENT
PROCON DEVELOPMENTS PTY LTD

Town Planning
Not for construction

| | | | |
|---|---|---|---|
| DATE AUG.'18 | SCALE @ A1 1:500 | NORTH | |
| DRAWN KM | CHECKED AB | | |
| ISSUE PLANNING | | | |
| PROJECT No. 15316 | DRAWING No. TP01 | REVISION No. E | SHEET 01 of 18 |

0m 5m 10m 15m 20m
1:500 @ A1 SIZE / 1:1000@ A3 SIZE




| REV | AMENDMENT DETAILS | BY | DATE |
|---|---|---|---|
| A | TREES TO BE REMOVED SHOWN | JS | 08-11-18 |
| Ø | PLANNING ISSUE | JP | 08-05-18 |
| P1 | PRELIMINARY ISSUE | KM | 10-04-18 |

PROCON DEVELOPMENTS
www.procon.net.au

trg
BRISBANE + MELBOURNE

concept + design + interiors + project management

Level 3, Suite 37, 799 Springvale Road,
Mulgrave, Victoria 3170 Australia
T: +61 3 9542 9300 F: +61 3 9542 9310
www.trg-aus.com
The Retail Group Pty Ltd ABN 85 050 134 686
RBP No. DP-AD1689



PROJECT
PROPOSED MIXED USE DEVELOPEMENT

PROJECT ADDRESS
3 LARSEN ROAD

BYFORD
WA 6122

DRAWING TITLE
EXISTING CONDITIONS PLAN & DEMOLITION PLAN

CLIENT
PROCON DEVELOPMENTS PTY LTD

| DATE | SCALE @ A1 | NORTH |
|---|---|---|
| AUG.'18 | 1:300 | |
| DRAWN | CHECKED | |
| KM | AB | |
| ISSUE | | |
| PLANNING | | |

| PROJECT No. | DRAWING No. | REVISION No. | SHEET |
|---|---|---|---|
| 15316 | TP02 | A | 02of 18 |

GEORGE STREET

EXISTING FOOTPATH

TITLE BOUNDARY 60.35m

OUT IN

VACUUM BAYS

WATER TANK

WATER TANK

LOADING BAY

RESTRICTED RETAIL 630m²

CAR WASH 100m²

PLANT AREA

LOT 112 PUMP HOUSE WATER CORP.

LOT 103

TITLE BOUNDARY 63.27m

CAR SPACES (23)

POSSIBLE CONNECTION LOCATION TO BE CONFIRMED

POSSIBLE CONNECTION LOCATION TO BE CONFIRMED

SITE AREA 11635m²

LOT 104

CAR SPACES (16)

TITLE BOUNDARY 115.05m

LARSEN ROAD

TITLE BOUNDARY 68.04m

LOADING BAY

BIN AREA

SERVICE CENTRE 400m²

OFFICE

SHOWROOM

LUNCH ROOM

RECEP.

CAR SPACES (10)

FUEL CANOPY

UNDERGROUND FUEL TANKS

UNDERGROUND PETROLEUM PRODUCTS CONTAINMENT TANK

WAITING BAY

CAR SPACES (20)

BIKES

CELLAR 25m²

OUTDOOR SEATING 125m²

FUEL SHOP 400m²

LOADING AREA

AIR & WATER

LANDSCAPE ZONE

4m HIGH PRICE SIGN

ENTRY FEATURE - SIGNAGE & FUEL PRICE

TITLE BOUNDARY 59.69m

TITLE BOUNDARY 81.69m

TITLE BOUNDARY 107.5m

SOUTH WESTERN HIGHWAY

PROPOSED ROAD WIDENING TO FUTURE DESIGN

EXISTING FOOTPATH

NEW FOOTPATH

EXTENDED LEFT TURN LANE 75m LONG

12.92m

12.25m

0m 3m 6m 9m 12m

1:300 @ A1 SIZE / 1:600@ A3 SIZE

DEVELOPMENT ASSESSMENT PANEL

APPROVED

11-Dec-2018

## AREA SCHEDULE:

| | |
|---|---|
| TOTAL SITE AREA - | 11,630m² |
| FUEL SHOP - | 400m² |
| VEHICLE SERVICE STORE - | 400m² |
| RESTRICTED RETAIL | 630m² |
| | 100m² |
| | 1,530m² |
| | 3,095m² (26.61%) |
| - | 69 cars |

## LEGEND:

- EXISTING TREE RETAINED 32 No.
- EXIST. TREE REMOVED 10 No.
- NEW TREE ADDED (REFER LANDSCAPE PLAN AND TREE SURVEY REPORT)
- MRWA PLANNING CONCEPT OVERLAY

ALL AREAS ARE APPROXIMATE AND SUBJECT TO FINAL SURVEY

| REV | AMENDMENT DETAILS | BY | DATE |
|---|---|---|---|
| M | AUTO CAR WASH & BIN AREA REVISED. NO. OF CAR PARKING REVISED | JS | 09-11-18 |
| L | TIMBER BATTEN ADDED | JS | 08-11-18 |
| K | PARKING AREA REVISED | KM | 30-10-18 |
| J | CAR CANOPY, SERVICE CENTRE & CAR WASH REVISED | KM | 23-10-18 |
| H | CAR WASH & SERVICE CENTRE REVISED. | KM | 19-10-18 |
| G | PARKING REVISED. | KM | 24-08-18 |
| F | TENANCIES & PARKING REVISED. | KM | 22-08-18 |
| E | FUEL SHOP & CANOPY REVISED. | KM | 13-08-18 |
| D | SITE ACCESS & CAR WASH REVISED. | KM | 17-07-18 |
| C | CAR CANOPY & CAR WASH REVISED. | KM | 12-07-18 |
| B | TRUCK CANOPY DELETED. CAR CANOPY REVISED. | JS | 06-07-18 |
| A | SITE KERB TO SOUTH WESTERN HIGHWAY AMENDED | JP | 09-05-18 |
| Ø | PLANNING ISSUE | JP | 08-05-18 |
| P2 | CARWASH LAYOUT REVISED | JS | 17-04-18 |
| P1 | PRELIMINARY ISSUE | KM | 10-04-18 |

PROCON DEVELOPMENTS
www.procon.net.au

trg
BRISBANE + MELBOURNE

concept + design + interiors + project management

Level 3, Suite 37, 799 Springvale Road, Mulgrave, Victoria 3170 Australia
T: +61 3 9542 9300 F: +61 3 9542 9310
www.trg-aus.com
The Retail Group Pty Ltd ABN 85 050 134 686
RBP No. DP-AD1689



PROJECT
PROPOSED MIXED USE DEVELOPEMENT

PROJECT ADDRESS
3 LARSEN ROAD

BYFORD
WA 6122

DRAWING TITLE
PROPOSED SITE PLAN

CLIENT
PROCON DEVELOPMENTS PTY LTD

| DATE | SCALE @ A1 | NORTH |
|---|---|---|
| APR.'18 | 1:300 | |
| DRAWN KM | CHECKED AB | |
| ISSUE PLANNING | | |

| PROJECT No. | DRAWING No. | REVISION No. | SHEET |
|---|---|---|---|
| 15316 | TP03 | M | 03of 18 |

## AREA SCHEDULE:

| | |
|---|---|
| TOTAL SITE AREA - | 11,630m² |
| FUEL SHOP - | 400m² |
| VEHICLE SERVICE STORE - | 400m² |
| RESTRICTED RETAIL | 630m² |
| | 100m² |
| | 1,530m² |
| | 3,095m² (26.61%) |
| - | 69 cars |

**DEVELOPMENT ASSESSMENT PANEL**

**APPROVED**

**11-Dec-2018**

GEORGE STREET

EXISTING FOOTPATH

TITLE BOUNDARY 60.35m

AV - Articulated Vehicle

OUT IN

VACUUM BAYS

WATER TANK

WATER TANK

LOADING BAY

RESTRICTED RETAIL 630m²

LOT 112 PUMP HOUSE WATER CORP.

PLANT AREA

CAR WASH 100m²

TITLE BOUNDARY 63.27m

LOT 103

POSSIBLE CONNECTION LOCATION TO BE CONFIRMED

CAR SPACES (23)

SITE AREA 11635m²

LOT 104

CAR SPACES (16)

TITLE BOUNDARY 68.04m

LARSEN ROAD

TITLE BOUNDARY 115.05m

BIN AREA

LOADING BAY

SERVICE CENTRE 400m²

OFFICE

RECEP.

SHOWROOM

LUNCH ROOM

FUEL CANOPY

UGROUND FUEL TANKS

CAR SPACES (10)

WAITING BAY

CAR SPACES (20)

BIKES

PYLON SIGN

OUTDOOR SEATING 25m²

FUEL SHOP 400m²

LOADING AREA

9m HIGH PRICE SIGN

FTC SIGNAGE

ENTRY FEATURE SIGNAGE & FUEL PRICE

TITLE BOUNDARY 59.69m

TITLE BOUNDARY 81.69m

SOUTH WESTERN HIGHWAY

PROPOSED ROAD WIDENING TO FUTURE DESIGN

TITLE BOUNDARY 107.5m

NEW FOOTPATH

EXTENDED LEFT TURN LANE 75m LONG

12.92m

12.25m

LANDSCAPE ZONE

RETAIN EX. TREES

NEW TREE

0m 3m 6m 9m 12m

1:300 @ A1 SIZE / 1:600@ A3 SIZE





| REV | AMENDMENT DETAILS | BY | DATE |
|---|---|---|---|
| A | PLAN REVISED TO SUIT TP03 REV.M | JS | 09-11-18 |
| Ø | PLANNING ISSUE | KM | 30-10-18 |

PROCON DEVELOPMENTS
www.procon.net.au

trg
BRISBANE + MELBOURNE

concept + design + interiors + project management

Level 3, Suite 37, 799 Springvale Road,
Mulgrave, Victoria 3170 Australia

T: +61 3 9542 9300 F: +61 3 9542 9310

www.trg-aus.com
The Retail Group Pty Ltd ABN 85 050 134 686

RBP No. DP-AD1689



PROJECT
PROPOSED MIXED USE DEVELOPEMENT

PROJECT ADDRESS
3 LARSEN ROAD

BYFORD
WA 6122

DRAWING TITLE
PROPOSED SITE PLAN - 19m AV VEHICLE SWEEP PATH

CLIENT
PROCON DEVELOPMENTS PTY LTD

| DATE | SCALE @ A1 | NORTH |
|---|---|---|
| OCT.'18 | 1:300 | |
| DRAWN | CHECKED | |
| KM | AB | |
| ISSUE | | |
| PLANNING | | |

| PROJECT No. | DRAWING No. | REVISION No. | SHEET |
|---|---|---|---|
| 15316 | TP03A | A | 04of 18 |

## AREA SCHEDULE:

| | |
|---|---|
| TOTAL SITE AREA - | 11,630m² |
| FUEL SHOP - | 400m² |
| VEHICLE SERVICE STORE - | 400m² |
| RESTRICTED RETAIL | 630m² |
| | 100m² |
| | 1,530m² |
| | 3,095m² (26.61%) |
| - | 69 cars |

**DEVELOPMENT ASSESSMENT PANEL**

**APPROVED**

**11-Dec-2018**

GEORGE STREET

EXISTING FOOTPATH

TITLE BOUNDARY 60.35m

OUT IN

VACUUM BAYS

WATER TANK

WATER TANK

LOADING BAY

RESTRICTED RETAIL 630m²

PLANT AREA

CAR WASH 100m²

LOT 112 PUMP HOUSE WATER CORP.

LOT 103

TITLE BOUNDARY 63.27m

POSSIBLE CONNECTION LOCATION TO BE CONFIRMED

CAR SPACES (23)

CAR SPACES (16)

SITE AREA 11635m²

LOT 104

TITLE BOUNDARY 68.04m

LARSEN ROAD

TITLE BOUNDARY 115.05m

LOADING BAY

BIN AREA

SERVICE CENTRE 400m²

SHOWROOM

OFFICES

RECEP.

LUNCH ROOM

FUEL CANOPY

UNDERGROUND FUEL TANKS

CAR SPACES (10)

CAR SPACES (20)

OUTDOOR SEATING 125m²

FUEL SHOP 400m²

LOADING AREA

WAITING BAY

LANDSCAPE ZONE

RETAIN EX. TREES

NEW TREE

TITLE BOUNDARY 81.69m

TITLE BOUNDARY 59.69m

8m HIGH PRICE SIGN

ENTRY FEATURE - SIGNAGE & FUEL PRICE

SOUTH WESTERN HIGHWAY

PROPOSED ROAD WIDENING TO FUTURE DESIGN

TITLE BOUNDARY 107.5m

EXISTING FOOTPATH

NEW FOOTPATH

EXTENDED LEFT TURN LANE, 75m LONG

12.92m

12.25m

0m 3m 6m 9m 12m

1:300 @ A1 SIZE / 1:600@ A3 SIZE

5 - TP03B - October 2018 - Revision A

Not for Planning Purposes

| REV | AMENDMENT DETAILS | BY | DATE |
|---|---|---|---|
| A | PLAN REVISED TO SUIT TP03 REV.M | JS | 09-11-18 |
| Ø | PLANNING ISSUE | KM | 26-10-18 |

PROCON DEVELOPMENTS
www.procon.net.au

trg
BRISBANE + MELBOURNE

concept + design + interiors + project management

Level 3, Suite 37, 799 Springvale Road,
Mulgrave, Victoria 3170 Australia
T: +61 3 9542 9300 F: +61 3 9542 9310
www.trg-aus.com
The Retail Group Pty Ltd ABN 85 050 134 686
RBP No. DP-AD1689



PROJECT
PROPOSED MIXED USE DEVELOPEMENT

PROJECT ADDRESS
3 LARSEN ROAD

BYFORD
WA 6122

DRAWING TITLE
PROPOSED SITE PLAN - 12.5m RIGID SERVICE VEHICLE SWEEP PATH (REST. RETAIL)

CLIENT
PROCON DEVELOPMENTS PTY LTD

| DATE | SCALE @ A1 | NORTH |
|---|---|---|
| OCT.'18 | 1:300 | |
| DRAWN KM | CHECKED AB | |
| ISSUE PLANNING | | |

| PROJECT No. | DRAWING No. | REVISION No. | SHEET |
|---|---|---|---|
| 15316 | TP03B | A | 05of 18 |

GEORGE STREET

EXISTING FOOTPATH

TITLE BOUNDARY 60.35m

EXISTING FOOTPATH

HRV – Heavy Rigid Vehicle

HRV – Heavy Rigid Vehicle

7m

OUT IN

LOADING BAY

RESTRICTED RETAIL 630m²

VACUUM BAYS

WATER TANK

WATER TANK

CAR WASH 100m²

PLANT AREA

LOT 112 PUMP HOUSE WATER CORP.

LOT 103

TITLE BOUNDARY 63.27m

CAR SPACES (23)

POSSIBLE CONNECTION LOCATION TO BE CONFIRMED

POSSIBLE CONNECTION LOCATION TO BE CONFIRMED

SITE AREA 11635m² LOT 104

CAR SPACES (16)

TITLE BOUNDARY 115.05m

TITLE BOUNDARY 68.04m

LARSEN ROAD

BIN AREA

LOADING BAY

SERVICE CENTRE 400m²

OFFICE

RECEP.

SHOWROOM

LUNCH ROOM

CAR SPACES (10)

FUEL CANOPY

UNDERGROUND FUEL TANKS

UNDERGROUND FUEL TANK CONTAINMENT SYSTEM

WAITING BAY

CAR SPACES (20)

BOLLARD

OUTDOOR SEATING 25m²

FUEL SHOP 400m²

LOADING AREA

LANDSCAPE ZONE

9m HIGH PRICE SIGN

FTC SIGNAGE

ENTRY FEATURE SIGNAGE & FUEL PRICE

TITLE BOUNDARY 81.69m

TITLE BOUNDARY 107.5m

TITLE BOUNDARY 99.69m

SOUTH WESTERN HIGHWAY

SOUTH WESTERN HIGHWAY

PROPOSED ROAD WIDENING TO FUTURE DESIGN

EXISTING FOOTPATH

NEW FOOTPATH

EXTENDED LEFT TURN LANE 75m LONG

12.92m

12.25m

50.0

55.0

RETAIN EX. TREES

NEW TREE

VENTS

FILL POINT

0m 3m 6m 9m 12m

1:300 @ A1 SIZE / 1:600@ A3 SIZE

## AREA SCHEDULE:

| | |
|---|---|
| TOTAL SITE AREA - | 11,630m² |
| FUEL SHOP - | 400m² |
| VEHICLE SERVICE STORE - | 400m² |
| | 630m² |
| | 100m² |
| | 1,530m² |
| | 3,095m² (26.61%) |
| - | 69 cars |

**DEVELOPMENT ASSESSMENT PANEL**

**APPROVED**

**11-Dec-2018**

October 2018 - Revision A

6 of TP03C - October

| REV | AMENDMENT DETAILS | BY | DATE |
|---|---|---|---|
| A | PLAN REVISED TO SUIT TP03 REV.M | JS | 09-11-18 |
| Ø | PLANNING ISSUE | KM | 26-10-18 |

PROCON DEVELOPMENTS
www.procon.net.au

trg
BRISBANE + MELBOURNE

concept + design + interiors + project management

Level 3, Suite 37, 799 Springvale Road,
Mulgrave, Victoria 3170 Australia

T: +61 3 9542 9300 F: +61 3 9542 9310

www.trg-aus.com
The Retail Group Pty Ltd ABN 85 050 134 686

RBP No. DP-AD1689



PROJECT
PROPOSED MIXED USE DEVELOPEMENT

PROJECT ADDRESS
3 LARSEN ROAD

BYFORD
WA 6122

DRAWING TITLE
PROPOSED SITE PLAN - 12.5m RIGID SERVICE VEHICLE SWEEP PATH (SERV. CENTRE)

CLIENT
PROCON DEVELOPMENTS PTY LTD

| DATE | SCALE @ A1 | NORTH |
|---|---|---|
| OCT.'18 | 1:300 | |
| DRAWN | CHECKED | |
| KM | AB | |
| ISSUE | | |
| PLANNING | | |

| PROJECT No. | DRAWING No. | REVISION No. | SHEET |
|---|---|---|---|
| 15316 | TP03C | A | 06of 18 |

## AREA SCHEDULE:

| | |
|---|---|
| TOTAL SITE AREA - | 11,630m² |
| FUEL SHOP - | 400m² |
| VEHICLE SERVICE STORE - | 400m² |
| RESTRICTED RETAIL | 630m² |
| | 100m² |
| | 1,530m² |
| | 3,095m² (26.61%) |
| - | 69 cars |

**DEVELOPMENT ASSESSMENT PANEL**

**APPROVED**

**11-Dec-2018**



GEORGE STREET

HRV – Heavy Rigid Vehicle

EXISTING FOOTPATH

TITLE BOUNDARY 60.35m

OUT IN

VACUUM BAYS

WATER TANK

WATER TANK

LOADING BAY

RESTRICTED RETAIL 630m²

LOT 112 PUMP HOUSE WATER CORP.

PLANT AREA

CAR WASH 100m²

LOT 103

TITLE BOUNDARY 63.27m

CAR SPACES (23)

POSSIBLE CONNECTION LOCATION TO BE CONFIRMED

SITE AREA 11635m²

LOT 104

CAR SPACES (16)

TITLE BOUNDARY 68.04m

LARSEN ROAD

TITLE BOUNDARY 115.05m

LOADING BAY

BIN AREA

SERVICE CENTRE 400m²

SHOWROOM

OFFICE

RECEP.

LUNCH ROOM

CAR SPACES (10)

FUEL CANOPY

UNDERGROUND FUEL TANKS

WAITING BAY

CAR SPACES (20)

BIKES

PILLAR

OUTDOOR SEATING 125m²

FUEL SHOP 400m²

LOADING AREA

AIR & WATER

ENTRY FEATURE - SIGNAGE & FUEL PRICE

6m HIGH PRICE SIGN

LANDSCAPE ZONE

NEW TREE

RETAIN EX. TREES

TITLE BOUNDARY 81.69m

TITLE BOUNDARY 107.5m

TITLE BOUNDARY 59.69m

PROPOSED ROAD WIDENING TO FUTURE DESIGN

SOUTH WESTERN HIGHWAY

EXTENDED LEFT TURN LANE 75m LONG

NEW FOOTPATH

12.92m

12.25m

0m 3m 6m 9m 12m

1:300 @ A1 SIZE / 1:600@ A3 SIZE

| REV | AMENDMENT DETAILS | BY | DATE |
|---|---|---|---|
| A | PLAN REVISED TO SUIT TP03 REV.M | JS | 09-11-18 |
| Ø | PLANNING ISSUE | KM | 26-10-18 |

PROCON DEVELOPMENTS
www.procon.net.au

trg
BRISBANE + MELBOURNE

concept + design + interiors + project management

Level 3, Suite 37, 799 Springvale Road,
Mulgrave, Victoria 3170 Australia
T: +61 3 9542 9300 F: +61 3 9542 9310
www.trg-aus.com
The Retail Group Pty Ltd ABN 85 050 134 686
RBP No. DP-AD1689



PROJECT
PROPOSED MIXED USE DEVELOPEMENT

PROJECT ADDRESS
3 LARSEN ROAD

BYFORD
WA 6122

DRAWING TITLE
PROPOSED SITE PLAN - 12.5m RIGID SERVICE VEHICLE SWEEP PATH (FUEL SHOP)

CLIENT
PROCON DEVELOPMENTS PTY LTD

| DATE | SCALE @ A1 | NORTH |
|---|---|---|
| OCT.'18 | 1:300 | |
| DRAWN KM | CHECKED AB | |
| ISSUE PLANNING | | |

| PROJECT No. | DRAWING No. | REVISION No. | SHEET |
|---|---|---|---|
| 15316 | TP03D | A | 07 of 18 |

DEVELOPMENT ASSESSMENT PANEL

APPROVED

11-Dec-2018

| REV | AMENDMENT DETAILS | BY | DATE |
|---|---|---|---|
| C | PLAN REVISED TO SUIT TP03 REV.L | JS | 08-11-18 |
| B | PLAN REVISED TO SUIT TP03 REV.G | KM | 24-08-18 |
| A | PLAN REVISED TO SUIT TP03 REV.B | JS | 06-07-18 |
| Ø | PLANNING ISSUE | JP | 08-05-18 |
| P1 | PRELIMINARY ISSUE | KM | 10-04-18 |





PROCON DEVELOPMENTS
www.procon.net.au

trg
BRISBANE + MELBOURNE

concept + design + interiors + project management

Level 3, Suite 37, 799 Springvale Road,
Mulgrave, Victoria 3170 Australia
T: +61 3 9542 9300 F: +61 3 9542 9310
www.trg-aus.com
The Retail Group Pty Ltd ABN 85 050 134 686
RBP No. DP-AD1689



PROJECT
PROPOSED MIXED USE DEVELOPEMENT

PROJECT ADDRESS
3 LARSEN ROAD

BYFORD
WA 6122

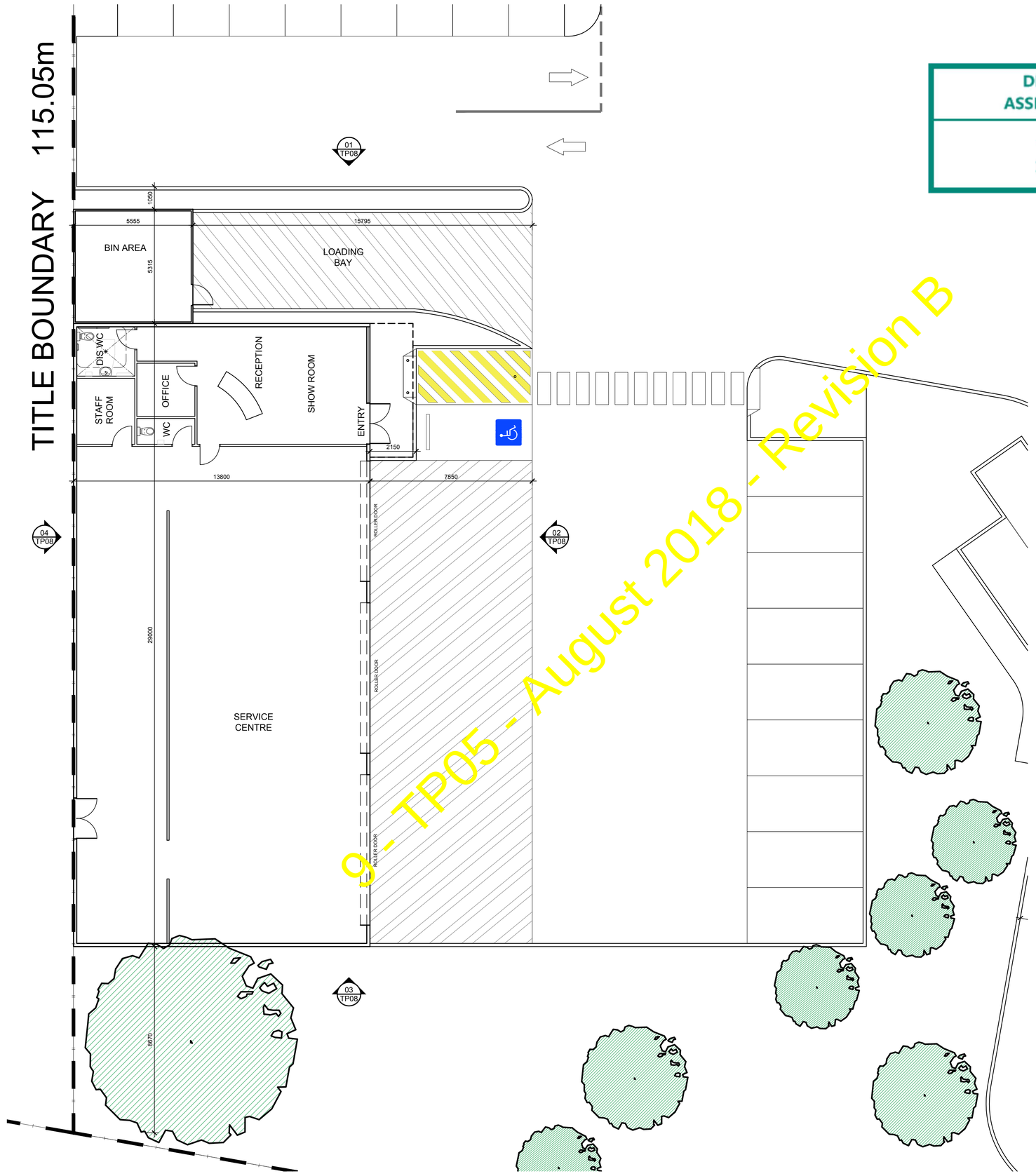
DRAWING TITLE
PROPOSED FLOOR PLAN - FUEL SHOP

CLIENT
PROCON DEVELOPMENTS PTY LTD

| DATE | SCALE @ A1 | NORTH |
|---|---|---|
| AUG.'18 | 1:100 | |
| DRAWN | CHECKED | |
| KM | AB | |
| ISSUE | | |
| PLANNING | | |

| PROJECT No. | DRAWING No. | REVISION No. | SHEET |
|---|---|---|---|
| 15316 | TP04 | C | 08of 18 |

0m 1m 2m 3m 4m
1:100 @ A1 SIZE / 1:200@ A3 SIZE








| REV | AMENDMENT DETAILS | BY | DATE |
|---|---|---|---|
| B | PLAN REVISED TO SUIT TP03 REV.L | JS | 08-11-18 |
| A | PLAN REVISED TO SUIT TP03 REV.G | KM | 24-08-18 |
| Ø | PLANNING ISSUE | JP | 08-05-18 |
| P2 | CARWASH LAYOUT REVISED | JS | 17-04-18 |
| P1 | PRELIMINARY ISSUE | KM | 10-04-18 |

PROCON DEVELOPMENTS
www.procon.net.au

trg
BRISBANE + MELBOURNE
concept + design + interiors + project management
Level 3, Suite 37, 799 Springvale Road, Mulgrave, Victoria 3170 Australia
T: +61 3 9542 9300 F: +61 3 9542 9310
www.trg-aus.com
The Retail Group Pty Ltd ABN 85 050 134 686
RBP No. DP-AD1689



PROJECT
PROPOSED MIXED USE DEVELOPEMENT

PROJECT ADDRESS
3 LARSEN ROAD

BYFORD
WA 6122

DRAWING TITLE
PROPOSED FLOOR PLAN - SERVICE CENTRE

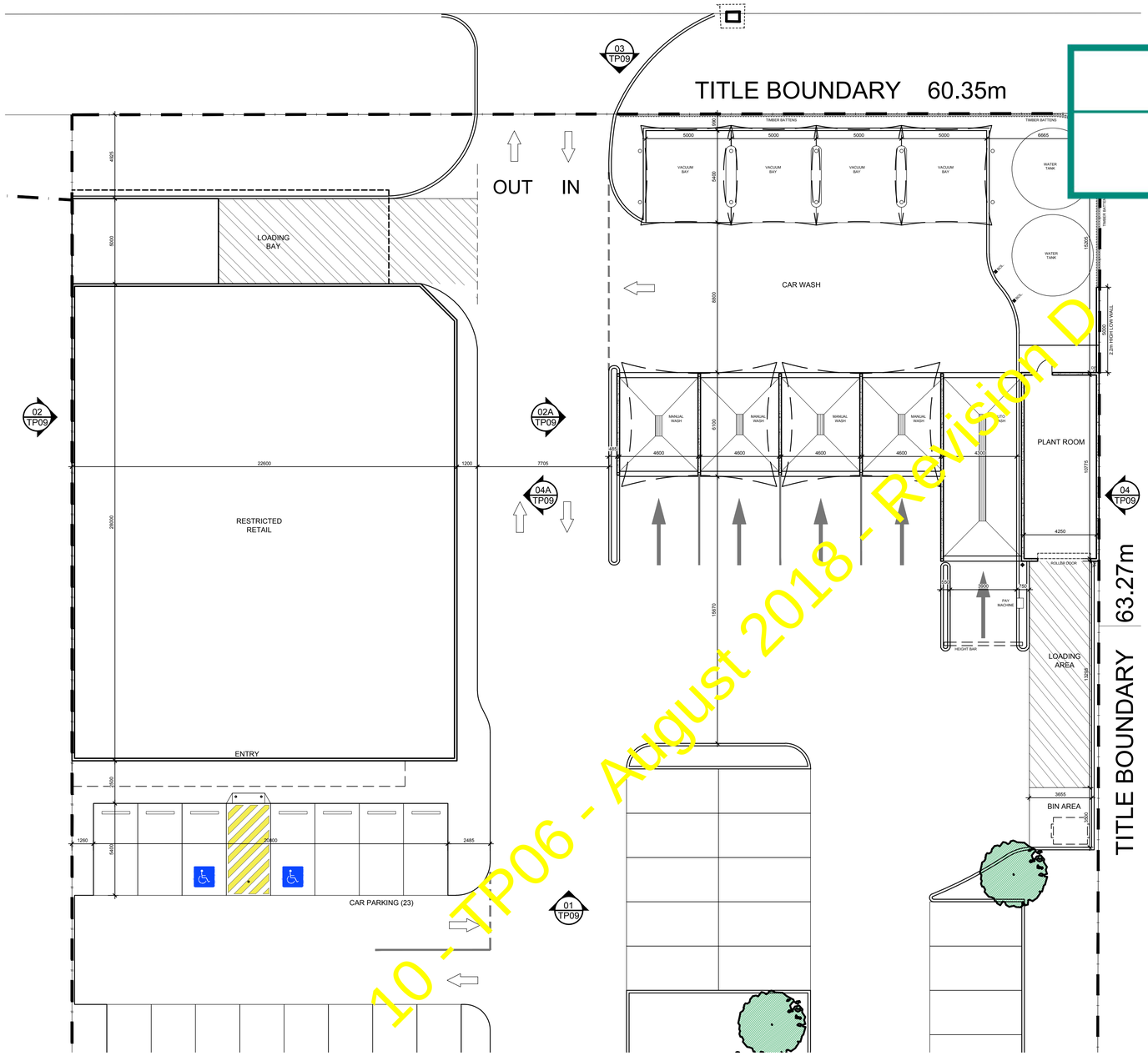
CLIENT
PROCON DEVELOPMENTS PTY LTD

| DATE | SCALE @ A1 | NORTH |
|---|---|---|
| AUG.'18 | 1:100 | |
| DRAWN | CHECKED | |
| KM | AB | |
| ISSUE | | |
| PLANNING | | |

| PROJECT No. | DRAWING No. | REVISION No. | SHEET |
|---|---|---|---|
| 15316 | TP05 | B | 09of 18 |

0m 1m 2m 3m 4m
1:100 @ A1 SIZE / 1:200@ A3 SIZE

Town Planning
Not for construction








| REV | AMENDMENT DETAILS | BY | DATE |
|---|---|---|---|
| D | DIMENSIONS REVISED | JS | 09-11-18 |
| C | PLAN REVISED TO SUIT TP03 REV.L | JS | 08-11-18 |
| B | PLAN REVISED TO SUIT TP03 REV.G | KM | 24-08-18 |
| A | SERVICE CENTRE INTERNAL LAYOUT REVISED | JS | 06-07-18 |
| Ø | PLANNING ISSUE | JP | 08-05-18 |
| P1 | PRELIMINARY ISSUE | KM | 10-04-18 |

PROCON DEVELOPMENTS
www.procon.net.au

trg
BRISBANE + MELBOURNE
concept + design + interiors + project management
Level 3, Suite 37, 799 Springvale Road, Mulgrave, Victoria 3170 Australia
T: +61 3 9542 9300 F: +61 3 9542 9310
www.trg-aus.com
The Retail Group Pty Ltd ABN 85 050 134 686
RBP No. DP-AD1689



PROJECT
PROPOSED MIXED USE DEVELOPEMENT

PROJECT ADDRESS
3 LARSEN ROAD

BYFORD
WA 6122

DRAWING TITLE
PROPOSED FLOOR PLAN - CAR WASH & RETAIL

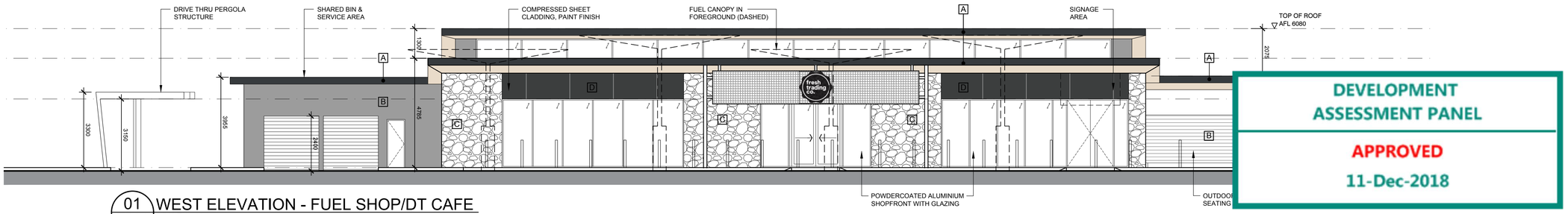
CLIENT
PROCON DEVELOPMENTS PTY LTD

| DATE | SCALE @ A1 | NORTH |
|---|---|---|
| AUG.'18 | 1:150 | |
| DRAWN | CHECKED | |
| KM | AB | |
| ISSUE | | |
| PLANNING | | |

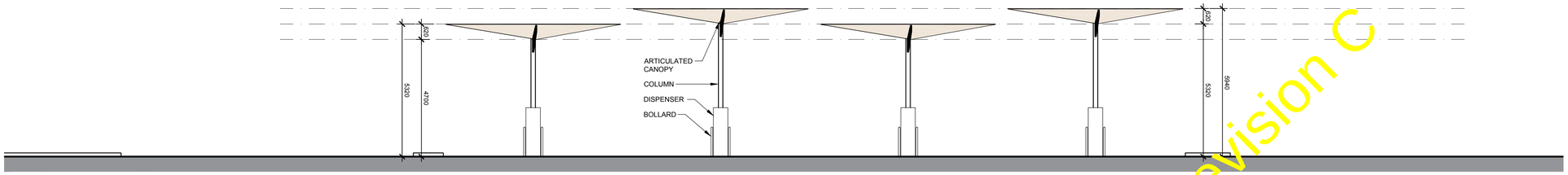
| PROJECT No. | DRAWING No. | REVISION No. | SHEET |
|---|---|---|---|
| 15316 | TP06 | D | 10of 18 |

Town Planning
Not for construction

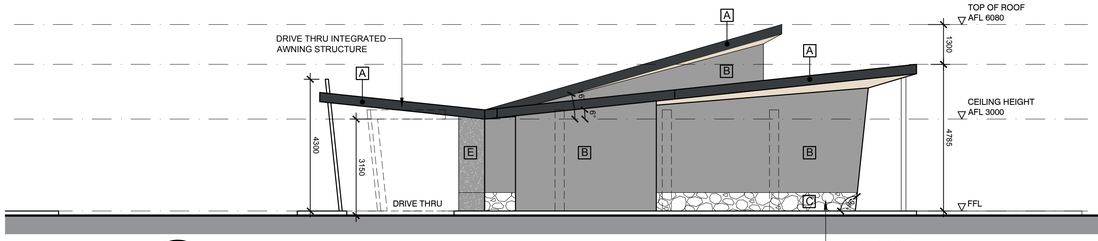
0m 1.5m 3m 4.5m 6m
1:150 @ A1 SIZE / 1:300@ A3 SIZE



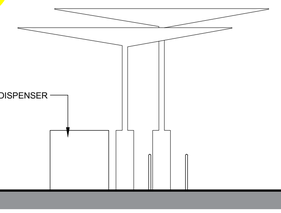

01 TP04 WEST ELEVATION - FUEL SHOP/DT CAFE
SCALE 1:100

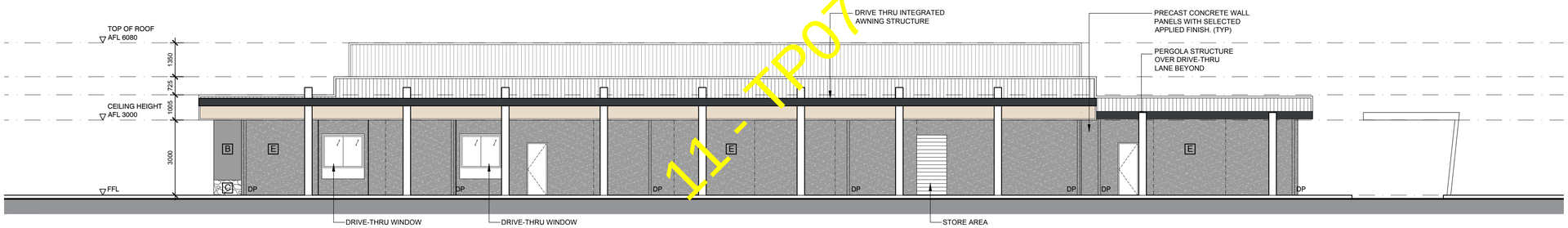



01A TP04 WEST ELEVATION - FUEL & DIESEL CANOPY
SCALE 1:100

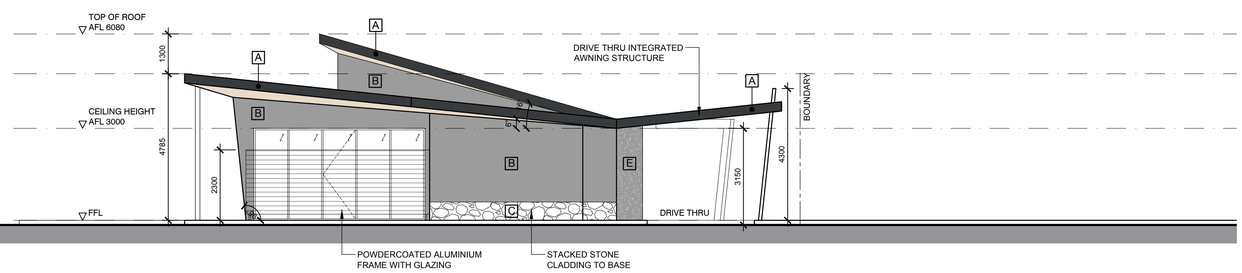



02 TP04 NORTH ELEVATION - DT CAFE (LARSEN RD)
SCALE 1:100




03 TP04 EAST ELEVATION - FUEL SHOP/DT CAFE (STH WESTERN HWY)
SCALE 1:100




04 TP04 SOUTH ELEVATION - FUEL SHOP
SCALE 1:100

## EXTERNAL COLOUR SCHEDULE

| | | |
|---|---|---|
| A | PAINT FINISH, DULUX 'CHARCOAL' |
| B | PAINT FINISH, DULUX 'NATURAL STONE' |
| C | STAKED STONE CLADDING |
| D | ALUCOBOND CLADDING, 'GREY BROWN' |
| E | TEXTURED PAINT FINISH, DULUX 'SILKWORT' |
| F | PAINT FINISH, CONCRETE PANEL LOOK |
| G | PAINT FINISH, 'BRIDGESTONE RED' |
| H | METAL CLADDING, PAINT FINISH COLORBOND 'SURFMIST' |
| J | PAINT FINISH DULUX 'ZEUS WHITE' GLOSS |

**DEVELOPMENT ASSESSMENT PANEL**

**APPROVED**

**11-Dec-2018**

| REV | AMENDMENT DETAILS | BY | DATE |
|---|---|---|---|
| C | PLAN REVISED TO SUIT TP03 REV.L | JS | 08-11-18 |
| B | PLAN REVISED TO SUIT TP03 REV.G | KM | 24-08-18 |
| A | ELEVATIONS REVISED TO SUIT PLAN | KM | 06-07-18 |
| Ø | PLANNING ISSUE | JP | 08-05-18 |
| P1 | PRELIMINARY ISSUE | KM | 10-04-18 |

PROCON DEVELOPMENTS
www.procon.net.au

trg
BRISBANE + MELBOURNE

concept + design + interiors + project management

Level 3, Suite 37, 799 Springvale Road, Mulgrave, Victoria 3170 Australia
T: +61 3 9542 9300 F: +61 3 9542 9310
www.trg-aus.com
The Retail Group Pty Ltd ABN 85 050 134 686
RBP No. DP-AD1689



PROJECT
PROPOSED MIXED USE DEVELOPEMENT

PROJECT ADDRESS
3 LARSEN ROAD

BYFORD
WA 6122

DRAWING TITLE
PROPOSED ELEVATIONS - FUEL SHOP & CANOPY

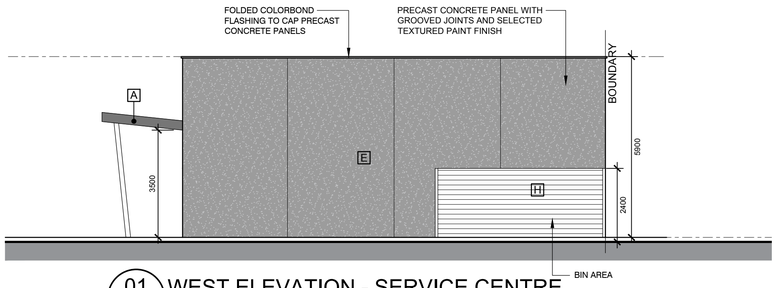
CLIENT
PROCON DEVELOPMENTS

| | | |
|---|---|---|
| DATE: AUG. '18 | SCALE @ A1: 1:100 | NORTH |
| DRAWN: KM | CHECKED: AB | |
| ISSUE: PLANNING | | |

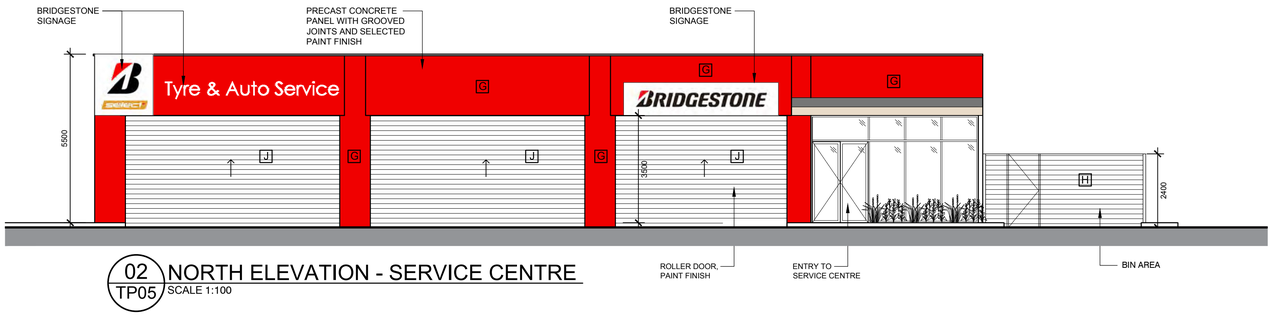
| PROJECT No. | DRAWING No. | REVISION No. | SHEET |
|---|---|---|---|
| 15316 | TP07 | C | 11of 18 |

0m 1m 2m 3m 4m
1:100 @ A1 SIZE / 1:200@ A3 SIZE

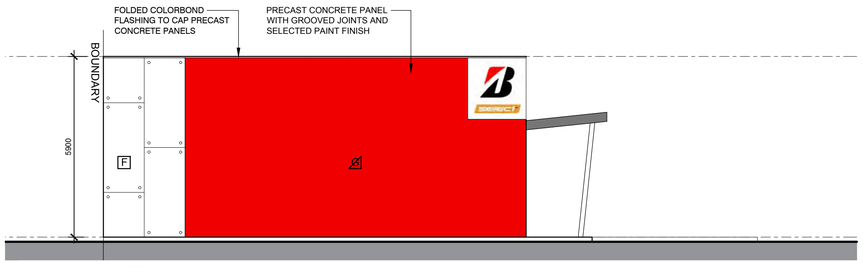
Town Planning
Not for construction



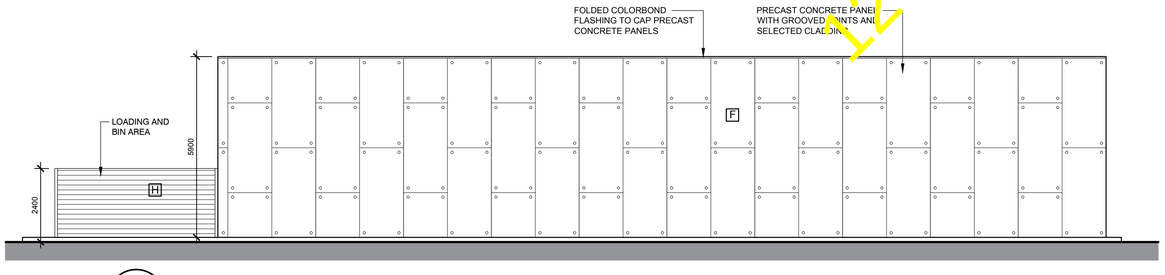

01 TP05 WEST ELEVATION - SERVICE CENTRE
SCALE 1:100




02 TP05 NORTH ELEVATION - SERVICE CENTRE
SCALE 1:100




03 TP05 EAST ELEVATION - SERVICE CENTRE
SCALE 1:100




04 TP05 SOUTH ELEVATION - SERVICE CENTRE
SCALE 1:100

## EXTERNAL COLOUR SCHEDULE

- A PAINT FINISH, DULUX 'CHARCOAL'
- RAL STONE'
- EY BROWN'
- ULUX 'SILKWORT'
- ANEL LOOK
- E RED'
- H METAL CLADDING, PAINT FINISH COLORBOND 'SURFMIST'
- J PAINT FINISH DULUX 'ZEUS WHITE' GLOSS

DEVELOPMENT ASSESSMENT PANEL
APPROVED
11-Dec-2018



| REV | AMENDMENT DETAILS | BY | DATE |
|---|---|---|---|
| B | PLAN REVISED TO SUIT TP03 REV.L | JS | 08-11-18 |
| A | PLAN REVISED TO SUIT TP03 REV.G | KM | 24-08-18 |
| Ø | PLANNING ISSUE | JP | 08-05-18 |
| P2 | CAR WASH REVISED. STAINLESS STEEL WIRE ADDED | JS | 17-04-18 |
| P1 | PRELIMINARY ISSUE | KM | 05-04-18 |

PROCON DEVELOPMENTS
www.procon.net.au

trg
BRISBANE + MELBOURNE

concept + design + interiors + project management

Level 3, Suite 37, 799 Springvale Road, Mulgrave, Victoria 3170 Australia
T: +61 3 9542 9300 F: +61 3 9542 9310
www.trg-aus.com
The Retail Group Pty Ltd ABN 85 050 134 686
RBP No. DP-AD1689



PROJECT
PROPOSED MIXED USE DEVELOPEMENT

PROJECT ADDRESS
3 LARSEN ROAD

BYFORD
WA 6122

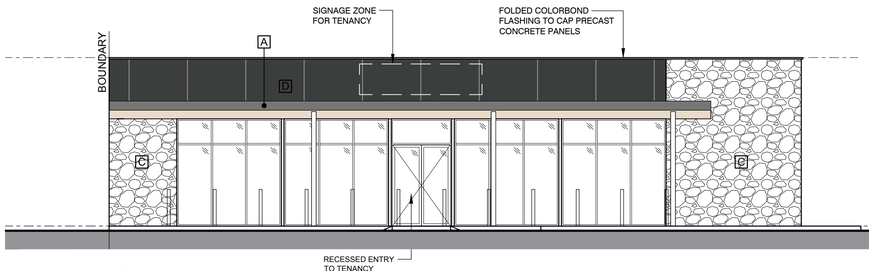
DRAWING TITLE
PROPOSED ELEVATIONS - SERVICE CENTRE

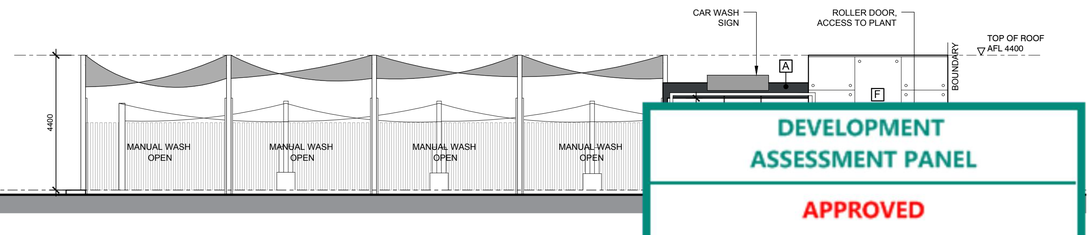
CLIENT
PROCON DEVELOPMENTS

| DATE | SCALE @ A1 | NORTH | |
|---|---|---|---|
| AUG. '18 | 1:100 | | |
| DRAWN | CHECKED | | |
| KM | AB | | |
| ISSUE | | | |
| PLANNING | | | |
| PROJECT No. | DRAWING No. | REVISION No. | SHEET |
| 15316 | TP08 | B | 12of 18 |

Town Planning
Not for construction

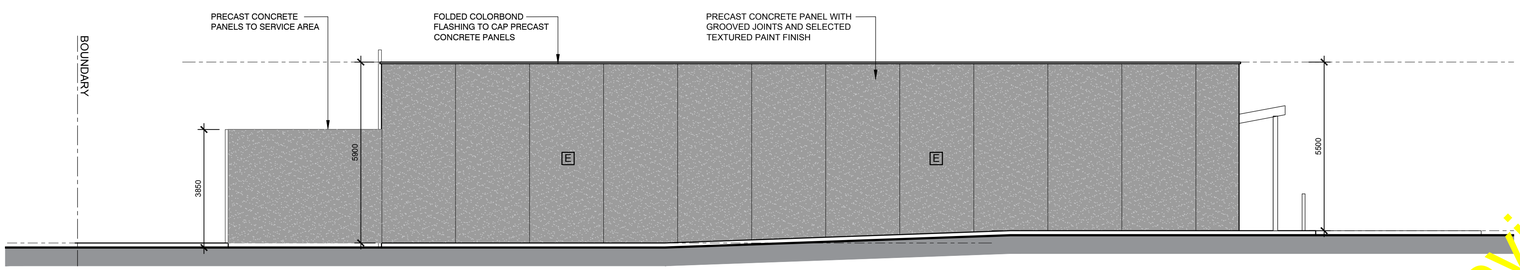
0m 1m 2m 3m 4m
1:100 @ A1 SIZE / 1:200@ A3 SIZE




01 TP06 EAST ELEVATION - RETAIL TENANCY/CAR WASH
SCALE 1:100

DEVELOPMENT ASSESSMENT PANEL
APPROVED
11-Dec-2018

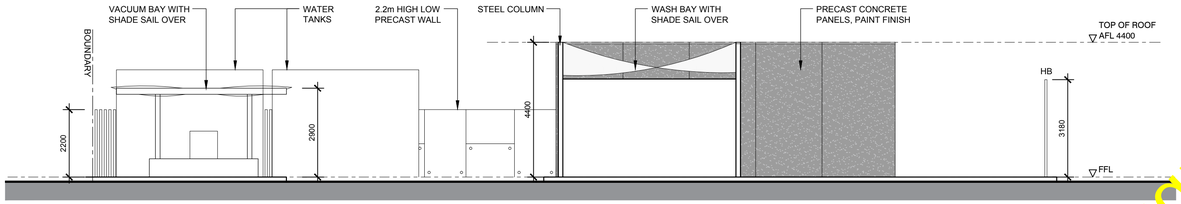



02 TP06 SOUTH ELEVATION - RETAIL TENANCY
SCALE 1:100

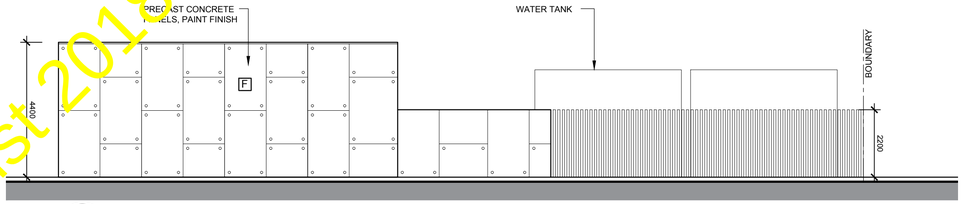
## EXTERNAL COLOUR SCHEDULE

| | | |
|---|---|---|
| A | PAINT FINISH, DULUX 'CHARCOAL' |
| B | PAINT FINISH, DULUX 'NATURAL STONE' |
| C | STAKED STONE CLADDING |
| D | ALUCOBOND CLADDING, 'GREY BROWN' |
| E | TEXTURED PAINT FINISH, DULUX 'SILKWORT' |
| F | PAINT FINISH, CONCRETE PANEL LOOK |
| G | PAINT FINISH, 'BRIDGESTONE RED' |
| H | METAL CLADDING, PAINT FINISH COLORBOND 'SURFMIST' |
| J | PAINT FINISH DULUX 'ZEUS WHITE' GLOSS |

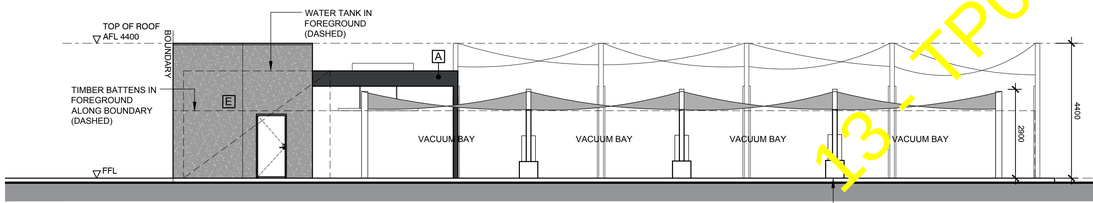
| REV | AMENDMENT DETAILS | BY | DATE |
|---|---|---|---|
| D | PLAN REVISED TO SUIT TP03 REV.M | JS | 09-11-18 |
| C | PLAN REVISED TO SUIT TP03 REV.L | JS | 08-11-18 |
| B | PLAN REVISED TO SUIT TP03 REV.G | KM | 24-08-18 |
| A | ELEVATIONS REVISED TO SUIT PLAN & FINISHES REVISED. BRIDGESTONE SIGNAGE & DOWNPIPE ADDED | JS | 06-07-18 |
| Ø | PLANNING ISSUE | JP | 08-05-18 |
| P2 | STAINLESS STEEL WIRE ADDED | JS | 17-04-18 |
| P1 | PRELIMINARY ISSUE | KM | 05-04-18 |



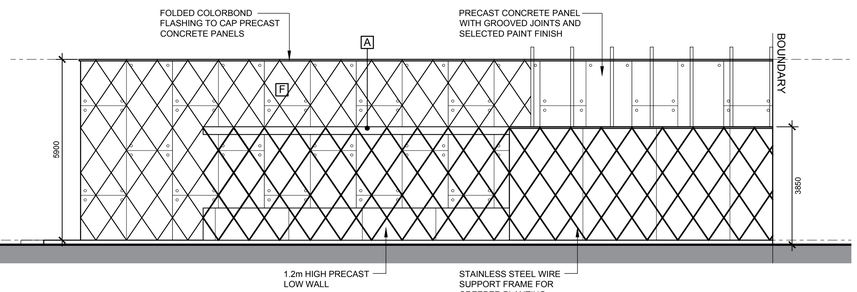

02A TP06 SOUTH ELEVATION - CAR WASH
SCALE 1:100

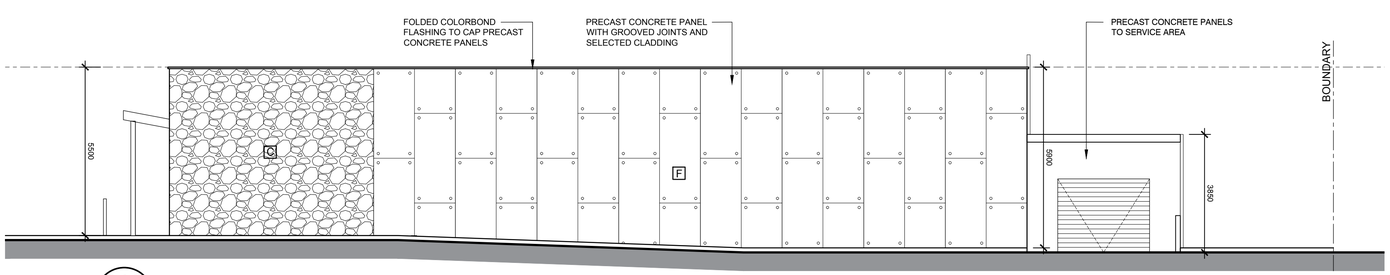



04 TP06 NORTH ELEVATION - CAR WASH
SCALE 1:100




03 TP06 WEST ELEVATION - CAR WASH/RETAIL TENANCY (GEORGE ST)
SCALE 1:100




04A TP06 NORTH ELEVATION - RETAIL TENANCY
SCALE 1:100



Town Planning
Not for construction

0m 1m 2m 3m 4m
1:100 @ A1 SIZE / 1:200@ A3 SIZE

PROCON DEVELOPMENTS
www.procon.net.au

trg
BRISBANE + MELBOURNE

concept + design + interiors + project management
Level 3, Suite 37, 799 Springvale Road, Mulgrave, Victoria 3170 Australia
T: +61 3 9542 9300 F: +61 3 9542 9310
www.trg-aus.com
The Retail Group Pty Ltd ABN 85 050 134 686
RBP No. DP-AD1689



PROJECT
PROPOSED MIXED USE DEVELOPEMENT

PROJECT ADDRESS
3 LARSEN ROAD

BYFORD
WA 6122

DRAWING TITLE
PROPOSED ELEVATIONS - CAR WASH & RETAIL

CLIENT
PROCON DEVELOPMENTS

| DATE | SCALE @ A1 | NORTH |
|---|---|---|
| AUG. '18 | 1:100 | |
| DRAWN | CHECKED | |
| KM | AB | |
| ISSUE | | |
| PLANNING | | |

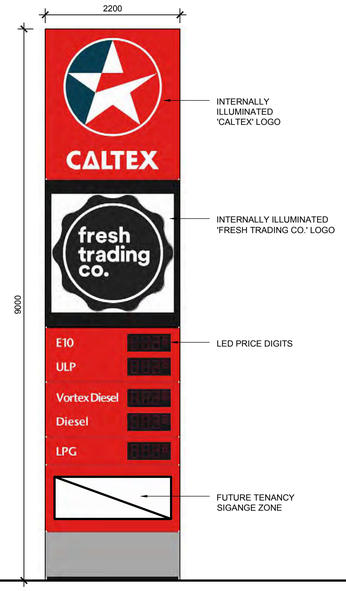
| PROJECT No. | DRAWING No. | REVISION No. | SHEET |
|---|---|---|---|
| 15316 | TP09 | D | 13of 18 |



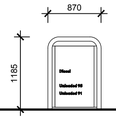


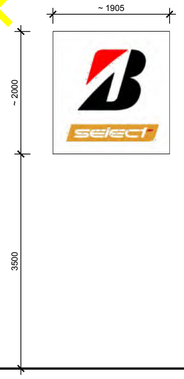

| REV | AMENDMENT DETAILS | BY | DATE |
|---|---|---|---|
| D | PLAN REVISED TO SUIT TP03 REV.M | JS | 09-11-18 |
| C | PLAN REVISED TO SUIT TP03 REV.L | JS | 08-11-18 |
| B | PLAN REVISED TO SUIT TP03 REV.G | KM | 24-08-18 |
| A | PLAN REVISED TO SUIT TP03 REV.B. BRIDGESTONE SIGNAGE ADDED | JS | 06-07-18 |
| Ø | PLANNING ISSUE | JP | 08-05-18 |

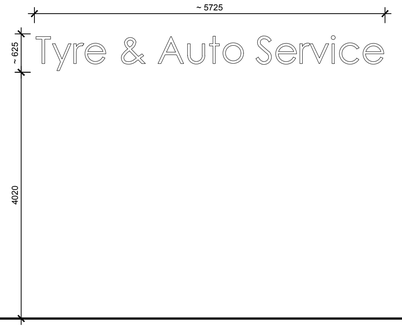
PROCON DEVELOPMENTS
www.procon.net.au

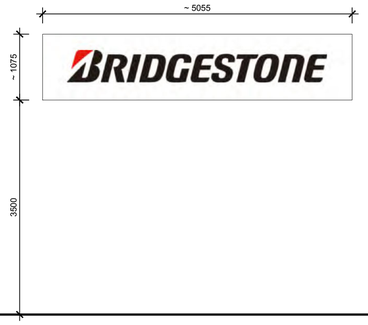







01 - SIGN 01 SCALE 1:50
PROPOSED 9m HIGH COMBINED PRICE SIGN & PYLON SIGN

02 - SIGN 02 SCALE 1:50
SHOP FASCIA SIGNAGE 'FRESH TRADING CO.' LOGO

03 - SIGN 03 SCALE 1:50
FUEL DISPENSER LEADERBOARD

04 - SIGN 04 SCALE 1:50
INTERNALLY ILLUMINATED BRIDGESTONE SIGNAGE

05 - SIGN 05 SCALE 1:50
NON-ILLUMINATED SIGNAGE

06 - SIGN 06 SCALE 1:50
NON-ILLUMINATED SIGNAGE

Town Planning
Not for construction

0m .5m 1m 1.5m 2m
1:50 @ A1 SIZE / 1:100@ A3 SIZE

trg
BRISBANE + MELBOURNE

concept + design + interiors + project management

Level 3, Suite 37, 799 Springvale Road, Mulgrave, Victoria 3170 Australia
T: +61 3 9542 9300 F: +61 3 9542 9310
www.trg-aus.com
The Retail Group Pty Ltd ABN 85 050 134 686
RBP No. DP-AD1689



PROJECT
PROPOSED MIXED USE DEVELOPMENT

PROJECT ADDRESS
3 LARSEN ROAD

BYFORD
WA 6122

DRAWING TITLE
SIGNAGE PLAN

CLIENT
PROCON DEVELOPMENTS

| DATE | SCALE @ A1 | NORTH |
|---|---|---|
| AUG. '18 | 1:50 | |
| DRAWN | CHECKED | |
| KM | AB | |
| ISSUE | | |
| PLANNING | | |

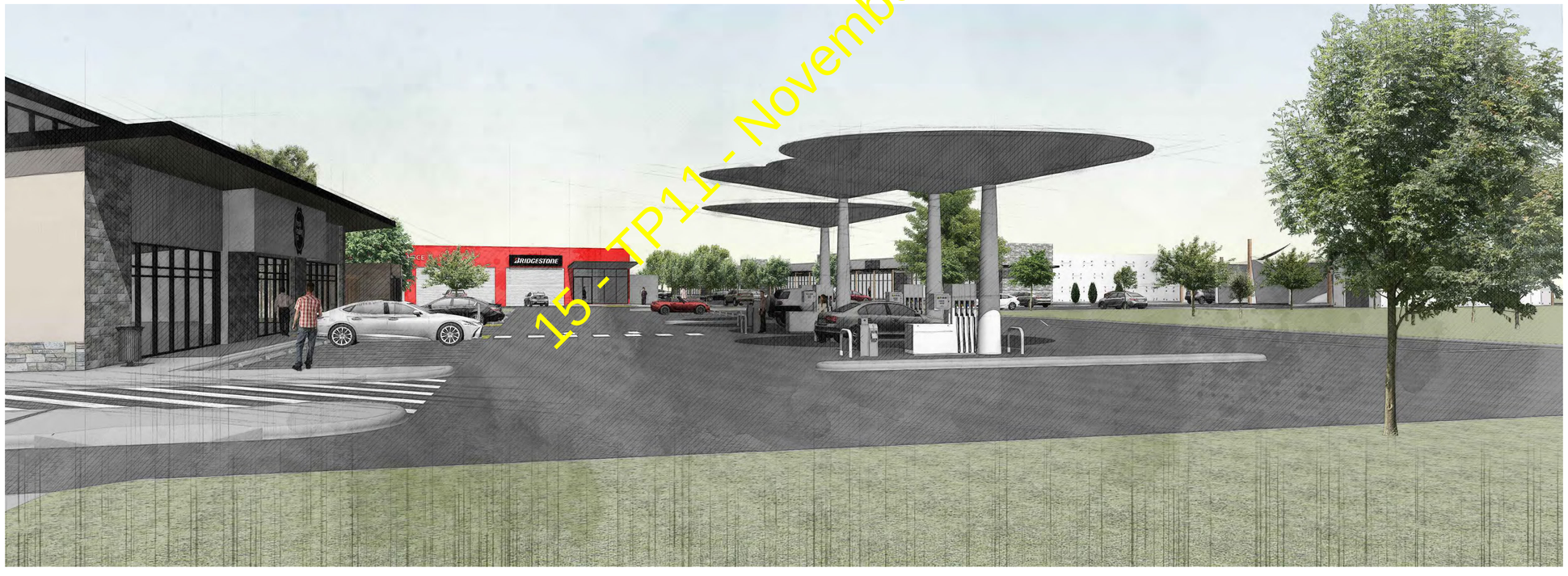
| PROJECT No. | DRAWING No. | REVISION No. | SHEET |
|---|---|---|---|
| 15316 | TP10 | D | 14of 18 |

DEVELOPMENT ASSESSMENT PANEL

APPROVED

11-Dec-2018

1A - VIEW FROM LARSEN ROAD LOOKING EAST TOWARDS THE FUEL SHOP




2A - VIEW LOOKING SOUTH TOWARDS THE FUEL SHOP & SERVICE CENTRE



Town Planning
Not for construction

| REV | AMENDMENT DETAILS | BY | DATE |
|---|---|---|---|
| A | PLANNING ISSUE | TC | 08-11-18 |
| Ø | PLANNING ISSUE | TC | 08-05-18 |
| P1 | PRELIMINARY ISSUE | KM | 05-04-18 |

PROCON DEVELOPMENTS
www.procon.net.au

trg
BRISBANE + MELBOURNE
concept + design + interiors + project management
Level 3, Suite 37, 799 Springvale Road, Mulgrave, Victoria 3170 Australia
T: +61 3 9542 9300 F: +61 3 9542 9310
www.trg-aus.com
The Retail Group Pty Ltd ABN 85 050 134 686
RBP No. DP-AD1689



PROJECT
PROPOSED MIXED USE DEVELOPEMENT

PROJECT ADDRESS
3 LARSEN ROAD

BYFORD
WA 6122

DRAWING TITLE
PROPOSED 3D VIEWS

CLIENT
PROCON DEVELOPMENTS

| DATE | SCALE @ A1 | NORTH | |
|---|---|---|---|
| NOV. '18 | NTS | | |
| DRAWN | CHECKED | | |
| TC | AB | | |
| ISSUE | | | |
| PLANNING | | | |
| PROJECT No. | DRAWING No. | REVISION No. | SHEET |
| 15316 | TP11 | A | 15of 18 |

DEVELOPMENT ASSESSMENT PANEL

APPROVED

11-Dec-2018

16 - TP12 - November 2018 - Revision A

1A - VIEW FROM GEORGE STREET LOOKING NORTH TOWARDS THE CARWASH

2A - VIEW FROM GEORGE STREET LOOKING SOUTH TOWARDS THE CARWASH

Town Planning
Not for construction

| REV | AMENDMENT DETAILS | BY | DATE |
|---|---|---|---|
| A | PLANNING ISSUE | TC | 08-11-18 |
| Ø | PLANNING ISSUE | TC | 08-05-18 |
| P1 | PRELIMINARY ISSUE | KM | 05-04-18 |

PROCON DEVELOPMENTS
www.procon.net.au

trg
BRISBANE + MELBOURNE

concept + design + interiors + project management

Level 3, Suite 37, 799 Springvale Road,
Mulgrave, Victoria 3170 Australia

T: +61 3 9542 9300 F: +61 3 9542 9310

www.trg-aus.com
The Retail Group Pty Ltd ABN 85 050 134 686

RBP No. DP-AD1689



PROJECT
PROPOSED MIXED USE DEVELOPEMENT

PROJECT ADDRESS
3 LARSEN ROAD

BYFORD
WA 6122

DRAWING TITLE
PROPOSED 3D VIEWS

CLIENT
PROCON DEVELOPMENTS

| DATE | SCALE @ A1 | NORTH | |
|---|---|---|---|
| NOV. '18 | NTS | | |
| DRAWN | CHECKED | | |
| TC | AB | | |
| ISSUE | | | |
| PLANNING | | | |
| PROJECT No. | DRAWING No. | REVISION No. | SHEET |
| 15316 | TP12 | A | 16of 18 |


DEVELOPMENT ASSESSMENT PANEL

APPROVED

11-Dec-2018

1A / - VIEW FROM SOUTH WESTERN HIGHWAY LOOKING NORTH-WEST TOWARDS THE SERVICE CENTRE


2A / - VIEW FROM SOUTH WESTERN HIGHWAY LOOKING SOUTH-WEST TOWARDS THE FUEL SHOP





| REV | AMENDMENT DETAILS | BY | DATE |
|---|---|---|---|
| A | PLANNING ISSUE | TC | 08-11-18 |
| Ø | PLANNING ISSUE | TC | 08-05-18 |

PROCON DEVELOPMENTS
www.procon.net.au

trg
BRISBANE + MELBOURNE
concept + design + interiors + project management
Level 3, Suite 37, 799 Springvale Road, Mulgrave, Victoria 3170 Australia
T: +61 3 9542 9300 F: +61 3 9542 9310
www.trg-aus.com
The Retail Group Pty Ltd ABN 85 050 134 686
RBP No. DP-AD1689



PROJECT
PROPOSED MIXED USE DEVELOPEMENT

PROJECT ADDRESS
3 LARSEN ROAD

BYFORD
WA 6122

DRAWING TITLE
PROPOSED 3D VIEW BUILDING & CANOPY

CLIENT
PROCON DEVELOPMENTS

| DATE | SCALE @ A1 | NORTH | |
|---|---|---|---|
| NOV. '18 | NTS | | |
| DRAWN | CHECKED | | |
| TC | AB | | |
| ISSUE | | | |
| PLANNING | | | |
| PROJECT No. | DRAWING No. | REVISION No. | SHEET |
| 15316 | TP13 | A | 17of 18 |

DEVELOPMENT ASSESSMENT PANEL

APPROVED

11-Dec-2018



1A - VIEW FROM THE CARPARK LOOKING NORTH-EAST TOWARDS THE FUEL SHOP



2A - VIEW FROM LARSEN ROAD LOOKING SOUTH-EAST TOWARDS THE FUEL SHOP



| REV | AMENDMENT DETAILS | BY | DATE |
|---|---|---|---|
| A | PLANNING ISSUE | TC | 08-11-18 |
| Ø | PLANNING ISSUE | TC | 08-05-18 |

PROCON DEVELOPMENTS
www.procon.net.au

trg
BRISBANE + MELBOURNE
concept + design + interiors + project management
Level 3, Suite 37, 799 Springvale Road, Mulgrave, Victoria 3170 Australia
T: +61 3 9542 9300 F: +61 3 9542 9310
www.trg-aus.com
The Retail Group Pty Ltd ABN 85 050 134 686
RBP No. DP-AD1689



PROJECT
PROPOSED MIXED USE DEVELOPEMENT

PROJECT ADDRESS
3 LARSEN ROAD

BYFORD
WA 6122

DRAWING TITLE
PROPOSED 3D VIEW BUILDING & CANOPY

CLIENT
PROCON DEVELOPMENTS

| DATE | SCALE @ A1 | NORTH | |
|---|---|---|---|
| NOV. '18 | NTS | | |
| DRAWN | CHECKED | | |
| TC | AB | | |
| ISSUE | | | |
| PLANNING | | | |
| PROJECT No. | DRAWING No. | REVISION No. | SHEET |
| 15316 | TP14 | A | 18of 18 |

DEVELOPMENT ASSESSMENT PANEL
APPROVED
11-Dec-2018

i3 consultants WA

# PROPOSED MIXED USE DEVELOPMENT (SERVICE STATION + CONVENIENCE STORE + DRIVE-THRU COFFEE | VEHICLE SERVICE STORE | COMMERCIAL TENANCIES | SELF SERVICE + AUTOMATIC CAR WASH)

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

## TRANSPORT IMPACT ASSESSMENT


Final 3-0

Prepared by i3 consultants WA for

Peter Webb & Associates | Procon

Transport Impact Assessment
Proposed Mixed Use Development (Service Station + Convenience Store + Drive-Thru Coffee| Vehicle Service Store | Commercial Tenancies | Self Service + Automatic Car Wash), Lot 104 [illegible]tern Highway) Byford
Prepared for Peter Webb & Associates | Procon

DEVELOPMENT ASSESSMENT PANEL
APPROVED
11-Dec-2018

i3 consultants wa

## Project details

| | |
|---|---|
| Project | Proposed Mixed Use Development (Service Station + Convenience Store + Drive-Thru Coffee\| Vehicle Service Store \| Commercial Tenancies \| Self Service + Automatic Car Wash) |
| Location | Lot 104 (SN3) Larsen Rd, (Cnr South Western Highway) Byford |
| Project ID | 02904 |
| Client | Peter Webb & Associates \| Procon |
| Description | A Transport Impact Statement for a proposed Mixed-Use Development (Service Station + Convenience Store + Drive-Thru Coffee \| Vehicle Service Store \| Commercial Tenancies \| Self Service + Automatic Car Wash) on Lot 104 at 3 Larsen Rd on the southwest corner of South Western Hwy within the Shire of Serpentine-Jarrahdale suburb of Byford prepared in accordance with the WAPC 2016 Transport Impact Assessment Guidelines. |

## Document control

| | |
|---|---|
| Author | David Wilkins TMIEAust |
| Status | Final 3-0 |
| File name | 02904 Lot 104 SWH_Larsen_George Service TIA (F3-0) |

| Distribution & Publication Record | | | | | | Final | | |
|---|---|---|---|---|---|---|---|---|
| | 12/04/18 | 17/04/18 | 08/11/18 | 04/05/18 | 07/05/18 | 20/09/18 | 09/11/18 | |
| Recipient \| Document version | D1-0 | D2-0 | D3-0 | F1-0 | F1-1 | F2-0 | F3-0 | F3-1 |
| nik@webbplan.com.au | ☑ | ☑ | ☑ | ☑ | ☑ | ☑ | ☑ | ☐ |
| Garrick@procon.net.au | ☑ | ☑ | ☐ | ☑ | ☑ | ☑ | ☑ | ☐ |
| leon@procon.net.au | ☐ | ☐ | ☑ | ☑ | ☑ | ☑ | ☑ | ☐ |
| Dominic@procon.net.au | ☐ | ☐ | ☐ | ☐ | ☐ | ☑ | ☑ | ☐ |

Revision status comments: D1-0 incomplete report issued for review of background information by client. D2-0 includes revised access and land uses: issued for review by client. F1-0 Final Issue with SIDRA data and completed WAPC checklist. F1-0 Section 14 amended to reflect changed parking bay numbers. F2-0 completely revised to reflect revised layout with no access to or from South Western Hwy, dualling of South Western Hwy including right and left turn lanes into Larsen Rd, largest vehicle restricted to 19 m ST and associated internal layout changes. D3-0 revised and updated to reflect revised plans and comments from the October JDAP process. F3-0 issued as Final with no changes other than adding cover image.

This is not an approved document unless certified here.

Digitally signed by David Wilkins
Date: 2018.11.09 12:06:03 +08'00'



PO Box 1638 Subiaco WA 6904 | T 08 9467 7478 | dwilkins@i3consultants.com | www.i3consultants.com | ABN 53 745 566 923

## CONTENTS

## FIGURES

## ABOUT THE AUTHOR

David Wilkins is an RTA NSW Certified Level 3 Lead Auditor (RSA-08-0178) and Main Roads Western Australia (MRWA) accredited Senior Road Safety Auditor (SRSA 0101). In addition to this, David is an MRWA accredited Crash Investigation Team Leader and Roadworks Traffic Manager (MRWA-RTM-10-RTM20). David has undertaken 104 road safety audits in the last five years and 236 road safety audits since 2001 across the full range of stages from feasibility through to pre-opening, including roadworks, existing roads, schools and mine sites.

David's specialist skills are in the management and development of transport infrastructure and planning, particularly with respect to road safety engineering, roadworks traffic management, traffic engineering, crash investigation, road safety audits, alternative transport systems (TravelSmart, shared paths, cycle facilities), transport statements, transport assessments, parking demand management, local area traffic management, speed management, accessible environments and innovation.

David specialises in undertaking and preparing traffic impact assessments in accordance with either the WAPC document 'Transport Impact Assessment Guidelines' (1) or Austroads 'Guide to Traffic Management Part 12: Traffic Impacts of Developments' (2) and has personally prepared over 160 of these in the last 10 years.

# 1 INTRODUCTION & BACKGROUND

This Transport Impact Assessment report has been prepared for Peter Webb & Associates | Procon (the applicant) by David Wilkins from i3 consultants WA (the consultant) in accordance with the WAPC publication Transport Impact Assessment Guidelines (1). These guidelines indicate that a Transport Impact Assessment (TIA) is required for developments that are likely to generate more than 100 vehicle trips in the development's peak hour and therefore would have a high impact on the surrounding land uses and transport networks, as shown in Figure 1 below.

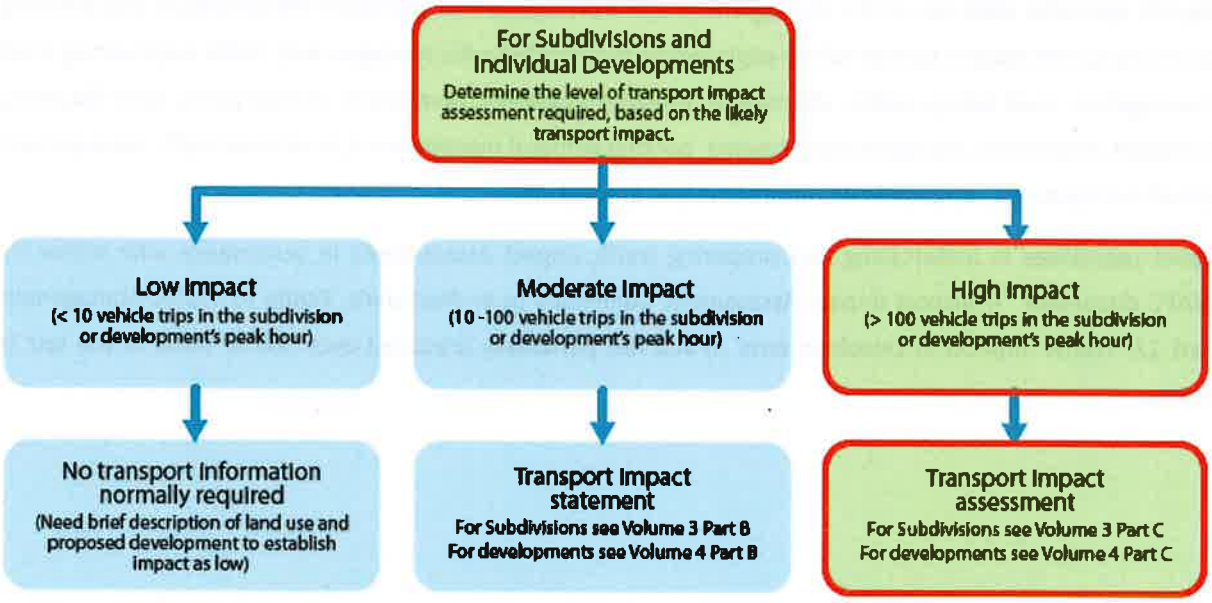



Figure 1 - Level of TIA required (Figure 2: WAPC Guidelines Vol 4)

Preliminary assessments indicate that this mixed-use development is likely to generate around 200 trips during its peak hour, mainly due to service station, drive-thru coffee and car wash land uses. More specific trip generation details are included in **Section 7**.

The location of the subject site in the context of the road and public transport network, 400 m (5-minute walk) and 800 m (10-minute walk) radii is shown in Figure 2 on the following page.

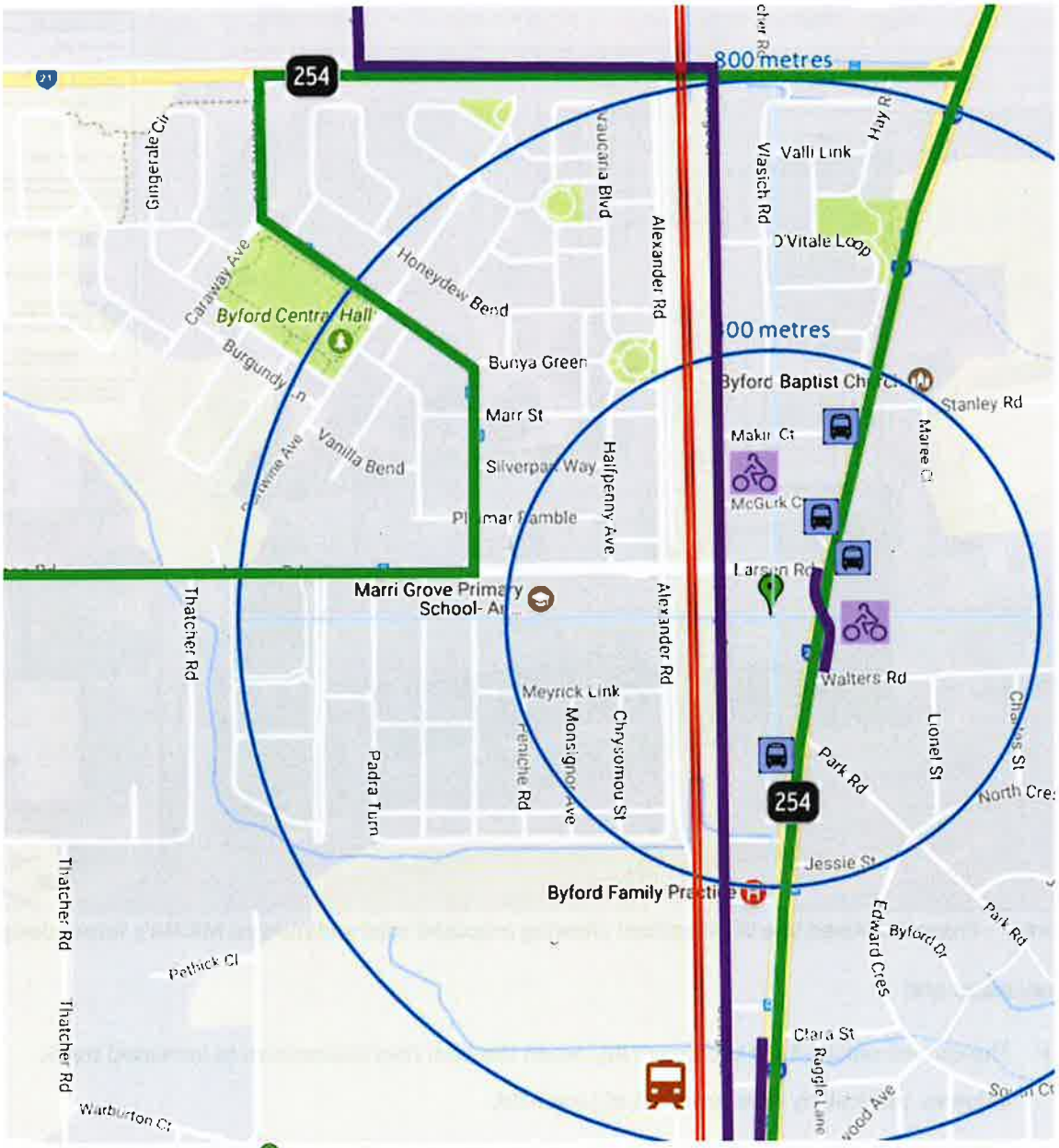



Figure 2 – Site location, road network, bus, train, cycle routes & 400 m/ 800 m walk/ cycle radii

The proposed Mixed-Use Development consists of an 8 fuelling point Service Station with a Convenience Store + Drive thru coffee, a Self Service Car wash with 4 manual bays and 1 automatic bay, a vehicle service store and two commercial tenancies, as described in Table 1 below and shown in Figure 3 on the following page.

| Land Use | GLA ($m^2$) | Number | Fuel Points |
|---|---|---|---|
| Restricted Retail | 630 | 1 | |
| Vehicle Service Centre | 400 | 1 | |
| Self Service Car Wash | 132 | 5 | |
| Service Station + Convenience Store + Drive-Thru Coffee | 400 | 1 | 8 |

Table 1 – Proposed Land Use Schedule

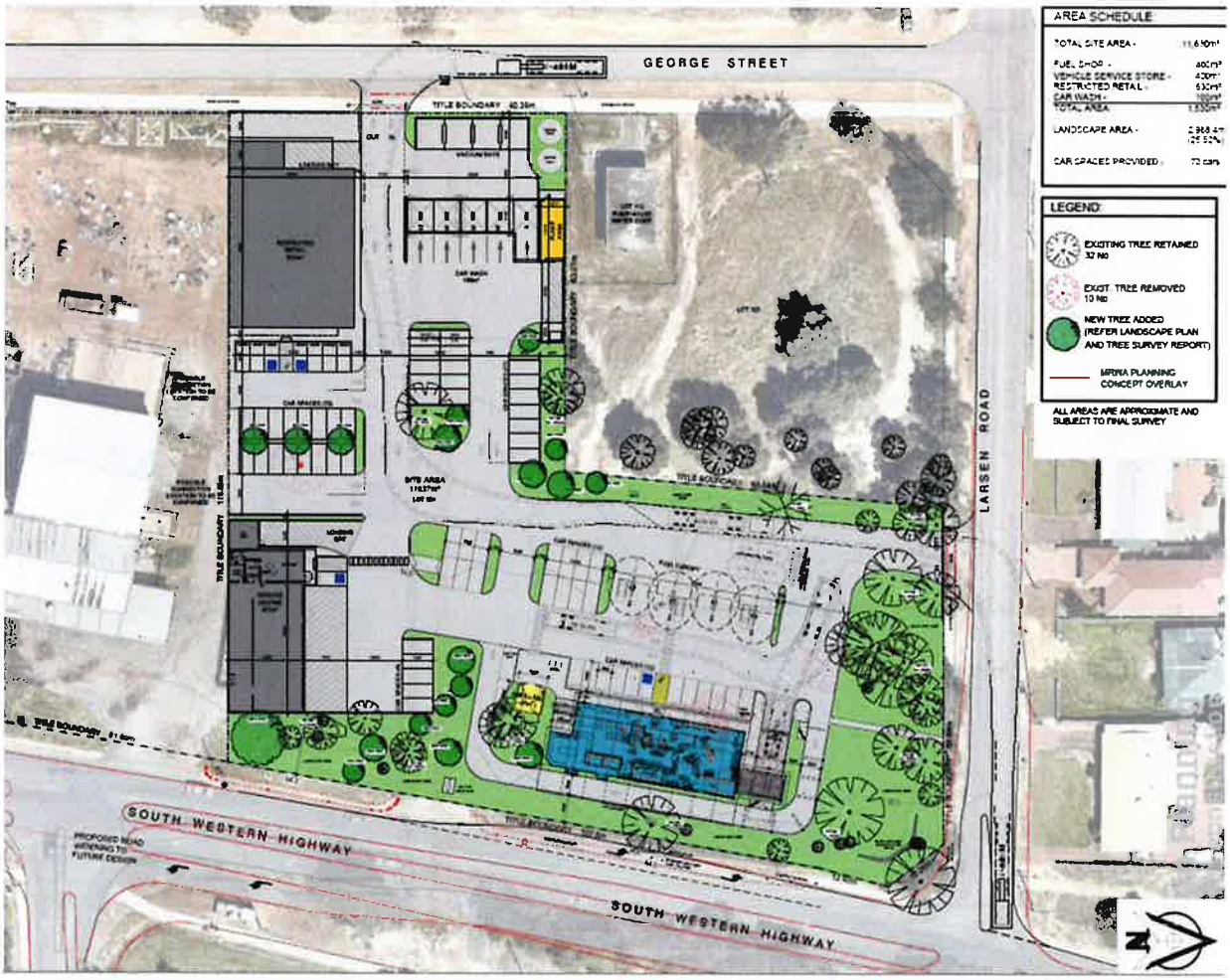



Figure 3 – Proposed Mixed Use Development showing proposed road widening to MRWA's future designs

The key issues are:

- The current sensitivity of the Larsen Rd/ South Western Hwy intersection to increased traffic volumes, particularly right turns out of Larsen Rd;
- The proposed closure of Larsen Rd at the railway level crossing just west of the subject site; and
- Accessibility by the 19 m ST fuel tanker.

In addition to the above, the Shire of Serpentine-Jarrahdale has identified its key concerns since issue of the previous version (F-2) of this TIA. These are listed and addressed in **Section 15** of this TIA.

# 2 EXISTING SITUATION

## 2.1 EXISTING SITE

The existing site is a cleared brownfield site as shown in Photograph 1 and Photograph 2 below.


Photograph 1 – Existing site conditions

Photograph 2 – Panoramic view of subject site from George St (Western Boundary)

## 2.2 EXISTING ROAD NETWORK AND HIERARCHY

A schematic representation of the existing road network, including Functional Hierarchy and traffic control on the main intersections, is provided as Figure 4 below. This shows that the site can currently be accessed from all directions and from Larsen Rd, South Western Highway and George St. It should be noted however that there are proposals to change the road network and controls, including relocating (i.e. closing) the Larsen Rd railway level crossing and this will impact on these access routes. Refer **Section 4.2** for more details.


Figure 4 – Functional Hierarchy, traffic control, subject site access points and access routes

The road classifications shown in Figure 4 on the previous page are defined in the Main Roads Functional Road Hierarchy as follows:

**Primary Distributor (South Western Highway)** *(Managed by Main Roads WA)*

These provide for major regional and inter-regional traffic movement and carry large volumes of generally fast-moving traffic. Some are strategic freight routes, and all are State roads.

**Regional Distributor (Soldiers Rd, Nettleton Rd)** *(Managed by Main Roads WA)*

These carry traffic between regional industrial, commercial and urban areas and generally connect to Primary Distributors. These are likely to carry larger volumes of generally fast-moving traffic than Local Distributors and be heavy truck routes.

**District Distributor A (Thomas Rd)** *Managed by Local Government*

These carry traffic between industrial, commercial and residential areas and generally connect to Primary Distributors. These are likely to be truck routes and provide only limited access to adjoining property.

**Local Distributors (Larsen Rd, Walters Rd, Abernethy Rd, Beenyup Rd, Briggs Rd)** *Managed by Local Government*

Carry traffic within a cell and link District/ Regional Distributors at the boundary to access roads. The route of the Local Distributor discourages through traffic so that the cell formed by the grid of Regional/District Distributors only carries traffic belonging to or serving the area. In Built Up Areas, these roads should accommodate buses, but discourage trucks.

**Access Roads** *Managed by Local Government*

Provide access to abutting properties with amenity, safety and aesthetic aspects having priority over the vehicle movement function. In Built Up Areas, these roads are bicycle and pedestrian friendly.

Based on the assessed road hierarchy and access routes, the key roads and intersection, in terms of impact of the proposed development, are Larsen Rd and South Western Hwy and its intersection.

## 2.3 EXISTING RESTRICTED ACCESS VEHICLE NETWORK

South Western Highway is classified as RAV Network 2, 3 and 4 and connects with other roads classified as RAV Network 2, 3 and 4 including Thomas Road to the north. RAV Networks 2, 3 and 4 all permit access by various heavy vehicle combinations up to 27.5m long. Larsen Rd and George St are not part of the RAV Network and hence the largest design vehicle that is permitted to use these roads and access the site, is the 19 m Semi Trailer.

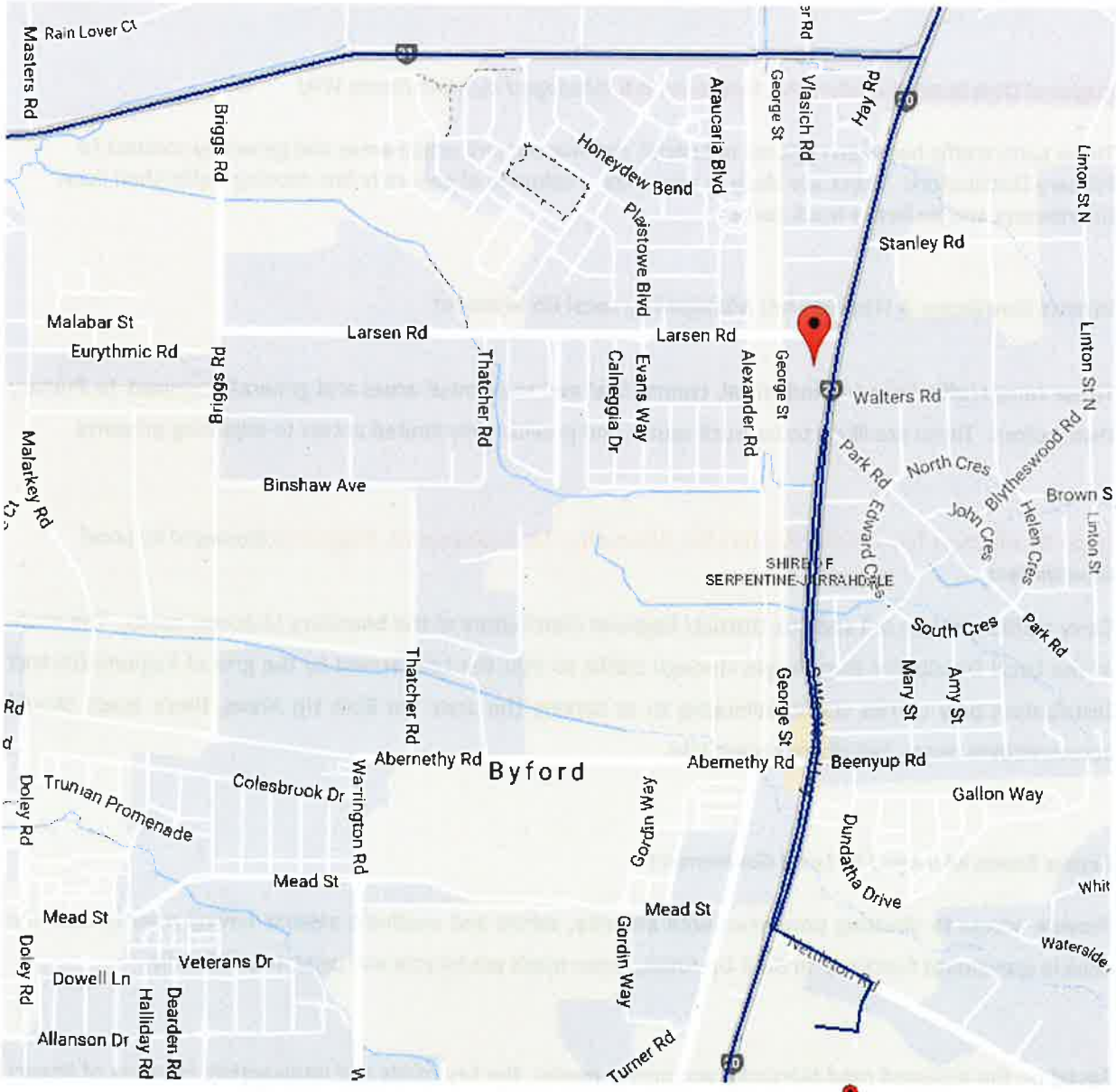



Figure 5 – RAV access routes in vicinity of the subject site ( )

## 2.4 KEY ROADS & INTERSECTIONS

### 2.4.1 South Western Highway

South Western Highway is a major north-south road connecting Byford with Bunbury and Busselton and other areas in the southwest of the state with Perth, via either Albany Highway or Tonkin Hwy.

South Western Highway is designated as National Highway 1 and is located on the eastern boundary of the subject site. It consists of single sealed and kerbed carriageway with one lane in each direction although this changes to a median separated dual carriageway with two lanes in each direction just south of the subject site, i.e. between Park Road and Nettleton Rd. South Western Highway is classified as a "Primary Distributor" road under the Main Roads Functional Hierarchy (3) and is subject to a posted speed limit of 60 km/h and a variable speed limit of 50 km/h between Abernethy Rd and Larsen Rd*. The 50 km/h variable speed limit signs at the northern end are shown in Photograph 3 below. A typical cross section in the vicinity of the subject site is shown in Photograph 4 on the following page, along with the latest available traffic volume data for South Western Highway south of Thomas Rd, i.e. Figure 6 (Mon-Fri) and Figure 7 (Sat). The traffic volumes are taken from SCATS data obtained from the traffic signals at South Western Hwy/ Thomas Rd (TCS 876) as they are more up-to-date than the latest midblock counts undertaken in September 2016 and include weekend data.

There is a short section of cycle path that travels between Larson Rd and Walters Rd that starts on the west (development) side and finishes on the east side via a refuge island as shown in Figure 2 on page 9 and Photograph 4 on the following page.


Photograph 3 – Looking south on South Western Hwy to 50 km/h variable speed limit signs before Larsen Rd

* The 50km/h speed limit operates between 7.30 am and 10 pm seven days a week. The 60 km/h applies outside these hours.

Photograph 4 – Looking south on South Western Hwy south of Larsen Rd (subject site on right)

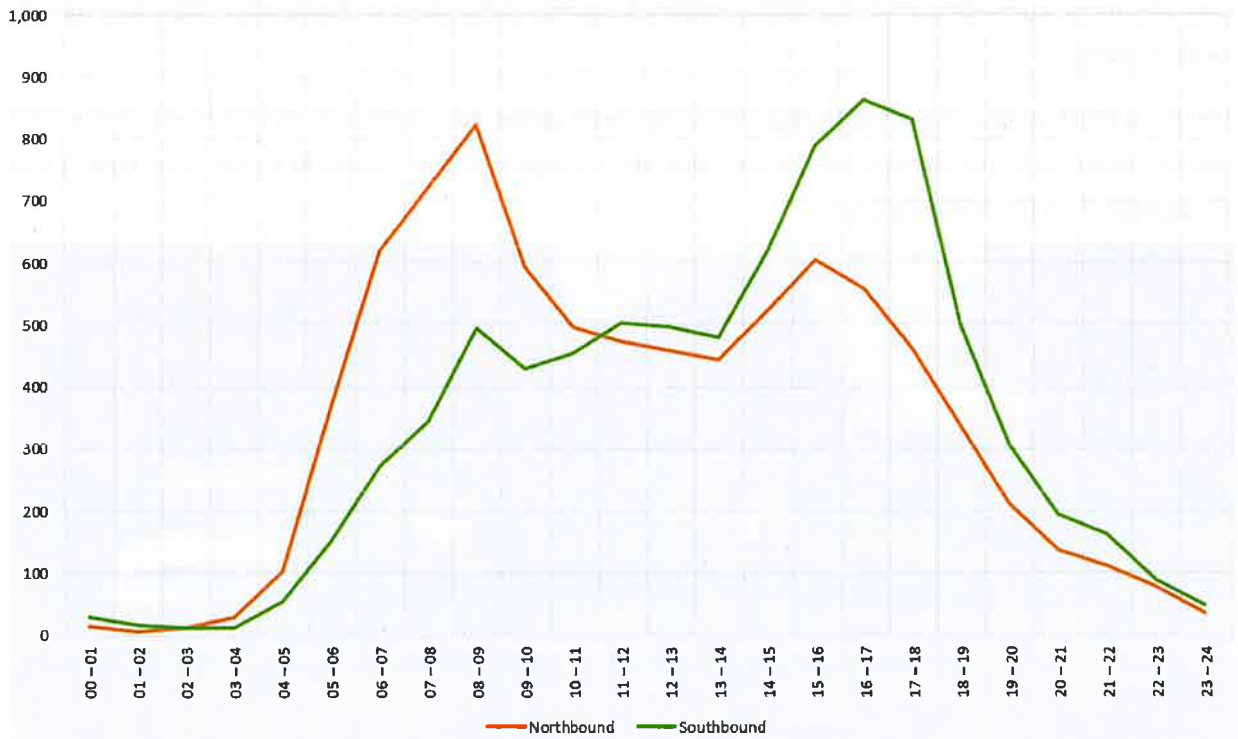



Figure 6 – Mon-Fri hourly traffic volume data for South Western Hwy south of Thomas Rd (March 2018)

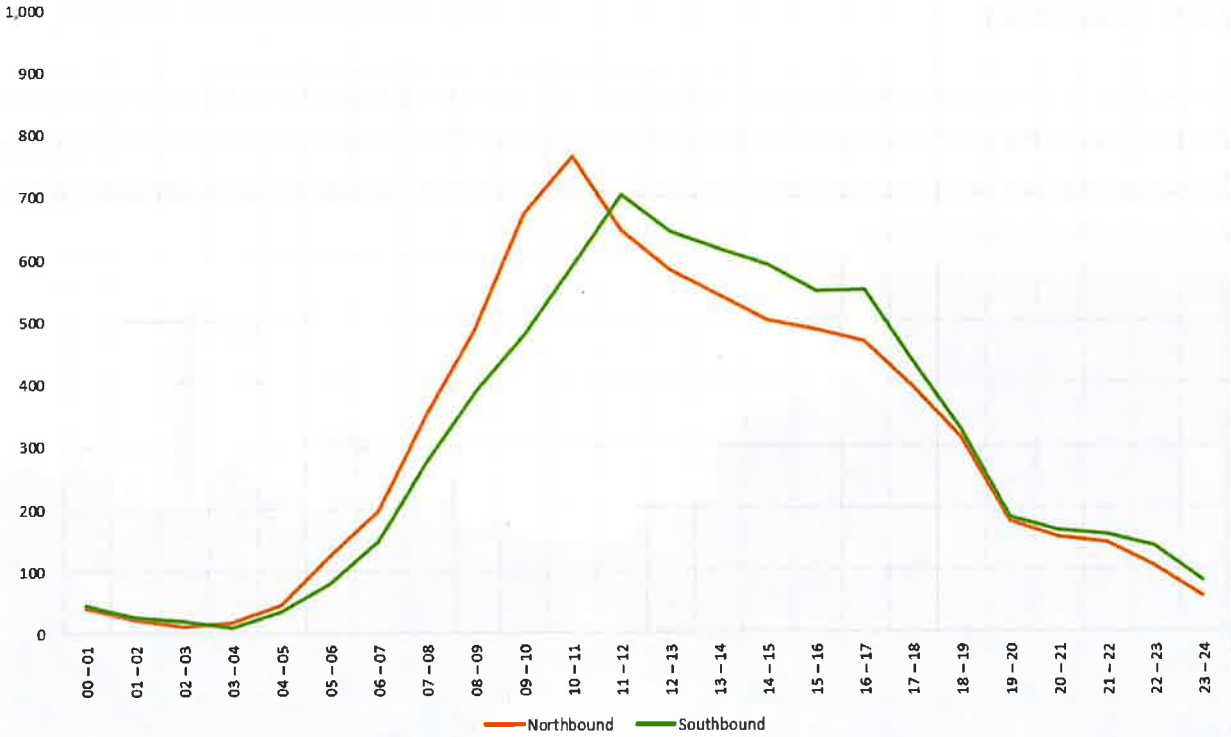



Figure 7 – Saturday hourly traffic volume data for South Western Hwy south of Thomas Rd (March 2018)

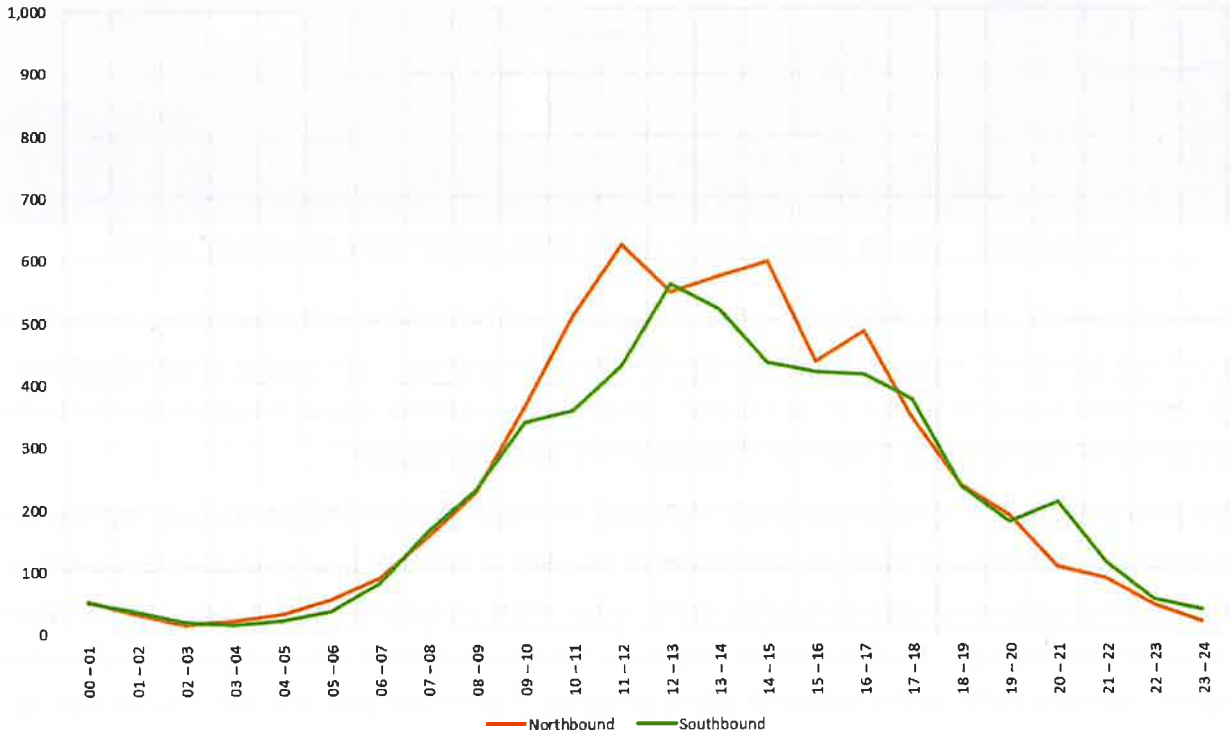



Figure 8 – Sunday hourly traffic volume data for South Western Hwy south of Thomas Rd (March 2018)

Existing midweek PM and Saturday mid-day peak hour turning volumes are included in **Section 2.3**.

Refer **Section 4.3** for proposed changes to South Western Highway.

### 2.4.2 Larsen Road

Larson Road is an east-west distributor (or connector) road connecting Briggs Rd to the west with South Western Hwy to the east. It is located on the northern boundary of the subject site and crosses the single line railway that runs along the west side of George St via an active level crossing with lights and boom gates, as shown in Photograph 5 below.

Photograph 5 – Looking west on Larsen Rd from South Western Hwy (subject site on left)

Larsen Rd consists of single sealed and kerbed carriageway with one lane in each direction and is classified as a "Local Distributor" road under the Main Roads Functional Hierarchy (3). It is subject to the default built-up area speed limit of 50 km/h and has a 40 km/h school zone west of the railway. A typical cross section in the vicinity of the subject site is shown in Photograph 6 on the following page.

The Shire of Serpentine-Jarrahdale provided traffic data for Larsen Rd west of South Western Highway for June 2014 on November 7th2018. An assessment of this data in terms of hourly volumes for weekdays, Saturdays and Sundays has been undertaken by the author and is provided as Figure 9, Figure 10 and Figure 11 on the following page. This data does not support the Shire's view that the school on Larsen Rd generates significantly more traffic on this section of Larsen Rd during its afternoon peak hour (i.e. 3-4 PM) than the adopted road network PM peak hour of 4-5 PM. The 4-5 PM peak hour was selected by the author based on the recorded March 2018 South Western Hwy peak hour.

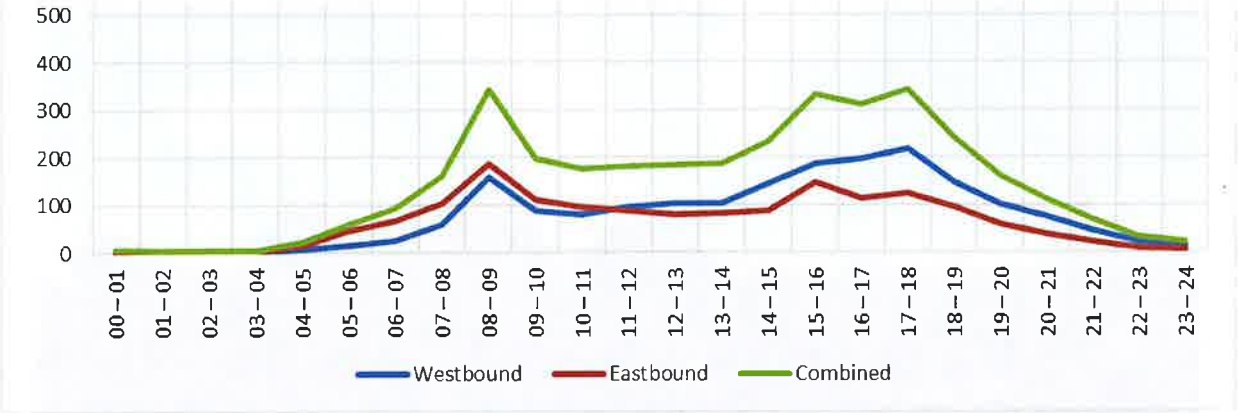



Figure 9 – Larsen Rd west of South Western Hwy Midweek volumes June 2014

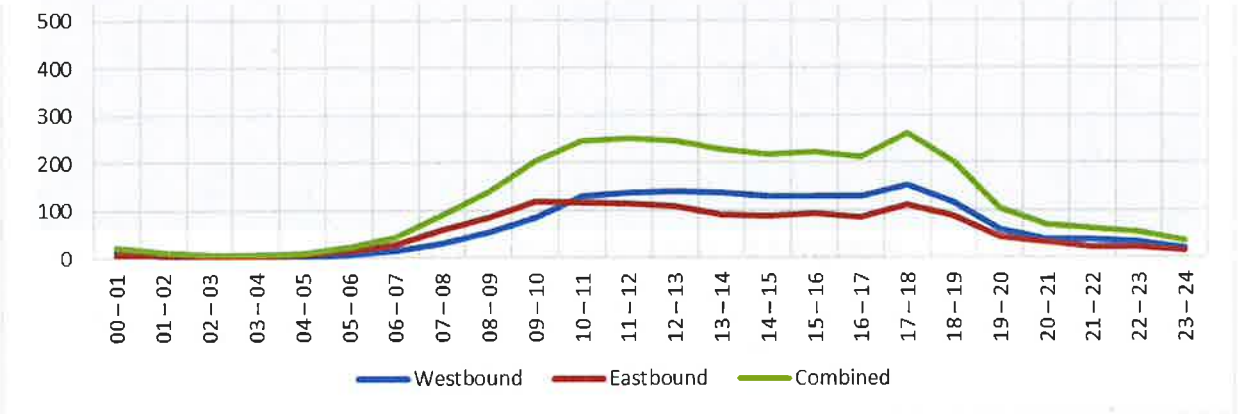



Figure 10 – Larsen Rd west of South Western Hwy Saturday volumes June 2014

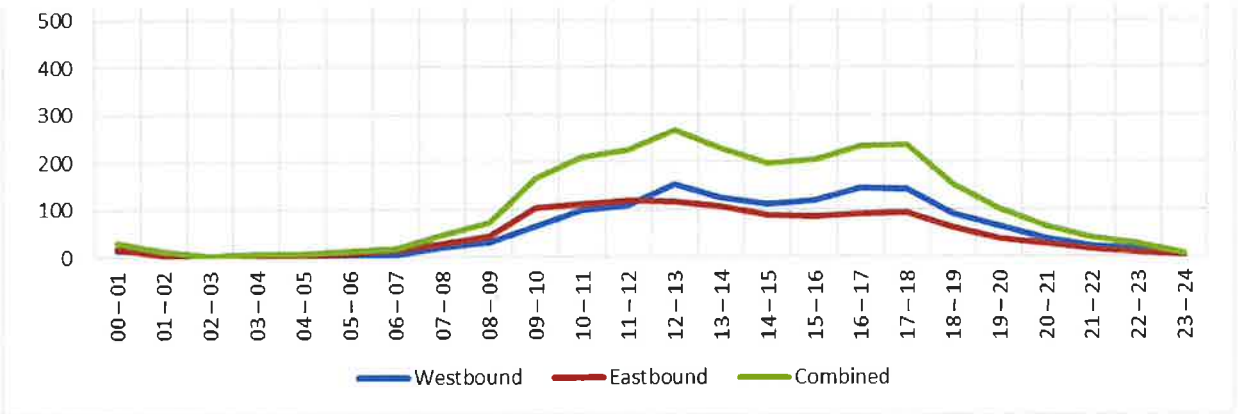



Figure 11 – Larsen Rd west of South Western Hwy Sunday volumes June 2014

More up-to-date (i.e. 2018) midweek PM and Saturday mid-day peak hour volumes are included in **Section 2.5**.

There are no existing or proposed designated cycle paths along Larsen Rd (refer **Section 14**). Cyclist were observed to use the road and the paths on either side.


Photograph 6 – Typical cross section of Larsen Rd

### 2.4.3 George Street

George St is a north-south local access road that currently terminates approximately 250 m south of Larsen Rd and is located on the western boundary of the subject site. It is proposed to construct George St for the full length of its road reserve sometime in the future (refer **Sections 4.2** and **4.4**).

George St consists of a single sealed carriageway for approximately 250 m south of Larsen Rd where it then becomes an unsealed road with pedestrian but not vehicular access to the south. It has a kerb on the east (development) side and is classified as an "Access Road" under the Main Roads Functional Hierarchy (3). It is subject to the default built-up area speed limit of 50 km/h. A typical cross section in the vicinity of the subject site is shown in Photograph 7 below.

Existing midweek PM and Saturday mid-day peak hour volumes (low due to lack of existing development south of Larsen Rd) are shown in **Section 2.3**.

There is an existing cycle path along the east (development) side of George St (refer **Section 14**).

Local Planning Policy No 53: George Street Construction Costs allows for "the contribution of funding for the construction of George Street from Pitman Way to Larsen Road in a coordinated manner by detailing the costs, method of apportionment and method of collecting contributions."

Lot 104 Larsen Road (the subject site) has an indicated percentage of construction cost liability of 10.22% based on a 61.1 m frontage to George St.

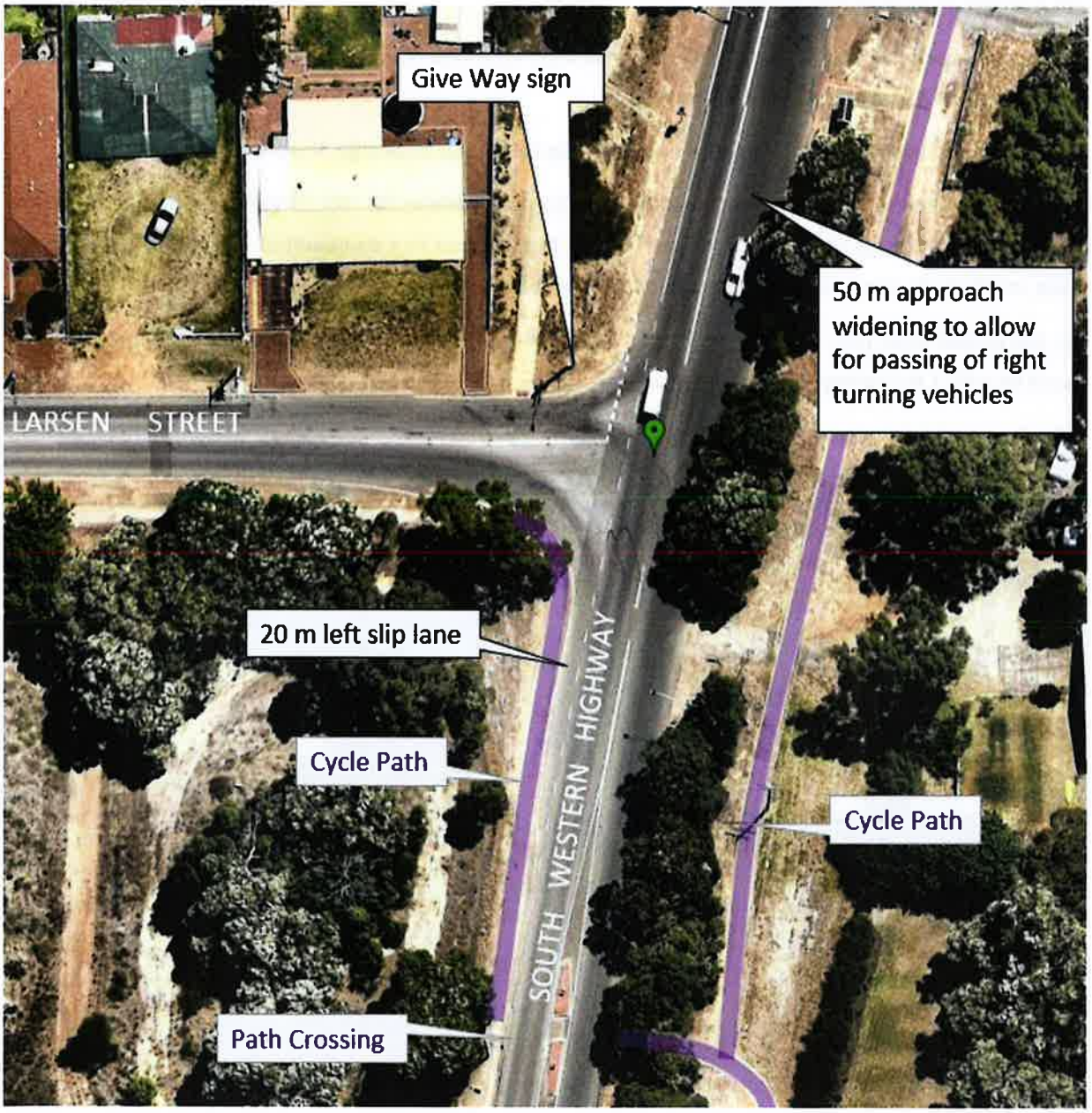
Refer **Section 4.4** for proposed changes to George St.


Photograph 7 – Typical cross section of George St

### 2.4.4 Key intersection 1 (Ki1): Larsen Rd/ South Western Hwy

This intersection has been identified as a Key intersection as the majority of traffic likely to be generated by the proposed development will perform right turn movements at this intersection.

The layout of this Give Way controlled 'T' intersection is best described through the annotated aerial photograph dated 14 February 2018 provided as Photograph 8 below. A street view of the Larsen Rd approach to South Western Hwy is provided as Photograph 9 on the following page. Existing midweek PM and Saturday mid-day peak hour turning and through volumes are included in **Section 2.3**.




Photograph 8 – Layout of Key intersection 1 as at 14 February 2018


Photograph 9 – Larsen Rd approach to South Western Hwy (peak hour conditions)

As shown in Photograph 9 above, drivers currently find it difficult to turn right into South Western Hwy during peak times. This is described and assessed in more detail in **Section 9**.

Refer **Section 4.3** for proposals to upgrade this intersection as part of the South Western Highway upgrade proposal.

### 2.4.5 Secondary intersection 1 (Si1): Larson Rd/ George St

This intersection has been identified as a Secondary intersection as it may experience a high proportion of right turning volumes associated with the development compared to existing volumes.

The layout of this Give Way controlled '4-way' intersection is best described through the annotated aerial photograph dated 14 February 2018 provided as Photograph 10 below. A street view of the railway level crossing is shown in Photograph 5 on page 18. Existing midweek PM and Saturday mid-day peak hour turning and through volumes are included in **Section 2.3**.


Photograph 10 – Layout of Secondary intersection 1 as at 14 February 2018

## 2.5 EXISTING PEAK HOUR TRAFFIC VOLUMES

Peak hour traffic volumes around the site and through the identified Key and Secondary intersections were compiled by the author for a Thursday (4 PM – 5 PM) and a Saturday (11 AM – 12 noon) in March 2018 with adjustments made for the Easter Holiday traffic. The assessment of this data in the draft report indicated that the key intersection of Larsen Rd and South Western Hwy was very sensitive to any increases in right turning traffic and it was therefore determined that further detailed traffic turning surveys for a weekday between 1 and 2 PM and 4 and 5 PM as well as a Saturday between 12 noon and 1 PM in April was warranted. Video surveys were undertaken by i3 on 13th and 14th April 2017 in order to develop the existing (2018) traffic volume diagrams provided as Figure 12 below and Figure 13 and Figure 14 on the following page.

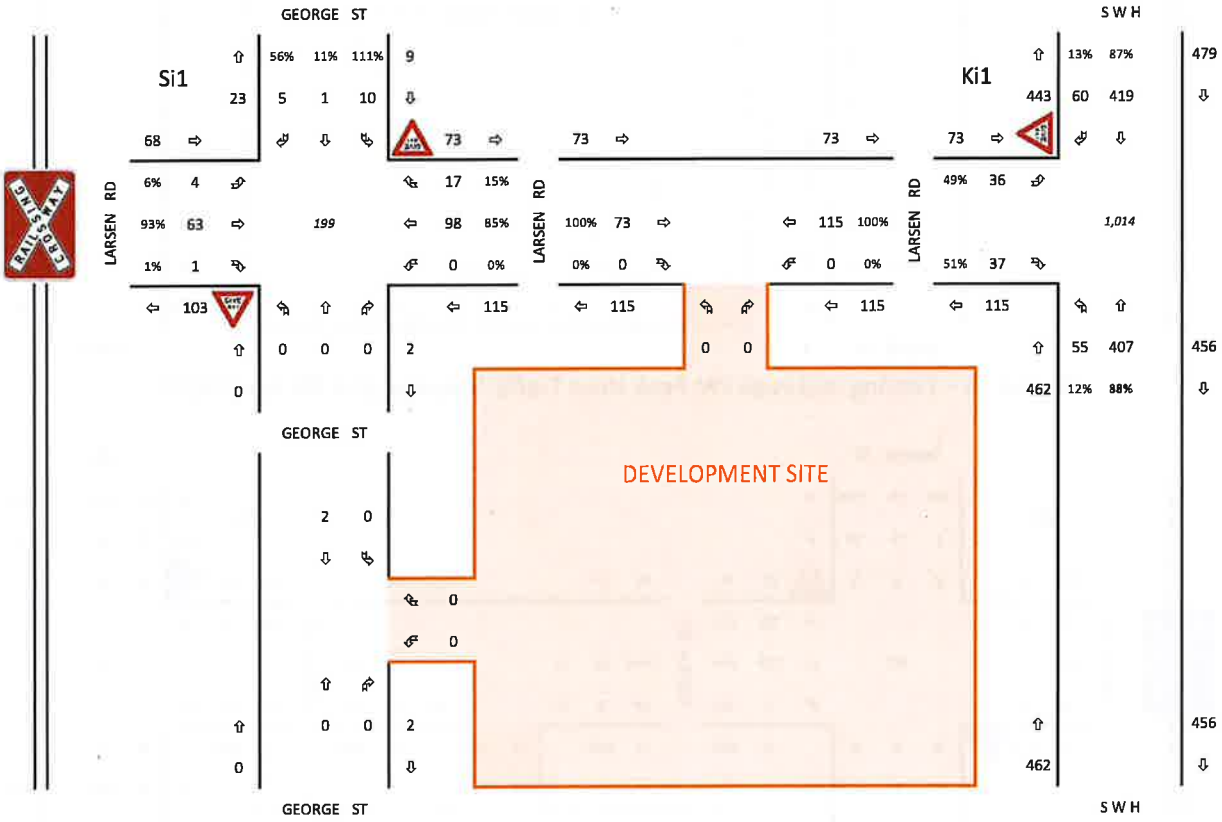



Figure 12 – Existing midweek PM Peak Hour Traffic Volumes (1-2 PM April 2018)

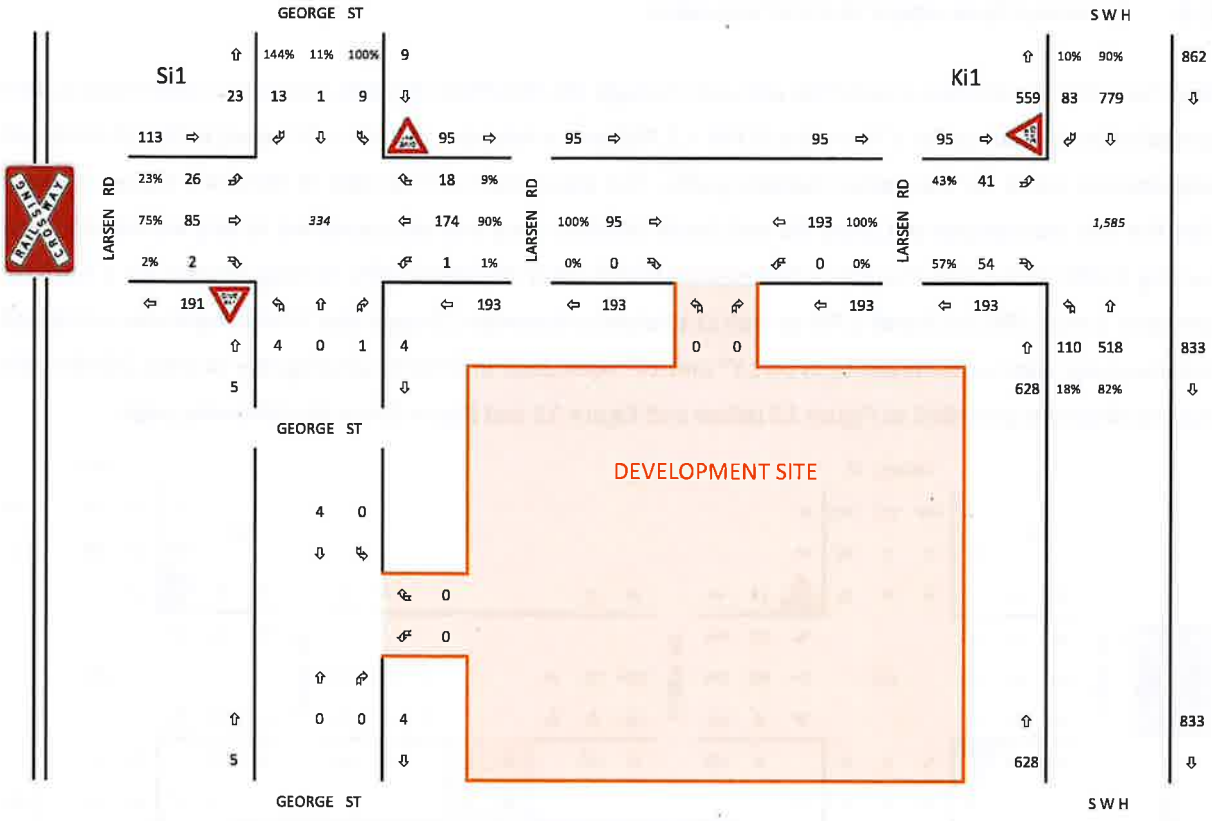



Figure 13 – Existing midweek PM Peak Hour Traffic Volumes (4-5 PM April 2018)

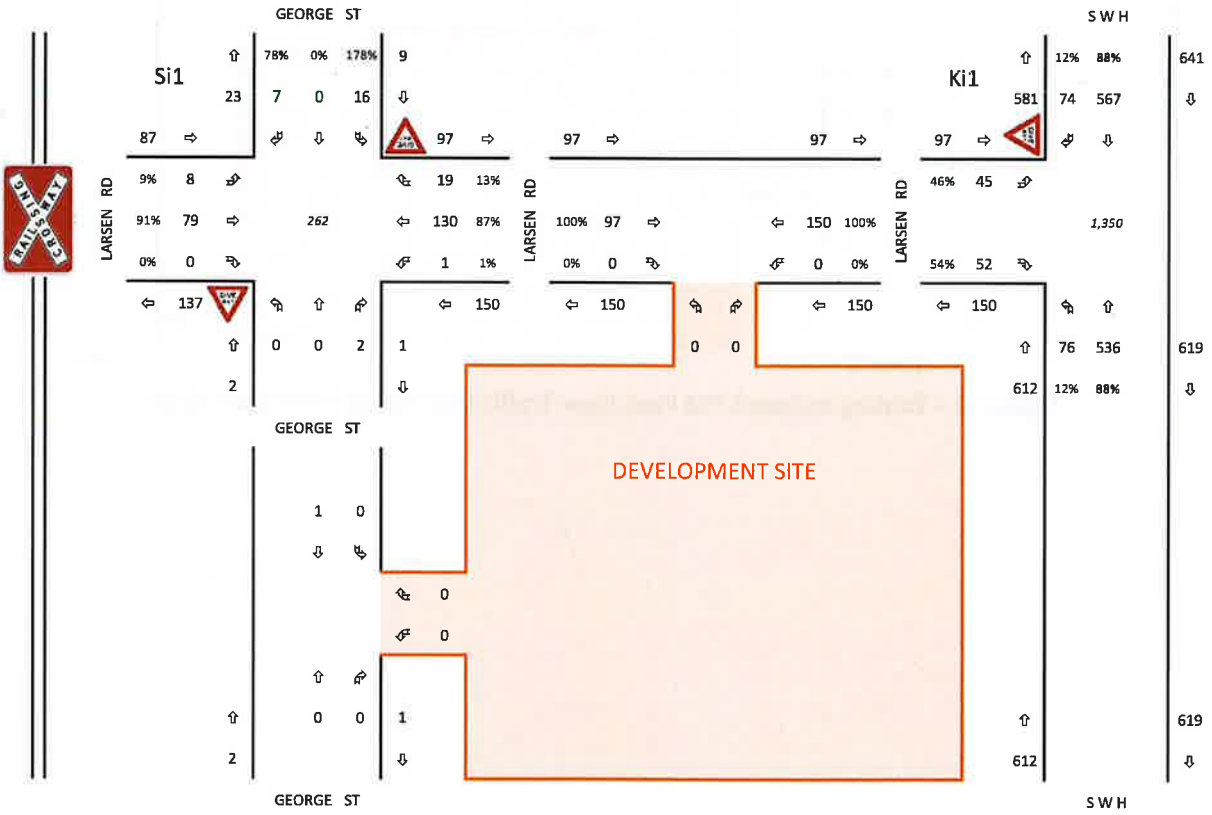



Figure 14 – Existing Saturday mid-day Peak Hour Traffic Volumes (12 noon – 1 PM April 2018)

# 3 DEVELOPMENT PROPOSAL

It is proposed to demolish all existing buildings on site and construct 4 buildings with parking and service areas throughout as shown in Figure 3 on page 10. The site will comprise of 630 $m^2$ Gross Floor Area of Restricted Retail, 400 $m^2$ Gross Floor Area of Vehicle Service Centre, a self-service car wash with 4 manual wash bays and 1 automatic wash bay and an 8 fuel-point service station with a Convenience Store + Drive-Thru Coffee. The car park comprises of 71 standard bays, 3 ACROD bays, 1 waiting bay and 3 loading bays.

The proposed development will not have fuel facilities for large vehicles. As such, the largest vehicles expected to access and egress the site is the 19 m Semi Trailer Fuel Tanker servicing the site at intervals of 2-3 times per week for a maximum duration of 1 hour for each service. The 12.5 m Heavy Rigid Vehicle will be the typical delivery and service vehicle for waste collection and stock deliveries to all tenancies.

It is proposed to provide full vehicular access off Larsen Rd and George St, i.e. no direct access off South Western Highway, in accordance with the agreed Main Roads WA/ Shire of Serpentine-Jarrahdale Access Strategy, as discussed in **Section 4.3**.

# 4 DEVELOPMENT + TRANSPORT PROPOSALS

## 4.1 PROPOSED DEVELOPMENTS

There is a current proposal for a Service Station and takeaway food outlet on Lots 30 & 31 (SN 801 & 803) on the west side of South Western Hwy approximately 250 m south of the subject site, as shown in Figure 15 below.

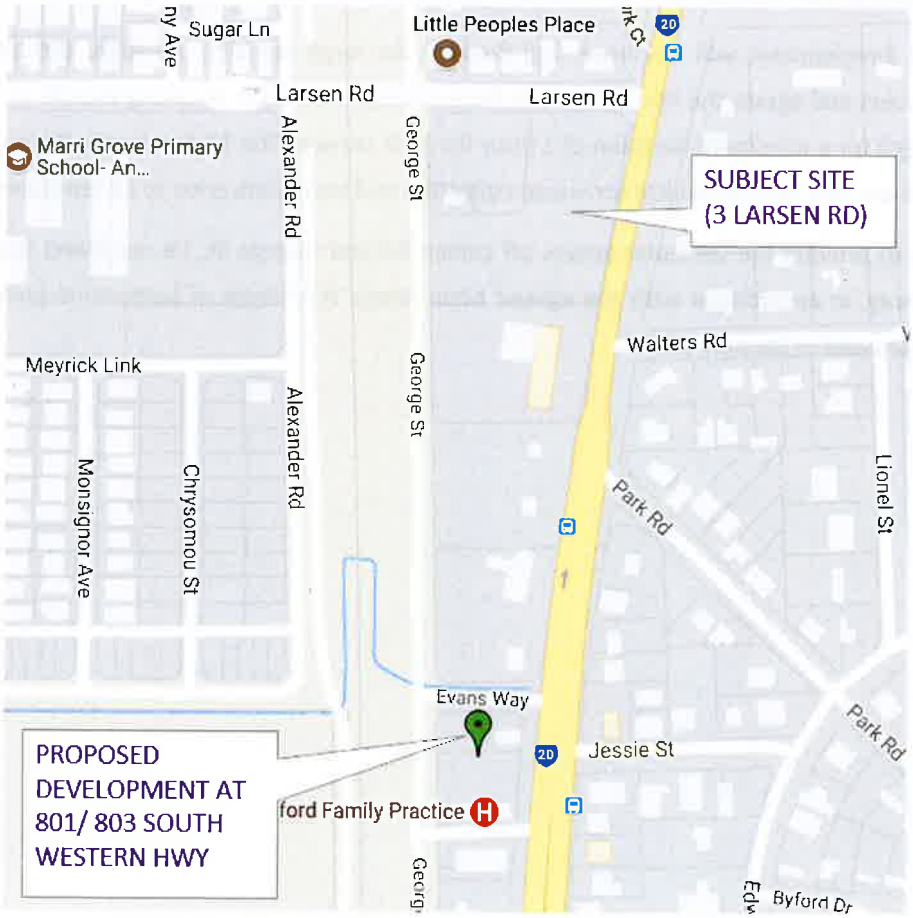



Figure 15 – Proposed development in vicinity of subject site

A Transport Impact Assessment report was prepared by Transcore for this development (Report No t17.170-3). The TIA for the subject site at 3 Larson Rd, i.e. this TIA, considers the cumulative traffic impacts associated with the proposed development at 801 and 803 based on the findings within the Transcore TIA.

An Aldi supermarket is nearing completion at 845 South Western Hwy which is approximately 900 m south of the subject site. Trip generation associated with this has been accommodated by applying 1% per annum growth on George St and Larsen Rd. Increased traffic on South Western Hwy is included in the 1% per annum growth applied to this road.

Refer **Sections 4.2** and **4.3** for details regarding proposed changes to the road network and public transport network respectively.

## 4.2 Proposed Road Network Changes

A review of various planning documents and discussions with the Shire of Serpentine Jarrahdale's planning officer on 9th March 2018 has revealed that there are a number of proposed changes to the road and public transport network that need to be considered as part of this traffic impact assessment report. A summary of these changes has been prepared by the author and is provided as Figure 16 below. In addition to the network changes, there are proposals to upgrade South Western Hwy north of Park Rd, including upgrading the Larsen Rd intersection and proposals to upgrade George St. Refer **Sections 4.3** and **4.4** respectively for more details.


Figure 16 – Summary of road and public transport network proposals in vicinity of the subject site

It is important to note that all of the above are subject to approval and change and that there are no firm dates for implementation. The biggest impact on the subject site is considered to be the proposal to relocate the railway level crossing on Larsen Rd further south, which will necessitate the full construction of George St as well as the closure of Larsen Rd on both sides of the railway, effectively changing the existing 4-way intersection with Larsen Rd as the through road (Si1) to a 'T' intersection with George St as the through road.

## 4.3 SOUTH WESTERN HIGHWAY UPGRADE PROPOSAL

Main Roads WA has an agreed Vehicle Access Strategy for South Western Highway with the Shire of Serpentine-Jarrahdale, as confirmed in its formal submission to Local Planning Policy No 31 (LPP 31) – Byford Town Centre – Built Form Guidelines. This Access Strategy articulates that "no vehicle access is available from South Western Highway where there is an alternate access point."

The proponent has held extensive discussions with Main Roads WA officers which resulted in altering the initial design to remove all direct vehicular access off South Western Highway, as per the Development Drawings included in **Appendix A**. The proponent has secured support for the development subject to upgrading the intersection at Larsen Rd consistent with the conceptual layout shown on the Main Roads WA Access Strategy drawings as shown in the extract provided as Figure 17. The Development Drawings in **Appendix A** show the same outlines in red. The formal MRWA approval conditions are reproduced on the following page.


Figure 17 – Extract from Main Roads WA South Western Highway Access Strategy drawing

Main Roads WA Approval Conditions (sourced from Metro East JDAP Agenda 17 October 2018)

"Main Roads advises that it has no objection subject to the following conditions being imposed:

1. Redundant crossover on South Western Highway shall be removed and the verge reinstated at the applicant's cost. The applicant is to advise Main Roads when this has been completed.
2. Modifications to South Western Highway must be in accordance with Main Roads Supplement to Austroads Guide to Road Design - Part 4 and Part 4A dated 18 September 2018 and consistent with future widening to South Western Highway as depicted on Main Roads Plan 2012-0002 dated approved 4 April 2012 and overlayed on Draft Master Plan Revision P3 dated 22 August 2018 (both attached). In particular:
    a. Left and right turn auxiliary lanes from South Western Highway onto Larsen Road, as depicted on Drawing No. TP03.1 Revision dated 14 September 2018 (reproduced as Figure 18 on the following page) must be designed in accordance with Main Roads Supplement to Austroads - Part 4, Section 5 and Appendix A.6 Auxiliary Lane Turn Treatments.
    b. The median on Larsen Road, as depicted on Drawing No. TP03.1 Revision dated 14 September 2018 (attached) must be as per Main Road Supplement to Austroads - Part 4A, Section 6.

Advertising Signage

3. The type of signs, size, content and location must comply with all relevant by-laws and planning schemes made by Council.
4. The signs and sign structures are to be placed on private property and shall not over hang or encroach upon the road reserve.
5. For the signs that are illuminated, it must be of a low-level not exceeding 300cd/m2, not flash, pulsate or chase.
6. The device shall not contain fluorescent, reflective or retro reflective colours or materials.

**In accordance with the above conditions, the proponent has confirmed that these conditions will be met during the detailed design stage and in discussion with Main Roads WA. This TIA includes assessment of the development with the intersection upgraded in accordance with the above stated conditions.**

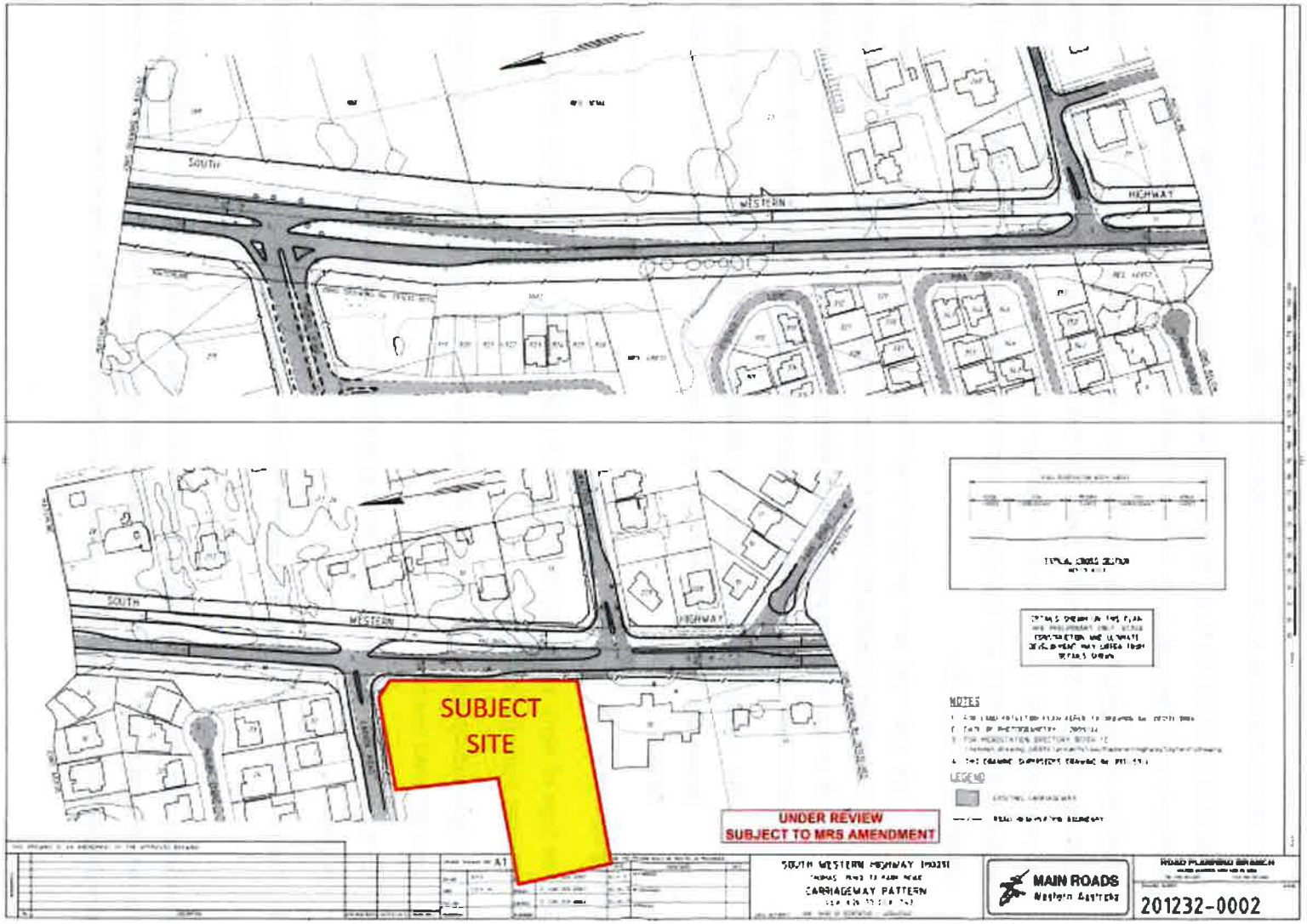



Figure 18 – Main Roads WA Drawing No. TP03.1 Revision dated 14 September 2018 (with 'Subject Site' overlaid)

DEVELOPMENT ASSESSMENT PANEL
APPROVED
11-Dec-2018

## 4.4 GEORGE STREET UPGRADE PROPOSAL

The Shire of Serpentine-Jarrahdale has advised, in an email dated 25 October 2018, that:

"George Street is planned to be the high street in Byford by the shire. Main roads recent access policy has been to discourage direct access to the highway and to favour access off George Street. Whilst George St is not line marked the shire does not consider it safe to have service vehicles sweeping across the total George street pavement when entering and exiting the development. George St is intended to be passenger vehicle and pedestrian in nature. Service Vehicles entering and exiting the development should be lane compliant when making turning manoeuvres on George St."

The above statement is not consistent with providing the required access for the adopted design vehicles as there are many properties between South Western Highway and George St that only have frontages to these streets. Main Roads WA has indicated that the Shire has agreed to restricting access off South Western Hwy which in turn requires that the majority of properties between George St and South Western Hwy will only have vehicular access off George Street. Many of these properties are zoned commercial and have a requirement for servicing by heavy vehicles up to the standard 19 m semi-trailer. To require that commercial vehicular access is provided off George St is not consistent with the statement that "George St is intended to be passenger vehicle and pedestrian in nature". It will be regularly used by commercial vehicles and requires to be designed in accordance with this function. The alternative is to provide commercial vehicular access off South Western Highway.

The Shire's statement that it "does not consider it safe to have service vehicles sweeping across the total George street pavement when entering and exiting the development" and that "Service Vehicles entering and exiting the development should be lane compliant when making turning manoeuvres on George St." is not consistent with currently approved developments along George St, as shown in Photograph 11 on the following page.

The practice of allowing service vehicles to enter and leave access driveways within the boundaries of the roadway, i.e. kerb lines, is permitted in Section 3.4.1(a) of Australian Standard AS 2890.2 (4), i.e.:

"On a minor public road, vehicles shall be able to enter and leave the access driveway without infringing the boundaries of the roadway. Local authorities may place further limits and controls on the extent to which movement across the centre-line of the roadway is allowed."

Refer further comment and assessment regarding the access to and from the site in **Section 15**.


Photograph 11 – Recently approved Aldi service area off George Street showing swept path of 19 m ST leaving the site and turning left or right into George St

## 4.5 PROPOSED PUBLIC TRANSPORT NETWORK

Planning work is underway to extend the Armadale Line approximately eight kilometres south to Byford.

This early planning and research takes into account a range of considerations, such as station location, precinct development opportunities, connections, constructability and community impact.

The METRONET Office is working closely with the Shire of Serpentine-Jarrahdale on developing a number of viable options for a transport solution which provides opportunities for urban development, however at this point there is no confirmed or preferred location for the station.

The intent of thorough planning is to identify the best location and alignment of the extension so that it supports plans for growth in the area, as well as creating an employment hub and boosting residential development.

Details on the construction method and timeframe will be developed during the planning phase. It is estimated the project business case and Project Definition Plan will be completed in late 2018.

The rail proposals are driven by population numbers, as shown in the following extract from the Perth and Peel @ 3.5 Million and Beyond publication.


Figure 19 – Public Transport Rail Network @3.5 Million and Beyond (showing Byford as No 5)

# 5 INTEGRATION WITH SURROUNDING AREA

Figure 2 on page 9, Figure 4 on page 12 and Figure 5 on page 14 all indicate that the proposed development is well connected to public transport, freight, cycling and walking facilities.

The provision of services such as the Service Station, Convenience Store, Drive-Thru Coffee, Car Wash, Vehicle Service Store and Retail are likely to be well patronised by passing traffic on South Western Highway (up to 70%) which in turn will reduce the overall impact of the development in terms of increased traffic volumes.

Byford is a town within the Shire of Serpentine-Jarrahdale community halls, two state schools, clubs, sporting oval, trotting complex, a range of shops and businesses, a flour mill, and farms in the surrounding rural areas.

In 1977, the local government responsibilities for Byford were transferred from the Shire of Armadale-Kelmscott (now the City of Armadale) to the Shire of Serpentine-Jarrahdale. Recently, Byford has become an extension of the Perth metropolitan area, connected to the Kwinana Freeway by Thomas Road, and has experienced a substantial rise in population. Historically, Byford's rural land supported sheep, beef and dairy cattle, orchards, and a vineyard (Sunrays, owned by the Vlasich family) but in recent decades there has been an increase in hobby farms geared to equine pursuits, and more recently housing estates with generous lot sizes.

# 6 ASSESSMENT YEARS AND TIME PERIODS

The WAPC Transport Impact Assessment Guidelines recommends that the appropriate assessment years include the year of opening of the development and 10 years after opening.

The subject site is expected to be fully developed and operational by 2020 and hence it is reasonable to adopt a 2020 'Operating Year' and 2030 'Horizon Year' (10 years later).

A review of historical traffic volume data for South Western Highway (Figure 20 below) has indicated that a Compound Annual Traffic Growth Rate (CATGR) of 1% is appropriate for this road up to the 'Horizon Year' of 2030 although there is a possibility of a reduction in this growth rate due to the provision of the Metronet rail extension to Byford, including a new train station (refer **Section 4.3**).

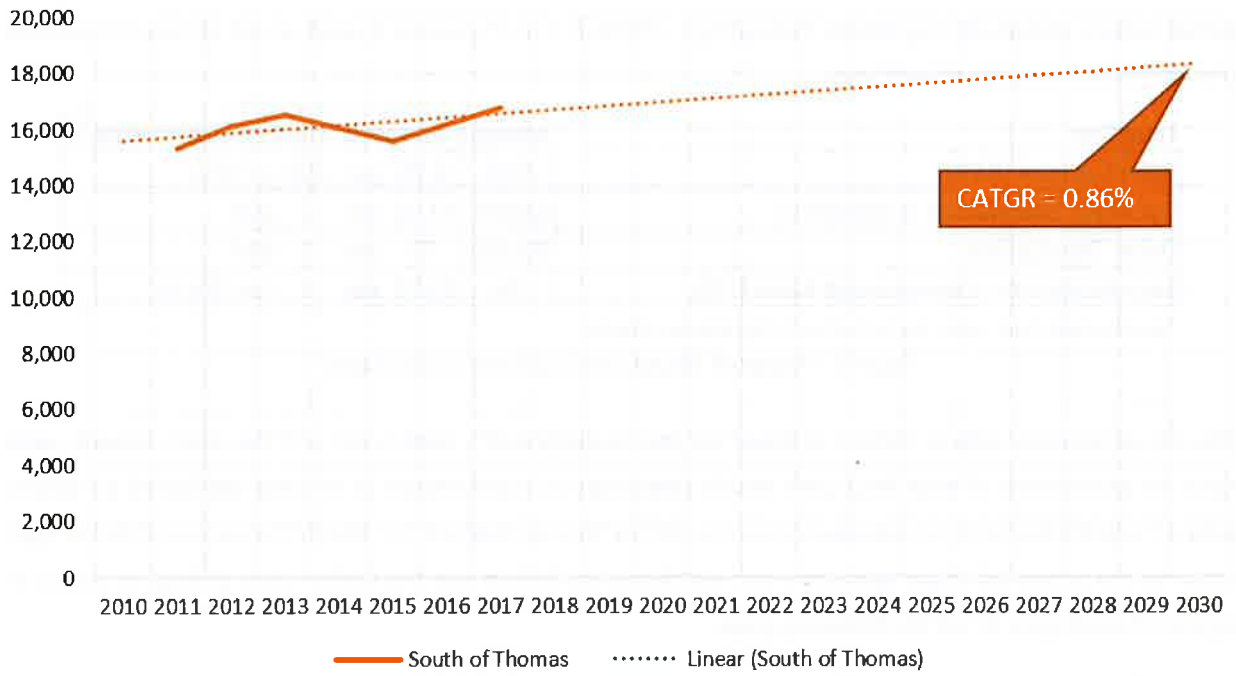



Figure 20 – Existing and forecast Annual Daily Traffic volumes on South Western Hwy past the subject site

Note that the above determination considers that South Western Hwy remains as a single lane in each direction mid-block and hence traffic volumes are constrained to around 20,000 vehicles per day (or 1,000 vehicles per lane per hour).

# 7 DEVELOPMENT GENERATION AND DISTRIBUTION

It is not considered appropriate to use standard trip generation rates for each element within developments with different land uses and then add these up as there can be significant differences in each land use's peak traffic generation times and days as well as a high likelihood of 'shared trips', i.e. a single trip to or from two or more different land uses.

Trip generation data for each of the proposed land uses, including source notes, are shown in Table 2 below. RMS refers to updated data to the Roads and Traffic Authority NSW document Guide to Traffic Generating Developments provided by the RTA's subsequent authority, i.e.: Roads and Maritime Services Guide to Traffic Generating Developments' Updated traffic surveys (4). ITE refers to the Institution of Transport Engineers (USA) (5) and SpackC refers to Spack Consulting, an open source trip generation service based on ITE and additional traffic surveys and data. Bitzios refers to a comprehensive trip generation study of 10 drive-thru coffee outlets undertaken by Bitzios Consulting in 2016. A mix of sources is used as not all sources contain trip generation data for all land uses.

| Land Use | Source | Adopted Trip Generation Rate* |
|---|---|---|
| Business Park (RMS) | RMS | 0.78 per 100 $m^2$ GFA |
| Car Wash (standalone automated) | SpackC | 17.00 per 1 stall |
| Drive-Thru Coffee | Bitzios | 70 per 1 site |
| Service Station + Convenience Store (ITE) | ITE | 13.51 per 1 Fuel Point |

*Development Peak - Refer Hourly Profiles for Road Network Peaks

Table 2 – Adopted Mixed Use Trip Generation Rates

The trip generation data in Table 2 is based on the development's peak hour, not the road network peak hour. An assessment of each land use's hourly patronage as a percentage of its peak use based on survey data of local similar land use developments (i.e. Caltex Service Station/ Car Wash/ Convenience store/ Tyre Store on the corner of South Western Hwy/ Nettleton Rd, Byford and the Coffee Club, Byford) is shown in Figure 21 and Figure 22 on the following page.

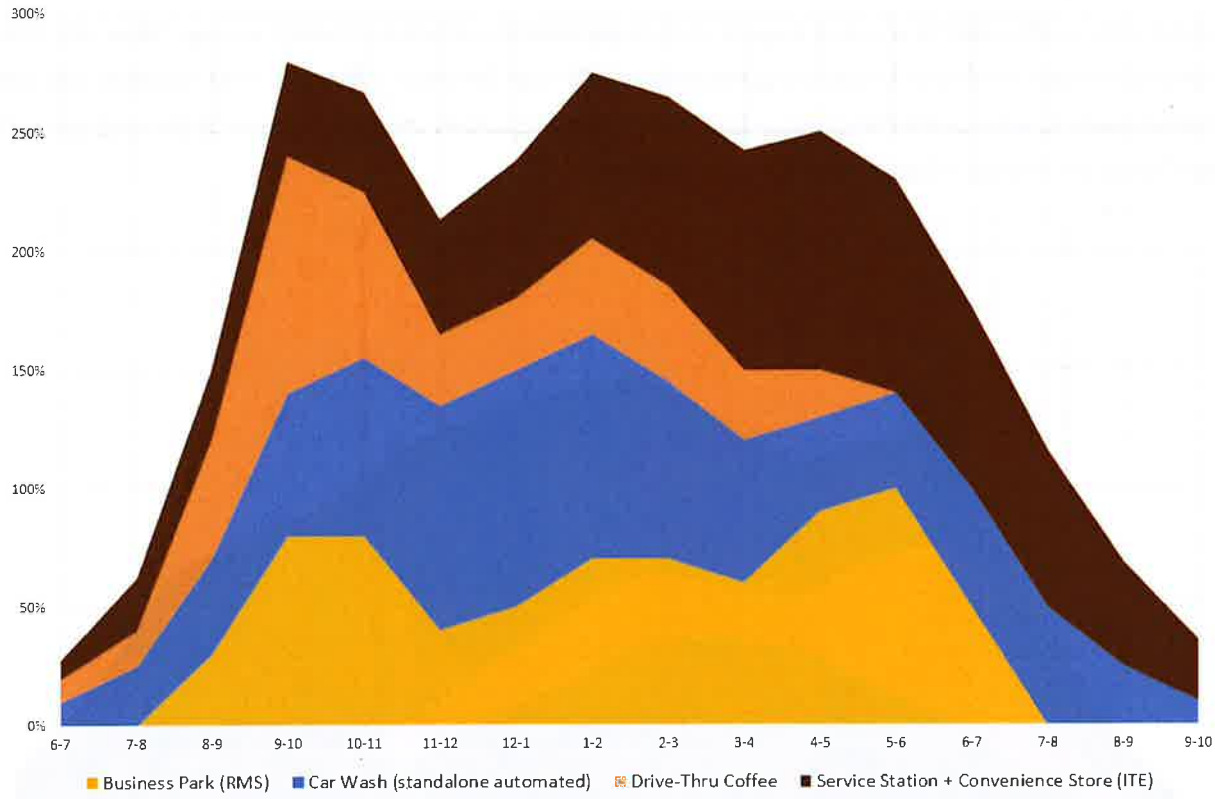



Figure 21 – Assessed weekday mixed-use development cumulative hourly trip generation profile

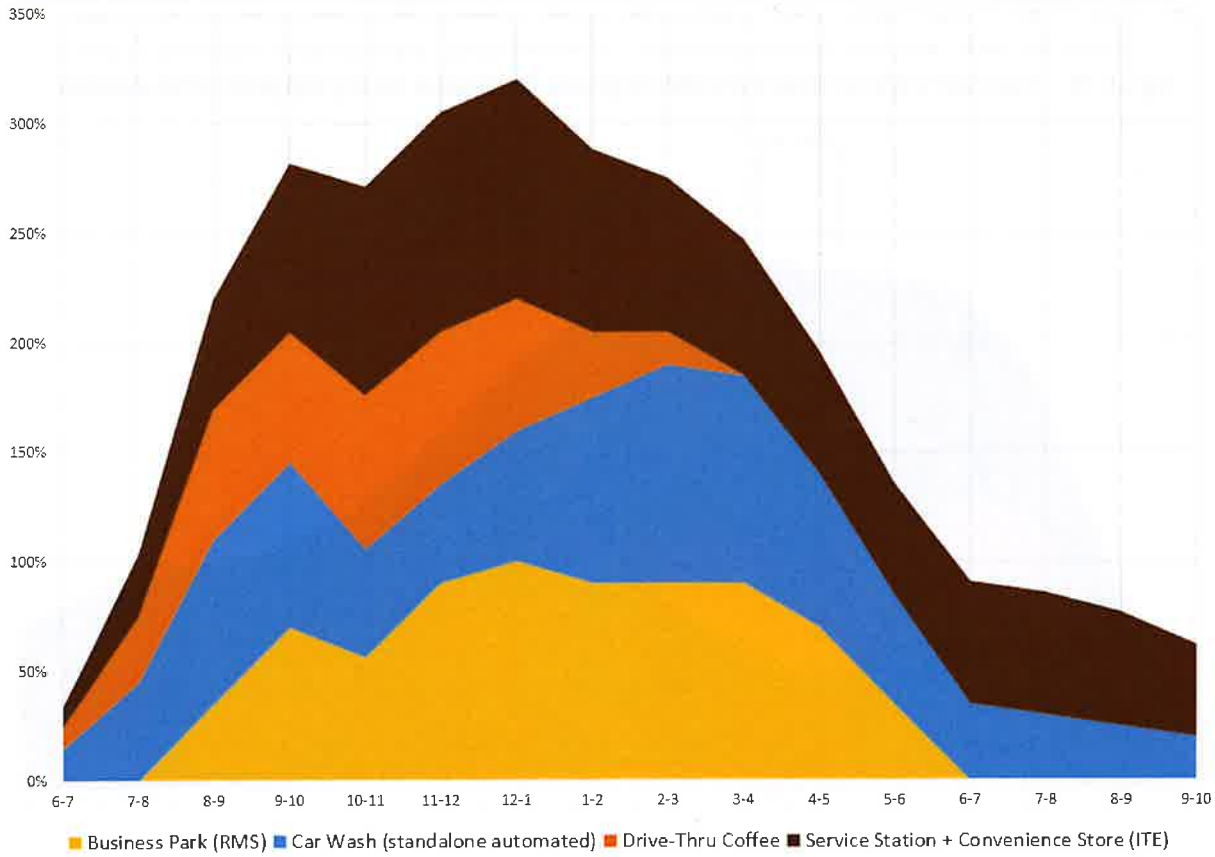



Figure 22 – Assessed Saturday mixed-use development cumulative hourly trip generation profile

Applying the profiles on the previous page to the trip generation indicated in Table 2 on page 38 results in an assessed forecast maximum hourly trip generation of **190** trips between 1 PM and 2 PM midweek and **209** trips between 12 noon and 1 PM on Saturdays. Full hourly assessment volumes, along with the road network peak hours, are shown in Figure 23 and Figure 24 below.

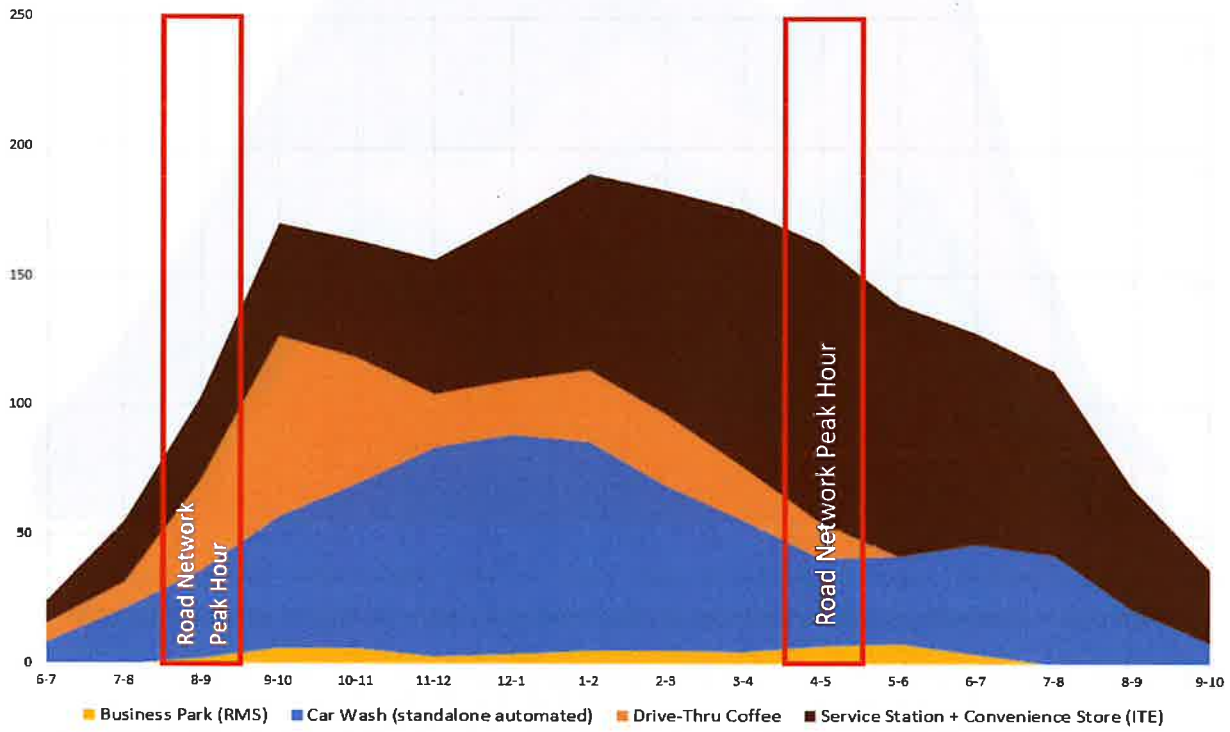



Figure 23 – Assessed weekday mixed-use development cumulative hourly trip generation volumes

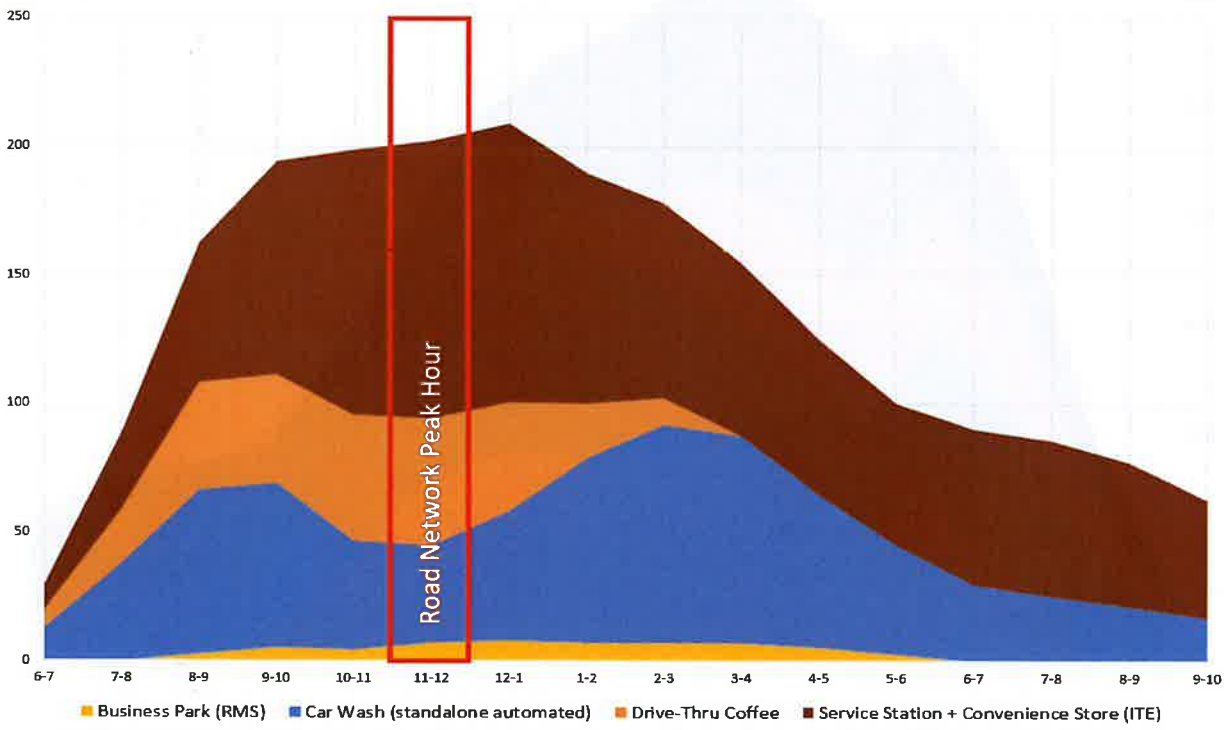



Figure 24 – Assessed weekend mixed-use development cumulative hourly trip generation volumes

In order to add value to the forecast data, the author undertook detailed surveys of traffic into and out of the existing Caltex Service St/ Convenience Store/ Car Wash and Tyre Outlet/ Repair Centre with additional commercial tenancies on the corner of South Western Hwy and Nettleton Rd which is located approximately 1.5 kms south of the subject site, as shown in Photograph 12 below.


Photograph 12 – Existing similar development on South Western Hwy 1.5 km south of subject site

A survey of all traffic in and out of this development site (including the car wash at the rear and the adjacent tyre shop) between 2 PM and 3 PM on Saturday 14th April indicated that 61 vehicles entered the site and 65 vehicles left the site during this time, a total of 126 vehicles. Using the adopted trip generation rates and hourly profiles in this TIA report, the forecast trip generation (minus the drive-thru coffee land use) would be 167 trips. On this basis, the adopted rates are a conservative estimate and hence appropriate.

# 8 DESIGN TRAFFIC FLOWS

The assessment in **Section 7** has indicated that the midweek development and road network peak hours are separated by 2-3 hours and have significantly different volumes. The Saturday development and road network peak hours are only an hour apart. Based on this it is considered appropriate to model and assess the following three peak hours:

- Midweek 1 PM- 2 PM (Development peak hour);
- Midweek 4 PM- 5 PM (Road Network peak hour); and
- Saturday 12 noon – 1 PM (Combined Development and Road Network maximum volumes).

The assessed trip generation, distribution (IN/ OUT split) and assignment for each of these peak hours is shown in Figure 25 below, and Figure 26 and Figure 27 on the following page.

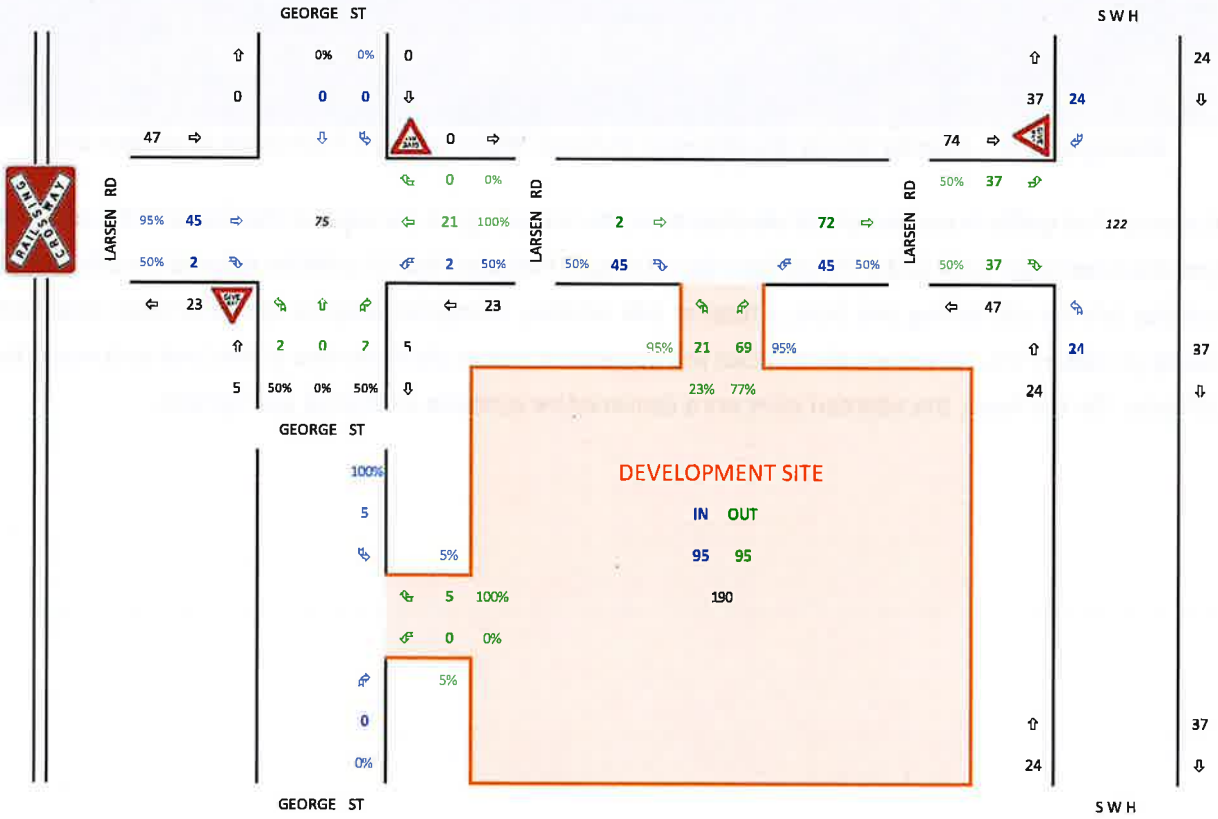



Figure 25 – Forecast 1 PM – 2 PM midweek Trip Generation, Distribution and Assignment

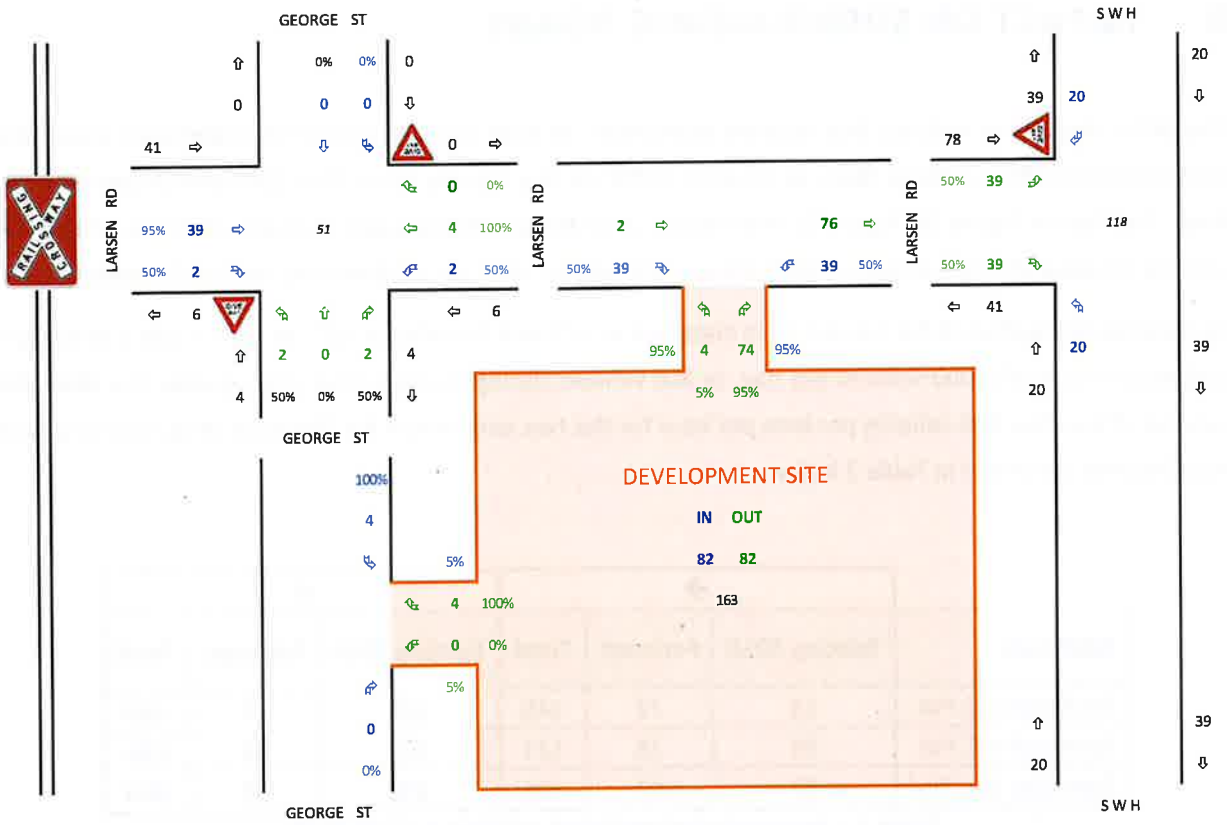



Figure 26 – Forecast 4 PM – 5 PM midweek Trip Generation, Distribution and Assignment

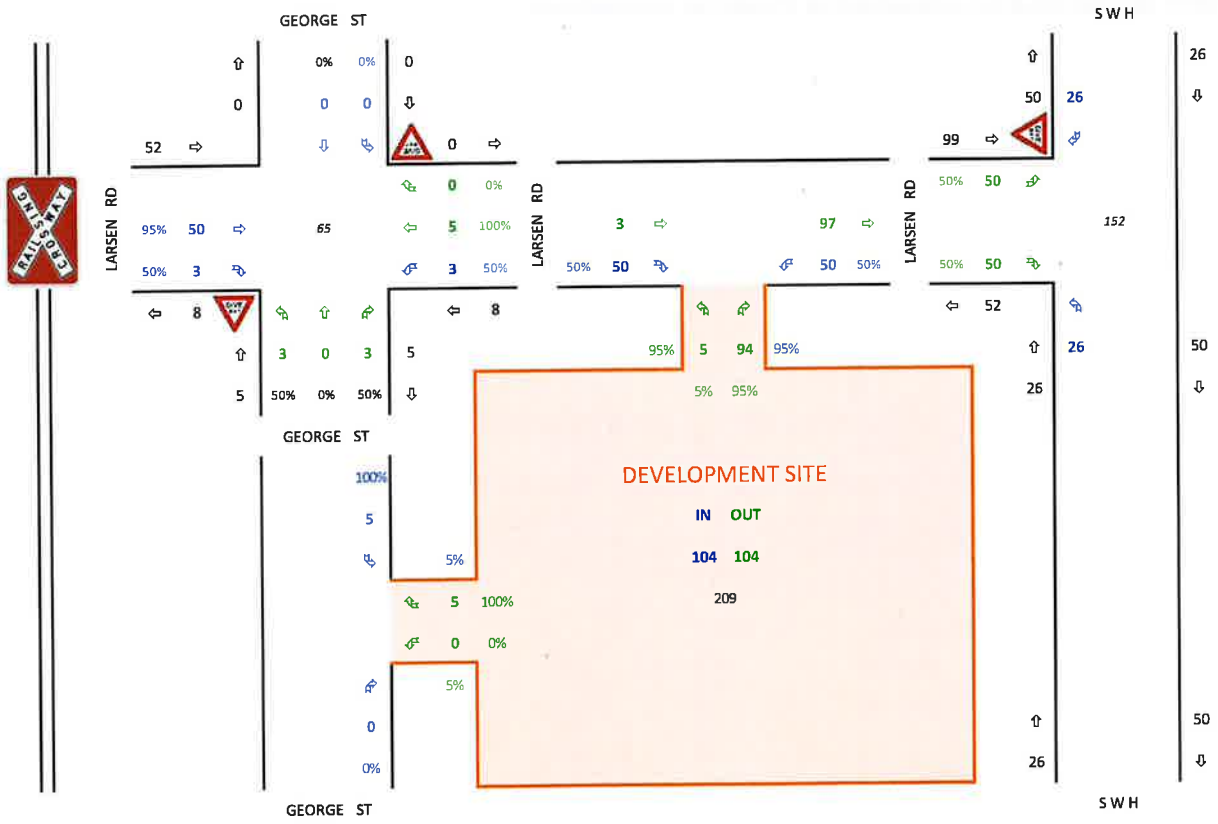



Figure 27 – Forecast 12 noon 1 PM Saturday Trip Generation, Distribution and Assignment

# 9 IMPACT ON SURROUNDING ROADS

The WAPC Guidelines indicate that detailed assessment of road sections should be undertaken where the development traffic would be likely to increase traffic on any lane by more than 100 vehicles per lane per hour. The data in Figure 25, Figure 26 and Figure 27 on the preceding pages indicates that this will be the case for eastbound traffic on Larsen Rd between the subject site's access driveway and South Western Hwy.

As indicated in **Section 2.2.2**, Larsen Rd is classified as a "Local Distributor Rd", as such it has a maximum desirable volume of 6,000 vehicles per day, or 600 vehicles during its peak hour. This equates to a desirable volume of less than 300 vehicles per lane per hour for the two-lane Larsen Rd. The total peak hour volume is less than this, as shown in Table 3 below.

| | → | | | ← | | |
|---|---|---|---|---|---|---|
| **Midblock** | **Existing 2018** | **Forecast** | **Total** | **Existing 2018** | **Forecast** | **Total** |
| Midweek 1-2 PM | 73 | 72 | 145 | 115 | 45 | 160 |
| Midweek 4-5 PM | 95 | 76 | 171 | 193 | 39 | 232 |
| Saturday 12-1 PM | 97 | 97 | 194 | 150 | 50 | 200 |

Table 3 – Assessed total mid-block volumes on Larsen Rd

Refer **Section 10.2** for assessment of impact on intersections.

# 10 IMPACT ON INTERSECTIONS

## 10.1 ASSESSED INTERSECTIONS AND TIMES

The WAPC Guidelines recommend that all intersections where flows are likely to increase by 10% should be assessed in detail. An assessment of increased flows through both of the assessed intersections has been undertaken and is shown in Table 4 and Table 5 below.

| Ki1 | Midweek | | Saturday |
|---|---|---|---|
| | 1 PM - 2 PM | 4 PM - 5 PM | 12 noon - 1 PM |
| Existing | 1,014 | 1,585 | 1,350 |
| Additional | 122 | 118 | 152 |
| Impact | 12.0% | 7.5% | 11.2% |

Table 4 – Assessed volume impacts at Ki1: Larsen Rd/ South Western Hwy

| Si1 | Midweek | | Saturday |
|---|---|---|---|
| | 1 PM - 2 PM | 4 PM - 5 PM | 12 noon - 1 PM |
| Existing | 199 | 334 | 262 |
| Additional | 75 | 51 | 65 |
| Impact | 37.8% | 15.2% | 24.8% |

Table 5 – Assessed volume impacts at Si1: Larsen Rd/ George St

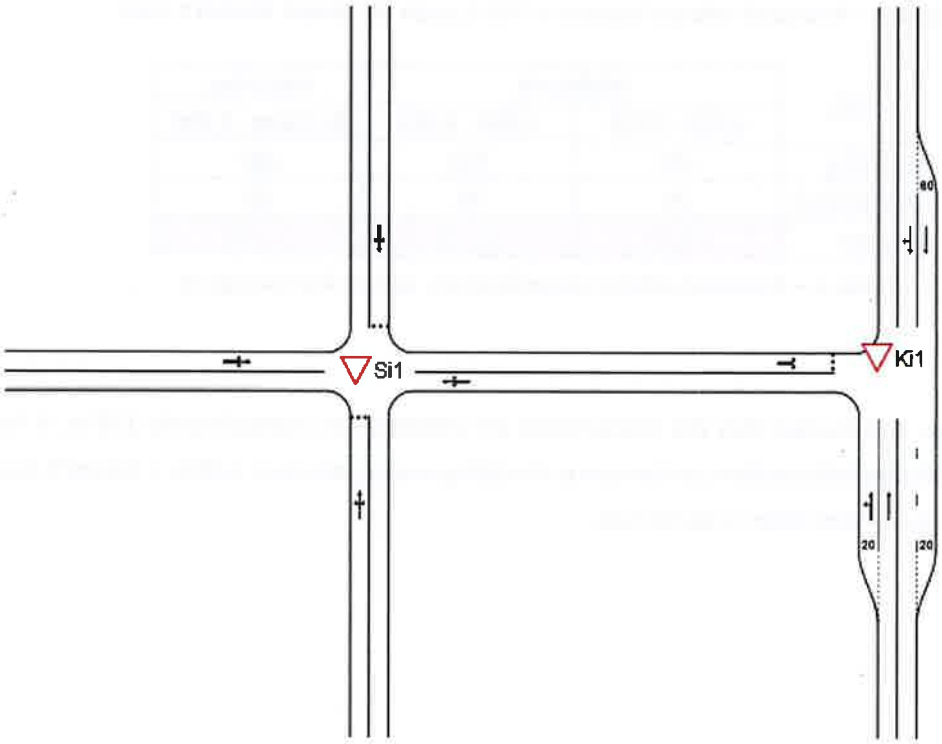
Based on the above, and the fact that the intersections are separated by approximately 150 m, it has been determined that detailed intersection performance modelling and assessment within a network model for each of the three assessment times is warranted.

## 10.2 NETWORK MODELLING

The existing traffic data has been used to develop a network model within SIDRA Intersection 6.1.

SIDRA Intersection is a "Signalised (and unsignalised) Intersection Design and Research Aid". The SIDRA Intersection software (older versions known as SIDRA and aaSIDRA) is an advanced lane-based micro-analytical tool for the design and evaluation of individual intersections and networks of intersections including modelling of separate Movement Classes (Light Vehicles, Heavy Vehicles, Buses, Bicycles, Large Trucks, Light Rail / Trams etc...). It provides estimates of capacity, level of service and a wide range of performance measures including delay, queue length and stops for vehicles and pedestrians, as well as fuel consumption, pollutant emissions and operating cost.

The SIDRA Intersection Network model is shown in Figure 28 below.




| SITES IN NETWORK | |
|---|---|
| Site ID | Site Name |
| Ki1 | Ki1: Larsen Rd/ South West Hwy Existing PM |
| Si1 | Si1: Larsen Rd/ George St Existing PM |

SIDRA INTERSECTION 6.1 | Copyright © 2000-2015 Akcelik and Associates Pty Ltd | sidrasolutions.com
Organisation: I3 CONSULTANTS WA | Created: Wednesday, 11 April 2018 20:05:57
Project: D:\Users\David\Documents\i3\i3c 2015_17 Projects\WIP\Peter Webb & Associates (029)\09204 Lot 104 SWH_Larsen Rd Byford TIS\Technical \SIDRA\09204 SN3 Larsen Rd Byford.sip6

Figure 28 – SIDRA Intersection 6.1 Si1 & Ki1 network model layout

An explanation of the various intersection performance criteria assessed and reported within this TIA is provided as Table 6 below.

| SIDRA v/c & colour code | LoS | Average Delay per vehicle (d) in seconds | | | | v/c Range | Performance Comments |
|---|---|---|---|---|---|---|---|
| | | Unsignalised intersections | Roundabouts | Signalised intersections | All (RTA) | | |
| <0.6 | A | d ≤ 10 | d ≤ 10 | d ≤ 10 | d ≤ 14.5 | ≤ 0.44 | **Good operation and plenty of spare capacity** *Stable free flow conditions where drivers are able to select desired speeds and to easily manoeuvre within the traffic stream.* |
| | B | 10 < d ≤ 15 | 10 < d ≤ 20 | 10 < d ≤ 20 | 14.5 < d ≤ 28.5 | | |
| | C | 15 < d ≤ 25 | 20 < d ≤ 35 | 20 < d ≤ 35 | 28.5 < d ≤ 42.5 | 0.45 - 0.64 | **Acceptable delays and spare capacity** *Stable flow but most drivers are restricted to some extent in their ability to select their desired speed and to manoeuvre within the traffic stream.* |
| 0.6 - 0.7 | D | 25 < d ≤ 35 | 35 < d ≤ 50 | 35 < d ≤ 55 | 42.5 < d ≤ 56.5 | 0.65 - 0.84 | **Acceptable delays** (Expected typical peak hour conditions) *Close to the limit of stable flow. All drivers are restricted in their ability to select their desired speed and to manoeuvre within the traffic stream. Small increases in traffic flow may cause operational problems.* |
| 0.7 - 0.8 | | | | | | | |
| 0.8 - 0.9 | E | 35 < d ≤ 50 | 50 < d ≤ 70 | 55 < d ≤ 80 | 56.5 < d ≤ 70.5 | 0.85 - 1.04 | **Near capacity and senstive to disturbances in flows** *Traffic volumes are close to capacity and there is virtually no freedom to select desired speeds. Flow is unstable and minor disturbances within the traffic stream will cause breakdown leading to long queues and delays.* |
| 0.9 - 1.0 | | | | | | | |
| >1.0 | F | 50 < d | 70 < d | 80 < d | 70.5 < d | >1.25 | **At Capacity** - Requires other control mode and/ or additional lanes *In the zone of forced flow where the amount of traffic approaching the point under consideration exceeds that which can pass. Flow breakdown occurs and extensive queues and delays result.* |

Table 6 – Assessed intersection performance criteria

### 10.2.1 Existing Performance

The existing Degree of Saturation of the two intersections during the midweek and Saturday road network peak hours is shown in Figure 29 below. Assessment of other intersection performance criteria is included in the SIDRA Intersection summary tables in **Appendix B.**

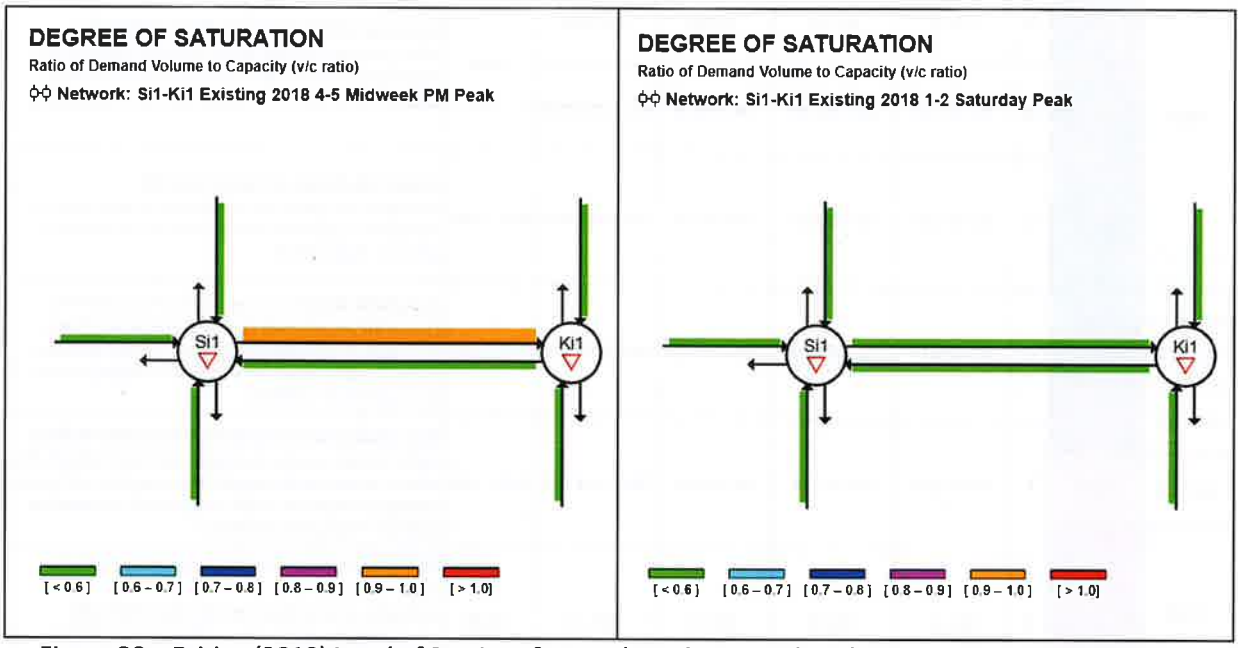



Figure 29 – Exiting (2018) Level of Service of Si1 and Ki1 during midweek PM and Saturday peak hours

Figure 29 indicates that both intersections currently perform with no delays to through movements on South Western Hwy and good operation of the Larsen Rd/ George St intersection with plenty of spare capacity. The Larsen Rd approach to South Western Hwy operates with acceptable delays and spare capacity during the Saturday peak hour but approaches capacity and is sensitive to disturbances in flows during the midweek afternoon peak hour. Any increased traffic flows through the intersection is therefore likely to result in capacity concerns.

### 10.2.2 Forecast 2020 Performance

The forecast Degree of Saturation of the two intersections during the midweek and Saturday road network and development peak hours is shown in Figure 30 below. Assessment of other intersection performance criteria is included in the SIDRA Intersection summary tables in **Appendix B.**

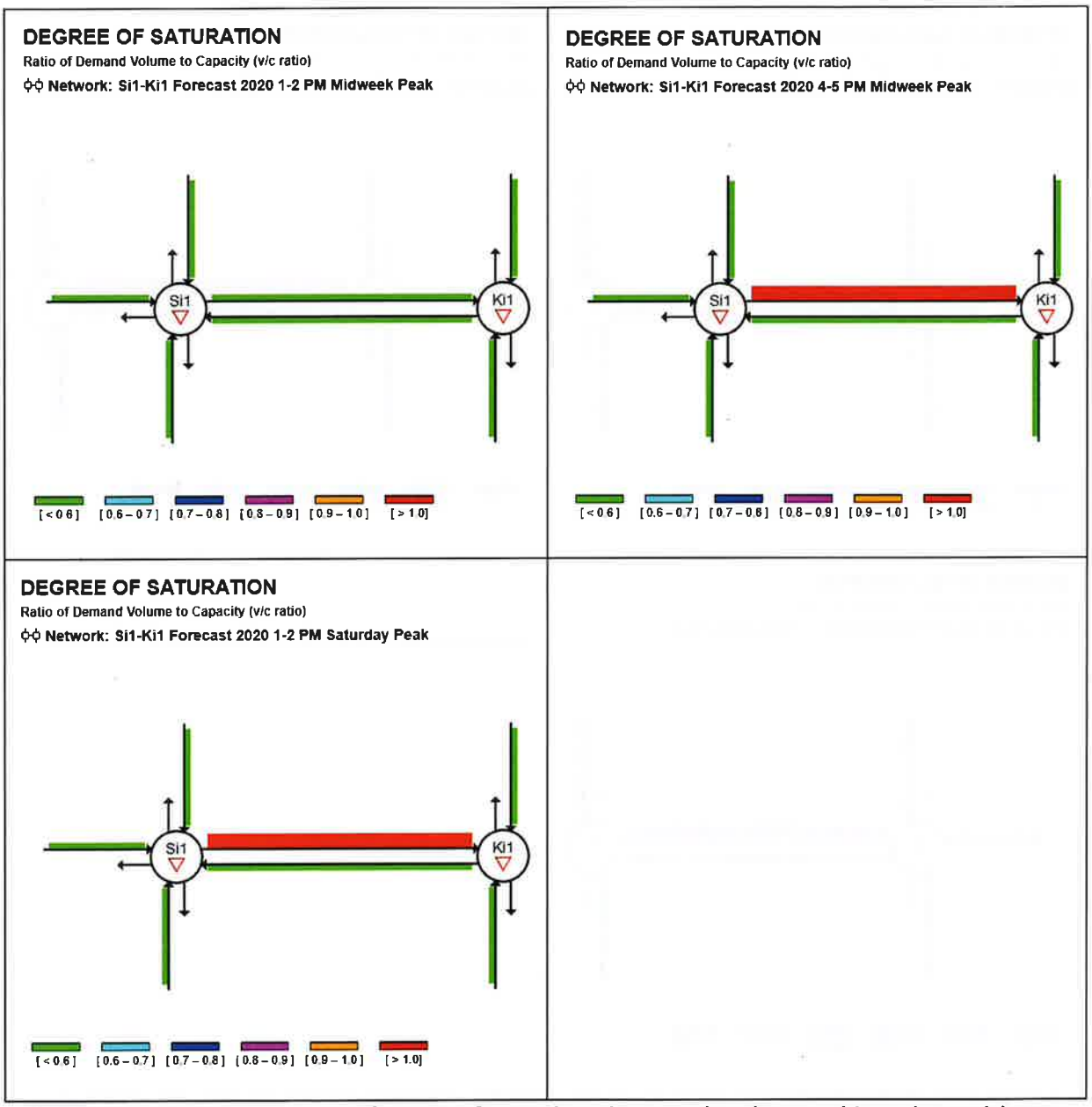



Figure 30 – Forecast 2020 Level of Service of Si1 and Ki1 during midweek PM and Saturday peak hours

Figure 30 indicates that the Larsen Rd approach to South Western Hwy is forecast to experience unacceptable delays during the midweek afternoon and Saturday road network peak hours. If not addressed, it is likely that drivers will avoid accessing the subject site and local and through traffic will experience significant delays resulting in frustrated drivers taking smaller gaps in traffic resulting in a poor safety performance.

### 10.2.3 Forecast 2030 Performance

The forecast Degree of Saturation of the two intersections during the midweek and Saturday road network and development peak hours is shown in Figure 31 below. Assessment of other intersection performance criteria is included in the SIDRA Intersection summary tables in **Appendix B.**

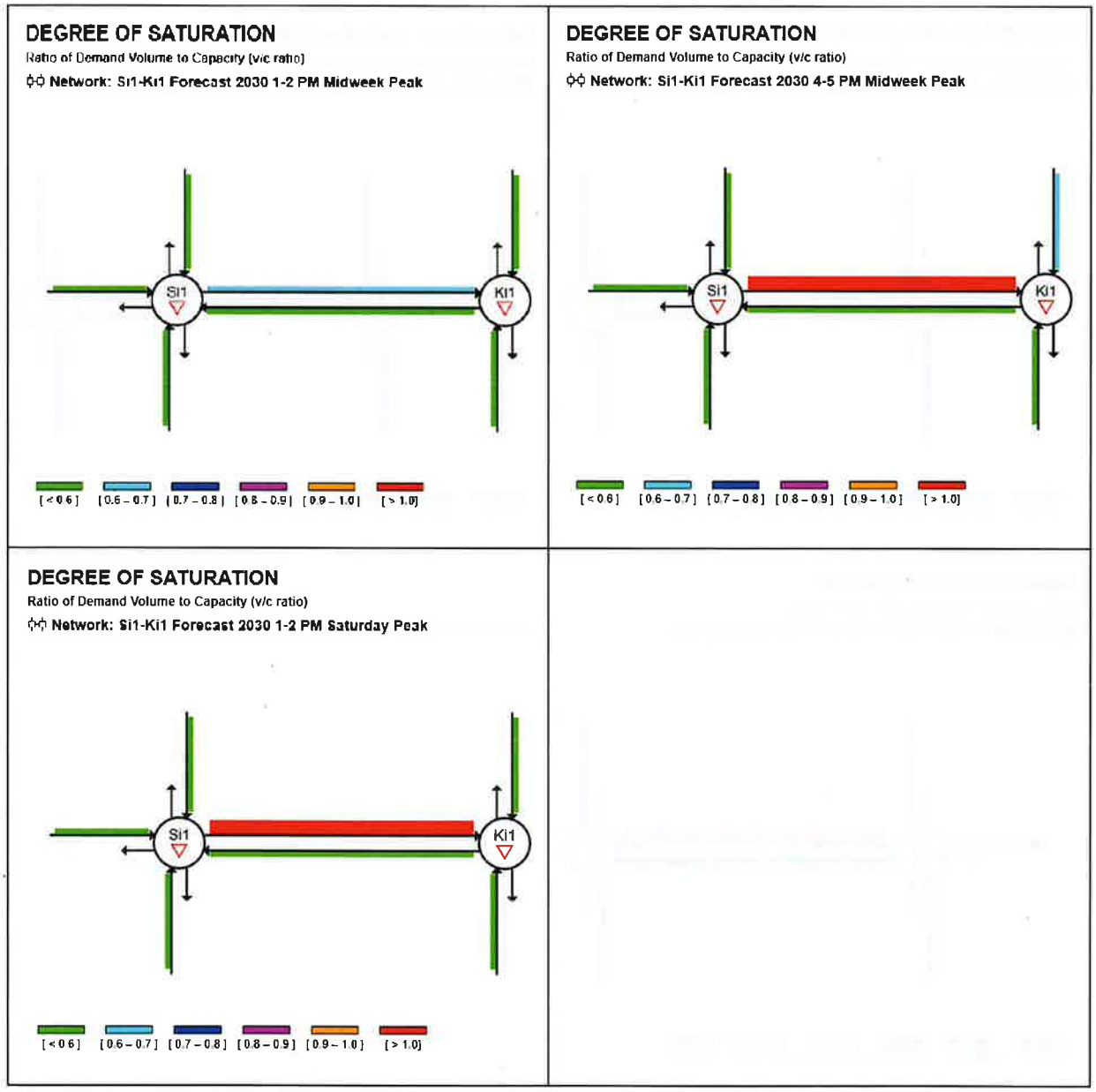



Figure 31 – Forecast 2030 Level of Service of Si1 and Ki1 during midweek PM and Saturday peak hours

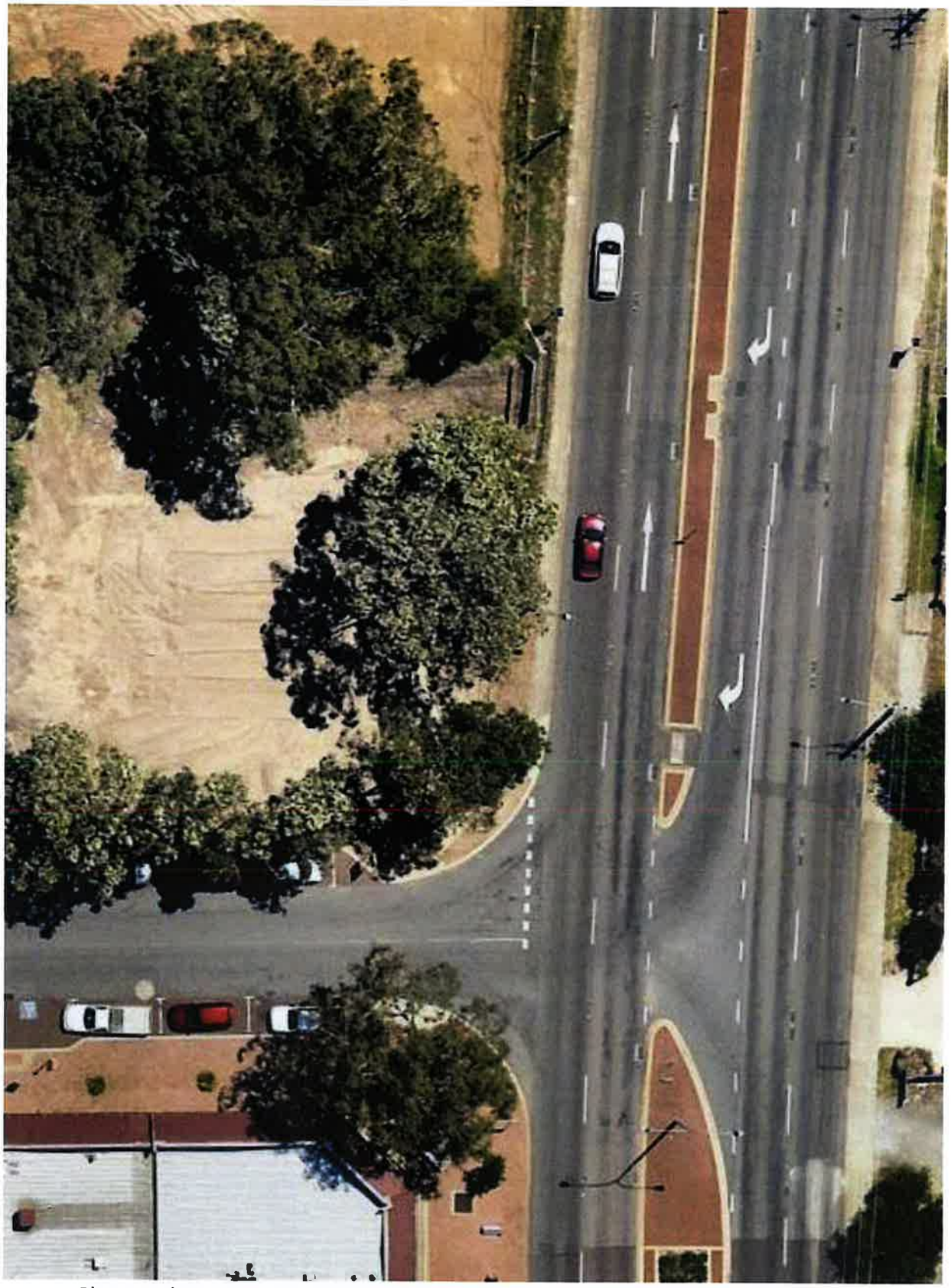
Figure 31 indicates that the Larsen Rd approach to South Western Hwy is forecast to experience unacceptable delays during the midweek afternoon and Saturday road network peak hours. If not addressed, it is likely that drivers will avoid accessing the subject site and local and through traffic will experience significant delays resulting in frustrated drivers taking smaller gaps in traffic resulting in a poor safety performance.

### 10.2.4 Remedial Measure

The previous sections have indicated that there are likely to be unacceptable delays on the Larsen Rd approach to South Western Highway as a result of the current sensitivity to increased traffic (refer Figure 29 on page 48).

Given the uncertainty with timing of the road closure, this TIA needs to identify and assess a suitable remedial measure that would address this concern without the closure of Larsen Rd.

The option of extending the existing dual lane dual carriageway on South Western Hwy south of Park Rd to just north of Larson Rd, including a median break and auxiliary right turn lane similar to that provided at Pitam Way (as shown in Photograph 13 on the following page) has been examined. The Development Drawings in **Appendix A** show two variants of this, one with a single lane Larsen Rd approach and the other with a dual lane, i.e. left and right turn lane, approach. For the purpose of this assessment these two layouts have been called Option 1 and Option 2. These two options have been assessed in SIDRA for the busiest period, i.e. 4-5 PM mid-week, and are forecast to operate at good levels, i.e., Degree of Saturation less than 0.6, as shown in Figure 32 and Figure 33 on page 53.



Photograph 13 – Example of dual lane dual carriageway with median break (Pitman/ SWH)

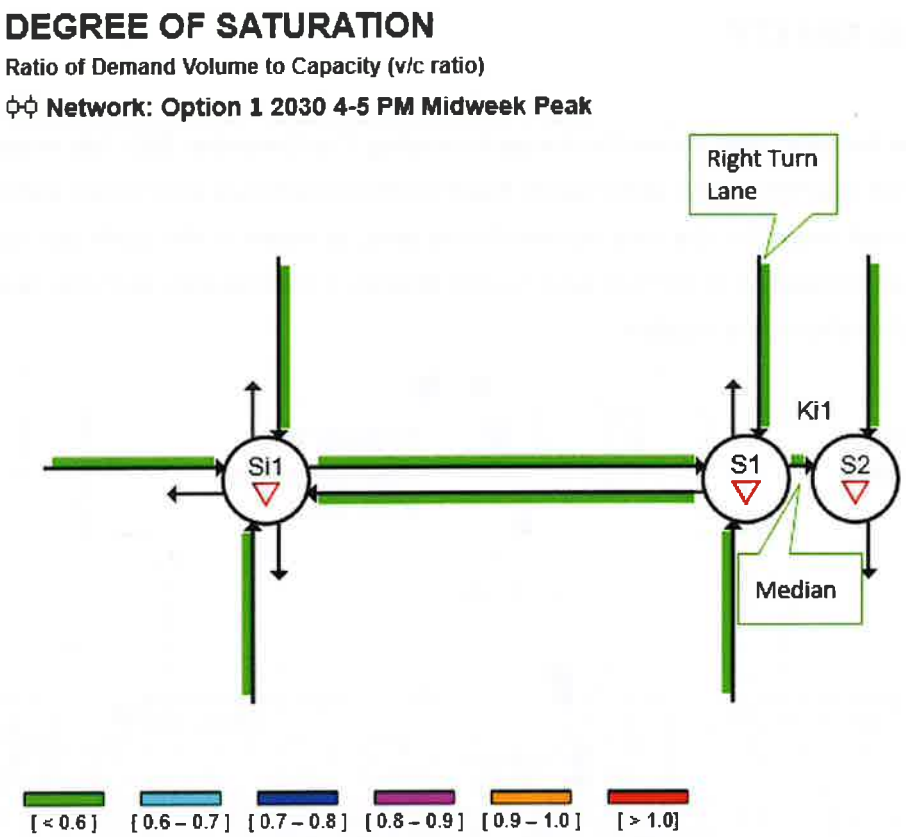



Figure 32 – Forecast 2030 Level of Service with Option 1 layout

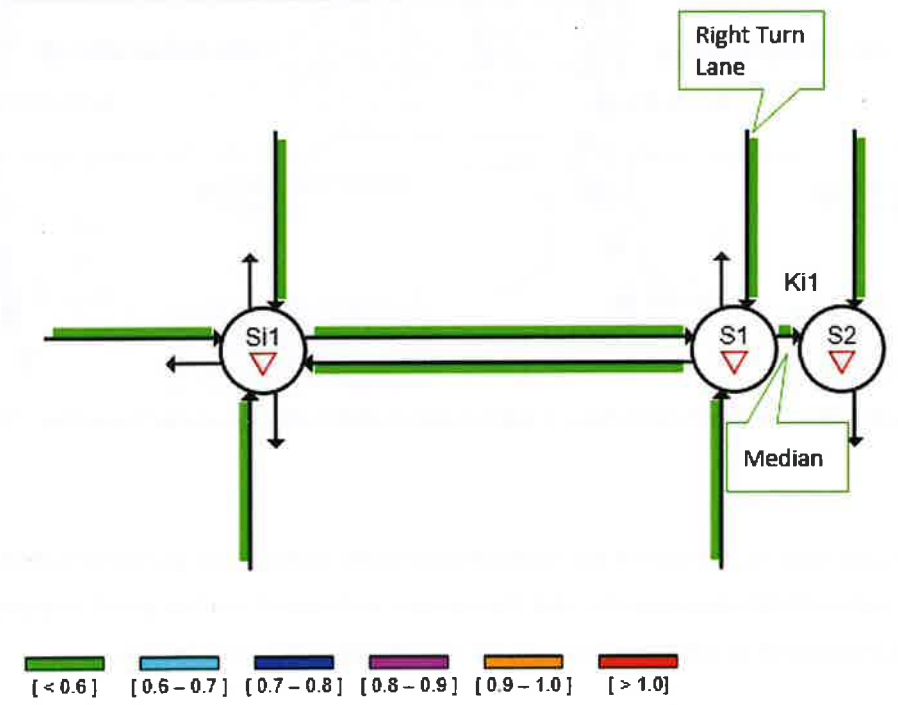



Figure 33 – Forecast 2030 Level of Service with Option 2 layout

# 11 ROAD SAFETY

A review of the five-year crash record for the period ending 31st December 2017 has revealed that there have been five (5) reported crashes at the Larsen Road/ South Western Hwy intersection and that this is fairly typical of the crash record for the road network in this area, as shown in the crash plot map provided as Figure 34 below. It should be noted that each marker denotes a crash location and may represent a single crash or several crashes at this location.

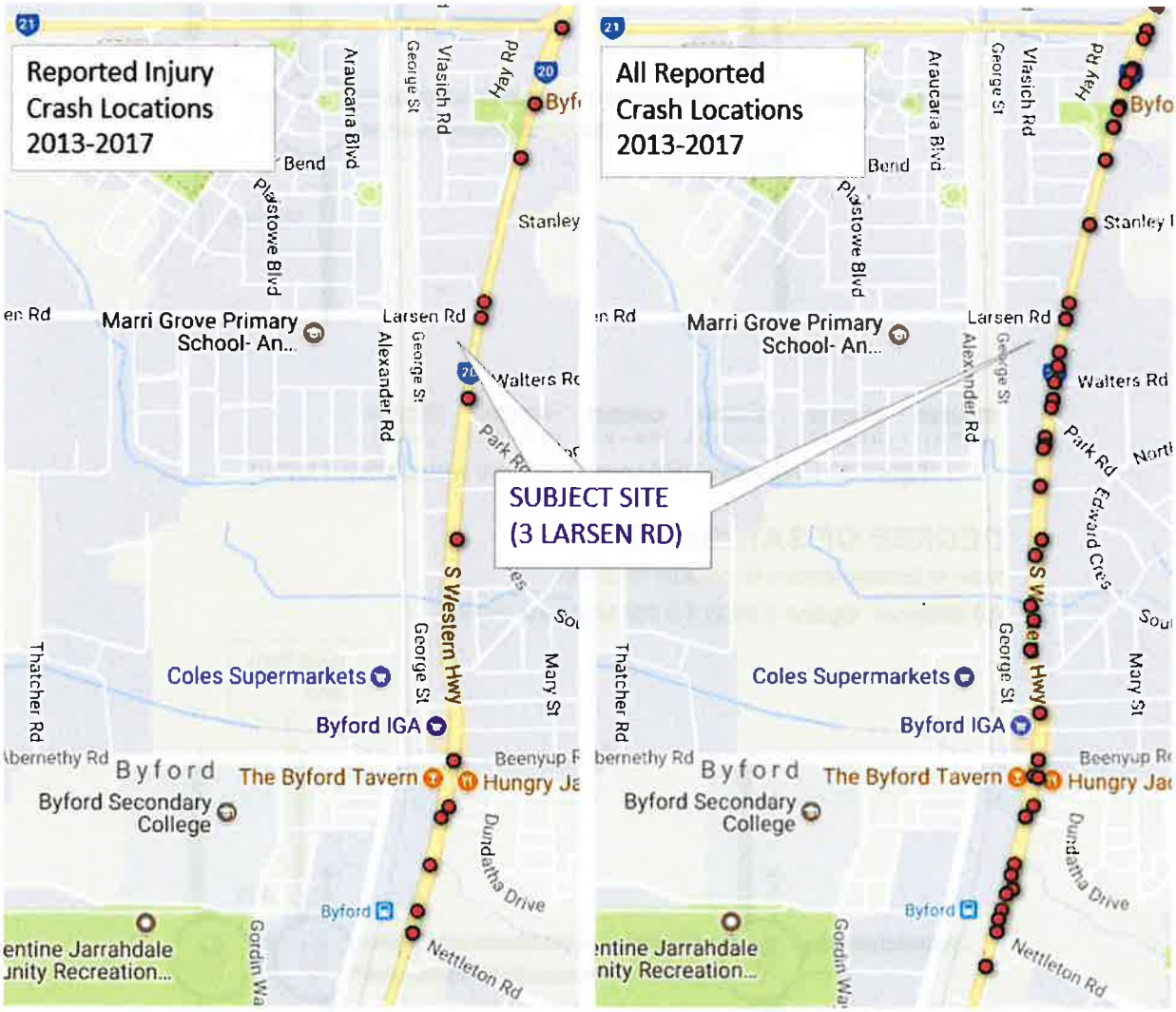



Figure 34 – South Western Hwy Crash Location plot map: 5 years to December 2017

Analysis of the crash data for the Larsen Rd/ South Western Hwy intersection using the MRWA Crash Analysis and Reporting System (CARS) has revealed that the number and type of crashes at this intersection is too low to allow for an assessment of the crash record to be undertaken within the system.

Prior to undertaking the crash review, the author, who is a MRWA accredited Senior Road Safety Auditor and Crash Investigation Team Leader, inspected the site and observed that sight lines are good in all directions but that there may be potential for some drivers to take smaller gaps in traffic that they normally would when there is a steady stream of traffic on South Western Hwy. The implementation of the variable 50 km/s speed limit assists in keeping impact forces low in the event of a crash, which is reflected in the crash severity data (i.e. 5 crashes, 0 Fatal, 0 Hospital, 1 Medical and 4 Property Damage Only). The medical injury resulted from a single car travelling south on South Western Hwy running off the road to the left out-of-control and hitting an electricity pole.

Subsequent crash analysis has revealed that there have not been more than 1 type of crash at the intersection in the five-year reporting period, as shown in the crash plot generated by CARS provided as Figure 35 below.

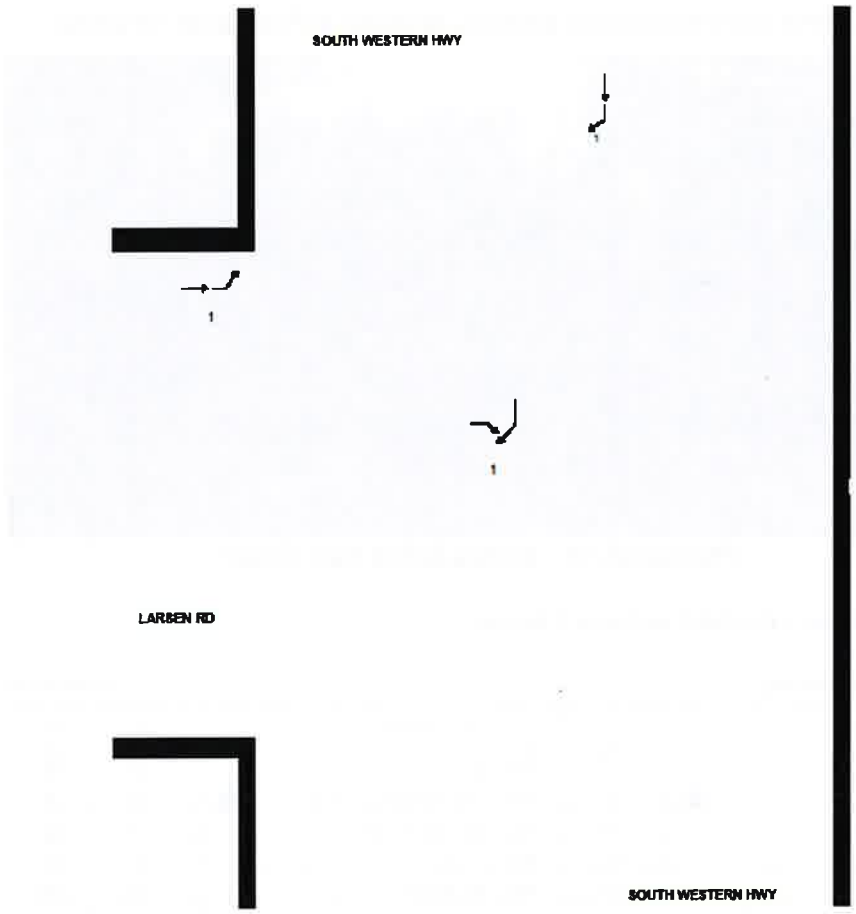



Figure 35 – Larsen Rd/ South Western Hwy Crash Plot (run-off road crashes not shown)

This road safety assessment has not identified any existing deficiency with the layout and control of South Western Hwy, Larsen Rd, George St or any of their intersections that warrants attention or raises concern with the proposed development. It is acknowledged however, that closing Larsen Rd at the railway level crossing will result in a significant reduction in traffic volumes on Larsen Rd at South Western Hwy which will result in reduced delays and the associated likelihood of drivers taking risks with identifying gaps in traffic.

# 12 PUBLIC TRANSPORT ACCESS

## 12.1 EXISTING TRAIN NETWORK

The closest metropolitan train station to the subject site is at Armadale, approximately 6.5 kms north.

As indicated in **Section 4.3**, it is intended to extend the Pert-Armadale line south to Byford, although at this stage the exact location of the new Byford Train station is yet to be determined.

A single line railway currently extends south from Armadale to Bunbury and is used by the Australind service. Passengers can board and alight at the existing Byford train station at the southern end of Byford near Nettleton Road but only if they give prior notice, otherwise the Australind train does not stop here. The existing train station is little more than a small platform, as shown in Photograph 14 below.


Photograph 14 – Existing Byford train station

The Australind Timetable is provided as Table 7 below.

**Perth to Bunbury** **Australind**

| From Perth | | 103 | 105 | From Bunbury | | 102 | 108 |
|---|---|---|---|---|---|---|---|
| | | Daily AM | Daily PM | | | Daily AM | Daily PM |
| **Perth Station** | ♿ Dep | 9:30 | **5:55** | **Bunbury Passenger Terminal** | ♿ Dep | 6:00 | **2:45** |
| **Armadale Station** | Dep | 9:56 | **6:25** | Brunswick Junction* | Dep | 6:17 | **3:02** |
| Byford* | Dep | 10:07 | **6:36** | Harvey* | Dep | 6:32 | **3:17** |
| Mundijong* | Dep | 10:14 | **6:43** | Cookernup** | Dep | 6:39 | **3:24** |
| Serpentine* | Dep | 10:21 | **6:50** | Yarloop** | Dep | 6:46 | **3:29** |
| North Dandalup** | Dep | 10:32 | **7:01** | Waroona* | Dep | 6:56 | **3:38** |
| Pinjarra* | Dep | **10:42** | **7:11** | Pinjarra* | Dep | 7:12 | **3:55** |
| Waroona* | Dep | **11:00** | **7:29** | North Dandalup** | Dep | 7:22 | **4:07** |
| Yarloop** | Dep | 11:11 | **7:40** | Serpentine* | Dep | 7:34 | **4:18** |
| Cookernup** | Dep | 11:15 | **7:44** | Mundijong* | Dep | 7:42 | **4:24** |
| Harvey* | Dep | 11:21 | **7:50** | Byford* | Dep | 7:49 | **4:32** |
| Brunswick Junction* | Dep | 11:36 | **8:05** | **Armadale Station** | Arr | 7:55 | **4:39** |
| **Bunbury Passenger Terminal** | ♿ Arr | 11:55 | **8:25** | **Perth Station** | ♿ Arr | 8:30 | **5:15** |

* Trains only stop at intermediate stations if advance bookings are made.

Table 7 – Australind Timetable

## 12.2 Existing Bus Network

There are two bus stops on either side of South Western Hwy that are within a 2-minute walk of the site. Each bus stop has a shelter, seat and tactile pavers and is serviced by Transport Bus Routes 251, 252 and 253, which run between Armadale Train Station to the north and Mundijong and Jarrahdale to the south via Byford. The location of the two bus stops, as well as photographs, are shown in Figure 36 below. The timetable is shown in Table 8 on the following page.

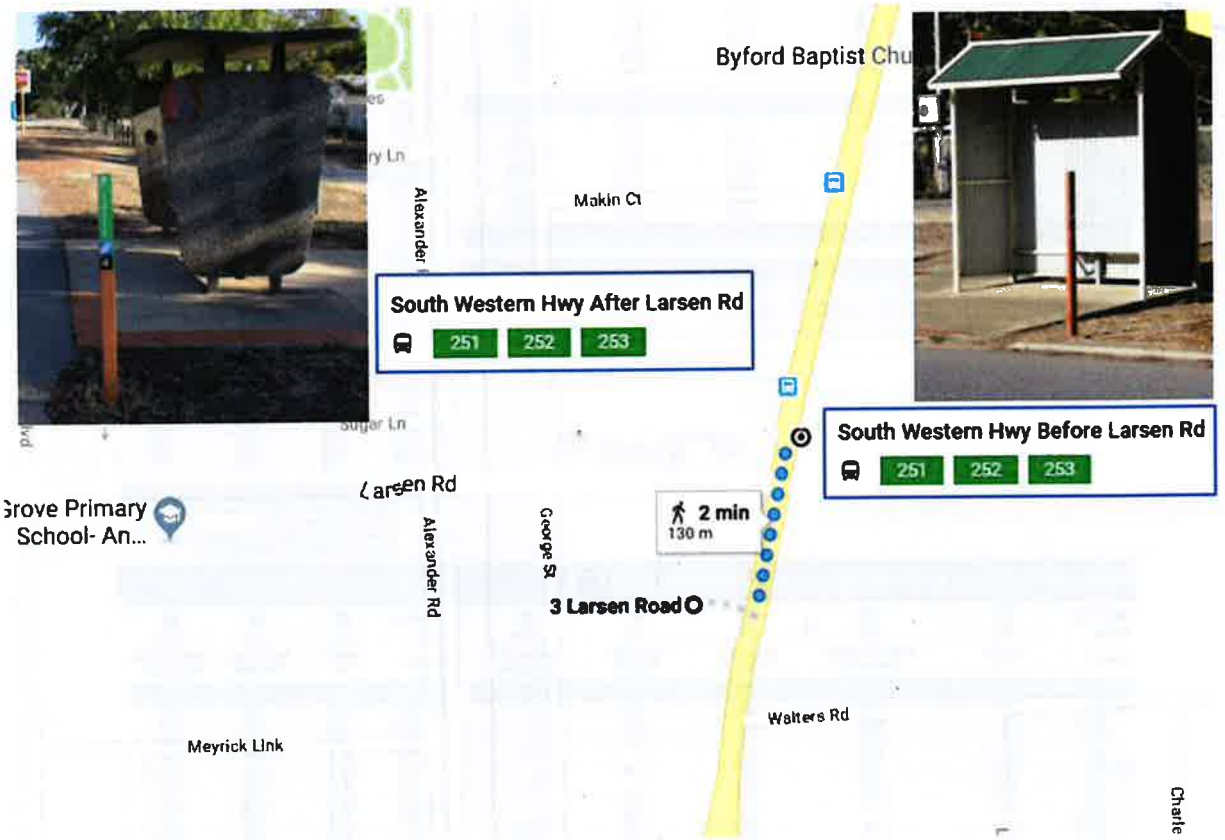



Figure 36 – Existing bus stops within a 2-minute walk of the subject site

## Route 251, 252, 253 - To Armadale

| Timed Stops | | | | | |
|---|---|---|---|---|---|
| Stop No. | 27109 | 23912 | 27650 | 13105 | 13192 |
| Route No. | Kingsbury Dr / Jacaranda Av | Paterson Rd / Whitby St | Benalla Cr / Limpet Wy | South Western Hwy / Blytheswood Av | Armadale Stn |
| **Monday to Friday** | | | | | |
| am 251 * | - | - | * 6:15 | 6:19 | 6:33 |
| 253 | 6:23 | 6:36 | 6:45 | 6:49 | 7:03 |
| 251 * | - | - | * 7:15 | 7:19 | 7:33 |
| 252 | - | 7:38 | 7:48 | 7:53 | 8:07 |
| 253 S | 7:33 | 7:48 | 7:59 | 8:08 | 8:23 |
| 253 H | 7:40 | 7:55 | 8:04 | 8:08 | 8:23 |
| 252 B | - | 8:09 | 8:20 | 8:30 | 8:46 |
| 252 | - | 8:57 | 9:06 | 9:10 | 9:24 |
| 251 * | - | - | * 9:36 | 9:40 | 9:54 |
| 252 | - | 10:27 | 10:36 | 10:40 | 10:54 |
| 251 * | - | - | * 11:36 | 11:40 | 11:54 |
| pm 252 | - | 1:27 | 1:36 | 1:40 | 1:54 |
| 252 A | - | 3:14 | 3:26 | 3:30 | 3:48 |
| 252 H | - | 3:18 | 3:26 | 3:30 | 3:48 |
| 252 | - | 5:08 | 5:16 | 5:20 | 5:34 |
| 252 | - | 6:28 | 6:36 | 6:40 | 6:54 |
| **Saturday** | | | | | |
| am 253 | 6:59 | 7:12 | 7:20 | 7:24 | 7:39 |
| 252 | - | 8:12 | 8:20 | 8:24 | 8:39 |
| 251 * | - | - | * 10:20 | 10:24 | 10:39 |
| pm 251 * | - | - | * 12:20 | 12:24 | 12:39 |
| 252 | - | 2:12 | 2:20 | 2:24 | 2:39 |
| 251 * | - | - | * 4:20 | 4:24 | 4:36 |
| 251 * | - | - | * 5:53 | 5:57 | 6:09 |

**No Sunday & Public Holidays service**

**Legend**

| | |
|---|---|
| 251 * | Time shown in Benalla Cr / Limpet Wy column is for timing point 25727 - Clondyke Dr after Burgess Dr. |
| 252 A | Operates on school days only and deviates via Serpentine Jarrahdale Grammar School. |
| 252 B | Operates on school days only and deviates via Byford Secondary College. |
| 253 S | Operates on school days only and deviates via Serpentine Jarrahdale Grammar School and Byford Secondary College. |
| H | Operates on school holidays only. |

## Route 254 - To Armadale

| Timed Stops | | | |
|---|---|---|---|
| Stop No. | 26510 | 26511 | 13192 |
| Route No. | Clifton St / South Western Hwy | Ballawarra Av / Fawcett Rd | Armadale Stn |
| **Monday to Friday** | | | |
| am 254 | 5:50 | 5:58 | 6:17 |
| 254 | 6:18 | 6:28 | 6:48 |
| 254 | 6:48 | 6:58 | 7:17 |
| 254 | 7:03 | 7:13 | 7:32 |
| 254 | 7:15 | 7:25 | 7:48 |
| 254 | 7:50 | 8:00 | 8:22 |
| 254 | 8:07 | 8:17 | 8:40 |
| 254 | 8:40 | 8:50 | 9:10 |
| 254 | 9:10 | 9:20 | 9:39 |
| 254 | 9:56 | 10:06 | 10:24 |
| 254 | 10:56 | 11:06 | 11:24 |
| 254 | 11:56 | 12:06 | 12:24 |
| pm 254 | 12:56 | 1:06 | 1:24 |
| 254 | 1:56 | 2:06 | 2:24 |
| 254 A | 3:10 | 3:30 | 3:55 |
| 254 S | 3:33 | 3:45 | 4:06 |
| 254 | 3:50 | 4:00 | 4:19 |
| 254 | 5:00 | 5:09 | 5:26 |
| 254 | 5:45 | 5:54 | 6:11 |
| 254 | 6:45 | 6:54 | 7:11 |
| **Saturday** | | | |
| am 254 | 6:42 | 6:50 | 7:09 |
| 254 | 7:42 | 7:50 | 8:09 |
| 254 | 8:42 | 8:50 | 9:09 |
| 254 | 9:42 | 9:50 | 10:09 |
| 254 | 10:42 | 10:50 | 11:11 |
| 254 | 11:42 | 11:50 | 12:11 |
| pm 254 | 12:42 | 12:50 | 1:11 |
| 254 | 1:42 | 1:50 | 2:09 |
| 254 | 2:42 | 2:50 | 3:09 |
| 254 | 3:42 | 3:50 | 4:09 |
| 254 | 4:42 | 4:50 | 5:09 |
| **Sunday and Public Holidays** | | | |
| am 254 | 8:58 | 9:06 | 9:26 |
| 254 | 10:58 | 11:06 | 11:26 |
| pm 254 | 12:58 | 1:06 | 1:26 |
| 254 | 2:58 | 3:06 | 3:26 |
| 254 | 4:58 | 5:06 | 5:26 |

**Legend**

| | |
|---|---|
| 254 A | Operates on school days only and deviates via Byford Secondary College. |
| 254 S | Departs from Serpentine Jarrahdale Grammer School at 3.25pm on school days only. |

## Route 251, 252, 253 - To Mundijong & Jarrahdale

| Timed Stops | | | | | |
|---|---|---|---|---|---|
| Stop No. | 13192 | 13138 | 25727 | 13165 | 27108 |
| Route No. | Armadale Stn | South Western Hwy / Blytheswood Av | Clondyke Dr / Burgess Dr | Paterson Rd / Whitby St | Kingsbury Dr / Jacaranda Av |
| **Monday to Friday** | | | | | |
| am 252 | 7:11 | 7:20 | 7:24 | 7:36 | - |
| 252 A | 8:12 | 8:23 | 8:27 | 8:41 | - |
| 252 | 9:56 | 10:06 | 10:10 | 10:21 | - |
| 251 | 10:56 | 11:06 | 11:14 | - | - |
| pm 252 | 12:55 | 1:05 | 1:09 | 1:20 | - |
| 251 | 1:56 | 2:06 | 2:14 | - | - |
| 252 | 2:40 | 2:51 | 2:55 | 3:06 | - |
| 252 B | - | - | 3:24 | 3:38 | - |
| 253 D | 3:05 | 3:17 | 3:28 | 3:40 | 3:59 |
| 253 S | 3:40 | 3:52 | 3:56 | 4:06 | 4:23 |
| 252 E | 4:11 | 4:23 | 4:27 | 4:40 | - |
| 252 | 4:40 | 4:51 | 4:55 | 5:06 | - |
| 253 | 5:13 | 5:25 | 5:29 | 5:37 | 5:52 |
| 252 | 5:54 | 6:05 | 6:09 | 6:20 | - |
| **Saturday** | | | | | |
| am 252 | 7:43 | 7:53 | 7:57 | 8:07 | - |
| 251 | 9:56 | 10:06 | 10:12 | - | - |
| 251 | 11:56 | 12:06 | 12:12 | - | - |
| pm 252 | 1:41 | 1:51 | 1:55 | 2:09 | - |
| 251 | 3:41 | 3:51 | 3:57 | - | - |
| 253 | 4:41 | 4:51 | 4:55 | 5:04 | 5:20 |
| 252 | 5:41 | 5:51 | 5:55 | 6:09 | - |

**No Sunday & Public Holidays service**

**Legend**

| | |
|---|---|
| 252 A | Deviates via Serpentine Jarrahdale Grammar School on school days only. |
| 252 B | Operates on school days only and departs Byford Secondary College at 3.17pm. |
| 252 E | Operates on school days only. |
| 253 D | Departs from Armadale Senior High School at 3.00pm, then deviates via Byford Secondary College and Serpentine Jarrahdale Grammar School on school days only. |
| 253 S | Deviates via Serpentine Jarrahdale Grammar School on school days only. |

## Route 254 - To Byford

| Timed Stops | | | | |
|---|---|---|---|---|
| Stop No. | 13192 | 26512 | 26510 |
| Route No. | Armadale Stn | Ballawarra Av / Fawcett Rd | Clifton St / South Western Hwy |
| **Monday to Friday** | | | |
| am 254 | 7:12 | 7:28 | 7:42 |
| 254 S | 7:53 | 8:14 | 8:30 |
| 254 | 8:27 | 8:44 | 8:58 |
| 254 | 9:25 | 9:41 | 9:54 |
| 254 | 10:26 | 10:42 | 10:54 |
| 254 | 11:26 | 11:42 | 11:54 |
| pm 254 | 12:25 | 12:42 | 12:54 |
| 254 | 1:25 | 1:42 | 1:54 |
| 254 | 2:26 | 2:43 | 3:00 |
| 254 A | 3:10 | 3:29 | 3:45 |
| 254 | 3:40 | 3:58 | 4:13 |
| 254 | 4:25 | 4:43 | 4:58 |
| 254 | 5:13 | 5:30 | 5:43 |
| 254 | 5:28 | 5:44 | 5:58 |
| 254 | 5:43 | 5:59 | 6:13 |
| 254 | 5:58 | 6:14 | 6:27 |
| 254 | 6:14 | 6:30 | 6:43 |
| 254 | 6:29 | 6:44 | 6:57 |
| 254 | 6:44 | 6:59 | 7:12 |
| 254 | 7:14 | 7:29 | 7:42 |
| **Saturday** | | | |
| am 254 | 8:13 | 8:28 | 8:40 |
| 254 | 9:11 | 9:26 | 9:39 |
| 254 | 10:11 | 10:26 | 10:39 |
| 254 | 11:11 | 11:26 | 11:40 |
| pm 254 | 12:11 | 12:26 | 12:40 |
| 254 | 1:11 | 1:26 | 1:40 |
| 254 | 2:11 | 2:26 | 2:40 |
| 254 | 3:11 | 3:26 | 3:40 |
| 254 | 4:11 | 4:26 | 4:40 |
| 254 | 5:11 | 5:26 | 5:39 |
| 254 | 6:11 | 6:26 | 6:39 |
| **Sunday and Public Holidays** | | | |
| am 254 | 8:28 | 8:43 | 8:56 |
| 254 | 10:28 | 10:43 | 10:56 |
| pm 254 | 12:28 | 12:43 | 12:56 |
| 254 | 2:28 | 2:43 | 2:56 |
| 254 | 4:28 | 4:43 | 4:56 |

**Legend**

| | |
|---|---|
| 254 A | Departs from Armadale Senior High School at 3.05pm on school days only. |
| 254 S | Extends to Serpentine Jarrahdale Grammar School on school days only. |

Table 8 – Transperth Routes 251, 252 and 253 Timetables

# 13 PEDESTRIAN AND CYCLE ACCESS/ AMENITY

As indicated in Figure 2 on page 9 and shown in Photograph 8 on page 22, there is an existing cycle route along George St and a short section of cycle path with associated crossing facility on South Western Hwy between Larsen Rd and Walters Rd. There are good paths along Larsen Rd and George St but the path on the development side of South Western Hwy south of the ped/ cycle crossing island is substandard and, in some locations, presents a hazard to people using wheeled devices such as skateboards, gophers, wheelchairs and prams as it can direct these devices into the path of vehicles on South Western Highway, as shown in the example provided as Photograph 15 below.

Photograph 15 – Example of South Western Hwy path on west side sloping towards traffic

There is a lack of continuous tactile ground surface indicators on the informal ped/ cycle crossing on South Western Hwy south of Larsen Rd as shown in Photograph 16 on the following page.

Photograph 16 – Existing ped/ cycle crossing on South Western Hwy south of Larsen Rd

A review of the paths around the recently developed Caltex Service Station on the corner of South Western Hwy and Nettleton Rd has revealed that paths and ramps in accordance with the latest standards have been provided to, from and around this site, as shown in the example provided as Photograph 17 below.


Photograph 17 – Caltex Service Station ped/ cycle facilities, South Western Hwy/ Nettleton Rd

# 14 PARKING AND SERVICING

As indicated in **Section 3**, it is proposed to provide a total of 71 standard car parking bays, 3 ACROD bays, 1 waiting bay and 3 loading bays on site.

The planning report assesses the statutory requirement and provision of parking bays. From a practical point of view, it is important to note that many of the trips to the site will be shared between the different land uses on the site, hence there is a high probability that each parking bay would be used for more than one land use trip. This was evidenced in the survey of the existing Caltex Service Station on the corner of South Western Hwy and Nettleton Rd.

The largest vehicle expected to service and the site is the 19 m Semi Trailer, as shown in Figure 37 below.

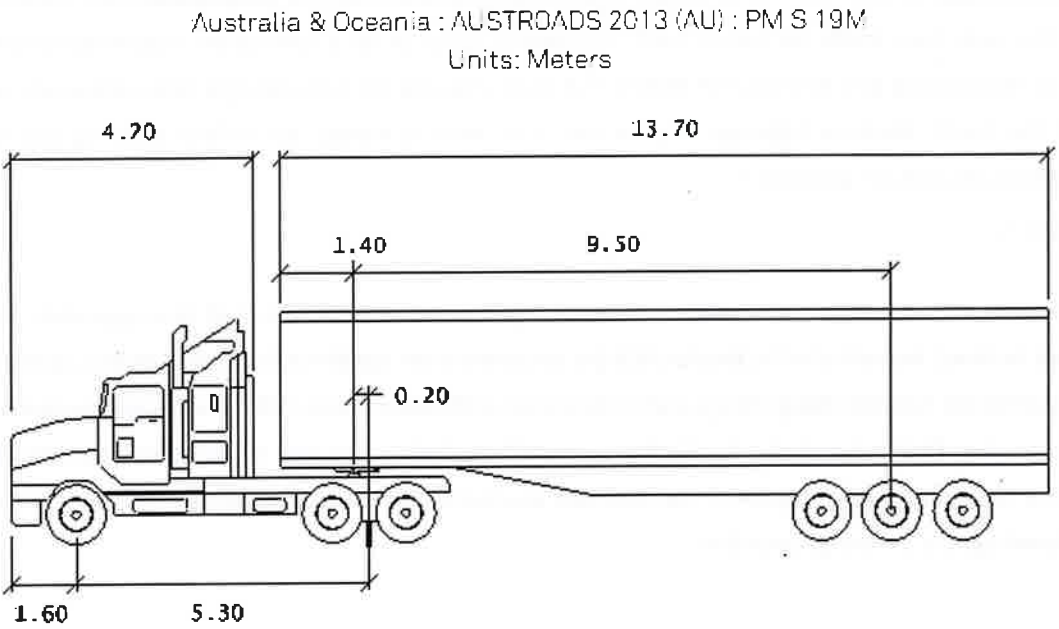



Figure 37 – 19 m Semi Trailer Design Vehicle

The assessed swept path of the above design vehicle, i.e. fuel tanker servicing the site, is shown in the Development Drawings included in **Appendix A**.

# 15 SITE SPECIFIC ISSUES

The Shire of Serpentine-Jarrahdale's Coordinator Subdivisions has provided a list of the Shire's concerns regarding the development proposal in the previously issued TIA (i.e. version 2.0) in an email dated 25th October 2018. In order to ensure that each of these issues is clearly addressed, this section reproduces those concerns and provides comment and assessment accordingly.

### ISSUE 1: LARSEN RD/ SOUTH WESTERN HIGHWAY INTERSECTION

"The shire is concerned by the midweek peak level of saturation on Larsen Road. This indicates we currently have unacceptable delays. The traffic impact Assessment indicates that the development will approximately double the peak hour traffic on Larsen road. To address issues around Saturation in addition to the works shown on the drawing and agreed with MRWA the shire requires the left and right channelisation on Larsen road at the South Western highway intersection. This work is shown on MRWA drawing 022 which is referenced In the MRWA decision."

### RESPONSE 1

The Development Drawings in **Appendix A** show it is proposed to provide a dual lane approach on Larsen Road (red outline). As indicated in **Section 4.3** the proponent has confirmed that the MRWA conditions will be met during the detailed design stage and in discussion with Main Roads WA. This TIA has assessed a single lane approach as Option 1 and the double lane approach as Option 2 as part of the assessment process. The proponent has indicated that Option 2, the dual lane approach, has been adopted and this has been included in the Development Drawings provided.

## Issue 2: Development Access from Larsen Road

"Larsen Road is a local distributer Road. While it is preferred to not have large vehicles on Local Distributor roads they can host 19m semi-trailers. It is unclear from the traffic impact assessment if it is proposed to have service facilities for large vehicles or if the 19m semi-trailers entering and exiting the site are purely service vehicles. The shire generally has adopted a policy of not supporting high-flo diesel or services for 19m semi-trailers on the south western highway in the Byford town site.

Concerning the service vehicle access the shire will not accept vehicles departing their lane to enter and exit the site. It is not considered safe at this location with proximity to the highway intersection and access driveways opposite creating an environment where uncertainty in decision making could occur. The shire also notes Larsen road has centre line road markings and therefore it is against the road traffic code for vehicles to not be lane compliant whilst performing turning manoeuvres.

The shire would like to see some assessment of the vehicle stacking on Larsen road related to the entry into the development to determine the necessary access arrangements. Noting there is around 90 vehicles per hour entering In the Saturday peak and plus 200 vehicles on Larsen road according to the 2014 count".

## Response 2

As indicated in **Section 3**, the proposed development will not have fuel facilities for large vehicles. As such, the largest vehicles expected to access and egress the site is the 19 m Semi Trailer (19 m ST) Fuel Tanker servicing the site. The 19 m ST is the design vehicle that all roads and intersections are designed for as it is the largest vehicle that is permitted to use all public roads without a permit. This also ensures that other large vehicles such as those associated with removalists, waste collection and emergency services can negotiate the road network.

The statement that "Concerning the service vehicle access, the shire will not accept vehicles departing their lane to enter and exit the site" is not consistent with currently approved developments along similar Local Distributor roads, as shown in Figure 38 and Photograph 18 on the following page. It is also not consistent with the Shire's reasoning, i.e. "It is not considered safe at this location with proximity to the highway intersection and access driveways opposite creating an environment where uncertainty in decision making could occur." The development access off Larsen Rd is the only access on this side of the road between the Highway and George St hence it will be very clear to other drivers where an indicating vehicle will be turning off Larsen Rd to access the site. The proposed access is located midway between the two intersections to minimise influence on movements at either of these intersections. It is also located as far away from the South Western Hwy intersection as is physically possible.

The Shire's statement that "Larsen road has centre line road markings and therefore it is against the road traffic code for vehicles to not be lane compliant whilst performing turning manoeuvres" is incorrect. Section 116 of the Road Traffic Code states that "a driver shall not permit any portion of the vehicle to travel on,

over, or to the right of, the dividing line except for the purpose of making a right turn or a U turn, where permissible." This is consistent with statements within AS 2890.1 that require left turns to be undertaken from the kerb lane but allow for the full width of the roadway to be used. The examples provided below show centre line road markings on Abernethy Road and the approved development that requires service vehicles to cross this line.

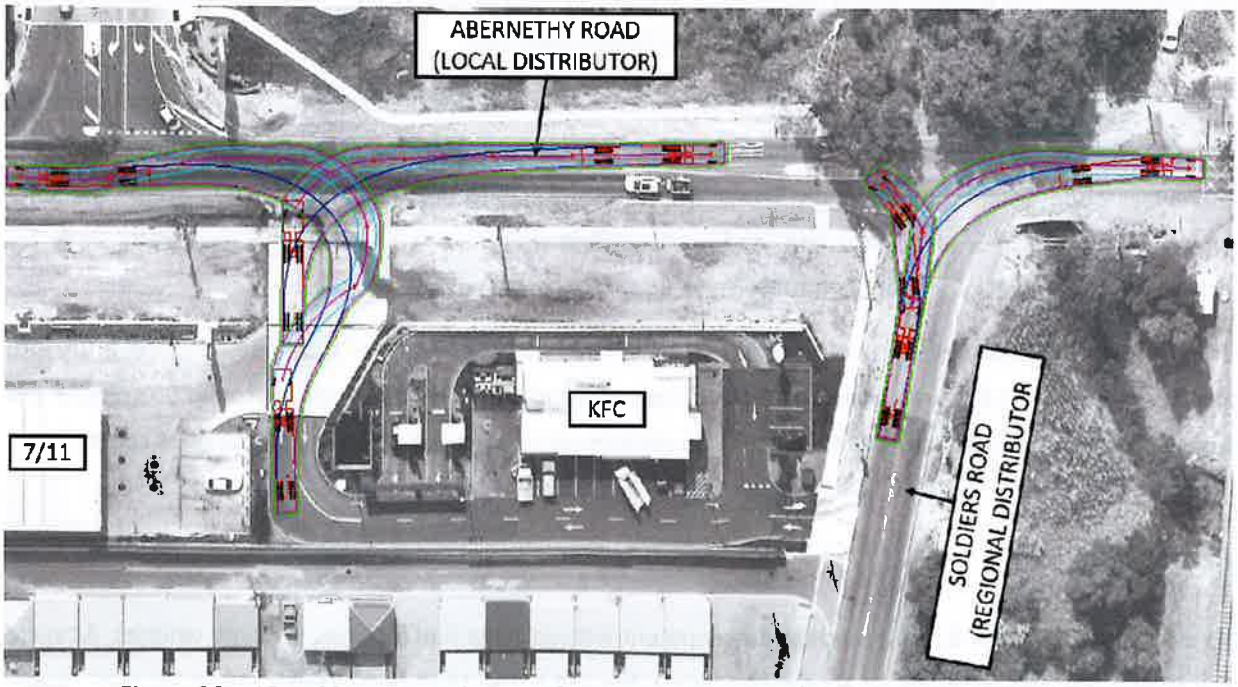



Figure 38 – 19 m ST swept paths out of Soldiers Rd and KFC/ 7eleven into Abernethy Rd


Photograph 18 – Looking west along Abernethy Rd (Local Distributor) to KFC/ 7eleven development on left

The practice of allowing service vehicles to enter and leave access driveways within the boundaries of the roadway, i.e. kerb lines, is permitted in Section 3.4.1(a) of Australian Standard AS 2890.2 (4), i.e.: "On a minor

public road, vehicles shall be able to enter and leave the access driveway without infringing the boundaries of the roadway. Local authorities may place further limits and controls on the extent to which movement across the centre-line of the roadway is allowed."

The shire has indicated that it would "like to see some assessment of the vehicle stacking on Larsen road related to the entry into the development to determine the necessary access arrangements. Noting there is around 90 vehicles per hour entering In the Saturday peak and plus 200 vehicles on Larsen road according to the 2014 count".

200 vehicles per hour is not a lot for a Local Distributor Rd and does not warrant assessment. Nevertheless, an assessment has been carried out as requested based on the forecast 2030 volumes and is shown in Figure 39 below and in Figure 40 and Figure 41 on the following page. Average and 95%ile back of queue lengths do not exceed more than 1 vehicle for any movement in any peak hour.

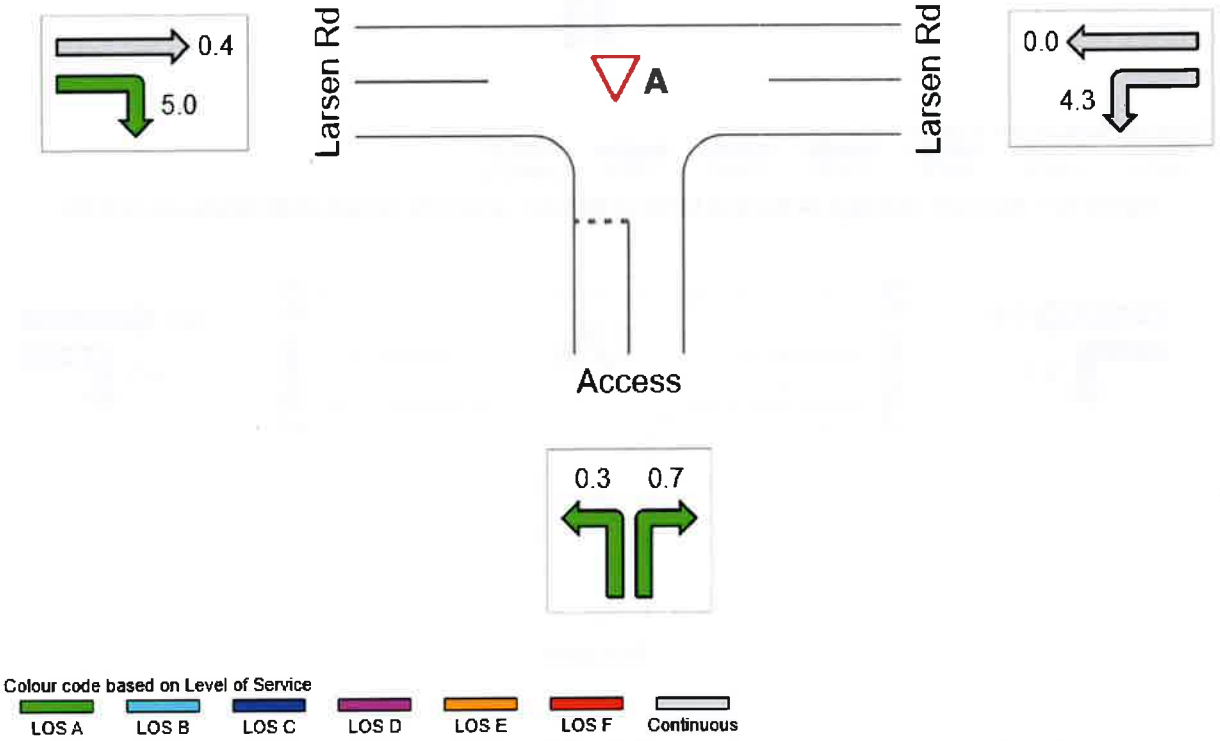



Figure 39 – Forecast Average Delay and Level of Service Larsen Rd Access 2030 Midweek 1-2 PM

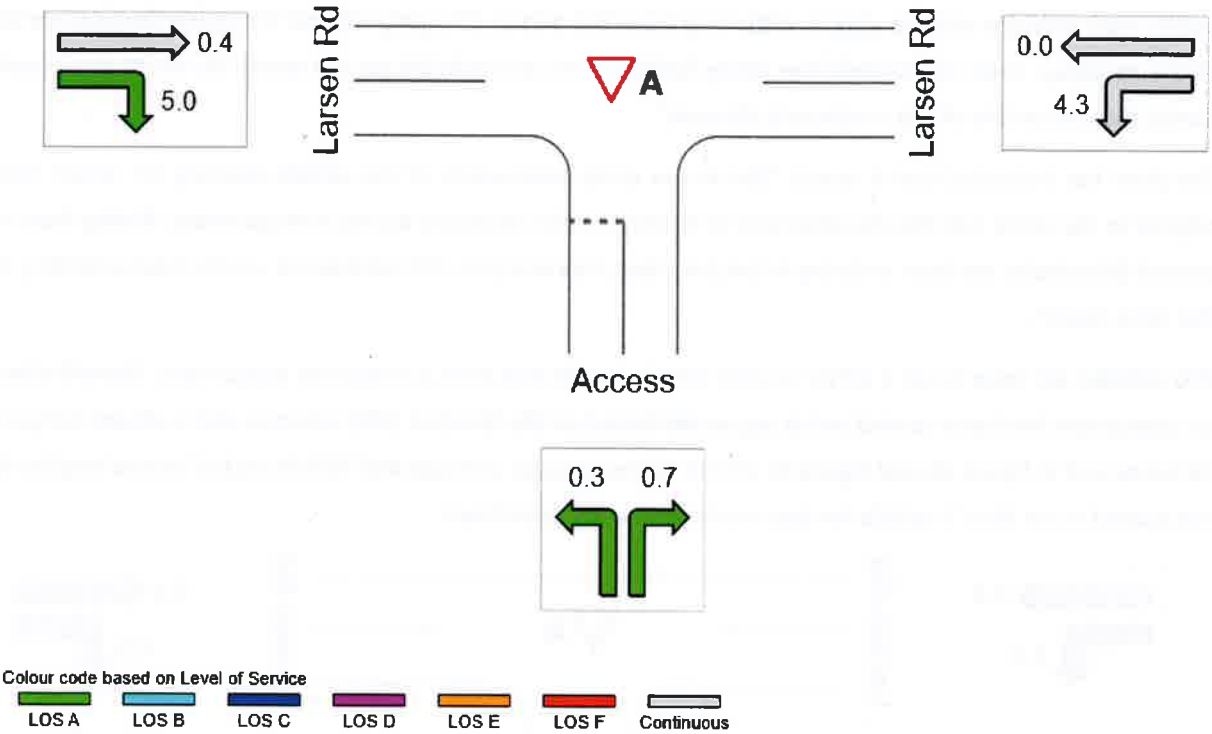



Figure 40 – Forecast Average Delay and Level of Service Larsen Rd Access 2030 Midweek 4-5 PM

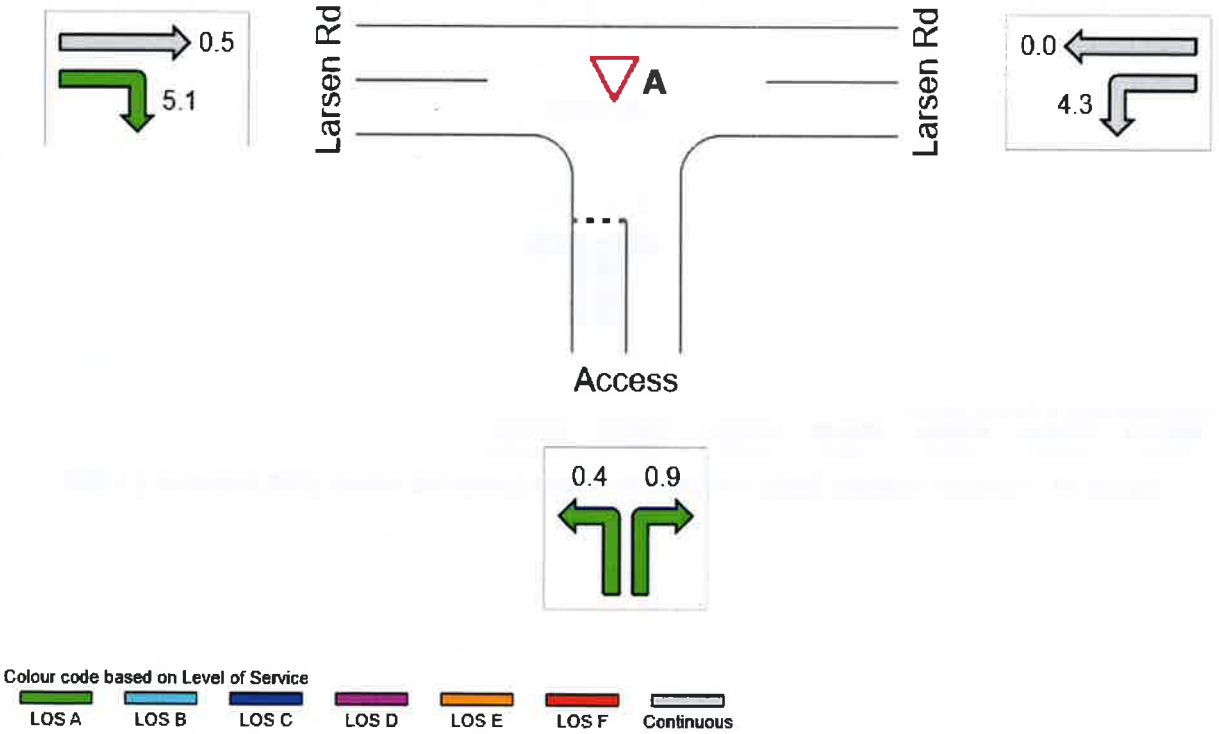



Figure 41 – Forecast Average Delay and Level of Service Larsen Rd Access 2030 Sat 12-1 PM

## Issue 3: Larsen Rd/ George St Intersection

"This intersection is a four way line marked intersection with priority to east – west traffic movements. The intersection is located 25m east of a rail level crossing. The TIA indicates that service vehicles will be moving through the Larsen road George Street intersection. No Swept path analysis of the service vehicle movements at this intersection have been presented. It will be necessary for all vehicles to remain lane compliant and to the left of the centre line at this intersection. Widening and upgrade works as necessary to support service vehicles using this intersection."

## Response 3

It is the Shire's and Main Roads WA's directive that servicing of all lots between George St and South Western Hwy must be via George St. It is therefore incumbent on the Shire to ensure that its road network supports these movements and/ or seek contributions for upgrades where required. As indicated in **Section 2.4.3**, the Shire has adopted Local Planning Policy No 53: George Street Construction Costs which allows for "the contribution of funding for the construction of George Street from Pitman Way to Larsen Road in a coordinated manner by detailing the costs, method of apportionment and method of collecting contributions."

Swept paths were not included in the TIA for this intersection as the largest service vehicle is the 19 m Semi Trailer which is the design vehicle for all intersections. Nevertheless, an assessment of the swept path of the 19 m ST turning into and out of George St is provided as Figure 42 below.

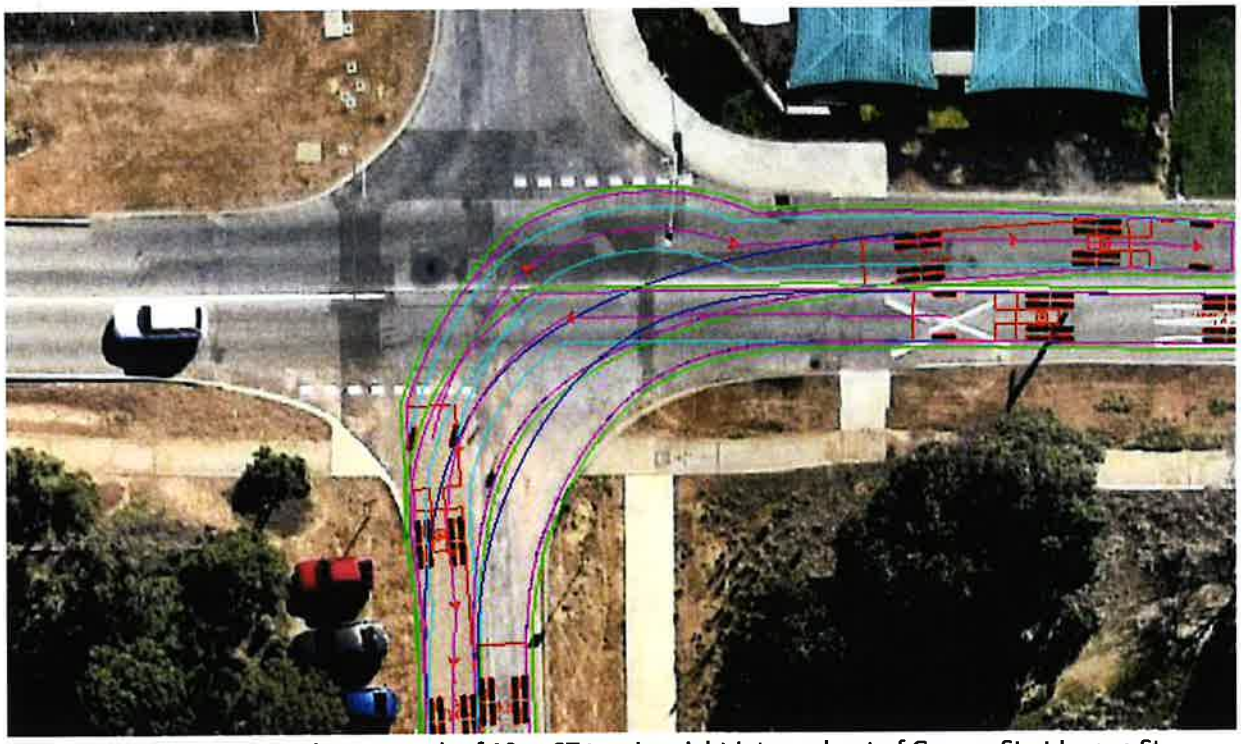


Figure 42 – Assessed swept path of 19 m ST turning right into and out of George St at Larsen St

The Shire's statement that "It will be necessary for all vehicles to remain lane compliant and to the left of the centre line at this intersection." Is not consistent with WAPC Operational Policy Liveable Neighbourhoods (7) which states, in Section R58 of Element 2, that "At intersections, turning vehicles must be accommodated using Standards Association of Australia Design Vehicles and turning templates, to enable turns to be made in a single forward movement as follows: ....**for turns between neighbourhood connector (i.e. Larsen Rd)...and an access street (i.e. George St), the design heavy rigid vehicle, using any part of the pavement**."

The assessment shown in Figure 42 is for the larger 19 m ST Design Vehicle as this is the largest service vehicle for all properties along George St and this larger vehicle has been shown to be able to complete all turn movements using any part of the pavement.

## Issue 4: George St Access Driveways

"George Street is planned to be the high street in Byford by the shire. Main roads recent access policy has been to discourage direct access to the highway and to favour access off George Street. Whilst George St is not line marked the shire does not consider it safe to have service vehicles sweeping across the total George street pavement when entering and exiting the development. George St is intended to be passenger vehicle and pedestrian in nature. Service Vehicles entering and existing the development should be lane complaint when making turning manoeuvres on George St."

## Response 4

Refer assessment **in Section 4.4**.

The Shire refers to Main Roads access policy. This access policy has been agreed with the Shire.

Subsequent to undertaking this assessment, the author requested and received from the Shire the latest "Movement Network Plan", provided as Figure 43 on the following page. Whilst this shows the intention for George St to be part of the Town Centre and hence a "High Street in Byford" it does not include the section of George St north of the indicated Town Centre which includes the section of George St adjacent to the development site.

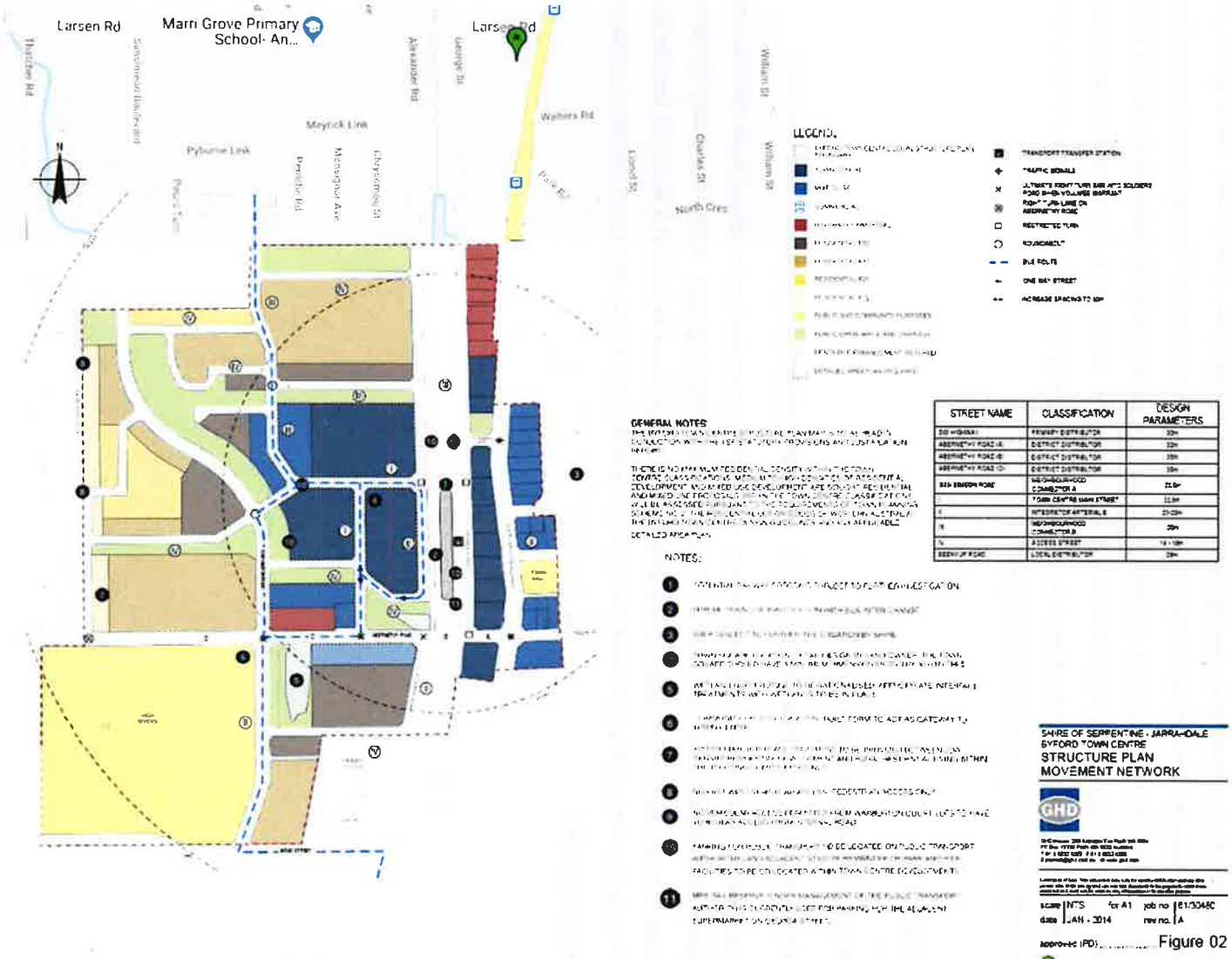



Figure 43 – SoSJ Byford Town Centre 'Movement Network Plan' with development site show as

DEVELOPMENT ASSESSMENT PANEL
APPROVED
11-Dec-2018

## Issue 5: Loading Bay Orientation and Access Arrangements

"The loading bays currently proposed running parallel to George St require vehicles entering and exiting the loading area to drive across the main access driveway and to reverse onto the access driveway. The shire considers the current proposed loading bay arrangements to be unsafe. The loading bays should be reconfigured to eliminate reversing of large vehicles where interaction with the public is possible. Vehicles entering and exiting the loading bays should be able to do so without moving across the driveway intersection. As an example of a preferred arrangement on George St please see below an aerial of the Aldi development. Aldi have separated the loading from the customer with an additional George St Access."

## Response 5

It appears that the Shire's officer may not be using the correct terminology for the elements of an off-street parking area as the development plans never showed a requirement for vehicles "to reverse onto the access driveway". For clarification, the terminology used in this TIA is the same as that used in the Australian Standards, as shown in Figure 44 below.

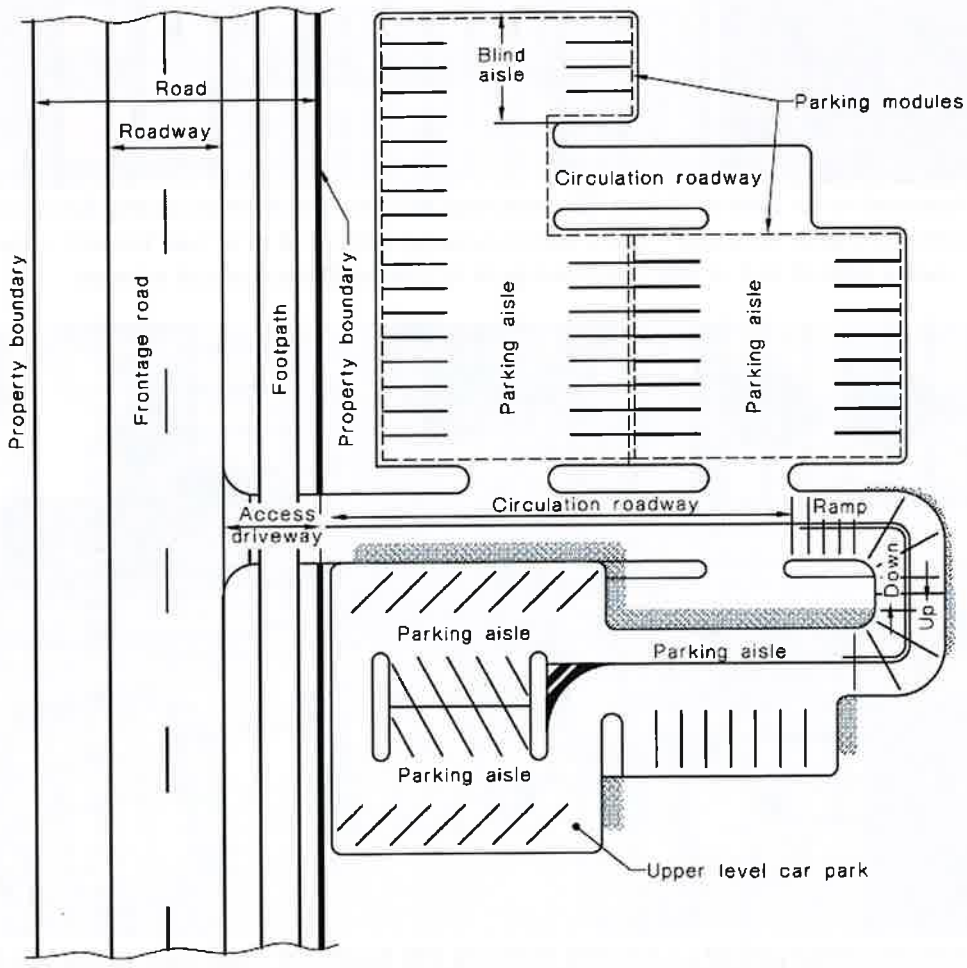



Figure 44 – Off-street car park elements and definitions

The development drawings have been amended since issue of the last version of the TIA (F2.0).

As indicated in **Section 3**, the 12.5 m Heavy Rigid Vehicles will be the typical delivery and service vehicle for waste collection and stock deliveries to all tenancies. An assessment of the swept paths of the 12.5 m HRV accessing and egressing each Loading Bay is shown in Figure 45 and Figure 46 below.

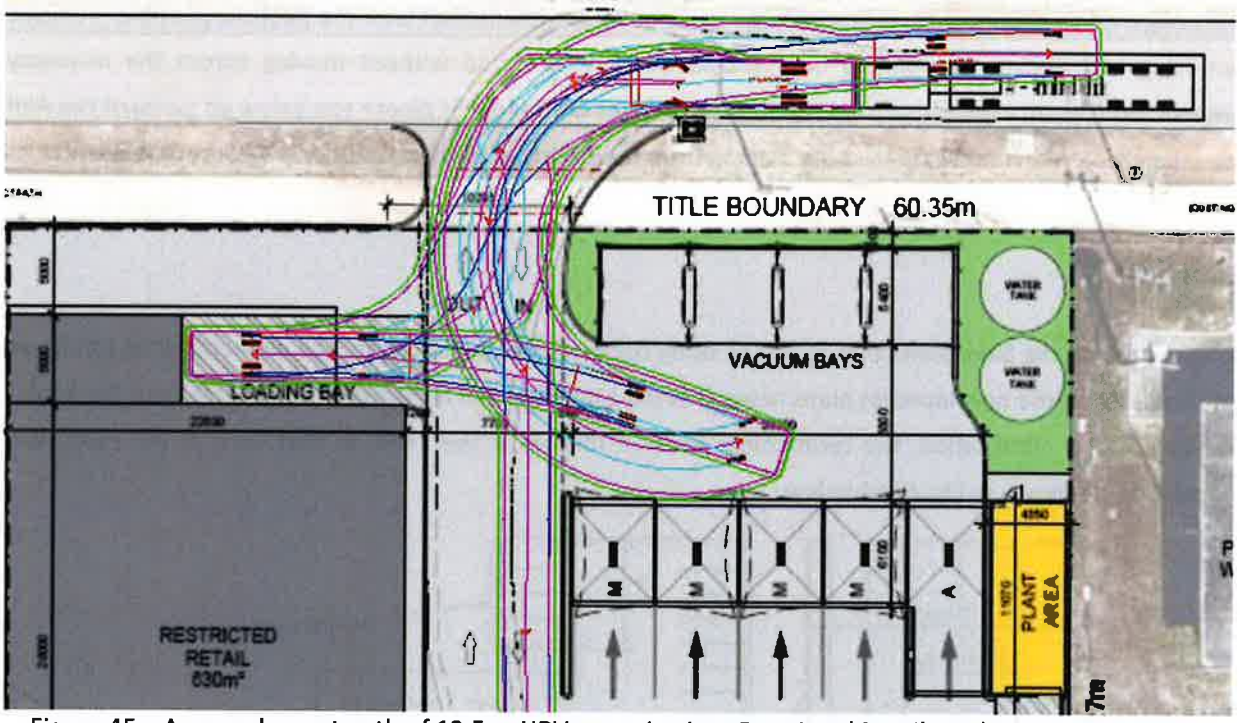



Figure 45 – Assessed swept path of 12.5 m HRV reversing into Restricted Retail Loading Bay and driving forward out onto George St (in colour – black outline is swept path of 19 m ST Fuel Tanker) – also shows swept path of 12.5 m HRV from George St to Loading Zone assessed in below

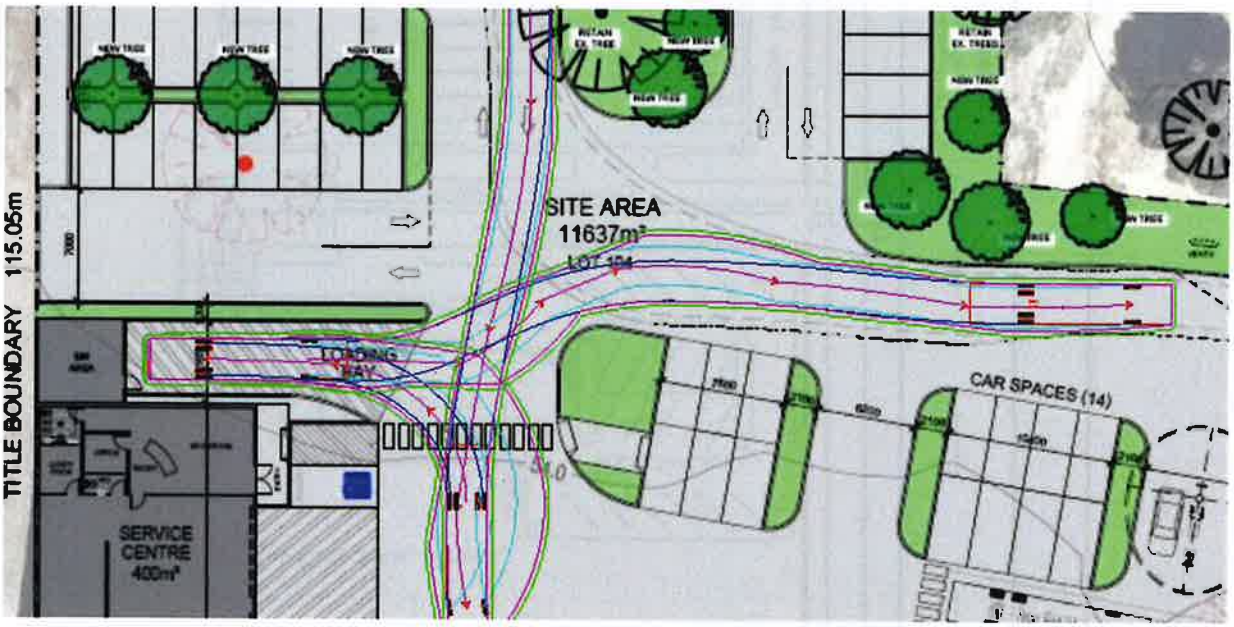



Figure 46 - Assessed swept path of 12.5 m HRV reversing into Restricted Retail Loading Bay and driving forward out onto George St (in colour – black outline is swept path of 19 m ST Fuel Tanker)

## Peak Hour Traffic on Larsen Rd

An assessment of the turning volume data collected on Wednesday 22nd August 2018 provided to the author by the Shire on 25th October 2018 has indicated maximum 'peak hour' volumes through this intersection occur between 3.15 and 4.15 PM as shown in Figure 47 below.

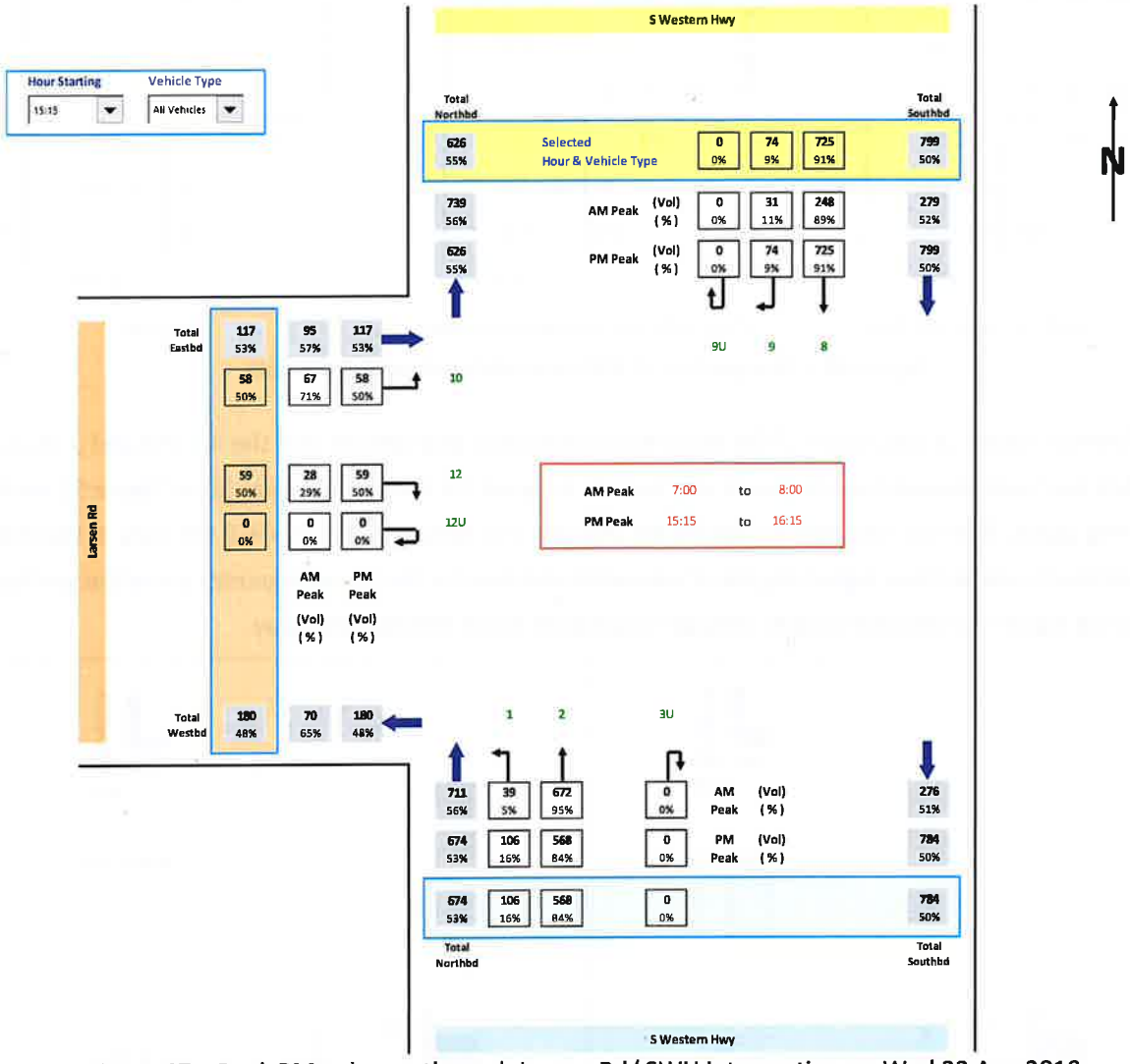



Figure 47 – Peak PM volumes through Larsen Rd/ SWH intersection on Wed 22 Aug 2018

A comparison between PM peak hour turning volume data collected on Wednesday 22nd August 2018 collected by the Shire and the PM peak hour data collected by the author in April 2018 and used for the assessment is provided as Figure 48 on the following page. This shows the total difference is 5 vehicles. There are higher volumes on Larsen Rd in the SoSJ data that may warrant assessment in order to provide stakeholders with confidence that the assessment is robust.

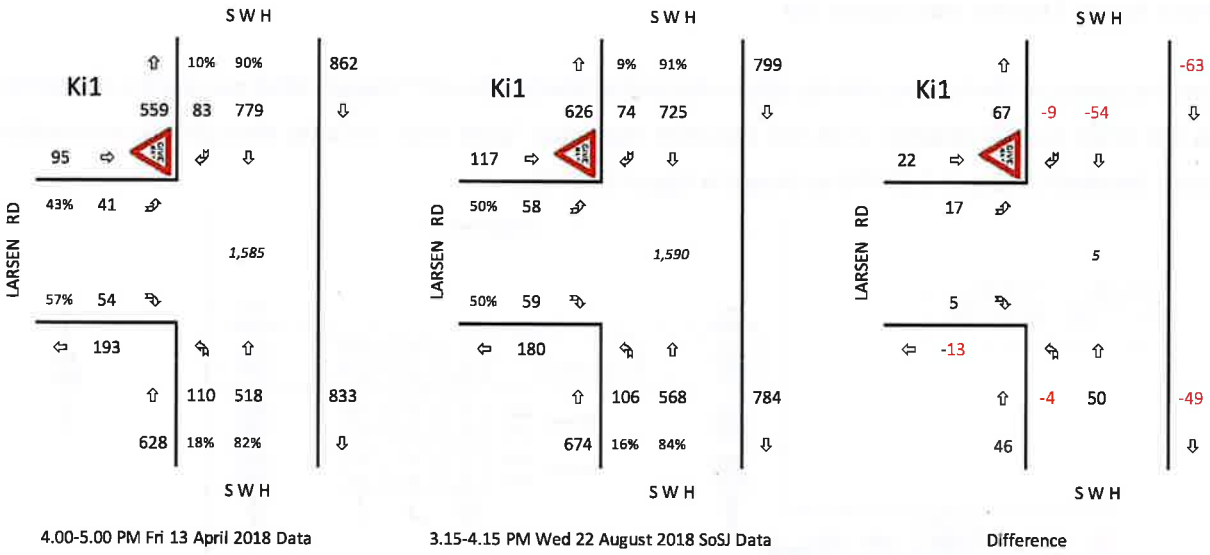



Figure 48 – Comparison of different midweek peak hour data

The forecast Degree of Saturation of the assessed intersections and options with the 4-5 PM and 3.15-4.15 PM data has been assessed and is shown side by side in Figure 49 below and Figure 50 to Figure 52 on the following pages. This has revealed no significant changes and indicates that the 4-5 PM data is the most appropriate to use as it has higher degree of saturation volumes for the key movements out of Larsen Road due to the higher northbound straight through volumes on South Western Highway.

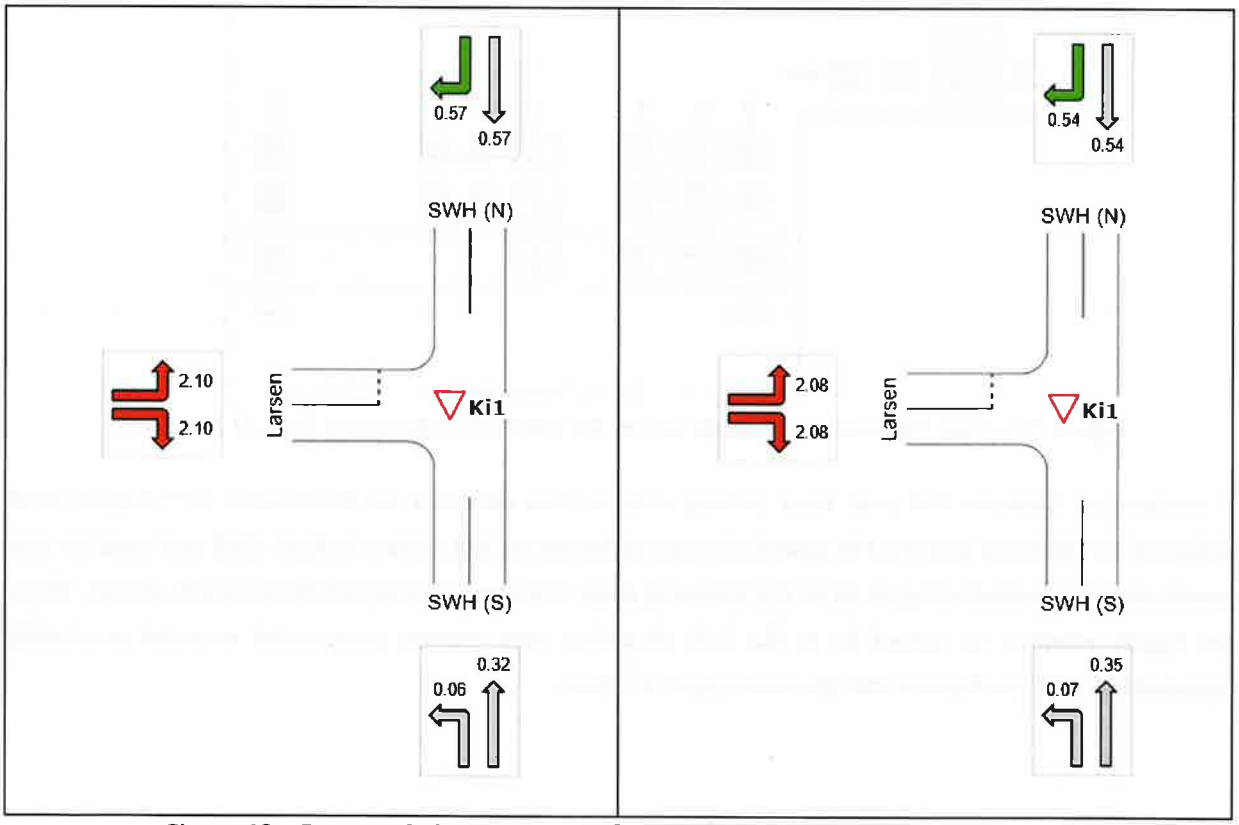



Figure 49 – Forecast 2020 Ki1 Degree of Saturation 4-5 PM v 3.15-4.15 PM data

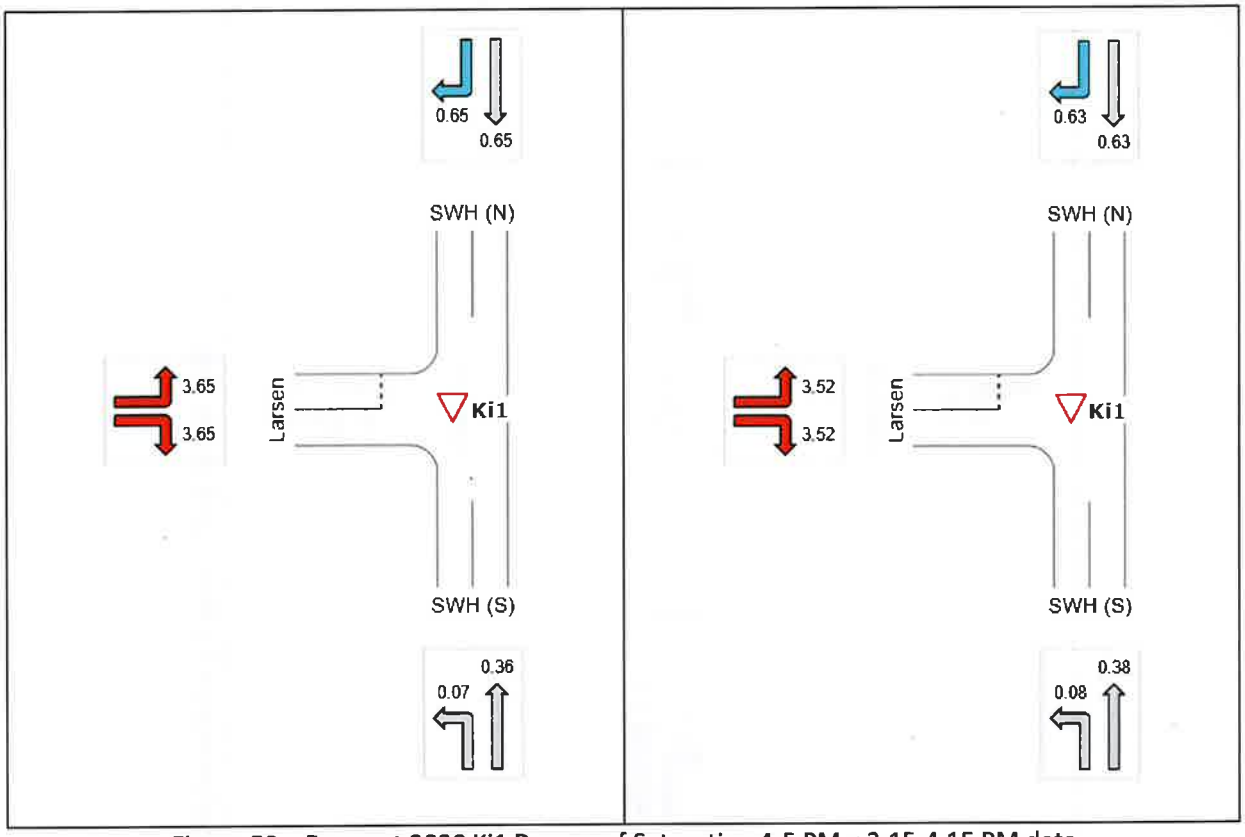



Figure 50 – Forecast 2030 Ki1 Degree of Saturation 4-5 PM v 3.15-4.15 PM data

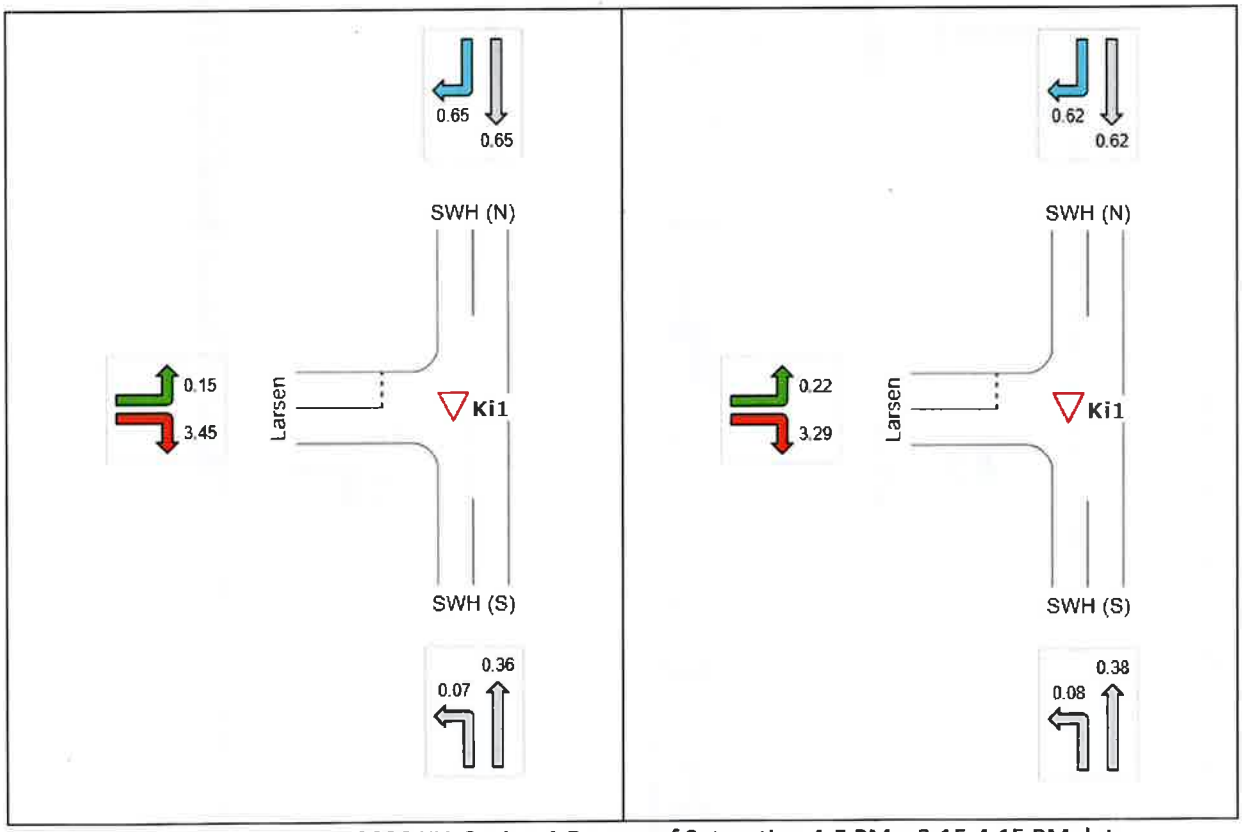



Figure 51 – Forecast 2030 Ki1 Option 1 Degree of Saturation 4-5 PM v 3.15-4.15 PM data

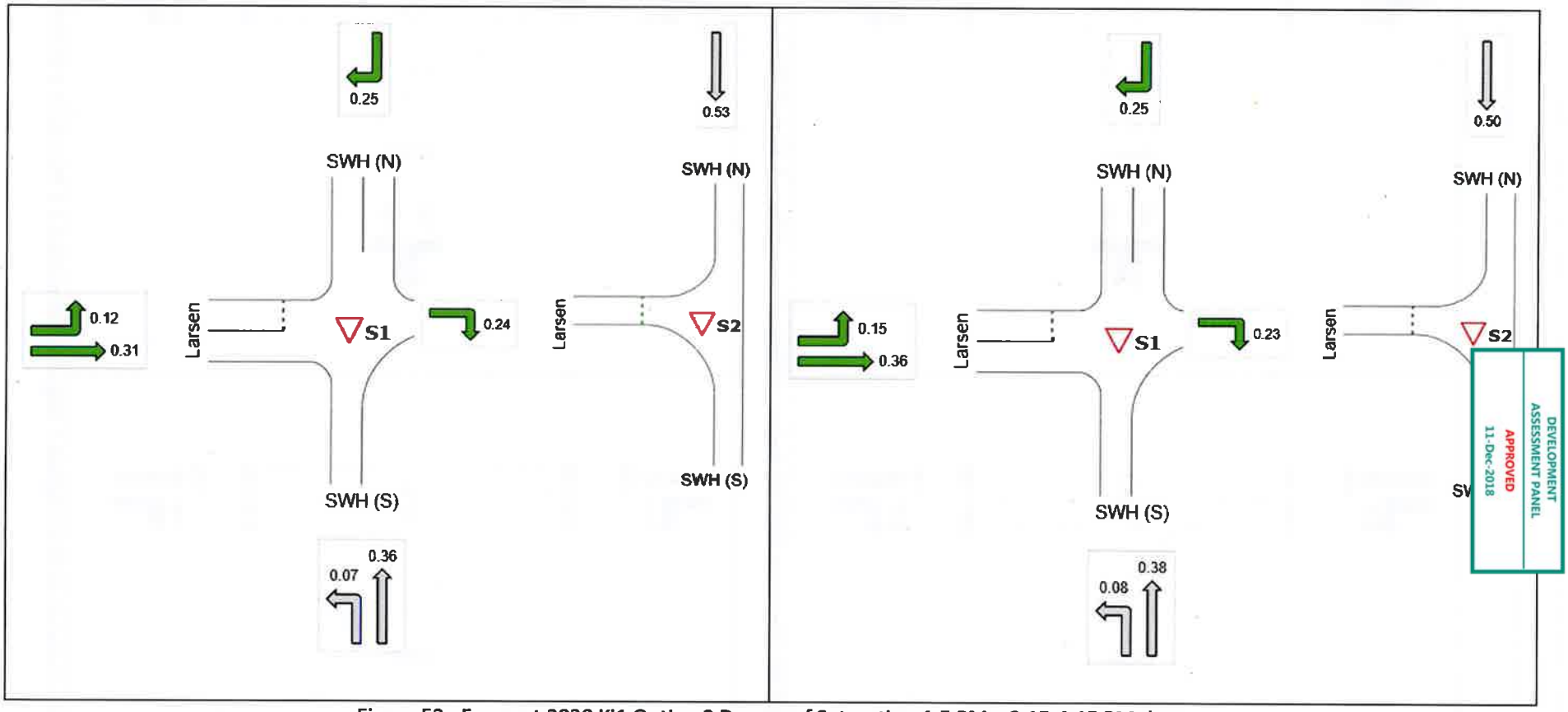



Figure 52– Forecast 2030 Ki1 Option 2 Degree of Saturation 4-5 PM v 3.15-4.15 PM data

# 16 CONCLUSIONS

This TIA has determined that the proposed development is likely to generate up to 200 trips during its busiest hours. Up to 70% of these trips are likely to be from passing traffic. The existing Larsen Rd approach to South Western Hwy is currently very close to capacity during the road network midweek PM and Saturday peak hours, hence any increase in traffic, including that associated with annual growth and other development in the area, is likely to push this to capacity unless changes are made to this intersection.

Two options to address the capacity concerns have been assessed and have demonstrated that the intersection is forecast to perform better than the existing layout despite the increased traffic. This is due to the improved intersection layout, i.e. a two-stage crossing for right turns out of Larsen Rd and protected right and left turn lanes into Larsen Rd.

# References

1. **Western Australian Planning Commission.** *Transport Impact Assessment Guidelines.* Department of Planning, Government of Western Australia. Perth, Western Australia : Western Australian Planning Commission, August 2016. p. 182, Revised August 2016. The current version of the TIA guidelines (August 2016) has been endorsed by the WAPC..

2. **Austroads.** *Guide to Traffic Management Part 12: Traffic Impacts of Developments.* [ed.] Gary Veith, et al. 1st edition. Sydney : Austroads, 2009. p. 115. Vol. 12. ISBN 978-1-921551-61-1.

3. **Main Roads Western Australia.** Perth Metropolitan Area Functional Road Hierarchy. [ed.] Asset & Network Information. Perth, WA, Australia : Main Roads Western Australia, August 1997.

4. **Standards Australia.** *AS 2890.2-2002 Parking facilities Part 2: Off-street commercial vehcile facilities.* Second. Sydney : Standards Australia International, 2002. p. 49. Vol. 2. ISBN 0 7337 4870 8.

5. **NSW Government.** *Guide to Traffic Generating Developments Updated traffic surveys.* Transport, Roads & Maritime Services. Sydney : NSW Government, August 2013. p. 22, Technical Direction. RMS.13.298.

6. **Institute of Transportation Engineers (USA).** *Trip Generation Manual, 9th Edition.* 9th Edition. Washington : Institute of Transportation Engineers (USA), September 2012. ISBN-13: 978-1-933452-64-7; ISBN-10: 1-933452-64-1.

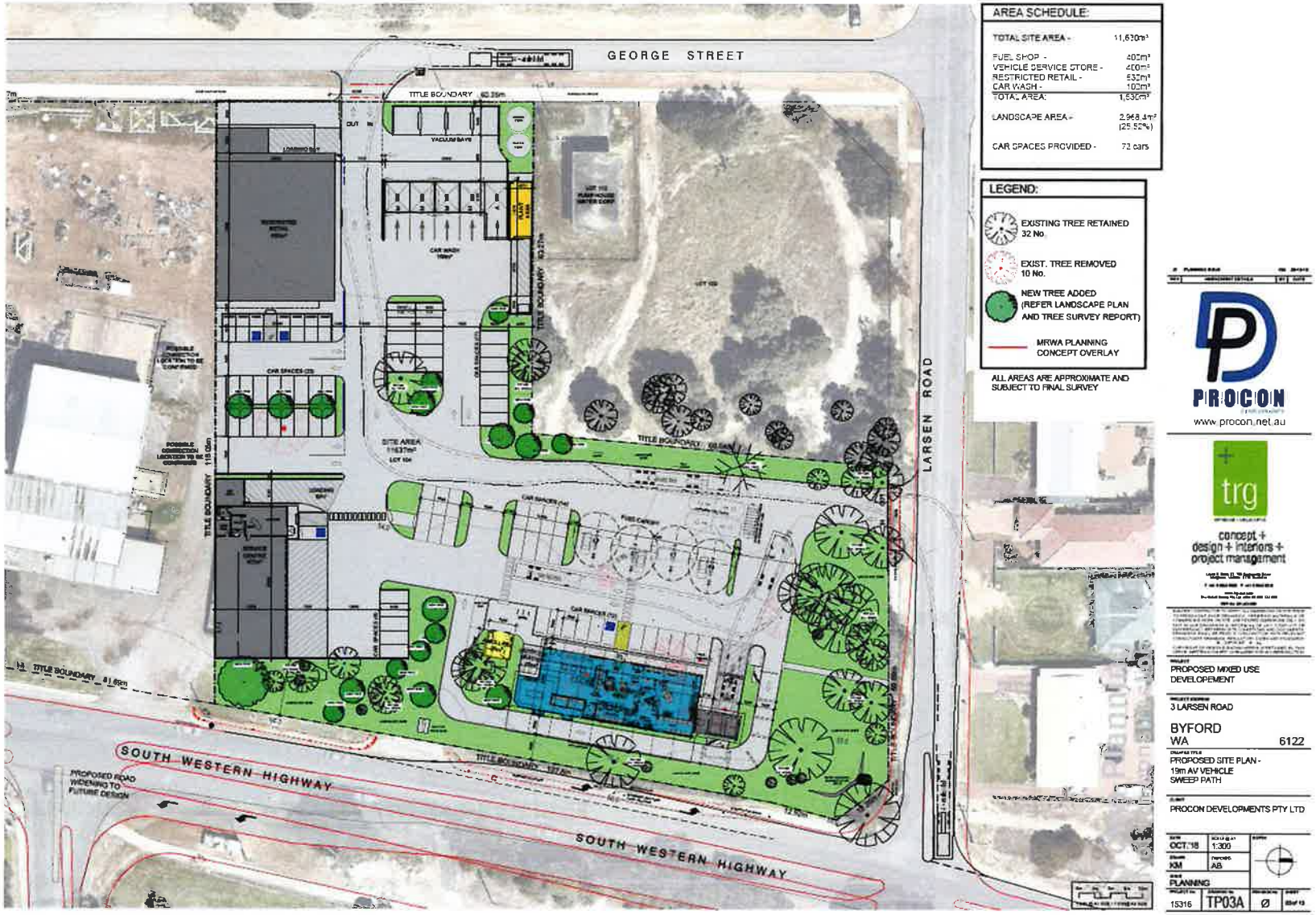
7. **Western Australian Planning Commisssion.** *Liveable Neighbourhoods.* Jan 2009 Update 02. Perth : Western Australian Planning Commisssion, 2009 Update. p. 178. ISBN 0 7309 9649 0.

8. **Standards Australia.** *AS/NZS 2890.1 - 2004 Parking facilities Part 1: Off-street car parking.* Sydney : Standards Australia/ Standards New Zealand, 2004. p. 77. (Incorporating Ammendment No 1). ISBN 0 7337 5742 1.

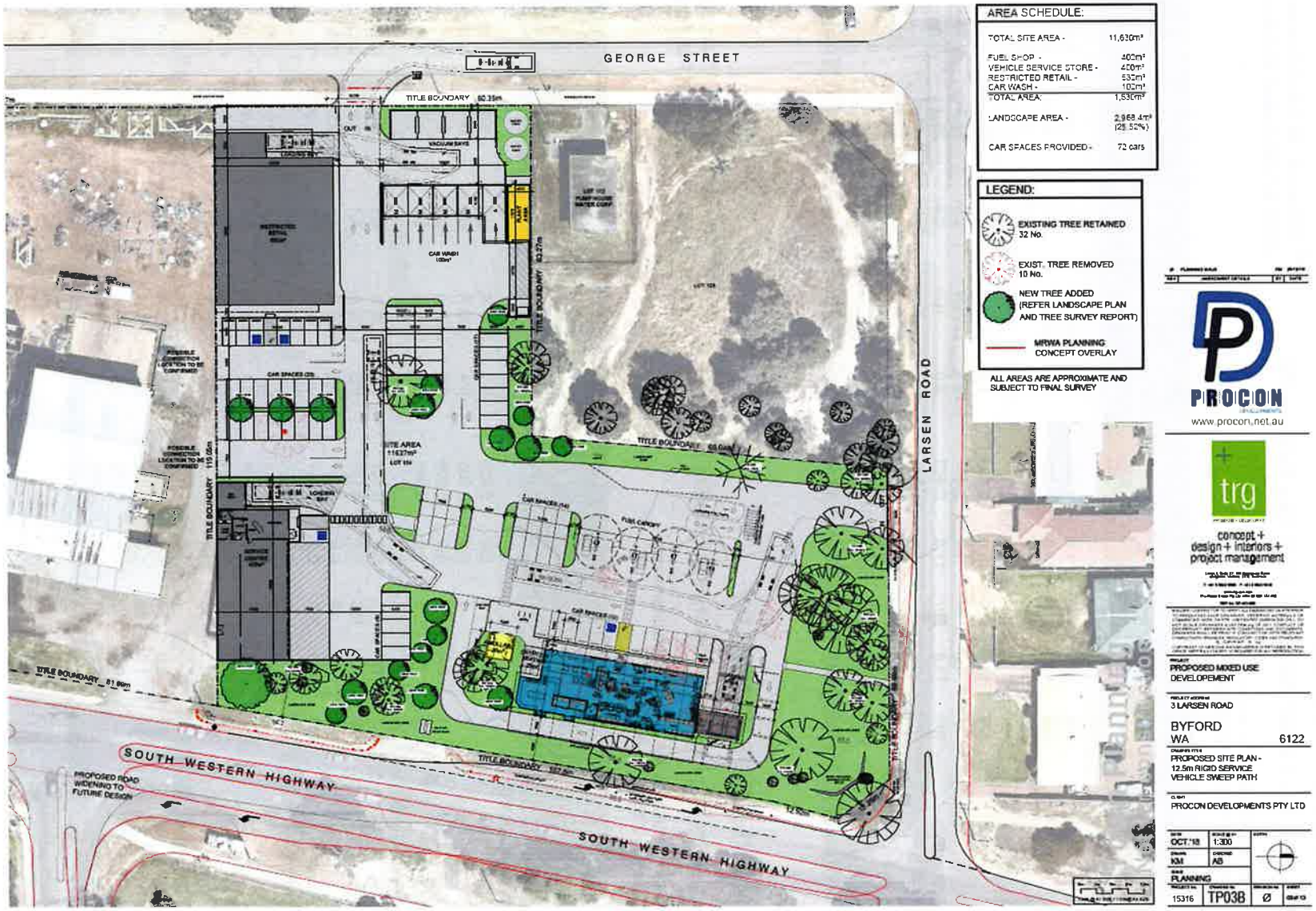
9. **Roads and Traffic Authority NSW.** *Guide to Traffic Generating Developments.* Transport Planning Section. Sydney : Roads and Traffic Authority NSW, October 2002. p. 174. Version 2.2. ISBN 0 7305 9080 1.

10. **Austroads.** *Guide to Traffic Management Part 3: Traffic Studies and Analysis.* Sydney : Austroads Incorporated, 2009. p. 196. Vol. 3. ISBN 978-1-921551-77-2.

# APPENDIX A DEVELOPMENT DRAWINGS




DEVELOPMENT ASSESSMENT PANEL
APPROVED
11-Dec-2018


GEORGE STREET
LARSEN ROAD
SOUTH WESTERN HIGHWAY
SOUTH WESTERN HIGHWAY
TITLE BOUNDARY
PROPOSED ROAD WIDENING TO FUTURE DESIGN
AREA SCHEDULE:
TOTAL SITE AREA - 11,630m²
FUEL SHOP - 400m²
VEHICLE SERVICE STORE - 400m²
RESTRICTED RETAIL - 53m²
CAR WASH - 100m²
TOTAL AREA: 1,530m²
LANDSCAPE AREA - 2,968.4m² (25.52%)
CAR SPACES PROVIDED - 72 cars
LEGEND:
EXISTING TREE RETAINED 32 No.
EXIST. TREE REMOVED 10 No.
NEW TREE ADDED (REFER LANDSCAPE PLAN AND TREE SURVEY REPORT)
MRWA PLANNING CONCEPT OVERLAY
ALL AREAS ARE APPROXIMATE AND SUBJECT TO FINAL SURVEY
PROCON
www.procon.net.au
trg
concept + design + interiors + project management
PROPOSED MIXED USE DEVELOPEMENT
3 LARSEN ROAD
BYFORD
WA 6122
PROPOSED SITE PLAN - 12.5m RIGID SERVICE VEHICLE SWEEP PATH
PROCON DEVELOPMENTS PTY LTD
OCT.'18
1:300
KM
AB
PLANNING
15316
TP03B
DEVELOPMENT ASSESSMENT PANEL
APPROVED
11-Dec-2018

## APPENDIX B SIDRA INTERSECTION DATA

# MOVEMENT SUMMARY

## Site: Ki1: Larsen Rd/ South West Hwy Existing PM

## Network: Si1-Ki1 Existing 2018 4-5 Midweek PM Peak


Giveway / Yield (Two-Way)

**Movement Performance - Vehicles**

| Mov ID | ODMov | Demand Flows Total veh/h | HV % | Arrival Flows Total veh/h | HV % | Deg. Satn v/c | Average Delay sec | Level of Service | 95% Back of Queue Vehicles veh | Distance m | Prop. Queued | Effective Stop Rate per veh | Average Speed km/h |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| South: SWH (S) | | | | | | | | | | | | | |
| 1 | L2 | 116 | 1.0 | 116 | 1.0 | 0.063 | 5.6 | LOS A | 0.0 | 0.0 | 0.00 | 0.58 | 49.1 |
| 2 | T1 | 545 | 13.0 | 545 | 13.0 | 0.303 | 0.0 | LOS A | 0.0 | 0.0 | 0.00 | 0.00 | 59.9 |
| Approach | | 661 | 10.9 | 661 | 10.9 | 0.303 | 1.0 | NA | 0.0 | 0.0 | 0.00 | 0.10 | 59.0 |
| North: SWH (N) | | | | | | | | | | | | | |
| 3 | T1 | 820 | 13.0 | 820 | 13.0 | 0.493 | 1.8 | LOS A | 2.9 | 22.3 | 0.26 | 0.08 | 57.6 |
| 4 | R2 | 87 | 1.0 | 87 | 1.0 | 0.493 | 13.4 | LOS B | 2.9 | 22.3 | 0.33 | 0.10 | 55.5 |
| Approach | | 907 | 11.8 | 907 | 11.8 | 0.493 | 3.0 | NA | 2.9 | 22.3 | 0.26 | 0.08 | 57.4 |
| West: Larsen | | | | | | | | | | | | | |
| 5 | L2 | 43 | 1.0 | 43 | 1.0 | 0.914 | 87.9 | LOS F | 5.9 | 41.8 | 0.95 | 1.47 | 18.8 |
| 6 | R2 | 57 | 1.0 | 57 | 1.0 | 0.914 | 144.3 | LOS F | 5.9 | 41.8 | 0.95 | 1.47 | 13.0 |
| Approach | | 100 | 1.0 | 100 | 1.0 | 0.914 | 120.0 | LOS F | 5.9 | 41.8 | 0.95 | 1.47 | 15.7 |
| All Vehicles | | 1668 | 10.8 | 1668 | 10.8 | 0.914 | 9.2 | NA | 5.9 | 41.8 | 0.20 | 0.17 | 52.4 |

# MOVEMENT SUMMARY

## Site: Si1: Larsen Rd/ George St Existing PM

## Network: Si1-Ki1 Existing 2018 4-5 Midweek PM Peak


Giveway / Yield (Two-Way)

**Movement Performance - Vehicles**

| Mov ID | ODMov | Demand Flows Total veh/h | HV % | Arrival Flows Total veh/h | HV % | Deg. Satn v/c | Average Delay sec | Level of Service | 95% Back of Queue Vehicles veh | Distance m | Prop. Queued | Effective Stop Rate per veh | Average Speed km/h |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| South: George (S) | | | | | | | | | | | | | |
| 1 | L2 | 4 | 0.0 | 4 | 0.0 | 0.005 | 6.1 | LOS A | 0.0 | 0.1 | 0.28 | 0.54 | 51.0 |
| 2 | T1 | 1 | 0.0 | 1 | 0.0 | 0.005 | 5.4 | LOS A | 0.0 | 0.1 | 0.28 | 0.54 | 52.1 |
| 3 | R2 | 1 | 0.0 | 1 | 0.0 | 0.005 | 6.9 | LOS A | 0.0 | 0.1 | 0.28 | 0.54 | 42.7 |
| Approach | | 6 | 0.0 | 6 | 0.0 | 0.005 | 6.1 | LOS A | 0.0 | 0.1 | 0.28 | 0.54 | 50.6 |
| East: Larsen (E) | | | | | | | | | | | | | |
| 4 | L2 | 1 | 0.0 | 1 | 0.0 | 0.107 | 5.9 | LOS A | 0.1 | 0.9 | 0.05 | 0.06 | 54.5 |
| 5 | T1 | 183 | 1.0 | 183 | 1.0 | 0.107 | 0.0 | LOS A | 0.1 | 0.9 | 0.05 | 0.06 | 58.9 |
| 6 | R2 | 19 | 0.0 | 19 | 0.0 | 0.107 | 5.8 | LOS A | 0.1 | 0.9 | 0.05 | 0.06 | 56.1 |
| Approach | | 203 | 0.9 | 203 | 0.9 | 0.107 | 0.6 | NA | 0.1 | 0.9 | 0.05 | 0.06 | 58.5 |
| North: George (N) | | | | | | | | | | | | | |
| 7 | L2 | 9 | 0.0 | 9 | 0.0 | 0.024 | 5.8 | LOS A | 0.1 | 0.6 | 0.23 | 0.58 | 51.0 |
| 8 | T1 | 1 | 0.0 | 1 | 0.0 | 0.024 | 5.4 | LOS A | 0.1 | 0.6 | 0.23 | 0.58 | 52.0 |
| 9 | R2 | 14 | 0.0 | 14 | 0.0 | 0.024 | 7.0 | LOS A | 0.1 | 0.6 | 0.23 | 0.58 | 53.0 |
| Approach | | 24 | 0.0 | 24 | 0.0 | 0.024 | 6.5 | LOS A | 0.1 | 0.6 | 0.23 | 0.58 | 52.4 |
| West: Larsen (W) | | | | | | | | | | | | | |
| 10 | L2 | 27 | 0.0 | 27 | 0.0 | 0.062 | 5.6 | LOS A | 0.0 | 0.1 | 0.02 | 0.15 | 57.3 |
| 11 | T1 | 89 | 1.0 | 89 | 1.0 | 0.062 | 0.0 | LOS A | 0.0 | 0.1 | 0.02 | 0.15 | 57.3 |
| 12 | R2 | 2 | 0.0 | 2 | 0.0 | 0.062 | 6.0 | LOS A | 0.0 | 0.1 | 0.02 | 0.15 | 55.4 |
| Approach | | 119 | 0.8 | 119 | 0.8 | 0.062 | 1.4 | NA | 0.0 | 0.1 | 0.02 | 0.15 | 57.2 |
| All Vehicles | | 353 | 0.8 | 353 | 0.8 | 0.107 | 1.4 | NA | 0.1 | 0.9 | 0.06 | 0.13 | 57.3 |

# MOVEMENT SUMMARY

## Site: Ki1: Larsen Rd/ South West Hwy Existing SAT

## Network: Si1-Ki1 Existing 2018 1-2 Saturday Peak


Giveway / Yield (Two-Way)

**Movement Performance - Vehicles**

| Mov ID | ODMov | Demand Flows Total veh/h | HV % | Arrival Flows Total veh/h | HV % | Deg. Satn v/c | Average Delay sec | Level of Service | 95% Back of Queue Vehicles veh | 95% Back of Queue Distance m | Prop. Queued | Effective Stop Rate per veh | Average Speed km/h |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| South: SWH (S) | | | | | | | | | | | | | |
| 1 | L2 | 80 | 1.0 | 80 | 1.0 | 0.060 | 5.6 | LOS A | 0.0 | 0.0 | 0.00 | 0.43 | 51.3 |
| 2 | T1 | 564 | 13.0 | 564 | 13.0 | 0.298 | 0.0 | LOS A | 0.0 | 0.0 | 0.00 | 0.02 | 59.7 |
| Approach | | 644 | 11.5 | 644 | 11.5 | 0.298 | 0.7 | NA | 0.0 | 0.0 | 0.00 | 0.07 | 59.3 |
| North: SWH (N) | | | | | | | | | | | | | |
| 3 | T1 | 597 | 13.0 | 597 | 13.0 | 0.375 | 1.6 | LOS A | 2.0 | 15.1 | 0.25 | 0.09 | 57.7 |
| 4 | R2 | 78 | 1.0 | 78 | 1.0 | 0.375 | 11.8 | LOS B | 2.0 | 15.1 | 0.32 | 0.12 | 55.7 |
| Approach | | 675 | 11.6 | 675 | 11.6 | 0.375 | 2.8 | NA | 2.0 | 15.1 | 0.26 | 0.09 | 57.5 |
| West: Larsen | | | | | | | | | | | | | |
| 5 | L2 | 47 | 1.0 | 47 | 1.0 | 0.510 | 16.9 | LOS C | 2.1 | 15.0 | 0.87 | 1.06 | 37.2 |
| 6 | R2 | 55 | 1.0 | 55 | 1.0 | 0.510 | 45.3 | LOS E | 2.1 | 15.0 | 0.87 | 1.06 | 29.8 |
| Approach | | 102 | 1.0 | 102 | 1.0 | 0.510 | 32.2 | LOS D | 2.1 | 15.0 | 0.87 | 1.06 | 33.8 |
| All Vehicles | | 1421 | 10.8 | 1421 | 10.8 | 0.510 | 4.0 | NA | 2.1 | 15.1 | 0.18 | 0.15 | 56.4 |

# MOVEMENT SUMMARY

## Site: Si1: Larsen Rd/ George St Existing SAT

## Network: Si1-Ki1 Existing 2018 1-2 Saturday Peak


Giveway / Yield (Two-Way)

**Movement Performance - Vehicles**

| Mov ID | ODMov | Demand Flows Total veh/h | HV % | Arrival Flows Total veh/h | HV % | Deg. Satn v/c | Average Delay sec | Level of Service | 95% Back of Queue Vehicles veh | 95% Back of Queue Distance m | Prop. Queued | Effective Stop Rate per veh | Average Speed km/h |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| South: George (S) | | | | | | | | | | | | | |
| 1 | L2 | 1 | 0.0 | 1 | 0.0 | 0.004 | 5.9 | LOS A | 0.0 | 0.1 | 0.28 | 0.55 | 51.2 |
| 2 | T1 | 1 | 0.0 | 1 | 0.0 | 0.004 | 5.0 | LOS A | 0.0 | 0.1 | 0.28 | 0.55 | 52.2 |
| 3 | R2 | 2 | 0.0 | 2 | 0.0 | 0.004 | 6.6 | LOS A | 0.0 | 0.1 | 0.28 | 0.55 | 43.0 |
| Approach | | 4 | 0.0 | 4 | 0.0 | 0.004 | 6.1 | LOS A | 0.0 | 0.1 | 0.28 | 0.55 | 49.3 |
| East: Larsen (E) | | | | | | | | | | | | | |
| 4 | L2 | 1 | 0.0 | 1 | 0.0 | 0.084 | 5.8 | LOS A | 0.1 | 0.9 | 0.06 | 0.08 | 54.1 |
| 5 | T1 | 137 | 1.0 | 137 | 1.0 | 0.084 | 0.1 | LOS A | 0.1 | 0.9 | 0.06 | 0.08 | 58.5 |
| 6 | R2 | 20 | 0.0 | 20 | 0.0 | 0.084 | 5.7 | LOS A | 0.1 | 0.9 | 0.06 | 0.08 | 55.9 |
| Approach | | 158 | 0.9 | 158 | 0.9 | 0.084 | 0.8 | NA | 0.1 | 0.9 | 0.06 | 0.08 | 58.1 |
| North: George (N) | | | | | | | | | | | | | |
| 7 | L2 | 17 | 0.0 | 17 | 0.0 | 0.020 | 5.8 | LOS A | 0.1 | 0.5 | 0.18 | 0.55 | 51.4 |
| 8 | T1 | 1 | 0.0 | 1 | 0.0 | 0.020 | 5.1 | LOS A | 0.1 | 0.5 | 0.18 | 0.55 | 52.3 |
| 9 | R2 | 7 | 0.0 | 7 | 0.0 | 0.020 | 6.6 | LOS A | 0.1 | 0.5 | 0.18 | 0.55 | 53.2 |
| Approach | | 25 | 0.0 | 25 | 0.0 | 0.020 | 6.0 | LOS A | 0.1 | 0.5 | 0.18 | 0.55 | 52.2 |
| West: Larsen (W) | | | | | | | | | | | | | |
| 10 | L2 | 8 | 0.0 | 8 | 0.0 | 0.048 | 5.6 | LOS A | 0.0 | 0.1 | 0.01 | 0.06 | 58.0 |
| 11 | T1 | 83 | 1.0 | 83 | 1.0 | 0.048 | 0.0 | LOS A | 0.0 | 0.1 | 0.01 | 0.06 | 58.8 |
| 12 | R2 | 1 | 0.0 | 1 | 0.0 | 0.048 | 5.9 | LOS A | 0.0 | 0.1 | 0.01 | 0.06 | 56.3 |
| Approach | | 93 | 0.9 | 93 | 0.9 | 0.048 | 0.6 | NA | 0.0 | 0.1 | 0.01 | 0.06 | 58.6 |
| All Vehicles | | 280 | 0.8 | 280 | 0.8 | 0.084 | 1.3 | NA | 0.1 | 0.9 | 0.06 | 0.12 | 57.4 |

# MOVEMENT SUMMARY

## Site: Ki1: Larsen Rd/ South West Hwy 2030 1-2 PM

**Network: Si1-Ki1 Forecast 2030 1-2 PM Midweek Peak**


Giveway / Yield (Two-Way)

**Movement Performance - Vehicles**

| Mov ID | OD Mov | Demand Flows Total veh/h | HV % | Arrival Flows Total veh/h | HV % | Deg. Satn v/c | Average Delay sec | Level of Service | 95% Back of Queue Vehicles veh | Distance m | Prop. Queued | Effective Stop Rate per veh | Average Speed km/h |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| South: SWH (S) | | | | | | | | | | | | | |
| 1 | L2 | 89 | 1.0 | 89 | 1.0 | 0.056 | 5.6 | LOS A | 0.0 | 0.0 | 0.00 | 0.50 | 50.2 |
| 2 | T1 | 520 | 13.0 | 520 | 13.0 | 0.281 | 0.0 | LOS A | 0.0 | 0.0 | 0.00 | 0.01 | 59.8 |
| Approach | | 609 | 11.2 | 609 | 11.2 | 0.281 | 0.8 | NA | 0.0 | 0.0 | 0.00 | 0.09 | 59.2 |
| North: SWH (N) | | | | | | | | | | | | | |
| 3 | T1 | 534 | 13.0 | 534 | 13.0 | 0.376 | 2.0 | LOS A | 2.3 | 17.9 | 0.30 | 0.14 | 57.2 |
| 4 | R2 | 107 | 1.0 | 107 | 1.0 | 0.376 | 11.2 | LOS B | 2.3 | 17.9 | 0.40 | 0.18 | 54.6 |
| Approach | | 641 | 11.0 | 641 | 11.0 | 0.376 | 3.5 | NA | 2.3 | 17.9 | 0.32 | 0.14 | 56.9 |
| West: Larsen | | | | | | | | | | | | | |
| 5 | L2 | 81 | 1.0 | 81 | 1.0 | 0.670 | 20.9 | LOS C | 3.6 | 25.5 | 0.87 | 1.18 | 36.6 |
| 6 | R2 | 82 | 1.0 | 82 | 1.0 | 0.670 | 46.4 | LOS E | 3.6 | 25.5 | 0.87 | 1.18 | 29.2 |
| Approach | | 163 | 1.0 | 163 | 1.0 | 0.670 | 33.7 | LOS D | 3.6 | 25.5 | 0.87 | 1.18 | 33.4 |
| **All Vehicles** | | **1414** | **9.9** | **1414** | **9.9** | **0.670** | **5.8** | **NA** | **3.6** | **25.5** | **0.24** | **0.24** | **54.6** |

# MOVEMENT SUMMARY

## Site: Si1: Larsen Rd/ George St 2030 1-2 PM

**Network: Si1-Ki1 Forecast 2030 1-2 PM Midweek Peak**


Giveway / Yield (Two-Way)

**Movement Performance - Vehicles**

| Mov ID | OD Mov | Demand Flows Total veh/h | HV % | Arrival Flows Total veh/h | HV % | Deg. Satn v/c | Average Delay sec | Level of Service | 95% Back of Queue Vehicles veh | Distance m | Prop. Queued | Effective Stop Rate per veh | Average Speed km/h |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| South: George (S) | | | | | | | | | | | | | |
| 1 | L2 | 2 | 0.0 | 2 | 0.0 | 0.020 | 5.9 | LOS A | 0.1 | 0.5 | 0.33 | 0.60 | 50.7 |
| 2 | T1 | 1 | 0.0 | 1 | 0.0 | 0.020 | 5.3 | LOS A | 0.1 | 0.5 | 0.33 | 0.60 | 51.8 |
| 3 | R2 | 15 | 0.0 | 15 | 0.0 | 0.020 | 6.9 | LOS A | 0.1 | 0.5 | 0.33 | 0.60 | 42.0 |
| Approach | | 18 | 0.0 | 18 | 0.0 | 0.020 | 6.7 | LOS A | 0.1 | 0.5 | 0.33 | 0.60 | 45.2 |
| East: Larsen (E) | | | | | | | | | | | | | |
| 4 | L2 | 14 | 0.0 | 14 | 0.0 | 0.091 | 5.8 | LOS A | 0.2 | 1.1 | 0.08 | 0.11 | 53.3 |
| 5 | T1 | 137 | 1.0 | 137 | 1.0 | 0.091 | 0.1 | LOS A | 0.2 | 1.1 | 0.08 | 0.11 | 57.9 |
| 6 | R2 | 20 | 0.0 | 20 | 0.0 | 0.091 | 5.8 | LOS A | 0.2 | 1.1 | 0.08 | 0.11 | 55.4 |
| Approach | | 171 | 0.8 | 171 | 0.8 | 0.091 | 1.2 | NA | 0.2 | 1.1 | 0.08 | 0.11 | 57.3 |
| North: George (N) | | | | | | | | | | | | | |
| 7 | L2 | 12 | 0.0 | 12 | 0.0 | 0.016 | 5.9 | LOS A | 0.1 | 0.4 | 0.23 | 0.56 | 51.2 |
| 8 | T1 | 1 | 0.0 | 1 | 0.0 | 0.016 | 5.3 | LOS A | 0.1 | 0.4 | 0.23 | 0.56 | 52.1 |
| 9 | R2 | 6 | 0.0 | 6 | 0.0 | 0.016 | 6.8 | LOS A | 0.1 | 0.4 | 0.23 | 0.56 | 53.1 |
| Approach | | 19 | 0.0 | 19 | 0.0 | 0.016 | 6.2 | LOS A | 0.1 | 0.4 | 0.23 | 0.56 | 52.1 |
| West: Larsen (W) | | | | | | | | | | | | | |
| 10 | L2 | 4 | 0.0 | 4 | 0.0 | 0.067 | 5.8 | LOS A | 0.0 | 0.2 | 0.02 | 0.03 | 58.2 |
| 11 | T1 | 121 | 1.0 | 121 | 1.0 | 0.067 | 0.0 | LOS A | 0.0 | 0.2 | 0.02 | 0.03 | 59.2 |
| 12 | R2 | 3 | 0.0 | 3 | 0.0 | 0.067 | 5.9 | LOS A | 0.0 | 0.2 | 0.02 | 0.03 | 56.6 |
| Approach | | 128 | 0.9 | 128 | 0.9 | 0.067 | 0.3 | NA | 0.0 | 0.2 | 0.02 | 0.03 | 59.0 |
| **All Vehicles** | | **336** | **0.8** | **336** | **0.8** | **0.091** | **1.5** | **NA** | **0.2** | **1.1** | **0.08** | **0.13** | **57.0** |

# MOVEMENT SUMMARY

## Site: Ki1: Larsen Rd/ South West Hwy 2030 4-5 PM

**Network: Si1-Ki1 Forecast 2030 4-5 PM Midweek Peak**


Giveway / Yield (Two-Way)

**Movement Performance - Vehicles**

| Mov ID | OD Mov | Demand Flows Total veh/h | HV % | Arrival Flows Total veh/h | HV % | Deg. Satn v/c | Average Delay sec | Level of Service | 95% Back of Queue Vehicles veh | Distance m | Prop. Queued | Effective Stop Rate per veh | Average Speed km/h |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| South: SWH (S) | | | | | | | | | | | | | |
| 1 | L2 | 151 | 1.0 | 151 | 1.0 | 0.082 | 5.6 | LOS A | 0.0 | 0.0 | 0.00 | 0.58 | 49.1 |
| 2 | T1 | 651 | 13.0 | 651 | 13.0 | 0.362 | 0.0 | LOS A | 0.0 | 0.0 | 0.00 | 0.00 | 59.9 |
| Approach | | 801 | 10.7 | 801 | 10.7 | 0.362 | 1.1 | NA | 0.0 | 0.0 | 0.00 | 0.11 | 58.9 |
| North: SWH (N) | | | | | | | | | | | | | |
| 3 | T1 | 957 | 13.0 | 957 | 13.0 | 0.656 | 4.4 | LOS A | 6.9 | 52.6 | 0.44 | 0.12 | 55.2 |
| 4 | R2 | 131 | 1.0 | 131 | 1.0 | 0.656 | 19.2 | LOS C | 6.9 | 52.6 | 0.59 | 0.16 | 51.1 |
| Approach | | 1087 | 11.6 | 1087 | 11.6 | 0.656 | 6.2 | NA | 6.9 | 52.6 | 0.46 | 0.13 | 54.9 |
| West: Larsen | | | | | | | | | | | | | |
| 5 | L2 | 89 | 1.0 | 89 | 1.0 | 3.737 | 2506.4 | LOS F | 52.8 | 372.8 | 1.00 | 3.64 | 1.3 |
| 6 | R2 | 104 | 1.0 | 104 | 1.0 | 3.737 | 2661.5 | LOS F | 52.8 | 372.8 | 1.00 | 3.64 | 0.8 |
| Approach | | 194 | 1.0 | 194 | 1.0 | 3.737 | 2589.8 | LOS F | 52.8 | 372.8 | 1.00 | 3.64 | 1.0 |
| **All Vehicles** | | **2082** | **10.3** | **2082** | **10.3** | **3.737** | **244.6** | **NA** | **52.8** | **372.8** | **0.33** | **0.45** | **12.3** |

# MOVEMENT SUMMARY

## Site: Ki1: Larsen Rd/ South West Hwy 2030 4-5 PM

**Network: Si1-Ki1 Forecast 2030 4-5 PM Midweek Peak**

© i3 consultants WA | www.i3consultants.com
Giveway / Yield (Two-Way)

**Movement Performance - Vehicles**

| Mov ID | OD Mov | Demand Flows Total veh/h | HV % | Arrival Flows Total veh/h | HV % | Deg. Satn v/c | Average Delay sec | Level of Service | 95% Back of Queue Vehicles veh | Distance m | Prop. Queued | Effective Stop Rate per veh | Average Speed km/h |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| South: SWH (S) | | | | | | | | | | | | | |
| 1 | L2 | 151 | 1.0 | 151 | 1.0 | 0.082 | 5.6 | LOS A | 0.0 | 0.0 | 0.00 | 0.58 | 49.1 |
| 2 | T1 | 651 | 13.0 | 651 | 13.0 | 0.362 | 0.0 | LOS A | 0.0 | 0.0 | 0.00 | 0.00 | 59.9 |
| Approach | | 801 | 10.7 | 801 | 10.7 | 0.362 | 1.1 | NA | 0.0 | 0.0 | 0.00 | 0.11 | 58.9 |
| North: SWH (N) | | | | | | | | | | | | | |
| 3 | T1 | 957 | 13.0 | 957 | 13.0 | 0.656 | 4.4 | LOS A | 6.9 | 52.6 | 0.44 | 0.12 | 55.2 |
| 4 | R2 | 131 | 1.0 | 131 | 1.0 | 0.656 | 19.2 | LOS C | 6.9 | 52.6 | 0.59 | 0.16 | 51.1 |
| Approach | | 1087 | 11.6 | 1087 | 11.6 | 0.656 | 6.2 | NA | 6.9 | 52.6 | 0.46 | 0.13 | 54.9 |
| West: Larsen | | | | | | | | | | | | | |
| 5 | L2 | 89 | 1.0 | 89 | 1.0 | 3.737 | 2506.4 | LOS F | 52.8 | 372.8 | 1.00 | 3.64 | 1.3 |
| 6 | R2 | 104 | 1.0 | 104 | 1.0 | 3.737 | 2661.5 | LOS F | 52.8 | 372.8 | 1.00 | 3.64 | 0.8 |
| Approach | | 194 | 1.0 | 194 | 1.0 | 3.737 | 2589.8 | LOS F | 52.8 | 372.8 | 1.00 | 3.64 | 1.0 |
| **All Vehicles** | | **2082** | **10.3** | **2082** | **10.3** | **3.737** | **244.6** | **NA** | **52.8** | **372.8** | **0.33** | **0.45** | **12.3** |

# MOVEMENT SUMMARY

## Site: Ki1: Larsen Rd/ South West Hwy 2030 1-2 Sat

**Network: Si1-Ki1 Forecast 2030 1-2 PM Saturday Peak**


Giveway / Yield (Two-Way)

**Movement Performance - Vehicles**

| Mov ID | OD Mov | Demand Flows Total veh/h | HV % | Arrival Flows Total veh/h | HV % | Deg. Satn v/c | Average Delay sec | Level of Service | 95% Back of Queue Vehicles veh | 95% Back of Queue Distance m | Prop. Queued | Effective Stop Rate per veh | Average Speed km/h |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| South: SWH (S) | | | | | | | | | | | | | |
| 1 | L2 | 117 | 1.0 | 117 | 1.0 | 0.073 | 5.6 | LOS A | 0.0 | 0.0 | 0.00 | 0.51 | 50.1 |
| 2 | T1 | 672 | 13.0 | 672 | 13.0 | 0.364 | 0.0 | LOS A | 0.0 | 0.0 | 0.00 | 0.01 | 59.8 |
| Approach | | 788 | 11.2 | 788 | 11.2 | 0.364 | 0.9 | NA | 0.0 | 0.0 | 0.00 | 0.09 | 59.1 |
| North: SWH (N) | | | | | | | | | | | | | |
| 3 | T1 | 708 | 13.0 | 708 | 13.0 | 0.531 | 4.0 | LOS A | 4.8 | 36.8 | 0.42 | 0.15 | 55.6 |
| 4 | R2 | 126 | 1.0 | 126 | 1.0 | 0.531 | 16.2 | LOS C | 4.8 | 36.8 | 0.57 | 0.20 | 51.5 |
| Approach | | 835 | 11.2 | 835 | 11.2 | 0.531 | 5.8 | NA | 4.8 | 36.8 | 0.44 | 0.15 | 55.1 |
| West: Larsen | | | | | | | | | | | | | |
| 5 | L2 | 105 | 1.0 | 105 | 1.0 | 1.985 | 921.4 | LOS F | 52.8 | 372.8 | 1.00 | 4.44 | 3.3 |
| 6 | R2 | 114 | 1.0 | 114 | 1.0 | 1.985 | 992.9 | LOS F | 52.8 | 372.8 | 1.00 | 4.44 | 2.0 |
| Approach | | 219 | 1.0 | 219 | 1.0 | 1.985 | 958.5 | LOS F | 52.8 | 372.8 | 1.00 | 4.44 | 2.6 |
| **All Vehicles** | | **1842** | **10.0** | **1842** | **10.0** | **1.985** | **116.9** | **NA** | **52.8** | **372.8** | **0.32** | **0.63** | **20.9** |

# MOVEMENT SUMMARY

## Site: Si1: Larsen Rd/ George St 2030 1-2 Sat

**Network: Si1-Ki1 Forecast 2030 1-2 PM Saturday Peak**


Giveway / Yield (Two-Way)

**Movement Performance - Vehicles**

| Mov ID | OD Mov | Demand Flows Total veh/h | HV % | Arrival Flows Total veh/h | HV % | Deg. Satn v/c | Average Delay sec | Level of Service | 95% Back of Queue Vehicles veh | 95% Back of Queue Distance m | Prop. Queued | Effective Stop Rate per veh | Average Speed km/h |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| South: George (S) | | | | | | | | | | | | | |
| 1 | L2 | 3 | 0.0 | 3 | 0.0 | 0.048 | 29.9 | LOS D | 0.3 | 2.4 | 0.78 | 0.68 | 38.8 |
| 2 | T1 | 1 | 0.0 | 1 | 0.0 | 0.048 | 19.8 | LOS C | 0.3 | 2.4 | 0.78 | 0.68 | 40.6 |
| 3 | R2 | 18 | 0.0 | 18 | 0.0 | 0.048 | 22.2 | LOS C | 0.3 | 2.4 | 0.78 | 0.68 | 24.2 |
| Approach | | 22 | 0.0 | 22 | 0.0 | 0.048 | 23.2 | LOS C | 0.3 | 2.4 | 0.78 | 0.68 | 28.8 |
| East: Larsen (E) | | | | | | | | | | | | | |
| 4 | L2 | 16 | 0.0 | 16 | 0.0 | 0.104 | 5.9 | LOS A | 0.2 | 1.3 | 0.08 | 0.11 | 53.2 |
| 5 | T1 | 158 | 1.0 | 158 | 1.0 | 0.104 | 0.1 | LOS A | 0.2 | 1.3 | 0.08 | 0.11 | 57.9 |
| 6 | R2 | 22 | 0.0 | 22 | 0.0 | 0.104 | 6.0 | LOS A | 0.2 | 1.3 | 0.08 | 0.11 | 55.4 |
| Approach | | 196 | 0.8 | 196 | 0.8 | 0.104 | 1.2 | NA | 0.2 | 1.3 | 0.08 | 0.11 | 57.3 |
| North: George (N) | | | | | | | | | | | | | |
| 7 | L2 | 19 | 0.0 | 19 | 0.0 | 0.041 | 27.2 | LOS D | 0.5 | 3.3 | 0.80 | 0.55 | 35.9 |
| 8 | T1 | 1 | 0.0 | 1 | 0.0 | 0.041 | 17.3 | LOS C | 0.5 | 3.3 | 0.80 | 0.55 | 39.9 |
| 9 | R2 | 8 | 0.0 | 8 | 0.0 | 0.041 | 19.8 | LOS C | 0.5 | 3.3 | 0.80 | 0.55 | 42.7 |
| Approach | | 28 | 0.0 | 28 | 0.0 | 0.041 | 24.7 | LOS C | 0.5 | 3.3 | 0.80 | 0.55 | 38.7 |
| West: Larsen (W) | | | | | | | | | | | | | |
| 10 | L2 | 9 | 0.0 | 9 | 0.0 | 0.158 | 27.6 | LOS D | 0.7 | 4.9 | 0.22 | 0.04 | 53.7 |
| 11 | T1 | 145 | 1.0 | 145 | 1.0 | 0.158 | 4.1 | LOS A | 0.7 | 4.9 | 0.22 | 0.04 | 50.1 |
| 12 | R2 | 3 | 0.0 | 3 | 0.0 | 0.158 | 33.9 | LOS D | 0.7 | 4.9 | 0.22 | 0.04 | 50.6 |
| Approach | | 158 | 0.9 | 158 | 0.9 | 0.158 | 6.1 | NA | 0.7 | 4.9 | 0.22 | 0.04 | 50.5 |
| **All Vehicles** | | **404** | **0.8** | **404** | **0.8** | **0.158** | **6.0** | **NA** | **0.7** | **4.9** | **0.23** | **0.15** | **51.0** |

# MOVEMENT SUMMARY

## Site: Ki1: Option 1: Larsen Rd/ South West Hwy 2030 4-5 PM S1 - Copy

## Network: Option 1: 2030 4-5 PM Midweek Peak


Giveway / Yield (Two-Way)

**Movement Performance - Vehicles**

| Mov ID | OD Mov | Demand Flows Total veh/h | HV % | Arrival Flows Total veh/h | HV % | Deg. Satn v/c | Average Delay sec | Level of Service | 95% Back of Queue Vehicles veh | 95% Back of Queue Distance m | Prop. Queued | Effective Stop Rate per veh | Average Speed km/h |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **South: SWH (S)** | | | | | | | | | | | | | |
| 1 | L2 | 151 | 1.0 | 151 | 1.0 | 0.082 | 5.6 | LOS A | 0.0 | 0.0 | 0.00 | 0.58 | 49.3 |
| 2 | T1 | 651 | 13.0 | 651 | 13.0 | 0.362 | 0.0 | LOS A | 0.0 | 0.0 | 0.00 | 0.00 | 59.9 |
| Approach | | 801 | 10.7 | 801 | 10.7 | 0.362 | 1.1 | NA | 0.0 | 0.0 | 0.00 | 0.11 | 58.6 |
| **North: SWH (N)** | | | | | | | | | | | | | |
| 4 | R2 | 131 | 1.0 | 131 | 1.0 | 0.257 | 12.4 | LOS B | 1.0 | 7.2 | 0.71 | 0.91 | 47.3 |
| Approach | | 131 | 1.0 | 131 | 1.0 | 0.257 | 12.4 | NA | 1.0 | 7.2 | 0.71 | 0.91 | 47.3 |
| **West: Larsen** | | | | | | | | | | | | | |
| 5 | L2 | 89 | 1.0 | 89 | 1.0 | 0.436 | 11.7 | LOS B | 2.2 | 15.4 | 0.78 | 1.00 | 45.7 |
| 6 | T1 | 104 | 0.0 | 104 | 0.0 | 0.436 | 18.8 | LOS C | 2.2 | 15.4 | 0.78 | 1.00 | 23.2 |
| Approach | | 194 | 0.5 | 194 | 0.5 | 0.436 | 15.5 | LOS C | 2.2 | 15.4 | 0.78 | 1.00 | 39.2 |
| **All Vehicles** | | **1125** | **7.8** | **1125** | **7.8** | **0.436** | **4.9** | **NA** | **2.2** | **15.4** | **0.22** | **0.35** | **54.6** |

# MOVEMENT SUMMARY

## Site: Ki1: Option 1: Larsen Rd/ South West Hwy 2030 4-5 PM S2 - Copy

## Network: Option 1: 2030 4-5 PM Midweek Peak


Giveway / Yield (Two-Way)

**Movement Performance - Vehicles**

| Mov ID | OD Mov | Demand Flows Total veh/h | HV % | Arrival Flows Total veh/h | HV % | Deg. Satn v/c | Average Delay sec | Level of Service | 95% Back of Queue Vehicles veh | 95% Back of Queue Distance m | Prop. Queued | Effective Stop Rate per veh | Average Speed km/h |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **North: SWH (N)** | | | | | | | | | | | | | |
| 7 | T1 | 957 | 13.0 | 957 | 13.0 | 0.532 | 0.2 | LOS A | 0.0 | 0.0 | 0.00 | 0.00 | 59.8 |
| Approach | | 957 | 13.0 | 957 | 13.0 | 0.532 | 0.2 | NA | 0.0 | 0.0 | 0.00 | 0.00 | 59.8 |
| **West: Larsen** | | | | | | | | | | | | | |
| 3 | R2 | 104 | 1.0 | 104 | 1.0 | 0.243 | 9.5 | LOS A | 0.8 | 5.4 | 0.76 | 0.91 | 40.3 |
| Approach | | 104 | 1.0 | 104 | 1.0 | 0.243 | 9.5 | LOS A | 0.8 | 5.4 | 0.76 | 0.91 | 40.3 |
| **All Vehicles** | | **1061** | **11.8** | **1061** | **11.8** | **0.532** | **1.1** | **NA** | **0.8** | **5.4** | **0.07** | **0.09** | **58.7** |

# MOVEMENT SUMMARY

## Site: Ki1: Option 2: Larsen Rd/ South West Hwy 2030 4-5 PM S1

## Network: Option 2: 2030 4-5 PM Midweek Peak


Giveway / Yield (Two-Way)

| Movement Performance - Vehicles | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Mov ID | OD Mov | Demand Flows Total veh/h | HV % | Arrival Flows Total veh/h | HV % | Deg. Satn v/c | Average Delay sec | Level of Service | 95% Back of Queue Vehicles veh | Distance m | Prop. Queued | Effective Stop Rate per veh | Average Speed km/h |
| South: SWH (S) | | | | | | | | | | | | | |
| 1 | L2 | 151 | 1.0 | 151 | 1.0 | 0.082 | 5.6 | LOS A | 0.0 | 0.0 | 0.00 | 0.58 | 49.3 |
| 2 | T1 | 651 | 13.0 | 651 | 13.0 | 0.362 | 0.0 | LOS A | 0.0 | 0.0 | 0.00 | 0.00 | 59.9 |
| Approach | | 801 | 10.7 | 801 | 10.7 | 0.362 | 1.1 | NA | 0.0 | 0.0 | 0.00 | 0.11 | 58.6 |
| North: SWH (N) | | | | | | | | | | | | | |
| 4 | R2 | 131 | 1.0 | 131 | 1.0 | 0.257 | 12.4 | LOS B | 1.0 | 7.2 | 0.71 | 0.90 | 47.5 |
| Approach | | 131 | 1.0 | 131 | 1.0 | 0.257 | 12.4 | NA | 1.0 | 7.2 | 0.71 | 0.90 | 47.5 |
| West: Larsen | | | | | | | | | | | | | |
| 5 | L2 | 89 | 1.0 | 89 | 1.0 | 0.117 | 9.0 | LOS A | 0.4 | 3.0 | 0.57 | 0.80 | 50.3 |
| 6 | T1 | 104 | 0.0 | 104 | 0.0 | 0.319 | 17.3 | LOS C | 1.4 | 9.5 | 0.80 | 0.96 | 21.4 |
| Approach | | 194 | 0.5 | 194 | 0.5 | 0.319 | 13.4 | LOS B | 1.4 | 9.5 | 0.70 | 0.88 | 41.0 |
| All Vehicles | | 1125 | 7.8 | 1125 | 7.8 | 0.362 | 4.5 | NA | 1.4 | 9.5 | 0.20 | 0.33 | 55.0 |

# MOVEMENT SUMMARY

## Site: Ki1: Option 2: Larsen Rd/ South West Hwy 2030 4-5 PM S2

## Network: Option 2: 2030 4-5 PM Midweek Peak


Giveway / Yield (Two-Way)

| Movement Performance - Vehicles | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Mov ID | OD Mov | Demand Flows Total veh/h | HV % | Arrival Flows Total veh/h | HV % | Deg. Satn v/c | Average Delay sec | Level of Service | 95% Back of Queue Vehicles veh | Distance m | Prop. Queued | Effective Stop Rate per veh | Average Speed km/h |
| North: SWH (N) | | | | | | | | | | | | | |
| 7 | T1 | 957 | 13.0 | 957 | 13.0 | 0.532 | 0.2 | LOS A | 0.0 | 0.0 | 0.00 | 0.00 | 59.8 |
| Approach | | 957 | 13.0 | 957 | 13.0 | 0.532 | 0.2 | NA | 0.0 | 0.0 | 0.00 | 0.00 | 59.8 |
| West: Larsen | | | | | | | | | | | | | |
| 3 | R2 | 104 | 1.0 | 104 | 1.0 | 0.243 | 9.5 | LOS A | 0.8 | 5.4 | 0.76 | 0.91 | 40.3 |
| Approach | | 104 | 1.0 | 104 | 1.0 | 0.243 | 9.5 | LOS A | 0.8 | 5.4 | 0.76 | 0.91 | 40.3 |
| All Vehicles | | 1061 | 11.8 | 1061 | 11.8 | 0.532 | 1.1 | NA | 0.8 | 5.4 | 0.07 | 0.09 | 58.7 |

# MOVEMENT SUMMARY

## ▽ Site: Larsen Rd/ Access 2030 Midweek 1-2


Giveway / Yield (Two-Way)

| Movement Performance - Vehicles | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Mov ID | OD Mov | Demand Flows Total veh/h | HV % | Deg. Satn v/c | Average Delay sec | Level of Service | 95% Back of Queue Vehicles veh | Distance m | Prop. Queued | Effective Stop Rate per veh | Average Speed km/h |
| South: Access | | | | | | | | | | | |
| 1 | L2 | 22 | 2.0 | 0.081 | 0.3 | LOS A | 0.3 | 2.0 | 0.22 | 0.12 | 24.9 |
| 2 | R2 | 73 | 2.0 | 0.081 | 0.7 | LOS A | 0.3 | 2.0 | 0.22 | 0.12 | 22.6 |
| Approach | | 95 | 2.0 | 0.081 | 0.6 | LOS A | 0.3 | 2.0 | 0.22 | 0.12 | 23.1 |
| East: Larsen Rd | | | | | | | | | | | |
| 3 | L2 | 47 | 2.0 | 0.067 | 4.3 | LOS A | 0.0 | 0.0 | 0.00 | 0.19 | 42.1 |
| 4 | T1 | 87 | 2.0 | 0.067 | 0.0 | LOS A | 0.0 | 0.0 | 0.00 | 0.19 | 44.0 |
| Approach | | 135 | 2.0 | 0.067 | 1.5 | NA | 0.0 | 0.0 | 0.00 | 0.19 | 43.2 |
| West: Larsen Rd | | | | | | | | | | | |
| 5 | T1 | 15 | 2.0 | 0.037 | 0.4 | LOS A | 0.2 | 1.2 | 0.24 | 0.39 | 35.7 |
| 6 | R2 | 47 | 2.0 | 0.037 | 5.0 | LOS A | 0.2 | 1.2 | 0.24 | 0.39 | 26.4 |
| Approach | | 62 | 2.0 | 0.037 | 3.9 | NA | 0.2 | 1.2 | 0.24 | 0.39 | 27.8 |
| All Vehicles | | 292 | 2.0 | 0.081 | 1.7 | NA | 0.3 | 2.0 | 0.12 | 0.21 | 30.4 |

# MOVEMENT SUMMARY

## ▽ Site: Larsen Rd/ Access 2030 Midweek 4-5


Giveway / Yield (Two-Way)

| Movement Performance - Vehicles | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Mov ID | OD Mov | Demand Flows Total veh/h | HV % | Deg. Satn v/c | Average Delay sec | Level of Service | 95% Back of Queue Vehicles veh | Distance m | Prop. Queued | Effective Stop Rate per veh | Average Speed km/h |
| South: Access | | | | | | | | | | | |
| 1 | L2 | 4 | 2.0 | 0.074 | 0.3 | LOS A | 0.2 | 1.7 | 0.24 | 0.14 | 24.8 |
| 2 | R2 | 78 | 2.0 | 0.074 | 0.7 | LOS A | 0.2 | 1.7 | 0.24 | 0.14 | 22.5 |
| Approach | | 82 | 2.0 | 0.074 | 0.7 | LOS A | 0.2 | 1.7 | 0.24 | 0.14 | 22.7 |
| East: Larsen Rd | | | | | | | | | | | |
| 3 | L2 | 41 | 2.0 | 0.066 | 4.3 | LOS A | 0.0 | 0.0 | 0.00 | 0.17 | 42.6 |
| 4 | T1 | 92 | 2.0 | 0.066 | 0.0 | LOS A | 0.0 | 0.0 | 0.00 | 0.17 | 44.6 |
| Approach | | 133 | 2.0 | 0.066 | 1.3 | NA | 0.0 | 0.0 | 0.00 | 0.17 | 43.9 |
| West: Larsen Rd | | | | | | | | | | | |
| 5 | T1 | 15 | 2.0 | 0.033 | 0.4 | LOS A | 0.2 | 1.1 | 0.24 | 0.38 | 36.0 |
| 6 | R2 | 41 | 2.0 | 0.033 | 5.0 | LOS A | 0.2 | 1.1 | 0.24 | 0.38 | 26.5 |
| Approach | | 56 | 2.0 | 0.033 | 3.8 | NA | 0.2 | 1.1 | 0.24 | 0.38 | 28.1 |
| All Vehicles | | 271 | 2.0 | 0.074 | 1.6 | NA | 0.2 | 1.7 | 0.12 | 0.20 | 30.9 |

# MOVEMENT SUMMARY

## Site: Larsen Rd/ Access 2030 Sat 12-1


Giveway / Yield (Two-Way)

**Movement Performance - Vehicles**

| Mov ID | OD Mov | Demand Flows Total veh/h | HV % | Deg. Satn v/c | Average Delay sec | Level of Service | 95% Back of Queue Vehicles veh | Distance m | Prop. Queued | Effective Stop Rate per veh | Average Speed km/h |
|---|---|---|---|---|---|---|---|---|---|---|---|
| South: Access | | | | | | | | | | | |
| 1 | L2 | 5 | 2.0 | 0.097 | 0.4 | LOS A | 0.3 | 2.3 | 0.27 | 0.18 | 24.7 |
| 2 | R2 | 99 | 2.0 | 0.097 | 0.9 | LOS A | 0.3 | 2.3 | 0.27 | 0.18 | 22.4 |
| Approach | | 104 | 2.0 | 0.097 | 0.8 | LOS A | 0.3 | 2.3 | 0.27 | 0.18 | 22.5 |
| East: Larsen Rd | | | | | | | | | | | |
| 3 | L2 | 53 | 2.0 | 0.083 | 4.3 | LOS A | 0.0 | 0.0 | 0.00 | 0.17 | 42.5 |
| 4 | T1 | 114 | 2.0 | 0.083 | 0.0 | LOS A | 0.0 | 0.0 | 0.00 | 0.17 | 44.5 |
| Approach | | 166 | 2.0 | 0.083 | 1.4 | NA | 0.0 | 0.0 | 0.00 | 0.17 | 43.8 |
| West: Larsen Rd | | | | | | | | | | | |
| 5 | T1 | 16 | 2.0 | 0.042 | 0.5 | LOS A | 0.2 | 1.4 | 0.27 | 0.40 | 35.3 |
| 6 | R2 | 53 | 2.0 | 0.042 | 5.1 | LOS A | 0.2 | 1.4 | 0.27 | 0.40 | 26.2 |
| Approach | | 68 | 2.0 | 0.042 | 4.0 | NA | 0.2 | 1.4 | 0.27 | 0.40 | 27.6 |
| All Vehicles | | 339 | 2.0 | 0.097 | 1.7 | NA | 0.3 | 2.3 | 0.14 | 0.22 | 30.6 |

## APPENDIX C WAPC TRANSPORT IMPACT ASSESSMENT CHECKLIST

Checklist for a Transport Impact Assessment for individual development

- Tick the provided column for items for which information is provided.
- Enter N/A in the provided column if the item is not appropriate and enter reason in comment column.
- Provide brief comments on any relevant issues.
- Provide brief description of any proposed transport improvements, for example, new bus routes or signalisation of an existing intersection.

| ITEM | PROVIDED | COMMENTS/PROPOSALS |
|---|---|---|
| **Summary** | | |
| **Introduction/Background** | | |
| name of applicant and consultant | ✓ | Section 1 |
| development location and context | ✓ | Section 1 & Figure 2 |
| brief description of development proposal | ✓ | Section 1 & Table 1 |
| key issues | ✓ | Section 1 |
| background information | ✓ | Section 1 |
| **Existing situation** | | |
| existing site uses (if any) | ✓ | Section 2.1, Photograph 1 & Photograph 2 |
| existing parking and demand (if appropriate) | NA | Vacant site |
| existing access arrangements | ✓ | Off South Western Hwy (Photograph 1) |
| existing site traffic | NA | Vacant site |
| surrounding land uses | ✓ | Sections 4.1 and 5 |
| surrounding road network | ✓ | Section 2.4 |
| traffic management on frontage roads | ✓ | Section 2.4 |
| traffic flows on surrounding roads (usually AM and PM peak hours) | ✓ | Section 2.5, Figure 12, Figure 13 and Figure 14 |
| traffic flows at major intersections (usually AM and PM peak hours) | ✓ | Section 2.5, Figure 12, Figure 13 and Figure 14 |
| operation of surrounding intersections | ✓ | Section 10.2.1, Figure 29 & Appendix B |
| existing pedestrian/cycle networks | ✓ | Sections 1 & 14 & Figure 2 |
| existing public transport services surrounding the development | ✓ | Sections 1 & 13, Figure 2, Table 7 & Table 8 |
| crash data | ✓ | Section 11, Figure 34 and Figure 35. |

| ITEM | PROVIDED | COMMENTS/PROPOSALS |
|---|---|---|
| **Development proposal** | | |
| regional context | ✓ | Section 5 |
| proposed land uses | ✓ | Section 3, Table 1 & Appendix A |
| table of land uses and quantities | ✓ | Table 1 |
| access arrangements | ✓ | Section 3 & Appendix A |
| parking provision | ✓ | Section 14 & Appendix A |
| end of trip facilities | × | No end of cycle trip facilities shown |
| any specific issues | ✓ | Section 15 |
| road network | ✓ | Sections 2.2 & 4.2, Figure 4 & Figure 16 |
| intersection layouts and controls | ✓ | Sections 2.4.4 & 2.4.5 |
| pedestrian/cycle networks and crossing facilities | ✓ | Section 13, Figure 2 & Photograph 8 |
| public transport services | ✓ | Sections 1 & 13, Figure 2, Table 7 & Table 8 |
| **Integration with surrounding area** | | |
| surrounding major attractors/ generators | ✓ | Section 5 |
| committed developments and transport proposals | ✓ | Section 4 |
| proposed changes to land uses within 1200 metres | ✓ | Section 4 |
| travel desire lines from development to these attractors/ generators | ✓ | Section 13, Figure 2 & Photograph 8 |
| adequacy of existing transport networks | ✓ | Section 12 |
| deficiencies in existing transport networks | ✓ | Section 12 |
| remedial measures to address deficiencies | ✓ | Section 4.3 |
| **Analysis of transport networks** | | |
| assessment years | ✓ | Section 6 |
| time periods | ✓ | Section 8 |
| development generated traffic | ✓ | Section 8, Figure 25, Figure 26 & Figure 27. |
| distribution of generated traffic | ✓ | Section 8, Figure 25, Figure 26 & Figure 27. |
| parking supply and demand | ✓ | Section 14 |
| base and 'with development' traffic flows | ✓ | Sections 10.2.2 & 10.2.3 |
| analysis of development accesses | NA | Left-in only off South Western Hwy |
| impact on surrounding roads | ✓ | Section 9 & Table 3. |
| impact on intersections | ✓ | Section 10, Table 4 & Table 5 |

DEVELOPMENT ASSESSMENT PANEL
APPROVED
11-Dec-2018

| ITEM | PROVIDED | COMMENTS/PROPOSALS |
|---|---|---|
| **Analysis of transport networks (cont.)** | | |
| impact on neighbouring areas | ✓ | Sections 9 & 10 |
| road safety | ✓ | Section 11 |
| public transport access | ✓ | Section 12 |
| pedestrian access/amenity | ✓ | Section 13 |
| cycle access/amenity | ✓ | Section 13 |
| analysis of pedestrian/cycle networks | ✓ | Section 13 |
| safe walk/cycle to school (for residential and school site developments only) | NA | |
| traffic management plan (where appropriate) | NA | |
| **Conclusions** | ✓ | Section 16 |

**Proponent's name** .....

**Company** Procon Developments **Date** .....

**Transport assessor's name** David Wilkins

**Company** i3 consultants WA **Date** 09/11/18

DEVELOPMENT
ASSESSMENT PANEL

APPROVED
11-Dec-2018

PROPOSED MIXED USE DEVELOPMENT
AT
# 3 LARSEN ROAD, BYFORD, WA

## ARCHITECTURAL DRAWING LIST:

| | |
|---|---|
| TP.01 | TITLE PAGE AND SITE LOCALITY PLAN |
| TP.02 | EXISTING CONDITIONS SITE PLAN & DEMOLITION PLAN |
| TP.03 | PROPOSED SITE PLAN |
| TP03A | TANKER PATH |
| TP03B | DELIVERY TRUCK PATH SHEET 1 |
| TP03C | DELIVERY TRUCK PATH SHEET 2 |
| TP03D | DELIVERY TRUCK PATH SHEET 3 |
| TP.04 | PROPOSED FLOOR PLAN - FUEL SHOP |
| TP.05 | PROPOSED FLOOR PLANS - SERVICE CENTRE |
| TP.06 | PROPOSED FLOOR PLANS - CAR WASH & RETAIL |
| TP.07 | ELEVATIONS - FUEL SHOP & CANOPY |
| TP.08 | ELEVATIONS - SERVICE CENTRE |
| TP.09 | ELEVATIONS - CAR WASH & RETAIL |
| TP.10 | SIGNAGE PLAN |
| TP.11 | PERSPECTIVE VIEW 1 |
| TP.12 | PERSPECTIVE VIEW 2 |
| TP.13 | PERSPECTIVE VIEW 3 |
| TP.14 | PERSPECTIVE VIEW 4 |

DEVELOPMENT ASSESSMENT PANEL
APPROVED
11-Dec-2018


1 - TP01 - August 2018 - Revision E

## AREA SCHEDULE:

| | |
|---|---|
| TOTAL SITE AREA - | 11,630m² |
| FUEL SHOP - | 400m² |
| VEHICLE SERVICE STORE - | 400m² |
| RESTRICTED RETAIL - | 630m² |
| CAR WASH - | 100m² |
| TOTAL AREA: | 1,530m² |
| LANDSCAPE AREA - | 3,095m² (26.61%) |
| CAR SPACES PROVIDED - | 69 cars |

| REV | AMENDMENT DETAILS | BY | DATE |
|---|---|---|---|
| E | PLAN REVISED TO SUIT TP03 REV.M | JS | 09-11-18 |
| D | PLAN REVISED TO SUIT TP03 REV.L | JS | 08-11-18 |
| C | PLAN REVISED TO SUIT TP03 REV.G | KM | 24-08-18 |
| B | PLAN REVISED TO SUIT TP03 REV.B | JS | 06-07-18 |
| A | SITE KERB TO SOUTH WESTERN HIGHWAY MODIFIED | JP | 09-05-18 |
| Ø | PLANNING ISSUE | JP | 08-05-18 |
| P3 | LOCALITY PLAN REVISED, DRAWING LIST UPDATED | JP | 07-05-18 |
| P2 | LOCALITY PLAN REVISED TO MATCH TP03 REV. P2 | JS | 17-04-18 |
| P1 | PRELIMINARY ISSUE | KM | 10-04-18 |

PROCON DEVELOPMENTS
www.procon.net.au

trg
BRISBANE + MELBOURNE

concept + design + interiors + project management

Level 3, Suite 37, 799 Springvale Road, Mulgrave, Victoria 3170 Australia
T: +61 3 9542 9300 F: +61 3 9542 9310
www.trg-aus.com
The Retail Group Pty Ltd ABN 85 050 134 686
RBP No. DP-AD1689



PROJECT
PROPOSED MIXED USE DEVELOPEMENT

PROJECT ADDRESS
3 LARSEN ROAD
BYFORD
WA 6122

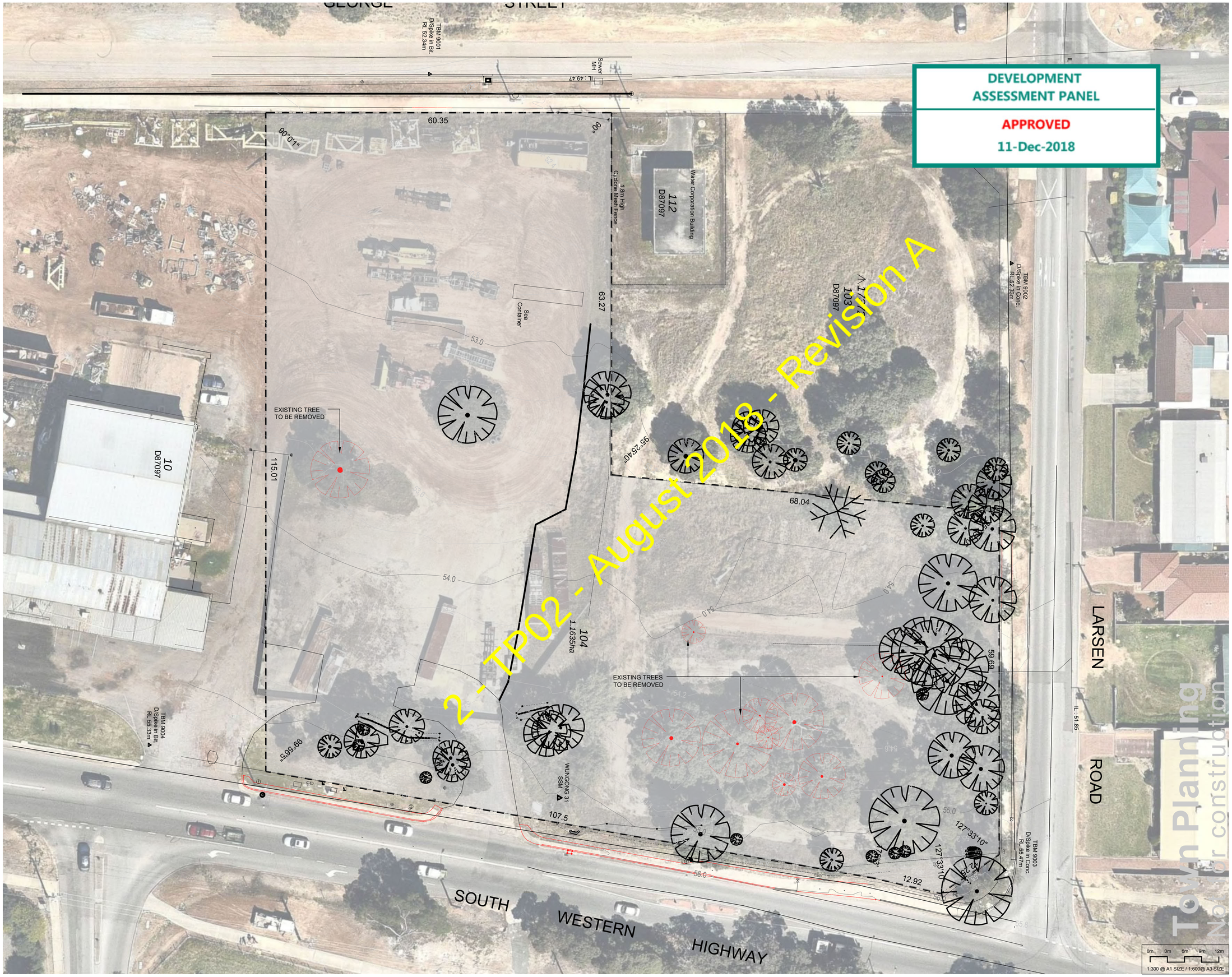
DRAWING TITLE
TITLE PAGE & LOCALITY PLAN

CLIENT
PROCON DEVELOPMENTS PTY LTD

Town Planning
Not for construction

| | | | |
|---|---|---|---|
| DATE AUG.'18 | SCALE @ A1 1:500 | NORTH | |
| DRAWN KM | CHECKED AB | | |
| ISSUE PLANNING | | | |
| PROJECT No. 15316 | DRAWING No. TP01 | REVISION No. E | SHEET 01 of 18 |

0m 5m 10m 15m 20m
1:500 @ A1 SIZE / 1:1000@ A3 SIZE




| REV | AMENDMENT DETAILS | BY | DATE |
|---|---|---|---|
| A | TREES TO BE REMOVED SHOWN | JS | 08-11-18 |
| Ø | PLANNING ISSUE | JP | 08-05-18 |
| P1 | PRELIMINARY ISSUE | KM | 10-04-18 |

PROCON DEVELOPMENTS
www.procon.net.au

trg
BRISBANE + MELBOURNE

concept + design + interiors + project management

Level 3, Suite 37, 799 Springvale Road,
Mulgrave, Victoria 3170 Australia
T: +61 3 9542 9300 F: +61 3 9542 9310
www.trg-aus.com
The Retail Group Pty Ltd ABN 85 050 134 686
RBP No. DP-AD1689



PROJECT
PROPOSED MIXED USE DEVELOPEMENT

PROJECT ADDRESS
3 LARSEN ROAD

BYFORD
WA 6122

DRAWING TITLE
EXISTING CONDITIONS PLAN & DEMOLITION PLAN

CLIENT
PROCON DEVELOPMENTS PTY LTD

| DATE | SCALE @ A1 | NORTH |
|---|---|---|
| AUG.'18 | 1:300 | |
| DRAWN | CHECKED | |
| KM | AB | |
| ISSUE | | |
| PLANNING | | |

| PROJECT No. | DRAWING No. | REVISION No. | SHEET |
|---|---|---|---|
| 15316 | TP02 | A | 02of 18 |

GEORGE STREET

EXISTING FOOTPATH

TITLE BOUNDARY 60.35m

OUT IN

VACUUM BAYS

WATER TANK

WATER TANK

LOADING BAY

RESTRICTED RETAIL 630m²

CAR WASH 100m²

PLANT AREA

LOT 112 PUMP HOUSE WATER CORP.

LOT 103

TITLE BOUNDARY 63.27m

CAR SPACES (23)

POSSIBLE CONNECTION LOCATION TO BE CONFIRMED

POSSIBLE CONNECTION LOCATION TO BE CONFIRMED

SITE AREA 11635m²

LOT 104

CAR SPACES (16)

TITLE BOUNDARY 115.05m

LARSEN ROAD

TITLE BOUNDARY 68.04m

LOADING BAY

BIN AREA

SERVICE CENTRE 400m²

OFFICE

SHOWROOM

LUNCH ROOM

RECEP.

CAR SPACES (10)

FUEL CANOPY

UNDERGROUND FUEL TANKS

UNDERGROUND PETROLEUM PRODUCTS CONTAINMENT TANK

WAITING BAY

CAR SPACES (20)

BIKES

CELLAR 25m²

OUTDOOR SEATING 125m²

FUEL SHOP 400m²

LOADING AREA

AIR & WATER

LANDSCAPE ZONE

4m HIGH PRICE SIGN

ENTRY FEATURE - SIGNAGE & FUEL PRICE

TITLE BOUNDARY 59.69m

TITLE BOUNDARY 81.69m

TITLE BOUNDARY 107.5m

SOUTH WESTERN HIGHWAY

PROPOSED ROAD WIDENING TO FUTURE DESIGN

EXISTING FOOTPATH

NEW FOOTPATH

EXTENDED LEFT TURN LANE 75m LONG

12.92m

12.25m

0m 3m 6m 9m 12m

1:300 @ A1 SIZE / 1:600@ A3 SIZE

DEVELOPMENT ASSESSMENT PANEL

APPROVED

11-Dec-2018

## AREA SCHEDULE:

| | |
|---|---|
| TOTAL SITE AREA - | 11,630m² |
| FUEL SHOP - | 400m² |
| VEHICLE SERVICE STORE - | 400m² |
| RESTRICTED RETAIL | 630m² |
| | 100m² |
| | 1,530m² |
| | 3,095m² (26.61%) |
| - | 69 cars |

## LEGEND:

- EXISTING TREE RETAINED 32 No.
- EXIST. TREE REMOVED 10 No.
- NEW TREE ADDED (REFER LANDSCAPE PLAN AND TREE SURVEY REPORT)
- MRWA PLANNING CONCEPT OVERLAY

ALL AREAS ARE APPROXIMATE AND SUBJECT TO FINAL SURVEY

| REV | AMENDMENT DETAILS | BY | DATE |
|---|---|---|---|
| M | AUTO CAR WASH & BIN AREA REVISED. NO. OF CAR PARKING REVISED | JS | 09-11-18 |
| L | TIMBER BATTEN ADDED | JS | 08-11-18 |
| K | PARKING AREA REVISED | KM | 30-10-18 |
| J | CAR CANOPY, SERVICE CENTRE & CAR WASH REVISED | KM | 23-10-18 |
| H | CAR WASH & SERVICE CENTRE REVISED. | KM | 19-10-18 |
| G | PARKING REVISED. | KM | 24-08-18 |
| F | TENANCIES & PARKING REVISED. | KM | 22-08-18 |
| E | FUEL SHOP & CANOPY REVISED. | KM | 13-08-18 |
| D | SITE ACCESS & CAR WASH REVISED. | KM | 17-07-18 |
| C | CAR CANOPY & CAR WASH REVISED. | KM | 12-07-18 |
| B | TRUCK CANOPY DELETED. CAR CANOPY REVISED. | JS | 06-07-18 |
| A | SITE KERB TO SOUTH WESTERN HIGHWAY AMENDED | JP | 09-05-18 |
| Ø | PLANNING ISSUE | JP | 08-05-18 |
| P2 | CARWASH LAYOUT REVISED | JS | 17-04-18 |
| P1 | PRELIMINARY ISSUE | KM | 10-04-18 |

PROCON DEVELOPMENTS
www.procon.net.au

trg
BRISBANE + MELBOURNE

concept + design + interiors + project management

Level 3, Suite 37, 799 Springvale Road, Mulgrave, Victoria 3170 Australia
T: +61 3 9542 9300 F: +61 3 9542 9310
www.trg-aus.com
The Retail Group Pty Ltd ABN 85 050 134 686
RBP No. DP-AD1689



PROJECT
PROPOSED MIXED USE DEVELOPEMENT

PROJECT ADDRESS
3 LARSEN ROAD

BYFORD
WA 6122

DRAWING TITLE
PROPOSED SITE PLAN

CLIENT
PROCON DEVELOPMENTS PTY LTD

| DATE | SCALE @ A1 | NORTH |
|---|---|---|
| APR.'18 | 1:300 | |
| DRAWN KM | CHECKED AB | |
| ISSUE PLANNING | | |

| PROJECT No. | DRAWING No. | REVISION No. | SHEET |
|---|---|---|---|
| 15316 | TP03 | M | 03of 18 |

## AREA SCHEDULE:

| | |
|---|---|
| TOTAL SITE AREA - | 11,630m² |
| FUEL SHOP - | 400m² |
| VEHICLE SERVICE STORE - | 400m² |
| RESTRICTED RETAIL | 630m² |
| | 100m² |
| | 1,530m² |
| | 3,095m² (26.61%) |
| - | 69 cars |

**DEVELOPMENT ASSESSMENT PANEL**

**APPROVED**

**11-Dec-2018**

GEORGE STREET

EXISTING FOOTPATH

TITLE BOUNDARY 60.35m

AV - Articulated Vehicle

OUT IN

VACUUM BAYS

WATER TANK

WATER TANK

LOADING BAY

RESTRICTED RETAIL 630m²

LOT 112 PUMP HOUSE WATER CORP.

PLANT AREA

CAR WASH 100m²

TITLE BOUNDARY 63.27m

LOT 103

POSSIBLE CONNECTION LOCATION TO BE CONFIRMED

CAR SPACES (23)

SITE AREA 11635m²

LOT 104

CAR SPACES (16)

TITLE BOUNDARY 68.04m

LARSEN ROAD

TITLE BOUNDARY 115.05m

BIN AREA

LOADING BAY

SERVICE CENTRE 400m²

OFFICE

RECEP.

SHOWROOM

LUNCH ROOM

FUEL CANOPY

UGROUND FUEL TANKS

CAR SPACES (10)

WAITING BAY

CAR SPACES (20)

BIKES

PYLON SIGN

OUTDOOR SEATING 25m²

FUEL SHOP 400m²

LOADING AREA

9m HIGH PRICE SIGN

FTC SIGNAGE

ENTRY FEATURE SIGNAGE & FUEL PRICE

TITLE BOUNDARY 59.69m

TITLE BOUNDARY 81.69m

SOUTH WESTERN HIGHWAY

PROPOSED ROAD WIDENING TO FUTURE DESIGN

TITLE BOUNDARY 107.5m

NEW FOOTPATH

EXTENDED LEFT TURN LANE 75m LONG

12.92m

12.25m

LANDSCAPE ZONE

RETAIN EX. TREES

NEW TREE

0m 3m 6m 9m 12m

1:300 @ A1 SIZE / 1:600@ A3 SIZE





| REV | AMENDMENT DETAILS | BY | DATE |
|---|---|---|---|
| A | PLAN REVISED TO SUIT TP03 REV.M | JS | 09-11-18 |
| Ø | PLANNING ISSUE | KM | 30-10-18 |

PROCON DEVELOPMENTS
www.procon.net.au

trg
BRISBANE + MELBOURNE

concept + design + interiors + project management

Level 3, Suite 37, 799 Springvale Road,
Mulgrave, Victoria 3170 Australia

T: +61 3 9542 9300 F: +61 3 9542 9310

www.trg-aus.com
The Retail Group Pty Ltd ABN 85 050 134 686

RBP No. DP-AD1689



PROJECT
PROPOSED MIXED USE DEVELOPEMENT

PROJECT ADDRESS
3 LARSEN ROAD

BYFORD
WA 6122

DRAWING TITLE
PROPOSED SITE PLAN - 19m AV VEHICLE SWEEP PATH

CLIENT
PROCON DEVELOPMENTS PTY LTD

| DATE | SCALE @ A1 | NORTH |
|---|---|---|
| OCT.'18 | 1:300 | |
| DRAWN | CHECKED | |
| KM | AB | |
| ISSUE | | |
| PLANNING | | |

| PROJECT No. | DRAWING No. | REVISION No. | SHEET |
|---|---|---|---|
| 15316 | TP03A | A | 04of 18 |

## AREA SCHEDULE:

| | |
|---|---|
| TOTAL SITE AREA - | 11,630m² |
| FUEL SHOP - | 400m² |
| VEHICLE SERVICE STORE - | 400m² |
| RESTRICTED RETAIL | 630m² |
| | 100m² |
| | 1,530m² |
| | 3,095m² (26.61%) |
| - | 69 cars |

**DEVELOPMENT ASSESSMENT PANEL**

**APPROVED**

**11-Dec-2018**

GEORGE STREET

EXISTING FOOTPATH

TITLE BOUNDARY 60.35m

OUT IN

VACUUM BAYS

WATER TANK

WATER TANK

LOADING BAY

RESTRICTED RETAIL 630m²

PLANT AREA

CAR WASH 100m²

LOT 112 PUMP HOUSE WATER CORP.

LOT 103

TITLE BOUNDARY 63.27m

POSSIBLE CONNECTION LOCATION TO BE CONFIRMED

CAR SPACES (23)

CAR SPACES (16)

SITE AREA 11635m²

LOT 104

TITLE BOUNDARY 68.04m

LARSEN ROAD

TITLE BOUNDARY 115.05m

LOADING BAY

BIN AREA

SERVICE CENTRE 400m²

SHOWROOM

OFFICES

RECEP.

LUNCH ROOM

FUEL CANOPY

UNDERGROUND FUEL TANKS

CAR SPACES (10)

CAR SPACES (20)

OUTDOOR SEATING 125m²

FUEL SHOP 400m²

LOADING AREA

WAITING BAY

LANDSCAPE ZONE

RETAIN EX. TREES

NEW TREE

TITLE BOUNDARY 81.69m

TITLE BOUNDARY 59.69m

8m HIGH PRICE SIGN

ENTRY FEATURE - SIGNAGE & FUEL PRICE

SOUTH WESTERN HIGHWAY

PROPOSED ROAD WIDENING TO FUTURE DESIGN

TITLE BOUNDARY 107.5m

EXISTING FOOTPATH

NEW FOOTPATH

EXTENDED LEFT TURN LANE, 75m LONG

12.92m

12.25m

0m 3m 6m 9m 12m

1:300 @ A1 SIZE / 1:600@ A3 SIZE

5 - TP03B - October 2018 - Revision A

Not for Planning Purposes

| REV | AMENDMENT DETAILS | BY | DATE |
|---|---|---|---|
| A | PLAN REVISED TO SUIT TP03 REV.M | JS | 09-11-18 |
| Ø | PLANNING ISSUE | KM | 26-10-18 |

PROCON DEVELOPMENTS
www.procon.net.au

trg
BRISBANE + MELBOURNE

concept + design + interiors + project management

Level 3, Suite 37, 799 Springvale Road,
Mulgrave, Victoria 3170 Australia
T: +61 3 9542 9300 F: +61 3 9542 9310
www.trg-aus.com
The Retail Group Pty Ltd ABN 85 050 134 686
RBP No. DP-AD1689



PROJECT
PROPOSED MIXED USE DEVELOPEMENT

PROJECT ADDRESS
3 LARSEN ROAD

BYFORD
WA 6122

DRAWING TITLE
PROPOSED SITE PLAN - 12.5m RIGID SERVICE VEHICLE SWEEP PATH (REST. RETAIL)

CLIENT
PROCON DEVELOPMENTS PTY LTD

| DATE | SCALE @ A1 | NORTH |
|---|---|---|
| OCT.'18 | 1:300 | |
| DRAWN KM | CHECKED AB | |
| ISSUE PLANNING | | |

| PROJECT No. | DRAWING No. | REVISION No. | SHEET |
|---|---|---|---|
| 15316 | TP03B | A | 05of 18 |

GEORGE STREET

EXISTING FOOTPATH

TITLE BOUNDARY 60.35m

EXISTING FOOTPATH

HRV – Heavy Rigid Vehicle

HRV – Heavy Rigid Vehicle

7m

OUT IN

LOADING BAY

RESTRICTED RETAIL 630m²

VACUUM BAYS

WATER TANK

WATER TANK

CAR WASH 100m²

PLANT AREA

LOT 112 PUMP HOUSE WATER CORP.

LOT 103

TITLE BOUNDARY 63.27m

CAR SPACES (23)

POSSIBLE CONNECTION LOCATION TO BE CONFIRMED

POSSIBLE CONNECTION LOCATION TO BE CONFIRMED

SITE AREA 11635m² LOT 104

CAR SPACES (16)

TITLE BOUNDARY 115.05m

TITLE BOUNDARY 68.04m

LARSEN ROAD

BIN AREA

LOADING BAY

SERVICE CENTRE 400m²

OFFICE

RECEP.

SHOWROOM

LUNCH ROOM

CAR SPACES (10)

FUEL CANOPY

UNDERGROUND FUEL TANKS

UNDERGROUND FUEL TANK CONTAINMENT SYSTEM

WAITING BAY

CAR SPACES (20)

BOLLARD

OUTDOOR SEATING 25m²

FUEL SHOP 400m²

LOADING AREA

LANDSCAPE ZONE

9m HIGH PRICE SIGN

FTC SIGNAGE

ENTRY FEATURE SIGNAGE & FUEL PRICE

TITLE BOUNDARY 81.69m

TITLE BOUNDARY 107.5m

TITLE BOUNDARY 99.69m

SOUTH WESTERN HIGHWAY

SOUTH WESTERN HIGHWAY

PROPOSED ROAD WIDENING TO FUTURE DESIGN

EXISTING FOOTPATH

NEW FOOTPATH

EXTENDED LEFT TURN LANE 75m LONG

12.92m

12.25m

50.0

55.0

RETAIN EX. TREES

NEW TREE

VENTS

FILL POINT

0m 3m 6m 9m 12m

1:300 @ A1 SIZE / 1:600@ A3 SIZE

## AREA SCHEDULE:

| | |
|---|---|
| TOTAL SITE AREA - | 11,630m² |
| FUEL SHOP - | 400m² |
| VEHICLE SERVICE STORE - | 400m² |
| | 630m² |
| | 100m² |
| | 1,530m² |
| | 3,095m² (26.61%) |
| - | 69 cars |

**DEVELOPMENT ASSESSMENT PANEL**

**APPROVED**

**11-Dec-2018**

October 2018 - Revision A

6 of TP03C - October

| REV | AMENDMENT DETAILS | BY | DATE |
|---|---|---|---|
| A | PLAN REVISED TO SUIT TP03 REV.M | JS | 09-11-18 |
| Ø | PLANNING ISSUE | KM | 26-10-18 |

PROCON DEVELOPMENTS
www.procon.net.au

trg
BRISBANE + MELBOURNE

concept + design + interiors + project management

Level 3, Suite 37, 799 Springvale Road,
Mulgrave, Victoria 3170 Australia

T: +61 3 9542 9300 F: +61 3 9542 9310

www.trg-aus.com
The Retail Group Pty Ltd ABN 85 050 134 686

RBP No. DP-AD1689



PROJECT
PROPOSED MIXED USE DEVELOPEMENT

PROJECT ADDRESS
3 LARSEN ROAD

BYFORD
WA 6122

DRAWING TITLE
PROPOSED SITE PLAN - 12.5m RIGID SERVICE VEHICLE SWEEP PATH (SERV. CENTRE)

CLIENT
PROCON DEVELOPMENTS PTY LTD

| DATE | SCALE @ A1 | NORTH |
|---|---|---|
| OCT.'18 | 1:300 | |
| DRAWN | CHECKED | |
| KM | AB | |
| ISSUE | | |
| PLANNING | | |

| PROJECT No. | DRAWING No. | REVISION No. | SHEET |
|---|---|---|---|
| 15316 | TP03C | A | 06of 18 |

## AREA SCHEDULE:

| | |
|---|---|
| TOTAL SITE AREA - | 11,630m² |
| FUEL SHOP - | 400m² |
| VEHICLE SERVICE STORE - | 400m² |
| RESTRICTED RETAIL | 630m² |
| | 100m² |
| | 1,530m² |
| | 3,095m² (26.61%) |
| - | 69 cars |

**DEVELOPMENT ASSESSMENT PANEL**

**APPROVED**

**11-Dec-2018**



GEORGE STREET

HRV – Heavy Rigid Vehicle

EXISTING FOOTPATH

TITLE BOUNDARY 60.35m

OUT IN

VACUUM BAYS

WATER TANK

WATER TANK

LOADING BAY

RESTRICTED RETAIL 630m²

LOT 112 PUMP HOUSE WATER CORP.

PLANT AREA

CAR WASH 100m²

LOT 103

TITLE BOUNDARY 63.27m

CAR SPACES (23)

POSSIBLE CONNECTION LOCATION TO BE CONFIRMED

SITE AREA 11635m²

LOT 104

CAR SPACES (16)

TITLE BOUNDARY 68.04m

LARSEN ROAD

TITLE BOUNDARY 115.05m

LOADING BAY

BIN AREA

SERVICE CENTRE 400m²

SHOWROOM

OFFICE

RECEP.

LUNCH ROOM

CAR SPACES (10)

FUEL CANOPY

UNDERGROUND FUEL TANKS

WAITING BAY

CAR SPACES (20)

BIKES

PILLAR

OUTDOOR SEATING 125m²

FUEL SHOP 400m²

LOADING AREA

AIR & WATER

ENTRY FEATURE - SIGNAGE & FUEL PRICE

6m HIGH PRICE SIGN

LANDSCAPE ZONE

NEW TREE

RETAIN EX. TREES

TITLE BOUNDARY 81.69m

TITLE BOUNDARY 107.5m

TITLE BOUNDARY 59.69m

PROPOSED ROAD WIDENING TO FUTURE DESIGN

SOUTH WESTERN HIGHWAY

EXTENDED LEFT TURN LANE 75m LONG

NEW FOOTPATH

12.92m

12.25m

0m 3m 6m 9m 12m

1:300 @ A1 SIZE / 1:600@ A3 SIZE

| REV | AMENDMENT DETAILS | BY | DATE |
|---|---|---|---|
| A | PLAN REVISED TO SUIT TP03 REV.M | JS | 09-11-18 |
| Ø | PLANNING ISSUE | KM | 26-10-18 |

PROCON DEVELOPMENTS
www.procon.net.au

trg
BRISBANE + MELBOURNE

concept + design + interiors + project management

Level 3, Suite 37, 799 Springvale Road,
Mulgrave, Victoria 3170 Australia
T: +61 3 9542 9300 F: +61 3 9542 9310
www.trg-aus.com
The Retail Group Pty Ltd ABN 85 050 134 686
RBP No. DP-AD1689



PROJECT
PROPOSED MIXED USE DEVELOPEMENT

PROJECT ADDRESS
3 LARSEN ROAD

BYFORD
WA 6122

DRAWING TITLE
PROPOSED SITE PLAN - 12.5m RIGID SERVICE VEHICLE SWEEP PATH (FUEL SHOP)

CLIENT
PROCON DEVELOPMENTS PTY LTD

| DATE | SCALE @ A1 | NORTH |
|---|---|---|
| OCT.'18 | 1:300 | |
| DRAWN KM | CHECKED AB | |
| ISSUE PLANNING | | |

| PROJECT No. | DRAWING No. | REVISION No. | SHEET |
|---|---|---|---|
| 15316 | TP03D | A | 07 of 18 |

DEVELOPMENT ASSESSMENT PANEL

APPROVED

11-Dec-2018

| REV | AMENDMENT DETAILS | BY | DATE |
|---|---|---|---|
| C | PLAN REVISED TO SUIT TP03 REV.L | JS | 08-11-18 |
| B | PLAN REVISED TO SUIT TP03 REV.G | KM | 24-08-18 |
| A | PLAN REVISED TO SUIT TP03 REV.B | JS | 06-07-18 |
| Ø | PLANNING ISSUE | JP | 08-05-18 |
| P1 | PRELIMINARY ISSUE | KM | 10-04-18 |





PROCON DEVELOPMENTS
www.procon.net.au

trg
BRISBANE + MELBOURNE

concept + design + interiors + project management

Level 3, Suite 37, 799 Springvale Road,
Mulgrave, Victoria 3170 Australia
T: +61 3 9542 9300 F: +61 3 9542 9310
www.trg-aus.com
The Retail Group Pty Ltd ABN 85 050 134 686
RBP No. DP-AD1689



PROJECT
PROPOSED MIXED USE DEVELOPEMENT

PROJECT ADDRESS
3 LARSEN ROAD

BYFORD
WA 6122

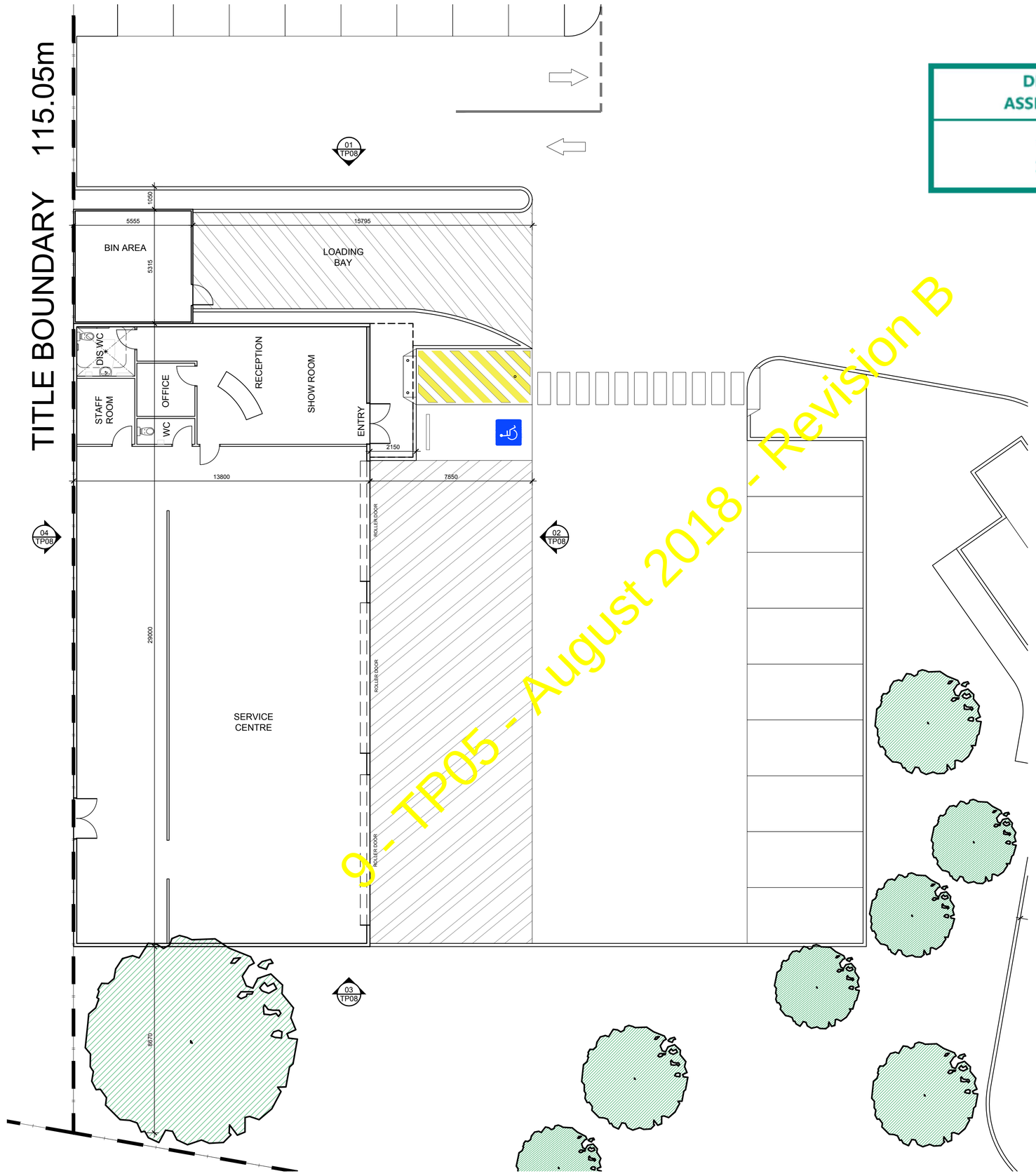
DRAWING TITLE
PROPOSED FLOOR PLAN - FUEL SHOP

CLIENT
PROCON DEVELOPMENTS PTY LTD

| DATE | SCALE @ A1 | NORTH |
|---|---|---|
| AUG.'18 | 1:100 | |
| DRAWN | CHECKED | |
| KM | AB | |
| ISSUE | | |
| PLANNING | | |

| PROJECT No. | DRAWING No. | REVISION No. | SHEET |
|---|---|---|---|
| 15316 | TP04 | C | 08of 18 |

0m 1m 2m 3m 4m
1:100 @ A1 SIZE / 1:200@ A3 SIZE








| REV | AMENDMENT DETAILS | BY | DATE |
|---|---|---|---|
| B | PLAN REVISED TO SUIT TP03 REV.L | JS | 08-11-18 |
| A | PLAN REVISED TO SUIT TP03 REV.G | KM | 24-08-18 |
| Ø | PLANNING ISSUE | JP | 08-05-18 |
| P2 | CARWASH LAYOUT REVISED | JS | 17-04-18 |
| P1 | PRELIMINARY ISSUE | KM | 10-04-18 |

PROCON DEVELOPMENTS
www.procon.net.au

trg
BRISBANE + MELBOURNE
concept + design + interiors + project management
Level 3, Suite 37, 799 Springvale Road, Mulgrave, Victoria 3170 Australia
T: +61 3 9542 9300 F: +61 3 9542 9310
www.trg-aus.com
The Retail Group Pty Ltd ABN 85 050 134 686
RBP No. DP-AD1689



PROJECT
PROPOSED MIXED USE DEVELOPEMENT

PROJECT ADDRESS
3 LARSEN ROAD

BYFORD
WA 6122

DRAWING TITLE
PROPOSED FLOOR PLAN - SERVICE CENTRE

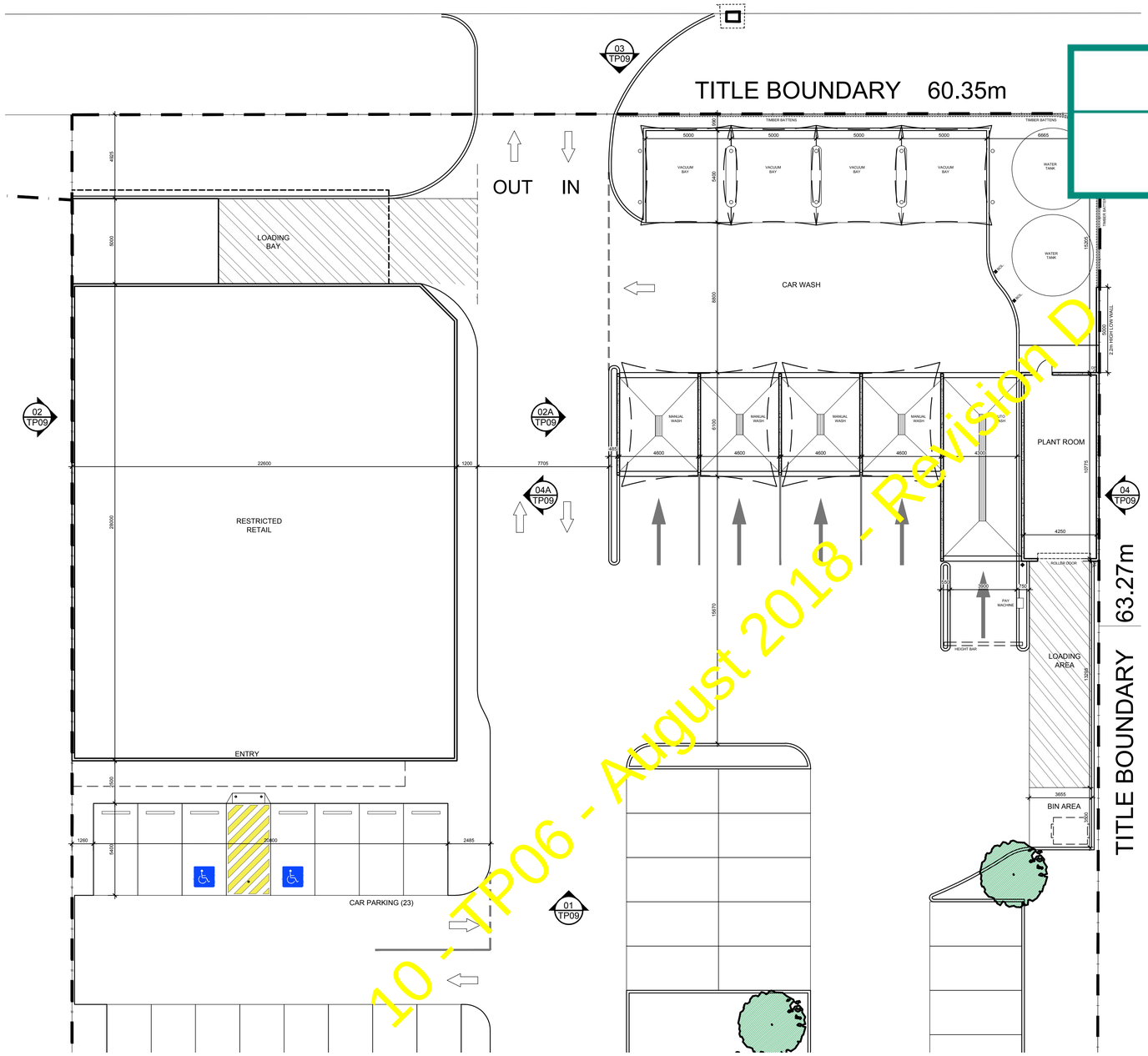
CLIENT
PROCON DEVELOPMENTS PTY LTD

| DATE | SCALE @ A1 | NORTH |
|---|---|---|
| AUG.'18 | 1:100 | |
| DRAWN | CHECKED | |
| KM | AB | |
| ISSUE | | |
| PLANNING | | |

| PROJECT No. | DRAWING No. | REVISION No. | SHEET |
|---|---|---|---|
| 15316 | TP05 | B | 09of 18 |

0m 1m 2m 3m 4m
1:100 @ A1 SIZE / 1:200@ A3 SIZE

Town Planning
Not for construction








| REV | AMENDMENT DETAILS | BY | DATE |
|---|---|---|---|
| D | DIMENSIONS REVISED | JS | 09-11-18 |
| C | PLAN REVISED TO SUIT TP03 REV.L | JS | 08-11-18 |
| B | PLAN REVISED TO SUIT TP03 REV.G | KM | 24-08-18 |
| A | SERVICE CENTRE INTERNAL LAYOUT REVISED | JS | 06-07-18 |
| Ø | PLANNING ISSUE | JP | 08-05-18 |
| P1 | PRELIMINARY ISSUE | KM | 10-04-18 |

PROCON DEVELOPMENTS
www.procon.net.au

trg
BRISBANE + MELBOURNE
concept + design + interiors + project management
Level 3, Suite 37, 799 Springvale Road, Mulgrave, Victoria 3170 Australia
T: +61 3 9542 9300 F: +61 3 9542 9310
www.trg-aus.com
The Retail Group Pty Ltd ABN 85 050 134 686
RBP No. DP-AD1689



PROJECT
PROPOSED MIXED USE DEVELOPEMENT

PROJECT ADDRESS
3 LARSEN ROAD

BYFORD
WA 6122

DRAWING TITLE
PROPOSED FLOOR PLAN - CAR WASH & RETAIL

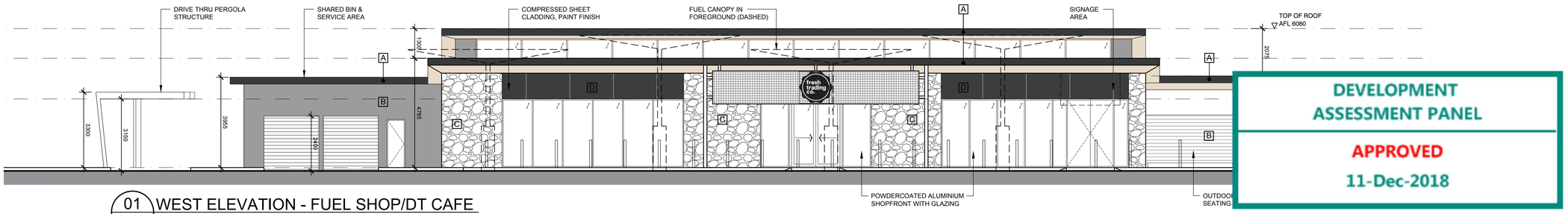
CLIENT
PROCON DEVELOPMENTS PTY LTD

| DATE | SCALE @ A1 | NORTH |
|---|---|---|
| AUG.'18 | 1:150 | |
| DRAWN | CHECKED | |
| KM | AB | |
| ISSUE | | |
| PLANNING | | |

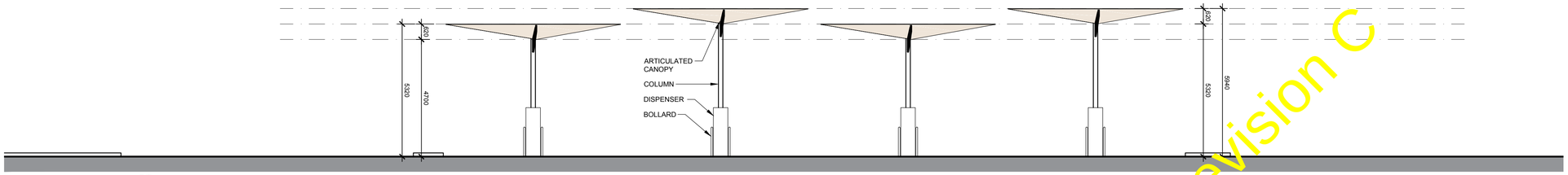
| PROJECT No. | DRAWING No. | REVISION No. | SHEET |
|---|---|---|---|
| 15316 | TP06 | D | 10of 18 |

Town Planning
Not for construction

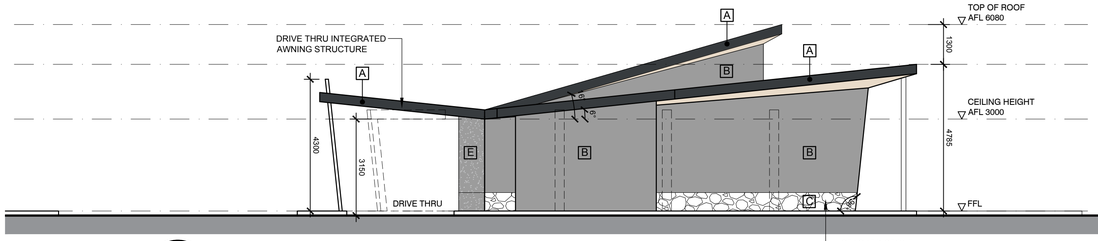
0m 1.5m 3m 4.5m 6m
1:150 @ A1 SIZE / 1:300@ A3 SIZE



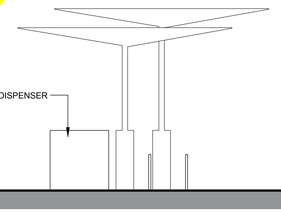

01 TP04 WEST ELEVATION - FUEL SHOP/DT CAFE
SCALE 1:100

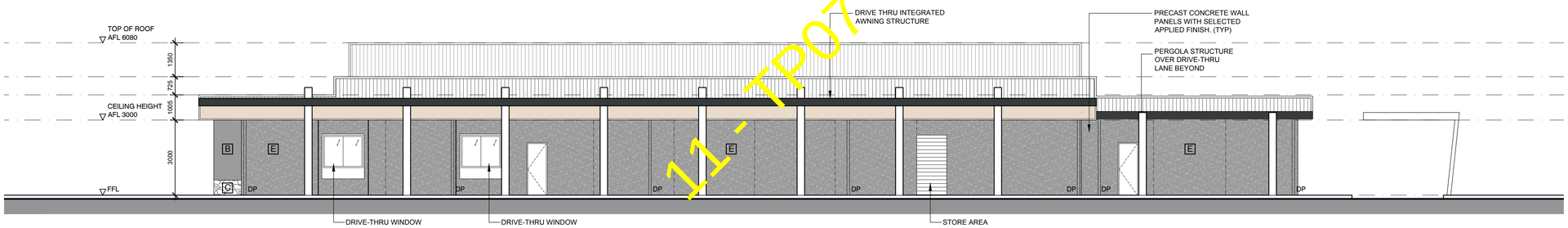



01A TP04 WEST ELEVATION - FUEL & DIESEL CANOPY
SCALE 1:100

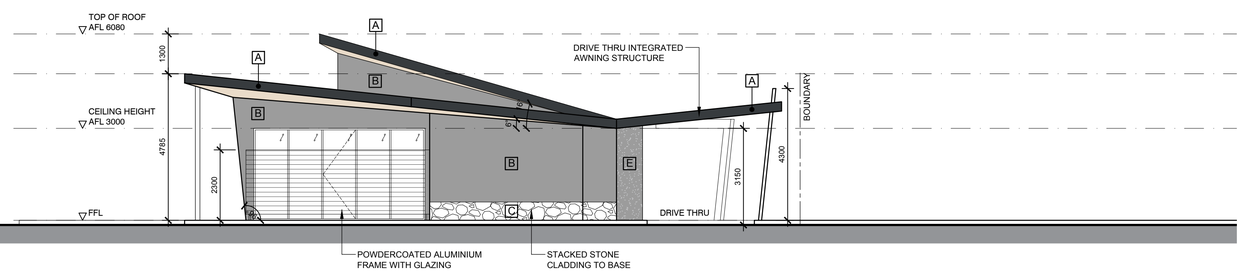



02 TP04 NORTH ELEVATION - DT CAFE (LARSEN RD)
SCALE 1:100




03 TP04 EAST ELEVATION - FUEL SHOP/DT CAFE (STH WESTERN HWY)
SCALE 1:100




04 TP04 SOUTH ELEVATION - FUEL SHOP
SCALE 1:100

## EXTERNAL COLOUR SCHEDULE

| | | |
|---|---|---|
| A | PAINT FINISH, DULUX 'CHARCOAL' |
| B | PAINT FINISH, DULUX 'NATURAL STONE' |
| C | STAKED STONE CLADDING |
| D | ALUCOBOND CLADDING, 'GREY BROWN' |
| E | TEXTURED PAINT FINISH, DULUX 'SILKWORT' |
| F | PAINT FINISH, CONCRETE PANEL LOOK |
| G | PAINT FINISH, 'BRIDGESTONE RED' |
| H | METAL CLADDING, PAINT FINISH COLORBOND 'SURFMIST' |
| J | PAINT FINISH DULUX 'ZEUS WHITE' GLOSS |

**DEVELOPMENT ASSESSMENT PANEL**

**APPROVED**

**11-Dec-2018**

| REV | AMENDMENT DETAILS | BY | DATE |
|---|---|---|---|
| C | PLAN REVISED TO SUIT TP03 REV.L | JS | 08-11-18 |
| B | PLAN REVISED TO SUIT TP03 REV.G | KM | 24-08-18 |
| A | ELEVATIONS REVISED TO SUIT PLAN | KM | 06-07-18 |
| Ø | PLANNING ISSUE | JP | 08-05-18 |
| P1 | PRELIMINARY ISSUE | KM | 10-04-18 |

PROCON DEVELOPMENTS
www.procon.net.au

trg
BRISBANE + MELBOURNE

concept + design + interiors + project management

Level 3, Suite 37, 799 Springvale Road, Mulgrave, Victoria 3170 Australia
T: +61 3 9542 9300 F: +61 3 9542 9310
www.trg-aus.com
The Retail Group Pty Ltd ABN 85 050 134 686
RBP No. DP-AD1689



PROJECT
PROPOSED MIXED USE DEVELOPEMENT

PROJECT ADDRESS
3 LARSEN ROAD

BYFORD
WA 6122

DRAWING TITLE
PROPOSED ELEVATIONS - FUEL SHOP & CANOPY

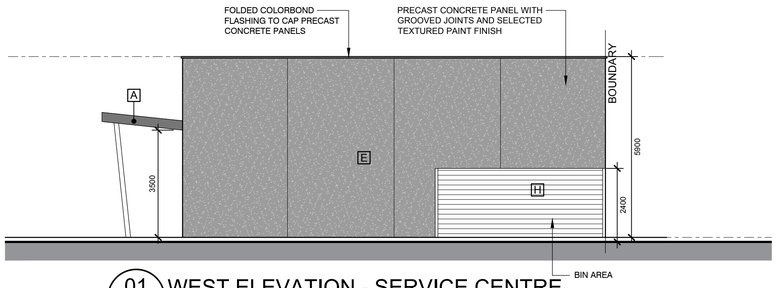
CLIENT
PROCON DEVELOPMENTS

| | | |
|---|---|---|
| DATE: AUG. '18 | SCALE @ A1: 1:100 | NORTH |
| DRAWN: KM | CHECKED: AB | |
| ISSUE: PLANNING | | |

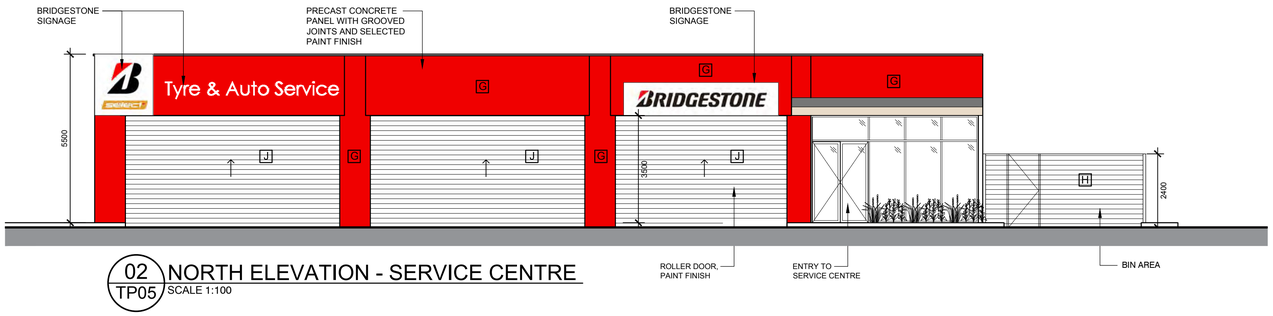
| PROJECT No. | DRAWING No. | REVISION No. | SHEET |
|---|---|---|---|
| 15316 | TP07 | C | 11of 18 |

0m 1m 2m 3m 4m
1:100 @ A1 SIZE / 1:200@ A3 SIZE

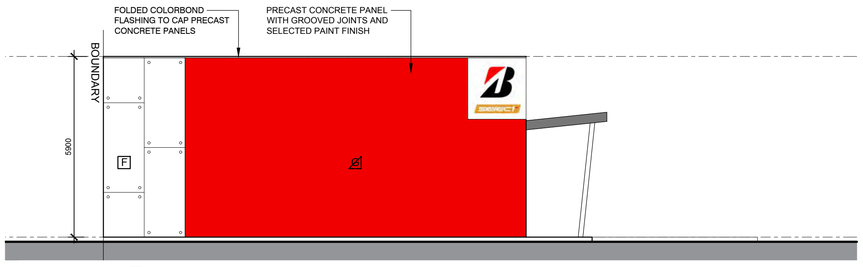
Town Planning
Not for construction



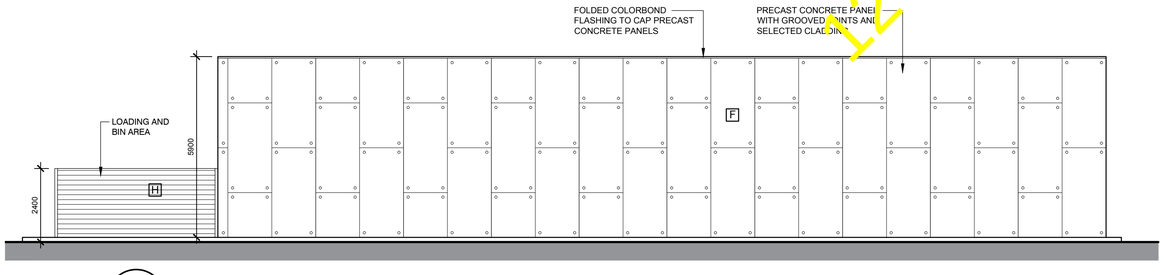

01 TP05 WEST ELEVATION - SERVICE CENTRE
SCALE 1:100




02 TP05 NORTH ELEVATION - SERVICE CENTRE
SCALE 1:100




03 TP05 EAST ELEVATION - SERVICE CENTRE
SCALE 1:100




04 TP05 SOUTH ELEVATION - SERVICE CENTRE
SCALE 1:100

## EXTERNAL COLOUR SCHEDULE

- A PAINT FINISH, DULUX 'CHARCOAL'
- RAL STONE'
- EY BROWN'
- ULUX 'SILKWORT'
- ANEL LOOK
- E RED'
- H METAL CLADDING, PAINT FINISH COLORBOND 'SURFMIST'
- J PAINT FINISH DULUX 'ZEUS WHITE' GLOSS

DEVELOPMENT ASSESSMENT PANEL
APPROVED
11-Dec-2018



| REV | AMENDMENT DETAILS | BY | DATE |
|---|---|---|---|
| B | PLAN REVISED TO SUIT TP03 REV.L | JS | 08-11-18 |
| A | PLAN REVISED TO SUIT TP03 REV.G | KM | 24-08-18 |
| Ø | PLANNING ISSUE | JP | 08-05-18 |
| P2 | CAR WASH REVISED. STAINLESS STEEL WIRE ADDED | JS | 17-04-18 |
| P1 | PRELIMINARY ISSUE | KM | 05-04-18 |

PROCON DEVELOPMENTS
www.procon.net.au

trg
BRISBANE + MELBOURNE

concept + design + interiors + project management

Level 3, Suite 37, 799 Springvale Road, Mulgrave, Victoria 3170 Australia
T: +61 3 9542 9300 F: +61 3 9542 9310
www.trg-aus.com
The Retail Group Pty Ltd ABN 85 050 134 686
RBP No. DP-AD1689



PROJECT
PROPOSED MIXED USE DEVELOPEMENT

PROJECT ADDRESS
3 LARSEN ROAD

BYFORD
WA 6122

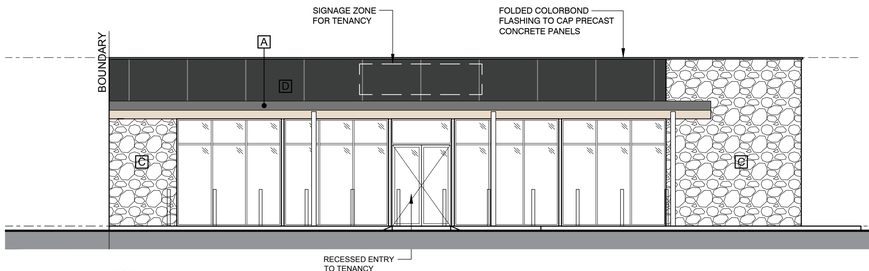
DRAWING TITLE
PROPOSED ELEVATIONS - SERVICE CENTRE

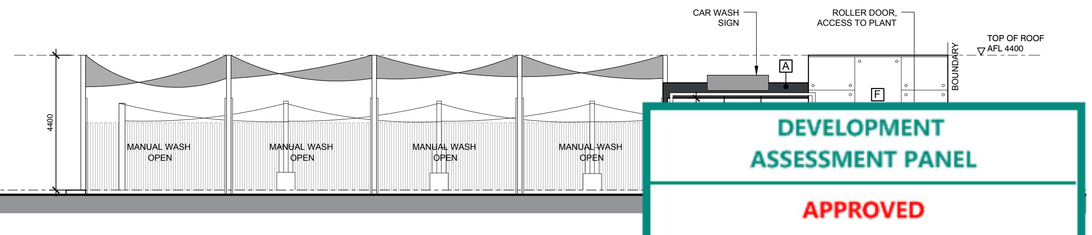
CLIENT
PROCON DEVELOPMENTS

| DATE | SCALE @ A1 | NORTH | |
|---|---|---|---|
| AUG. '18 | 1:100 | | |
| DRAWN | CHECKED | | |
| KM | AB | | |
| ISSUE | | | |
| PLANNING | | | |
| PROJECT No. | DRAWING No. | REVISION No. | SHEET |
| 15316 | TP08 | B | 12of 18 |

Town Planning
Not for construction

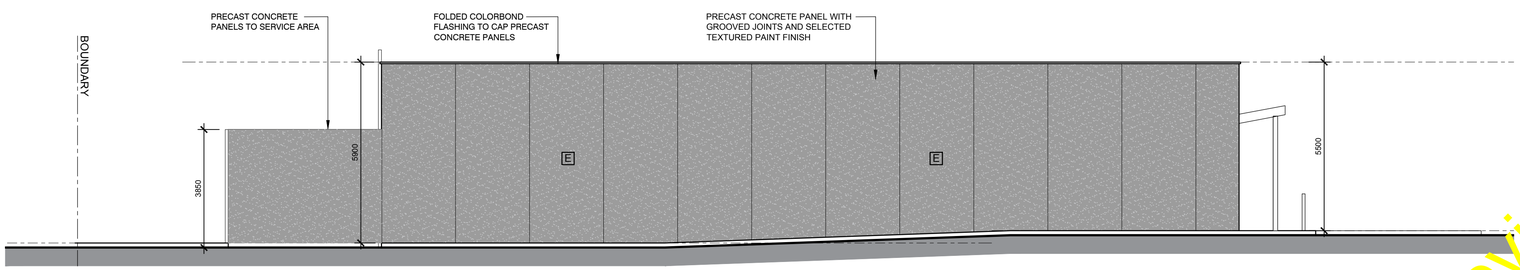
0m 1m 2m 3m 4m
1:100 @ A1 SIZE / 1:200@ A3 SIZE




01 TP06 EAST ELEVATION - RETAIL TENANCY/CAR WASH
SCALE 1:100

DEVELOPMENT ASSESSMENT PANEL
APPROVED
11-Dec-2018

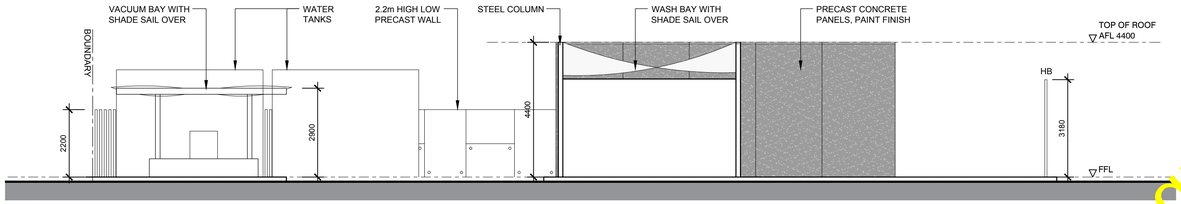



02 TP06 SOUTH ELEVATION - RETAIL TENANCY
SCALE 1:100

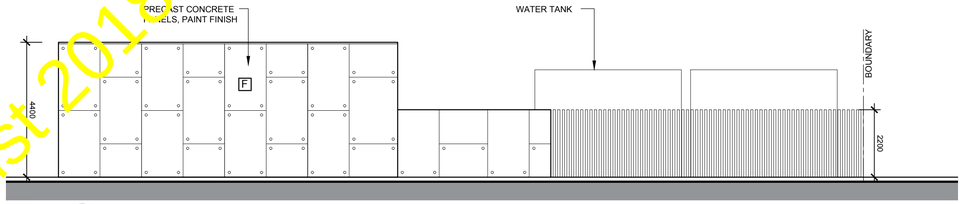
## EXTERNAL COLOUR SCHEDULE

| | | |
|---|---|---|
| A | PAINT FINISH, DULUX 'CHARCOAL' |
| B | PAINT FINISH, DULUX 'NATURAL STONE' |
| C | STAKED STONE CLADDING |
| D | ALUCOBOND CLADDING, 'GREY BROWN' |
| E | TEXTURED PAINT FINISH, DULUX 'SILKWORT' |
| F | PAINT FINISH, CONCRETE PANEL LOOK |
| G | PAINT FINISH, 'BRIDGESTONE RED' |
| H | METAL CLADDING, PAINT FINISH COLORBOND 'SURFMIST' |
| J | PAINT FINISH DULUX 'ZEUS WHITE' GLOSS |

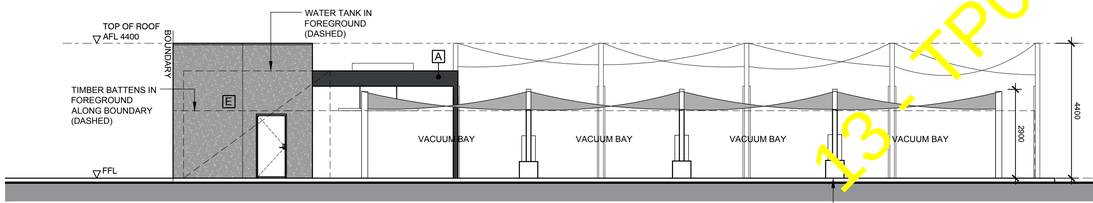
| REV | AMENDMENT DETAILS | BY | DATE |
|---|---|---|---|
| D | PLAN REVISED TO SUIT TP03 REV.M | JS | 09-11-18 |
| C | PLAN REVISED TO SUIT TP03 REV.L | JS | 08-11-18 |
| B | PLAN REVISED TO SUIT TP03 REV.G | KM | 24-08-18 |
| A | ELEVATIONS REVISED TO SUIT PLAN & FINISHES REVISED. BRIDGESTONE SIGNAGE & DOWNPIPE ADDED | JS | 06-07-18 |
| Ø | PLANNING ISSUE | JP | 08-05-18 |
| P2 | STAINLESS STEEL WIRE ADDED | JS | 17-04-18 |
| P1 | PRELIMINARY ISSUE | KM | 05-04-18 |



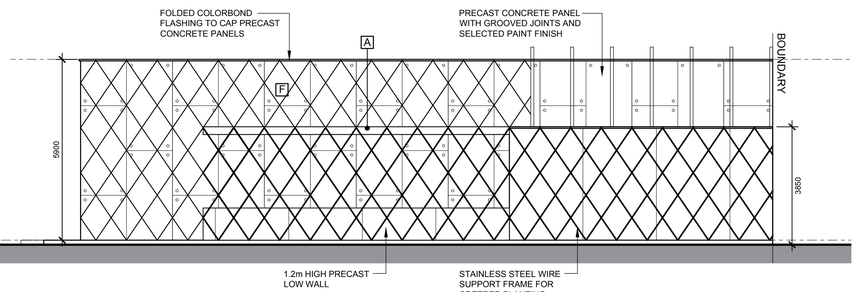

02A TP06 SOUTH ELEVATION - CAR WASH
SCALE 1:100

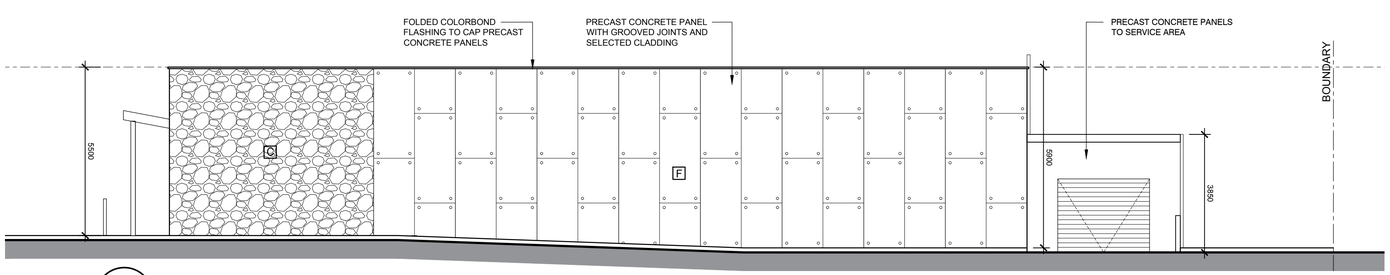



04 TP06 NORTH ELEVATION - CAR WASH
SCALE 1:100




03 TP06 WEST ELEVATION - CAR WASH/RETAIL TENANCY (GEORGE ST)
SCALE 1:100




04A TP06 NORTH ELEVATION - RETAIL TENANCY
SCALE 1:100



Town Planning
Not for construction

0m 1m 2m 3m 4m
1:100 @ A1 SIZE / 1:200@ A3 SIZE

PROCON DEVELOPMENTS
www.procon.net.au

trg
BRISBANE + MELBOURNE

concept + design + interiors + project management
Level 3, Suite 37, 799 Springvale Road, Mulgrave, Victoria 3170 Australia
T: +61 3 9542 9300 F: +61 3 9542 9310
www.trg-aus.com
The Retail Group Pty Ltd ABN 85 050 134 686
RBP No. DP-AD1689



PROJECT
PROPOSED MIXED USE DEVELOPEMENT

PROJECT ADDRESS
3 LARSEN ROAD

BYFORD
WA 6122

DRAWING TITLE
PROPOSED ELEVATIONS - CAR WASH & RETAIL

CLIENT
PROCON DEVELOPMENTS

| DATE | SCALE @ A1 | NORTH |
|---|---|---|
| AUG. '18 | 1:100 | |
| DRAWN | CHECKED | |
| KM | AB | |
| ISSUE | | |
| PLANNING | | |

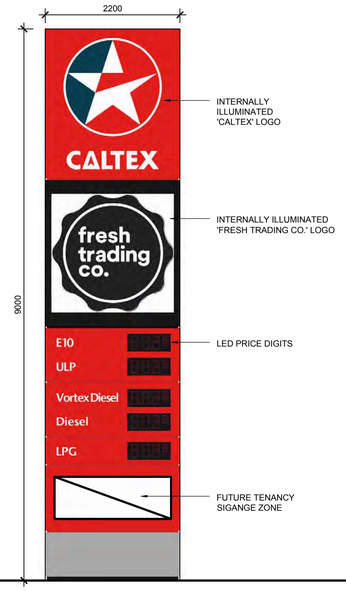
| PROJECT No. | DRAWING No. | REVISION No. | SHEET |
|---|---|---|---|
| 15316 | TP09 | D | 13of 18 |



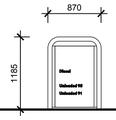


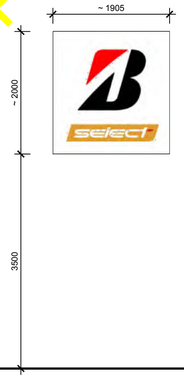

| REV | AMENDMENT DETAILS | BY | DATE |
|---|---|---|---|
| D | PLAN REVISED TO SUIT TP03 REV.M | JS | 09-11-18 |
| C | PLAN REVISED TO SUIT TP03 REV.L | JS | 08-11-18 |
| B | PLAN REVISED TO SUIT TP03 REV.G | KM | 24-08-18 |
| A | PLAN REVISED TO SUIT TP03 REV.B. BRIDGESTONE SIGNAGE ADDED | JS | 06-07-18 |
| Ø | PLANNING ISSUE | JP | 08-05-18 |

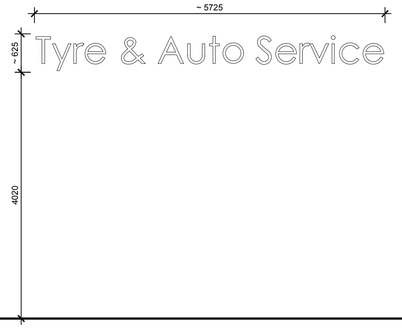
PROCON DEVELOPMENTS
www.procon.net.au

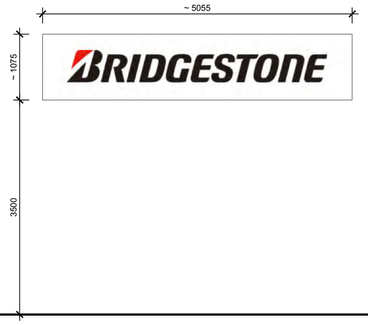







01 - SIGN 01 SCALE 1:50
PROPOSED 9m HIGH COMBINED PRICE SIGN & PYLON SIGN

02 - SIGN 02 SCALE 1:50
SHOP FASCIA SIGNAGE 'FRESH TRADING CO.' LOGO

03 - SIGN 03 SCALE 1:50
FUEL DISPENSER LEADERBOARD

04 - SIGN 04 SCALE 1:50
INTERNALLY ILLUMINATED BRIDGESTONE SIGNAGE

05 - SIGN 05 SCALE 1:50
NON-ILLUMINATED SIGNAGE

06 - SIGN 06 SCALE 1:50
NON-ILLUMINATED SIGNAGE

Town Planning
Not for construction

0m .5m 1m 1.5m 2m
1:50 @ A1 SIZE / 1:100@ A3 SIZE

trg
BRISBANE + MELBOURNE

concept + design + interiors + project management

Level 3, Suite 37, 799 Springvale Road, Mulgrave, Victoria 3170 Australia
T: +61 3 9542 9300 F: +61 3 9542 9310
www.trg-aus.com
The Retail Group Pty Ltd ABN 85 050 134 686
RBP No. DP-AD1689



PROJECT
PROPOSED MIXED USE DEVELOPMENT

PROJECT ADDRESS
3 LARSEN ROAD

BYFORD
WA 6122

DRAWING TITLE
SIGNAGE PLAN

CLIENT
PROCON DEVELOPMENTS

| DATE | SCALE @ A1 | NORTH |
|---|---|---|
| AUG. '18 | 1:50 | |
| DRAWN | CHECKED | |
| KM | AB | |
| ISSUE | | |
| PLANNING | | |

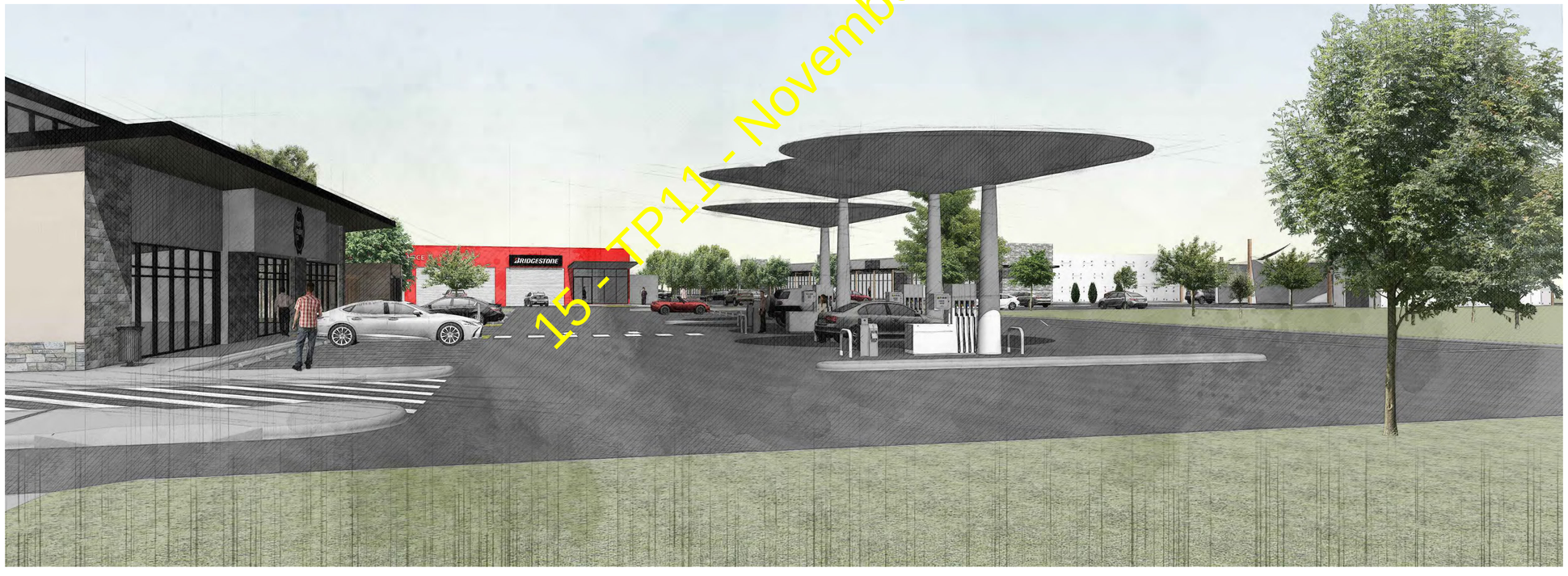
| PROJECT No. | DRAWING No. | REVISION No. | SHEET |
|---|---|---|---|
| 15316 | TP10 | D | 14of 18 |

DEVELOPMENT ASSESSMENT PANEL

APPROVED

11-Dec-2018

1A - VIEW FROM LARSEN ROAD LOOKING EAST TOWARDS THE FUEL SHOP




2A - VIEW LOOKING SOUTH TOWARDS THE FUEL SHOP & SERVICE CENTRE



Town Planning
Not for construction

| REV | AMENDMENT DETAILS | BY | DATE |
|---|---|---|---|
| A | PLANNING ISSUE | TC | 08-11-18 |
| Ø | PLANNING ISSUE | TC | 08-05-18 |
| P1 | PRELIMINARY ISSUE | KM | 05-04-18 |

PROCON DEVELOPMENTS
www.procon.net.au

trg
BRISBANE + MELBOURNE
concept + design + interiors + project management
Level 3, Suite 37, 799 Springvale Road, Mulgrave, Victoria 3170 Australia
T: +61 3 9542 9300 F: +61 3 9542 9310
www.trg-aus.com
The Retail Group Pty Ltd ABN 85 050 134 686
RBP No. DP-AD1689



PROJECT
PROPOSED MIXED USE DEVELOPEMENT

PROJECT ADDRESS
3 LARSEN ROAD

BYFORD
WA 6122

DRAWING TITLE
PROPOSED 3D VIEWS

CLIENT
PROCON DEVELOPMENTS

| DATE | SCALE @ A1 | NORTH | |
|---|---|---|---|
| NOV. '18 | NTS | | |
| DRAWN | CHECKED | | |
| TC | AB | | |
| ISSUE | | | |
| PLANNING | | | |
| PROJECT No. | DRAWING No. | REVISION No. | SHEET |
| 15316 | TP11 | A | 15of 18 |

DEVELOPMENT ASSESSMENT PANEL

APPROVED

11-Dec-2018

16 - TP12 - November 2018 - Revision A

1A - VIEW FROM GEORGE STREET LOOKING NORTH TOWARDS THE CARWASH

2A - VIEW FROM GEORGE STREET LOOKING SOUTH TOWARDS THE CARWASH

Town Planning
Not for construction

| REV | AMENDMENT DETAILS | BY | DATE |
|---|---|---|---|
| A | PLANNING ISSUE | TC | 08-11-18 |
| Ø | PLANNING ISSUE | TC | 08-05-18 |
| P1 | PRELIMINARY ISSUE | KM | 05-04-18 |

PROCON DEVELOPMENTS
www.procon.net.au

trg
BRISBANE + MELBOURNE

concept + design + interiors + project management

Level 3, Suite 37, 799 Springvale Road,
Mulgrave, Victoria 3170 Australia

T: +61 3 9542 9300 F: +61 3 9542 9310

www.trg-aus.com
The Retail Group Pty Ltd ABN 85 050 134 686

RBP No. DP-AD1689



PROJECT
PROPOSED MIXED USE DEVELOPEMENT

PROJECT ADDRESS
3 LARSEN ROAD

BYFORD
WA 6122

DRAWING TITLE
PROPOSED 3D VIEWS

CLIENT
PROCON DEVELOPMENTS

| DATE | SCALE @ A1 | NORTH | |
|---|---|---|---|
| NOV. '18 | NTS | | |
| DRAWN | CHECKED | | |
| TC | AB | | |
| ISSUE | | | |
| PLANNING | | | |
| PROJECT No. | DRAWING No. | REVISION No. | SHEET |
| 15316 | TP12 | A | 16of 18 |


DEVELOPMENT ASSESSMENT PANEL

APPROVED

11-Dec-2018

1A / - VIEW FROM SOUTH WESTERN HIGHWAY LOOKING NORTH-WEST TOWARDS THE SERVICE CENTRE


2A / - VIEW FROM SOUTH WESTERN HIGHWAY LOOKING SOUTH-WEST TOWARDS THE FUEL SHOP





| REV | AMENDMENT DETAILS | BY | DATE |
|---|---|---|---|
| A | PLANNING ISSUE | TC | 08-11-18 |
| Ø | PLANNING ISSUE | TC | 08-05-18 |

PROCON DEVELOPMENTS
www.procon.net.au

trg
BRISBANE + MELBOURNE
concept + design + interiors + project management
Level 3, Suite 37, 799 Springvale Road, Mulgrave, Victoria 3170 Australia
T: +61 3 9542 9300 F: +61 3 9542 9310
www.trg-aus.com
The Retail Group Pty Ltd ABN 85 050 134 686
RBP No. DP-AD1689



PROJECT
PROPOSED MIXED USE DEVELOPEMENT

PROJECT ADDRESS
3 LARSEN ROAD

BYFORD
WA 6122

DRAWING TITLE
PROPOSED 3D VIEW BUILDING & CANOPY

CLIENT
PROCON DEVELOPMENTS

| DATE | SCALE @ A1 | NORTH | |
|---|---|---|---|
| NOV. '18 | NTS | | |
| DRAWN | CHECKED | | |
| TC | AB | | |
| ISSUE | | | |
| PLANNING | | | |
| PROJECT No. | DRAWING No. | REVISION No. | SHEET |
| 15316 | TP13 | A | 17of 18 |

DEVELOPMENT ASSESSMENT PANEL

APPROVED

11-Dec-2018



1A - VIEW FROM THE CARPARK LOOKING NORTH-EAST TOWARDS THE FUEL SHOP



2A - VIEW FROM LARSEN ROAD LOOKING SOUTH-EAST TOWARDS THE FUEL SHOP



| REV | AMENDMENT DETAILS | BY | DATE |
|---|---|---|---|
| A | PLANNING ISSUE | TC | 08-11-18 |
| Ø | PLANNING ISSUE | TC | 08-05-18 |

PROCON DEVELOPMENTS
www.procon.net.au

trg
BRISBANE + MELBOURNE
concept + design + interiors + project management
Level 3, Suite 37, 799 Springvale Road, Mulgrave, Victoria 3170 Australia
T: +61 3 9542 9300 F: +61 3 9542 9310
www.trg-aus.com
The Retail Group Pty Ltd ABN 85 050 134 686
RBP No. DP-AD1689



PROJECT
PROPOSED MIXED USE DEVELOPEMENT

PROJECT ADDRESS
3 LARSEN ROAD

BYFORD
WA 6122

DRAWING TITLE
PROPOSED 3D VIEW BUILDING & CANOPY

CLIENT
PROCON DEVELOPMENTS

| DATE | SCALE @ A1 | NORTH | |
|---|---|---|---|
| NOV. '18 | NTS | | |
| DRAWN | CHECKED | | |
| TC | AB | | |
| ISSUE | | | |
| PLANNING | | | |
| PROJECT No. | DRAWING No. | REVISION No. | SHEET |
| 15316 | TP14 | A | 18of 18 |

Application for Planning Approval

# Proposed Service Station, Car Wash, Tyre Centre & Showrooms

Lot 104 (#3) Larsen Road, Byford

Shire of Serpentine-Jarrahdale / Metro East JDAP

Application for Planning Approval

# Proposed Service Station, Car Wash, Tyre Centre & Showrooms

Lot 104 (#3) Larsen Road, Byford

Shire of Serpentine-Jarrahdale / Metro East JDAP

Prepared by:

**PETER WEBB & ASSOCIATES**

PO Box 920
SUBIACO WA 6904

T: (08) 9388 7111
F: (08) 9388 7240
E: nik@webbplan.com.au

Principal: Mr Nik Hidding
Job Number: C2145
Version / Date: Final – 10 May 2018

PETER D WEBB AND ASSOCIATES
CONSULTANTS IN TOWN PLANNING AND URBAN DESIGN

Prepared for:

**BYFORD DEVELOPMENT No. 3 PTY LTD**

PO Box 522
KILSYTH VIC 3137

# 1.0 INTRODUCTION

This report has been prepared by Peter Webb & Associates (PWA) on behalf of *Byford Development No. 3 Pty Ltd* as part of an Application for Planning Approval for the development and use of Lot 104 (#3) Larsen Road, Byford (the Subject Site). This Application proposes the land uses of "Service Station", "Automotive Vehicle Wash", "Industry-Service" (Tyre Centre) and "Showroom" (x2) on the Subject Site.

This report considers the planning context of the proposed development and provides an assessment of the application against the relevant State and local planning framework. The information contained in this report confirms that the proposed uses are appropriate for the site and reflects the applicable planning framework.

## 1.1 Joint Development Assessment Panel (JDAP) Determination

As the anticipated construction cost of the project is **$4.95 million**, the Applicant has "opted in" to the Development Assessment Panel (DAP) process and therefore, this Development Application will be required to be determined by the Metro-East Joint Development Assessment Panel (JDAP).

Accordingly, please find ***attached*** our completed Shire of Serpentine-Jarrahdale Application for Development Approval Form, MRS Form 1 and DAP Form 1, all signed by the director of *Byford Development No. 3 Pty Ltd* (the landowner).

The following reports/plans are appended to this report in support of the application:

- Transport Impact Assessment (TIA) – *i3 Consultants*
- Tree Survey Report – *Paperbark Technologies Pty Ltd*
- Landscaping Plan – *Urban Retreat Garden Design*
- Stormwater Management Plan – *Procon Developments*

# 2.0 OVERVIEW & SITE LOCATION

## 2.1 Overview

| | | |
|---|---|---|
| **Applicant:** | | Peter Webb & Associates (PWA) |
| **Designer:** | | TRG |
| **Landowner:** | | Byford Development No. 3 Pty Ltd |
| **Scheme:** | | Local Planning Scheme No. 2 (LPS 2) |
| **Zoning:** | LPS 2: | "Showroom/Warehouse" |
| | MRS: | "Urban" |
| **Current Use:** | | Vacant/Hardstands |
| **Lot Size:** | | 1.1635ha |
| **Proposed Uses:** | | "Service Station" |
| | | "Automotive Vehicle Wash" |
| | | "Industry-Service" (Tyre Centre) |
| | | "Showroom" |
| **Construction Cost:** | | $4.95 million |

## 2.2 Location

The subject site comprises Lot 104 (#3) Larsen Road, Byford which is located within the Shire of Serpentine-Jarrahdale, approximately 32km south-east of the Perth Central Business District and 8km south of the Armadale Town Centre. The subject site is located within the Byford Town Centre and is surrounded by a range of commercial and residential land uses.

A context plan showing the subject site and its surrounds is provided in **Figure 1**.

**Figure 1: Context Plan**

The site is located within the “Showroom/Warehouse” zone in the Shire of Serpentine-Jarrahdale Local Planning Scheme No. 2 (LPS 2).

The subject site is strategically located in the context of the expansion of the Byford Town Centre and is in a prominent location at the gateway to Byford.

## 2.3 Legal Description

This development application refers to Lot 104 (#3) Larsen Road, Byford, the details of which are provided in **Table 1** below

| Lot | Plan | Vol/Folio | Area | Address | Proprietor |
|---|---|---|---|---|---|
| 104 | 169930 | 1843/126 | 1.1635ha | 3 Larsen Road, Byford | Byford Development No. 3 Pty Ltd |

**Table 1: Legal Description**

The Certificate of Title for the subject site is attached at **Annexure 1**.

# 3.0 THE PROPOSAL

The proposed development is depicted on comprehensive Development Plans prepared by TRG (see **Annexure 2**). Artist Impressions of the proposed development are also provided to demonstrate the high quality nature of the development.

Byford has many local attributes which contribute to its unique character and identity. This proposal seeks to maintain Byford's character by proposing interesting built form and using materials that are reflective of the earlier traditional rural locality, whilst providing complementary land uses necessary to service the surrounding residential and commercial areas.

The development utilises the South Western Highway frontage as the primary access to the site (entry only). An exit-only crossover to Larsen Road is also proposed. Rear full-movement access to George Street is proposed, which provides opportunity for enhanced traffic distribution.

The proposal includes the establishment of Service Station, Automotive Vehicle Wash, Industry Service (Tyre Centre) and Showroom land uses. The design and layout of the proposed uses on the site has been specifically designed to ensure appropriate vehicle legibility across the site and between the proposed uses.

## 3.1 Service Station

The proposed Service Station is located at the north-eastern corner of the subject site fronting Larsen Road and South Western Highway. The Service Station consists of the following components:

- 432m$^2$ convenience store and associated café, outdoor seating area and drive thru;
- 8 filling point forecourt inclusive of high quality articulated canopy;
- 2 filling point truck facility inclusive of high quality articulated canopy;
- 9m high pylon sign adjacent to South Western Highway;
- Associated car parking bays;
- Loading bay;
- Underground fuel tanks

The design of this Service Station is quite different to standard service stations, which therefore provides a high quality amenity to customers and passers-by.

The design of the Service Station convenience store building will include a skillion roof, stacked stone cladding to visible walls, extensive glazing areas and earth coloured painted surfaces. The articulated fuel canopy structures also provide visual interest and functionality.

The drive thru (for takeaway coffee only) that 'wraps' around the western part of the convenience store building includes interesting pergola structures at the entrance to the drive thru. All of the western part of the drive thru area will be covered by the proposed integrated awning structure.

### 3.1.1 Hours of Operation & Staff

The proposed Service Station will be operated 24/7 to provide customers of the area with the ability to refuel and purchase a range of food, drink and associated items at all times. The café and drive through coffee outlet will operate between the hours of 5:00am and 9:00pm. This is a service which is currently in demand in this part Byford.

The operation will require a maximum of five (5) employees on site at any one time, with approximately 10 employment positions being created by the operation of the Service Station.

### 3.1.2 Convenience Store

The convenience store associated with the Service Station proposes to incorporate an internal area of 432m$^2$, which will include a point-of-sale and offer for sale of goods generally expected in a Service Station, including food and drink products and other associated items for the convenience of motorists, workers and residents in the area. The convenience store building will also provide a café and drive through coffee outlet and an outdoor seating area. The convenience store building will also include standard amenities and an adminstration office.

Pedestrians can access the convenience store building through a linked footpath to Larsen Road. There is also a bike rack for bike users near the entry to the convenience store building.

### 3.1.3 Fuel Types & Dispensing

The proposed Service Station will provide unleaded fuels (ULP, PULP95, PULP98), E10, LPG, and diesel. The dispensing arrangements are through standard bowsers, drawing from underground storage tanks.

### 3.1.4 Fuel Delivery & Storage

All fuel storage and delivery activities will be undertaken in a manner which complies with Australian Standard *1940 – The Storage and Handling of Combustible Liquids*. Fuel delivery will occur at a rate of one to two deliveries per week.

The proposed tanker swept path has been reviewed by i3 Consultants in its Transport Impact Assessment (TIA).

The fuel will be stored in two (2) underground horizontal cylindrical tanks with the tanks located in proximity to the main pump canopy.

### 3.1.5 Environmental Considerations

The risk of contamination and pollution of the local environment is considered minimal. Service Stations are a highly regulated land use and designers use industry best practices to minimise any fuel or other contaminant access to stormwater drains. Design, operational and management measures will include:

- The connection of washrooms and toilets to reticulated sewerage;
- The use of double-contained fuel storage tank systems with a leak monitoring space. Fuel tanks are also established in stable compacted soils;
- On-site retention and treatment of all stormwater using a using a SPEL Puraceptor Stormwater Treatment and Hydrocarbon Capture system;
- Vapour recovery systems compliant with the *Protection of the Environment Operation (Clean Air) Regulation* 2002 (NSW Guidance Document);
- Fuel spill kit compliant with the latest Australian Standards and Federal National Occupational Health and Safety Council (NOHSC Codes) or Practice that pertain to the handling, storage, clean-up and disposal of Dangerous Goods and Hazardous Substances: NOHSC: 2007(1994), 1005(1994), & 1015(2001) and AS/NZS 3816:1998, AS1940-2004, AS3780-1994, & AS2507-1998;
- Fuel distribution and leak detection infrastructure compliant with all the relevant Australian Standards, Regulations and Industry Best Practices.
- Site operators will be trained personnel to effectively handle incidents such as fuel and oil spills; and
- Equipment will be installed on site to use in the clean up of any fuel, oil or chemical spills.

## 3.2 Automotive Vehicle Wash

A car wash facility (under an Automotive Vehicle Wash land use) is located at the southern end of the site, adjacent to South Western Highway. The car wash facility will include one (1) fully automated wash bay, four (4) manual wash bays and four (4) vacuum bays. The wash facility includes shade sail canopies. The plant room will be a fully constructed building. Access to the car wash will be derived from the internal movement network.

### 3.2.1 Hours of Operation & Staff

The car wash will be operated 24/7 and is a fully automated system requiring limited attendance by the tenant (other than for cleaning and maintenance). Only one staff member will be required for cleaning and maintenance.

## 3.3 Tyre Centre

A tyre centre (under an “Industry Service” land use) is located along the southern boundary of the site, situated behind the car wash (as viewed from South Western Highway). The tyre centre building is 365m$^2$ in area and includes three (3) main roller doors on the northern side for access by vehicles to be fitted with new tyres. There is a reception area and office on the western side of this building.

There is forecourt area in front of the roller doors to allow for vehicles to be parked awaiting tyre fitment. There is a rear loading area and bin store behind the building. There is a car park with 43 car parking bays on the northern side of the tyre centre which will be shared by customers and staff of the two showroom uses and the tyre centre.

The tyre centre can be accessed directly from South Western Highway or George Street through the internal movement network.

### 3.3.1 Hours of Operation & Staff

The tyre centre will be operated during standard business hours of between 8:00am and 5:00pm Monday to Saturday, but it is likely that Saturday operating hours will finish around 1:00pm (at the discretion of the tenant). The tyre centre will not be operated on Sundays.

Approximately 15 staff members will be employed by the tyre centre, inclusive of technicians and administration staff.

## 3.4 Showroooms

Two showroom buildings are located along the western part of the site, adjacent to George Street. Tenancy 1 is 440m$^2$ in area and Tenancy 2 is 413m$^2$ in area. The showroom tenancies are typical of standard showrooms, with a large floorspace and central entry doors. The showroom tenancies are serviced with their own loading bays.

### 3.4.1 Hours of Operation & Staff

Each of the showrooms will be operated between the hours of 8:00am and 5:00pm on all days of the week, but it is likely that Saturday and Sunday operating hours will finish around 1:00pm (at the discretion of the tenant).

Each of the showroom uses will employ up to 10 staff members.

## 3.5 General

### 3.5.1 Access & Movement

Site access is principally from South Western Highway, allowing for safe and easy access for passing motorists. The crossover to South Western Highway (which will be through the modification of an existing crossover) will be an **entry-only** crossover.

Tanker movements into the site will be from the South Western Highway crossover and exit movements will be via the **exit-only** crossover to Larsen Road. Tanker movements associated with the site will only occur one to two times a week, at a non-peak time of the day.

The site also proposes full-movement vehicular access from George Street to provide for enhanced traffic distribution.

The site also provides opportunity for access across to the adjacent lot to the south (Lot 10) at a generally mid-point location, to assist with future site connectivity.

A Transport Impact Assessment (**Annexure 3**) has been prepared by i3 Consultants to support the proposed development. The design of the site has demonstrated that access requirements for both car and truck movement can be efficiently accommodated on this site, in accordance with both the Shire of Serpentine-Jarrahdale and Main Roads WA requirements.

### 3.5.2 On-Site Parking & Servicing

The proposed development has been provided with a total of 50 standard parking bays and 4 ACROD parking bays (total 54 car parking bays).

In addition, the site also includes four (4) standard fuel bowsers (servicing 8 light vehicles simultaneously).

Separate loading/unloading bays have been provided for each development component on the site (excluding the car wash).

### 3.5.3 Landscaping

The proposed extensive landscaping of the site will ensure that the development provides an attractive frontage and improves the visual amenity along South Western Highway and Larsen Road.

Extensive landscaping areas will be developed around the perimeter of the site and between each of the development components, totalling 2886m$^2$ (or **25% of the site area**) including the retention of 26 mature trees. 22 trees are proposed to be removed to facilitate the proposed development (and some are not in good health), however it is proposed to plant an additional 22 trees to account for the loss of existing ones.

In support of the application, a Tree Survey Report has been prepared by Paperbark Technologies Pty Ltd and is included at **Annexure 4**. This Tree Survey Report provides recommendations about the retention and removal of trees. The report satisfies the provisions of Clause 7.12 (Tree Preservation and Planting) of LPS 2.

A comprehensive Landscaping Plan has been prepared by Urban Retreat Garden Design for the site which is attached at **Annexure 5** which has accounted for the proposed trees to be retained and details additional landscape treatments and new trees.

### 3.5.4 Servicing

A Stormwater Management Plan (SWMP) has been prepared over the subject site in order to demonstrate the site can appropriately accommodate the stormwater generated by the proposal in the context of the local groundwater levels, topography of the land and amount of impervious surfaces proposed. This SWMP also confirms the ability for runoff associated with the fuel

forecourt to be contained. A copy of the SWMP prepared by Procon Developments is attached at **Annexure 6**. A Geotechnical Report will provided to the Shire within 2 weeks from the date of this submission.

Existing power and telecommunication infrastructure suggests the proposal can be readily serviced without major upgrade. The proposal is to be connected to reticulated sewer and water systems.

# 4.0 PLANNING ASSESSMENT

## 4.1 Metropolitan Region Scheme

The subject land is zoned "Urban" under the Metropolitan Region Scheme (MRS). The land fronts South Western Highway which is reserved under the MRS as a "Primary Regional Road".

## 4.2 Local Planning Scheme No. 2

### 4.2.1 Zoning

The subject land is zoned "Showroom/Warehouse" under the Shire of Serpentine-Jarrahdale Local Planning Scheme No. 2 (LPS 2). The subject land is adjacent to a Local Scheme Reserve for "Public and Community Purposes". An extract of the Scheme Map is included at **Figure 2**.

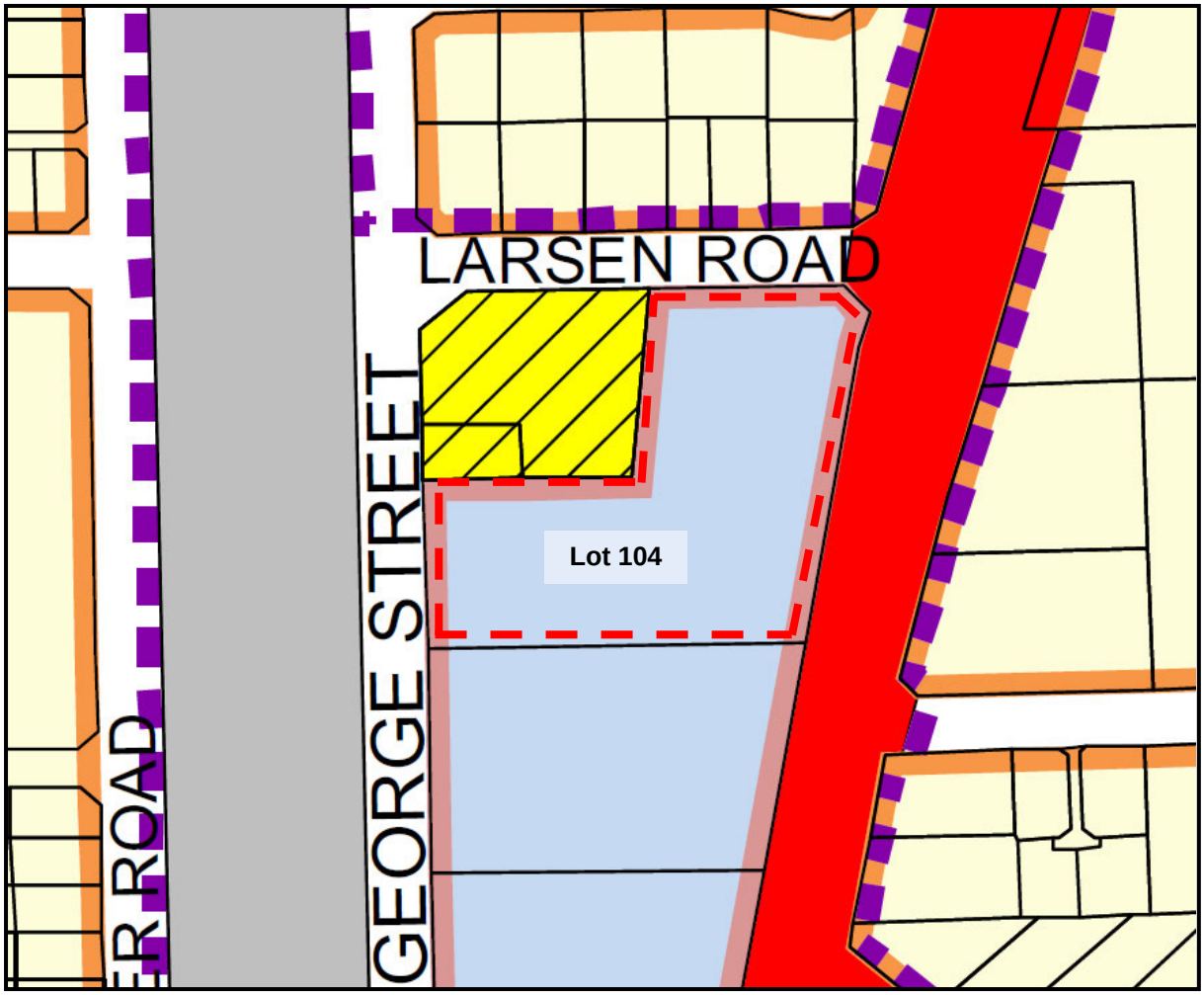



**Figure 2: LPS 2 Scheme Map Extract**

Clause 5.7.1 of LPS 2 states that, *"The purpose and intent of the Showroom Warehouse Zone is to provide for a range of commercially oriented uses with low traffic generating characteristics and dealing in goods of a bulky nature."*

Under LPS 2, the proposed uses fall under the following land use classifications:

***Service Station*** *- means land and buildings used for the supply of petroleum products and motor vehicle accessories and for carrying out greasing, tyre repairs and minor mechanical repairs and may include a cafeteria, restaurant or shop incidental to the primary use; but does not include a transport depot, panel beating, spray painting, major repairs or wrecking.*

***Automotive Vehicle Wash*** *– means a building or portion of a building wherein vehicles are washed and cleaned by or primarily by mechanical means.*

***Industry Service*** *– means a light industry carried out on land or in buildings which may have a retail shop front and from which goods manufactured on the premises may be sold; or land and buildings having a retail shop front and used as a depot for receiving goods to be serviced.*

***Showroom*** *– means land and buildings wherein goods are displayed and may be offered for sale by wholesale and/or by retail excluding the sale by retail of: foodstuffs, liquor or beverages, items of clothing or apparel, magazines, newspapers, books or paper products, medical or pharmaceutical products, china, glassware or domestic hardware, and items of personal adornment.*

The land use permissibility for each of the proposed uses is set out in **Table 2** below.

| Land Use | Zone | Use Class |
|---|---|---|
| **Service Station** | Highway Commercial | SA* |
| **Automotive Vehicle Wash** | Highway Commercial | P (Permitted) |
| **Industry Service** | Highway Commercial | P (Permitted) |
| **Showroom** | Highway Commercial | P (Permitted) |
| **SA – means that the Council may, at its discretion, permit the use after notice of the application has been given in accordance with Clause 64 of the Deemed Provisions.* | | |

**Table 2 Land Use Permissibility**

Given the above, there is discretion to approve the proposed Service Station. There is no need for the exercise of discretion for the three Permitted uses, as long as these uses comply with the provisions of the Scheme (to be discussed later in this report).

### 4.2.2 Development Requirements

Table 4 of LPS 2 indicates that development in the Showroom/Warehouse zone is to be set back a minimum of 9.00m from the primary street. The proposed development complies with the setback requirement.

Clause 5.7.7 of LPS 2 states that any building erected in the Showroom/Warehouse zone shall have a facade to the street constructed of brick, stone, timber, concrete or glass or any

combination of these. The proposed development complies with this requirement, as it provides high quality buildings and façade finishes.

### 4.2.3 Car Parking

Car parking is required to be provided in accordance with Table 5 of LPS 2.

The development proposes to provide 50 standard car parking bays and 4 ACROD parking bays (total 54 car parking bays).

The car parking calculation is demonstrated below at **Table 3**.

| Use Class | LPS2 Requirement | Provided | Complies |
|---|---|---|---|
| "Service Station" | 1.5 spaces per Service Bay<br>Plus **(0)**<br>1 space per Employee.<br>5 employees<br>**(5)** | **11** | **Yes** |
| "Automotive Vehicle Wash" | 2 spaces per wash stall<br>5 wash stalls = 10<br>**(10)** | **0** | **No** |
| Industry Service (Tyre Centre) | 1 space per 50m$^2$ GLA<br>365/50 = 7.3<br>**(7)** | **16** | **Yes** |
| Showroom | 1 space per 60m$^2$ GLA<br>(853/60 = 14.2)<br>**(14)** | **27** | **Yes** |
| **Total** | **36** | **54** | **Yes** |

**Table 3: Car Parking Requirements of LPS 2**

The proposed development is required under LPS 2 to provide a total of 36 car parking bays. The proposed development complies with the overall requirement by providing a total of 54 car parking bays (in addition to the fuel bowser bays and car wash stall and vacuum bays).

The Service Station has been provided with 11 designated parking bays directly adjacent to the Service Station convenience store building, including one (1) disabled bay. In addition, there is the ability for customers to leave their cars/trucks at the bowsers to access the convenience store building, as is common practice.

The Car Wash does not propose to include any standalone car parking bays, as it is envisaged that customers wishing to use the facility will access the automatic wash bay or the four other manual wash bays. If the facility is full, there is opportunity to wait in front of each of the five wash bays. There are also four vaccuum bays. There is plenty of room in front of the car wash for vehicles to leave if the facility is full and they do not want to wait. The need for separate car parking bays for a car wash needs to be questioned, given the use is to wash cars.

The Tyre Centre and Showroom uses have surplus car parking requirements in close proximity to each use.

Having considered the range of car parking options across the site and the total number of bays provided, the car parking provision complies with the requirements of LPS 2.

#### 4.2.4 Clause 5.2 – Discretion to Modify Development Standards

We are aware that the decision-maker has the ability to conditionally approve developments that do not necessarily comply with the requirements/standards of LPS 2.

### 4.3 Byford District Structure Plan

The subject land is included in the "Highway Commercial" zone in the Byford District Structure Plan (DSP). As demonstrated within the text of the DSP and LPS 2, the proposal is consistent with the objectives and intentions for the "Highway Commercial" zone even though the land is zoned "Showroom/Warehouse" under LPS 2.

The site is not included in a Development Area (DA).

The site is also not within a DCP Precinct (refer to Plan 15A of LPS 2).

### 4.4 Byford Townsite Local Development Plan

The subject land is included in the Commercial "Character Area H" of the Byford Townsite Local Development Plan (LDP) (previously Byford Townsite Detailed Area Plan) which identifies the site as "Highway Commercial".

The LDP states that *"'Highway Commercial' land uses will be an appropriate form of new development in the northern area, complementing and invigorating existing commercial developments."*

The LDP also states that the sites are, *"proposed to accommodate showrooms, bulky goods, offices, medical centres, consulting rooms, and the like."*

No indicative Concept Plans are included in the LDP.

We consider that the proposed uses are consistent with the intent of the "Highway Commercial" precinct of the LDP.

### 4.5 Local Planning Policies

#### 4.5.1 Local Planning Policy 4 "Revegetation"

The objective of LPP 4 is to encourage the use of local native flora for revegetation.

As set out previously in this Report, the proposed development encourages the retention of mature vegetation, and proposes new areas of planting and revegetation using local native species (refer to Landscaping Plan). The proposed development complies with the provisions of LPP 4.

### 4.5.2 Local Planning Policy 5 "Control of Advertisements"

The objective of LPP 5 is to provide guidance on the provision of signage. LPP 5 has a number of objectives including:

- Ensuring the visual quality and character of the locality is not eroded;
- Ensure signage is not misleading or dangerous to vehicular and pedestrian traffic;
- Minimise the total area and impacts of outdoor advertising;
- Prohibit superfluous or unnecessary outdoor advertising;
- Reduce and minimise clutter; and
- Promote a high standard of design and presentation.

The proposed Service Station includes signage associated with the operator (Caltex), inclusive of 9.00m high, 2.20m wide pylon sign located along the South Western Highway frontage of the site, on the southern side of the entry crossover.

The proposed pylon sign incorporates the Caltex logo, the Fresh Trading Co. logo (convenience store operator), fuel types provided, pricing of fuel and opportunity for signage for one of the other tenancies on the site (yet to be determined).

The pylon sign location is indicated on the Site Plan (TP03) and the design of the pylon sign is shown on the Signage Elevation Plan (TP10).

In the circumstances of the subject site (which is more than 1.00ha in area), and given only one pylon sign is proposed, it is considered the proposed signage is consistent with the objectives of LPP 5.

### 4.5.3 Local Planning Policy 24 "Designing Out Crime"

The objective of LPP 24 is to ensure that new developments are to be designed with regard to the principles of surveillance, access control, territorial reinforcement measures, security and management, and maintenance.

The proposed development has been designed with active frontages to facilitate passive surveillance of adjacent roads and internal car parking areas. Further, the 24/7 operation of the Service Station will allow for 'round the clock' passive surveillance, also through the use of security and CCTV cameras. The proposed development complies with the intentions of LPP 24.

### 4.5.4 Local Planning Policy 53 "George Street Construction Costs"

The objective of LPP 53 is to guide the contribution of funding for the construction of George Street from Pitman Way to Larsen Road in a coordinated manner by detailing the costs, method of apportionment and method of collecting contributions.

We are aware that George Street is already constructed along the entire frontage of the subject site, but may require upgrading at a future time.

We are aware that the Policy requires the developers of Lot 104 to contribute 10.22% of the cost of the George Street upgrade (based on the length of the sites' frontage).

We will be guided by the Shire as to the requirements for George Street in its assessment of this Application. In the interim, vehicles will be able to continue to use the constructed part of George Street in its current form.

## 4.6 WAPC Development Control Policies

### 4.6.1 DC Policy 5.1 Regional Roads (Vehicular Access)

The objectives of DC Policy 5.1 seek to ensure that vehicle access to regional roads and the type of abutting developments is controlled and conforms with sound town planning principles, and to improve traffic flow and safety on all regional roads by minimising the number of junctions or driveways.

The proposed development will use an existing crossover from South Western Highway for the creation of a new formalised crossover that will operate as "entry-only".

The proposed development is therefore, consistent with the objectives of DC Policy 5.1.

## 4.7 Deemed Provisions

Clause 67 - Part 2 - Schedule 2 (Deemed Provisions) of the *Planning and Development (Local Planning Schemes) Regulations 2015* (Regulations) outlines matters to be given due regard by local government when considering development applications. **Table 4** below provides an assessment against matters relevant to this proposal.

| **Relevant Matters to be Considered** | **Comment** |
|---|---|
| (a) The aims and provisions of this Scheme and any other local planning scheme operating within the Scheme area; | The propose use and development is consistent with the aims and provisions of the Shire's LPS2 for the following reasons:<br>• The proposal seeks approval for land uses which are "P" (Permitted) and "SA" (Discretionary) within the Showroom/Warehouse zone and are therefore capable of approval.<br>• The proposed development is in general compliance with the provisions of LPS 2.<br>• The proposed development will improve the amenity of the site. |
| (b) The requirements of orderly and proper planning including any proposed local planning scheme or amendment to this Scheme that has been advertised under the *Planning and Development (Local Planning Schemes) Regulations 2015* or any | This report demonstrates the proposed development is in general compliance with the local planning framework applicable to the subject site. |

| | |
|---|---|
| other proposed planning instrument that the local government is seriously considering adopting or approving; | |
| (g) any local planning policy for the Scheme area; | This report demonstrates the proposed development is in general compliance with the local planning policies applicable to the subject site. |
| (m) the compatibility of the development with its setting including the relationship of the development to development on adjoining land or on other land in the locality including, but not limited to, the likely effect of the height, bulk, scale, orientation and appearance of the development; | The proposed development is entirely compatible with its setting for the following reasons:<br>• The proposed development has been designed to provide a high quality, attractive interface to South Western Highway;<br>• The proposal presents an attractive, high quality built form which enhances the appearance of the subject site and its impact on adjoining properties and the streetscape;<br>• The amenity of the subject site and surrounds will be improved through the redevelopment of the subject site;<br>• Extensive landscaping areas are proposed over the site, including the retention of 26 mature trees.<br>Having regard to the above, the nature of the proposed development is entirely compatible with its surroundings, and substantially improves amenity of the locality. |
| (n) the amenity of the locality including the following –<br>(i) Environmental impacts of the development;<br>(ii) The character of the locality;<br>(iii) Social impact of the development; | <u>Environmental Impacts:</u><br>The proposed development is not anticipated to result in any adverse environmental impacts.<br><u>Character of the Locality:</u><br>The proposed land uses and building design are compatible with the surrounding amenity including other new developments in Byford. The proposal is consistent with the local statutory and strategic planning requirements for the subject site, which sets out the desired built form and character of the locality.<br><u>Social Impacts:</u><br>The proposed development will not have any adverse social impacts on the surrounding locality, but will provide a positive social impact through the creation of jobs through construction and operation of the proposed |

| | |
|---|---|
| | development. |
| (s) the adequacy of –<br>(i) the proposed means of access to and egress from the site; and<br>(ii) arrangements for the loading, unloading, manoeuvring and parking of vehicles; | As outlined in this Report and the supporting Transport Impact Assessment (TIA) prepared by i3 Consultants **(Annexure 3)**, the proposed access arrangements to and from the site are satisfactory.<br><br>A turn path analysis has been undertaken for 19.0m trucks/tankers, which shows that these vehicles can enter the site from South Western Highway via a left turn, circulate within the site and turn right out onto Larsen Road satisfactorily. |
| (t) the amount of traffic likely to be generated by the development, particularly in relation to the capacity of the road system in the locality and the probable effect on traffic flow and safety; | The Transport Impact Assessment prepared by i3 Consultants **(Annexure 3)** provides an assessment on traffic generation and measures to improve the road network. |

***Table 4 Matters to be considered by local government***

## 4.8 Transport Impact Assessment

i3 Consultants have been engaged to prepare a Transport Impact Assessment (TIA) in support of the proposed development (see **Annexure 3**).

i3 Consultants were commissioned to undertake a traffic impact assessment to address the adequacy of the vehicle access arrangements, vehicle and truck turning requirements and on-site parking. The internal turning requirements for a 19.0m semi/tanker entering/exiting the site have been checked and confirm that the proposed crossover arrangements are satisfactory.

The parking dimensions have also been reviewed and confirm that the parking bays are in accordance with *AS 2890.1:2004 Parking Facilities Part 1: Off Street Car Parking for a User Class 3A for Short Term*.

A referral to Main Roads WA (MRWA) for comments and recommendations will occur once the Application is progressed. The TIA has raised some issue with the intersection of Larsen Road and South Western Highway. Further discussion with MRWA will occur during the assessment of the Application. The Proponent has already met with MRWA (on 7 May 2018) to briefly discuss the proposed development and flag the issue concerning the intersection and road upgrades.

## 5.0 CONCLUSION

The proposed Service Station, Car Wash, Tyre Centre and Showroom development will provide a complete redevelopment of Lot 104, including its improvement through quality building design and extensive areas of landscaping. The development will also fit seamlessly into adjacent future developments, by ensuring vehicular and site connectivity.

The information provided in this report provides comprehensive planning and design justification for the proposed development, addresses the existing planning framework, relevant technical considerations, built form outcomes, landscaping, and key safety and vehicle movement considerations.

For these reasons, and in light of the assessment contained within this report, we respectfully request that the Shire of Serpentine-Jarrahdale have regard to the merits and broader benefits of the proposal when undertaking its assessment of the application, and to recommend approval to the Metro-Central JDAP, subject to reasonable conditions.

**Peter Webb & Associates**

# ANNEXURES

# ANNEXURE 1

*Certificate of Title*

# ANNEXURE 2

*Development Plans (TRG) &*
*Feature Survey (JBA Surveys)*

# ANNEXURE 3

*Transport Impact Assessment*
*(i3 Consultants)*

# ANNEXURE 4

*Tree Survey Report*
*(Paperbark Technologies Pty Ltd)*

# ANNEXURE 5

*Landscaping Plan*
*(Urban Retreat Garden Design)*

# ANNEXURE 6

*Stormwater Management Plan*
*(Procon Developments)*

PROCON DEVELOPMENTS

# SITE BASED STORMWATER MANAGEMENT PLAN

**PROJECT:** Proposed Mixed Use Development
3 Larsen Road
Byford, WA 6122

**JOB NO.** -

**CLIENT:** Procon Developments

**DESIGN ENGINEER:** Darren Griffiths
BE(Hons), MIE (Aust), CP Eng,
NER (Civil/Structural), RPEQ, RBP

**DATE:** June 2018

*Procon Developments (Australia) Pty Ltd as Trustee for*
***Procon Developments Unit Trust***
*ABN: 94 364 564 982*
*P.O. Box 522 Kilsyth, Victoria 3137*
*820 Mountain Hwy Bayswater VIC 3153*
***Telephone (03) 9720 0817 Facsimile (03) 9720 0827***

# *Table of Contents*



# *List of Figures*

# 1.0 Introduction

This Stormwater Management Plan (SMP) has been developed to support the proposed mixed use development at 3 Larsen Road, Byford.

The purpose of this SMP is to identify the stormwater quality detention options required to be implemented within the site.

The objectives of this SMP are as follows:

- Consider suitable stormwater quality improvement devices to achieve effective hydrocarbon management;
- Ensure the development achieves non-worsening of stormwater flows downstream of the site; and,
- Ensure the proposed development does not worsen the environmental value of the stormwater flows through the construction phase.

## 1.1 Site Characteristics

The location of the proposed development site is shown in Figure 1-1.

The previous land use was a light industrial allotment to the south with a residential property to the north.

To the north, the site is bounded by Larsen Road with the South Western Highway to the east and George Street to the west. An existing light industrial allotment is located on the south boundary.

The site grades from east to west with elevations ranging from 55.5m to 52.4m (AHD).

There are no external catchments affecting the existing development area.

The proposed development layout is provided in Appendix A.

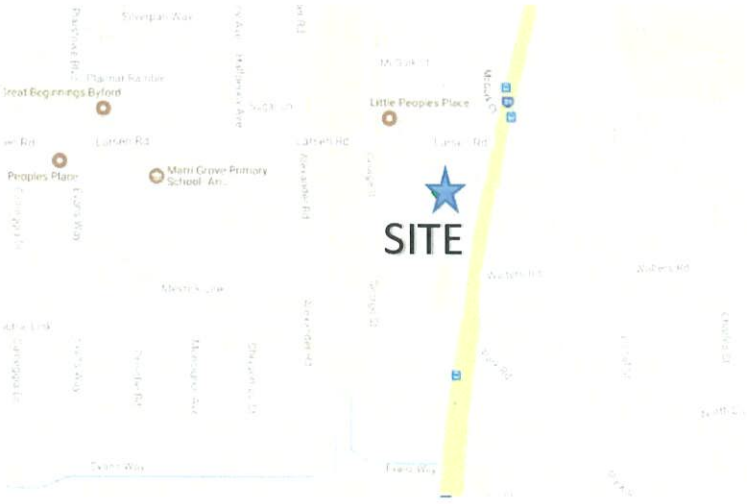



Figure 1-1: Locality Plan (Source: Nearmap)

### *1.2 Soakwells*

The geotechnical investigation undertaken by STATS notes that, due to the very low permeability clayey soils underlying the site, disposal of stormwater via soakwells is NOT appropriate for this development.

Stormwater runoff shall be directed off-site via an orifice pit as noted in Section 3.

The comments on stormwater drainage from the geotechnical investigation report are provided in Appendix B.

## *2.0 Stormwater Quality Management*

### *2.1 'Best Practice'*

Procon Developments actively undertakes 'Best Practice' Management with respect to stormwater quality management across all our fuel development sites.

The following stormwater quality improvement devices (SQID's) are proposed to be installed as part the of stormwater drainage system for this development:

- 2 No. 58,000L above ground rainwater harvesting tanks. The collected rainwater will be used for toilet flushing (4 No. toilets – shop & tenancies) and tree watering. This will reduce potable water demand for the development. The Water by Design - Deemed to Comply Solution (CI1/2) specifies a minimum tank size per toilet of 1,500L. This will provide up to 26,300L of rainwater for tree watering (83,700L is reserved for flood storage).

As a member of the Australasian Convenience and Petroleum Marketers Association (ACAPMA), Procon Developments are committed to ensuring that all our fuel development sites are designed to minimize the risk of pollutants being washed from the forecourt and into urban waterways.

The design of the fuel canopy (with a 10 degree inset of the drip line) and fuel hose lines within the canopy drip line is in accordance with the ACAPMA 'Best Practice' guidelines for management of stormwater pollution at service stations.

ACAPMA also note the hydrocarbon separator should provide full containment of at least the capacity of a fuel tanker compartment (approximately 8,000L). Tank Solutions Aquator is a tried and proven solution for the capture separation of hydrocarbons.

### *2.2 Hydrocarbon Management*

The Western Australia Water Quality Guidelines require the prevention of hydrocarbons from entering the stormwater system or internal watercourses that discharge from the site. In accordance with this criteria, the following hydrocarbon management device is proposed;

- Tank Solutions Aquator – A full retention separator which has both containment and coalescer chambers. Total suspended solids, silt, sediments, sludge and gross pollutants settle on the chamber floor while light liquids are contaminated and separated to 5mg/litre or less prior to discharge. All liquid is treated. There is no by-pass operation. An automatic closure device is fitted which is sensitive to any changes in water density. This prevents pollutants from discharging from the site.

The Tank Solutions Aquator also reduces average annual loads as per below which allows safe discharge to the stormwater drain in George Street:

- Total suspended solids (TSS)
- Gross pollutant solids (GP)
- Light liquids (TPH)
- Phosphorus & Nitrogen (particulates)

The Tank Solutions Aquator is proposed to be installed in series to ensure all stormwater run-off from the pavement containment zones are treated prior to discharging from the site.

Refer to Appendix C for the Aquator specification and Water Corporation approval certificate.

## *3.0 Stormwater Quantity Management*

### *3.1 Existing Scenario*

From looking at historical Nearmap data, the site was previously a light industrial allotment to the south (between South Western Highway and George Street). A residential property was located to the north end. The site has a total area of 11,630m$^2$.

Hence, the parameters for the permissible site discharge (PSD) are adopted as follows:

- Runoff coefficient = 0.45 (low density urban);
- 5 year ARI storm event; and,
- Time of concentration = 6 mins.

The site drains generally west overland to George Street and the adjoining property on Larsen Road (which is currently relatively greenfield).

## *3.2 Developed Scenario*

Runoff from the proposed development site will be collected internally and directed to the north-west corner of the site. It will then be detained via an orifice pit which will reduce the outlet flow to less than the PSD (up to the 10 year ARI storm event).

The calculated maximum orifice plate outlet diameter is 200mm for this site (assuming a non-drowned orifice condition).

Underground on-site stormwater detention has been provided for the site up to the calculated minimum storage volume for the 10 year ARI storm. Hence, the calculated on-site detention volume for this development is 57.2m$^3$. This detention volume is proposed to be provided via oversized underground stormwater drainage pipes & pits.

For the 100 year ARI storm event, run-off from the site will be via overland flow to the railway reserve.

Refer to Appendix E for the stormwater drainage plan which has been marked-up to show the stormwater flow paths and contributing catchment areas.

The forecourt pavements, crossovers and pedestrian pathways are all proposed to be reinforced concrete in accordance with Procon Developments 'Best Practice' Management across all our fuel development sites.

After consideration of the on-site underground storage capacity any the minor and major flow paths, the impact of the development is not considered to cause any nuisance or annoyance to upstream or downstream properties.

## *3.3 Lawful Point of Discharge*

The lawful point of discharge for this development is proposed to be the existing grated stormwater pit within the George Street road reserve. This drain outfalls to the railway reserve to the west of the site.

Refer to the attached marked-up stormwater drainage plan for details.

# 5.0 Conclusion

This report has aimed to satisfactorily address the requirements of the material change of use for service station development, with respect to addressing stormwater quality and quantity over the site at 3 Larsen Road, Byford.

It is proposed for the development to implement a detention system within the site in order to achieve the intent of the Shire of Serpentine Jarrahdale Planning Scheme. An orifice pit is also proposed to be included to limit the outlet flows into Council's stormwater drainage system to the permissible site discharge. This will achieve a non-worsening criteria for the site up to and including the 1 in 10 year ARI storm event for the underground stormwater drainage system (including the on-site stormwater detention) & 1 in 100 year ARI storm event for the overland flow. This is in accordance with the Western Australia Stormwater Management Manual.

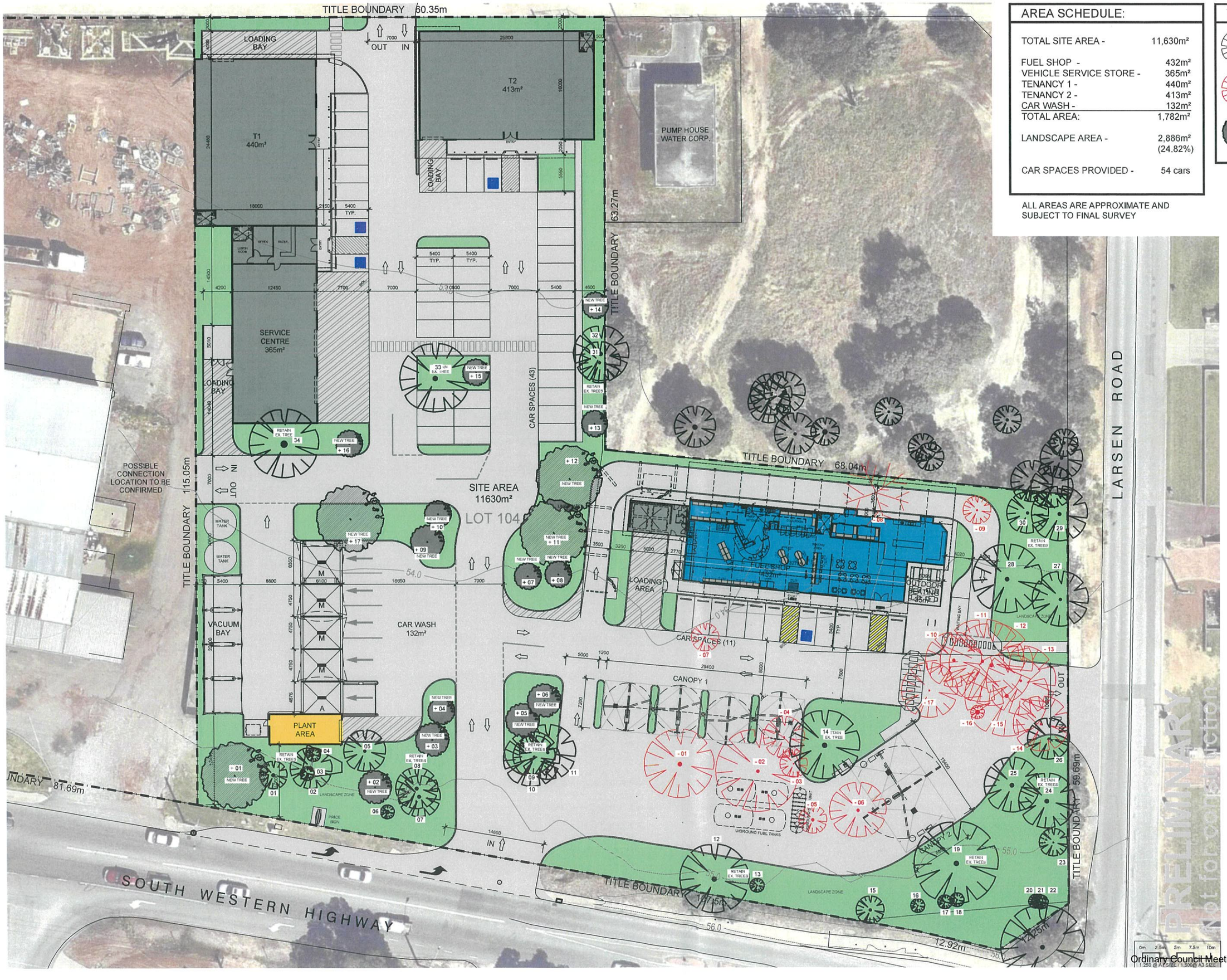
This stormwater management plan demonstrates that effective treatment of stormwater at the proposed development can be achieved through non-worsening principles.

# 6.0 References


- Shire of Serpentine Jarrahdale, Planning Scheme
- Western Australia Government, State Planning Policy
- Department of Water and Environmental Regulation, Stormwater Management Manual for Western Australia, 2004 - 2007
- Water by Design, Deemed to Comply Solutions – Stormwater Quality Management, 2010
- Australasian Convenience and Petroleum Marketers Association, Managing Stormwater Pollution at Service Station Sites.

# *Appendix A*

Site Layout (TRG)




## AREA SCHEDULE:

| | |
|---|---|
| TOTAL SITE AREA - | 11,630m² |
| FUEL SHOP - | 432m² |
| VEHICLE SERVICE STORE - | 365m² |
| TENANCY 1 - | 440m² |
| TENANCY 2 - | 413m² |
| CAR WASH - | 132m² |
| TOTAL AREA: | 1,782m² |
| LANDSCAPE AREA - | 2,886m² (24.82%) |
| CAR SPACES PROVIDED - | 54 cars |

ALL AREAS ARE APPROXIMATE AND SUBJECT TO FINAL SURVEY

## TREE SCHEDULE:

EXISTING TREE RETAINED
34

EXIST. TREE REMOVED
17

NEW TREE ADDED
17

| REV | AMENDMENT DETAILS | BY | DATE |
|---|---|---|---|
| P2 | CARWASH LAYOUT REVISED | JS | 17-04-18 |
| P1 | PRELIMINARY ISSUE | KM | 10-04-18 |

PROCON DEVELOPMENTS
www.procon.net.au

trg
BRISBANE + MELBOURNE

concept + design + interiors + project management

Level 3, Suite 37, 799 Springvale Road, Mulgrave, Victoria 3170 Australia
T +61 3 9542 9000 F +61 3 9542 9010
www.trgaus.com
The Retail Group Pty Ltd ABN 85 050 134 686
RBP No. DP-AD1689



PROJECT
PROPOSED MIXED USE DEVELOPEMENT

PROJECT ADDRESS
3 LARSEN ROAD

BYFORD
WA 6122

DRAWING TITLE
PROPOSED SITE PLAN

CLIENT
PROCON DEVELOPMENTS PTY LTD

| DATE | SCALE @ A1 | NORTH |
|---|---|---|
| APR.'18 | 1:250 | |
| DRAWN: KM | CHECKED: AB | |
| ISSUE: PRELIMINARY | | |

| PROJECT No. | DRAWING No. | REVISION No. | SHEET |
|---|---|---|---|
| 15316 | TP 103 | P2 | 03 of 12 |

PRELIMINARY
Not for construction

0m 2.5m 5m 7.5m 10m
1:250 @ A3 SIZE | 1:500 @ A3 SIZE

# *Appendix B*

Extract from Geotechnical Investigation Report

STATS

# PROPOSED MIXED USE DEVELOPMENT AT LOT 104 (#3) LARSEN RD, BYFORD

## Geotechnical Investigation Work

Prepared for

PROCON DEVELOPMENTS

ABN: 90 016 537 577
Perth T: +61 (0) 8 9455 3654
Unit 1/24 Baile Road, Canning Vale, WA 6155
www.statswa.com.au

ABN: 90 016 537 577
Karratha T: +61 (0) 8 9144 4637
1938 Pyramid Rd Karratha WA 6714
www.statswa.com.au

*Table 4: Compaction Requirements for Fill (DCP & PSP)*

| Depth intervals | DCP Blows (cumulative) | PSP Blows (cumulative) |
|---|---|---|
| 0 - 150 | Seat | Seat |
| 150 – 450 | 9 | 8 |
| 450 – 750 | 14 | 11 |
| 750 – 1050 | 19 | 15 |

## 8.7 Drainage

8.7.1 If construction works were to take place during the rainy seasons, the perimeter around the site and areas of proposed earthworks should be constructed with a shallow gradient to allow drainage to a sump and to allow water to be discharged from the site. It is important that the conditions under the footings remain relatively dry. Where required, drains should be constructed to divert water from the site and to ensure no erosion or premature saturation occurs around the footings.

8.7.2 Based on the type of clayey soils encountered on site, we recommend that stormwater shall be discharged off site.

8.7.3 Based on the Falling Head Permeability laboratory test result, we obtain a Permeability of 0.00041m/d. In accordance to AS/NZS 1547:2012, this falls under a Soil Category of 6 out of 6, under a soil texture described as Medium to Heavy Clays.

## 8.8 Cut and Fill Batters

8.8.1 Cut and fill batters will be generally stable at 1: 2 (V: H), however batters constructed at 1:3 will enable re-establishment of vegetation and be less prone to damage from wetting, drying and erosion.

## 8.9 Suitability of Site Materials

8.9.1 The Filling gravelly SANDS / GRAVELS, up to a shallow depth of 0.5m are suitable as General Backfill material, provided they are screened off to remove organics and rubbles. For building pads, clean imported sands shall be used.

# 9.0 EFFECTS OF SITE WORKS ON CLASSIFICATION

9.1 Any earthworks required in preparing the building platform should be carried out in a controlled manner in accordance with the recommendations given in Australian Standard AS 3798-2007, "Guidelines on earthworks for commercial and residential developments".

9.2 The type of fill material used and the depth of fill may also affect the site classification.

9.3 In the event that the site conditions encountered have a different soil profile/materials from that provided in this report, this office should be contacted immediately. This also applies in the event the site has a fill layer greater than 0.5m in height, to raise the site finished level.

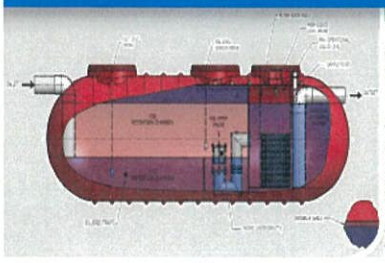
# *Appendix C*

Hydrocarbon Separator Specification

TANK SOLUTIONS
FUEL · CHEMICALS · WATER

# 4 Compelling Reasons to Choose Aquator as your Oil-Water Separator at Retail Service Stations for the Capture of Fuel Spills.

## AQUATOR®



1

Aquator is designed, engineered and manufactured by Tank Solutions Pty Ltd, Australia's leading manufacturer of Double Wall Fibreglass Underground Fuel Storage Tanks for Retail Service Stations. Our business is focused on Retail Service Stations. We understand that hydrocarbon management is not the same as water management. Aquator can be manufactured as a double wall tank – an Oil-Water Separator is designed to contain an environmentally disastrous hydrocarbon spill, not just a non-hazardous water spill. You need to ask your existing Oil-Water Separator supplier if their tank is:

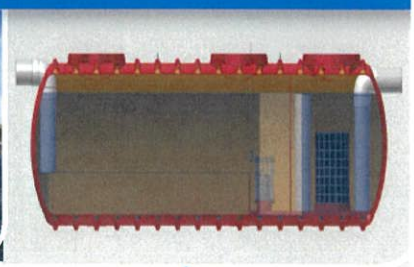
a. Providing a double wall tank to mitigate your risk to the environment of a major hydrocarbon spill
b. Has a means of knowing if their Oil Water Separator is leaking – are you certain that your tank is fully containing hydrocarbons
c. Is an ISO 9001 approved manufacturer
d. Is UL authorized to ensure consistent quality of product
e. Knows how to manage hazardous liquids – especially hydrocarbons

2

Aquator can be ordered from the same company that provides your fuel tanks – Tank Solutions. It provides the Installer and site owner a one stop shop. It allows the Installer to more easily plan the underground phase of the construction program. Aquator can potentially be shipped to site at the same time as the fuel tank ancillary components – providing very significant freight savings depending on site location.

3

Aquator can be installed below pavement. This allows the site owner to increase the footprint of paved area to maximize forecourt returns. Aquator can even be installed in the same excavation as the fuel tanks. You may not have to engage a separate Plumber for installation of the Oil-Water Separator.



4

Tank Solutions is the most cost effective Full retention Oil Water Separator available today.

- Meets EN858-1
- Triple Alarm
- Sized to site needs

## The perfect solution for your Oil-Water Separator

513 Tomago Road,
Tomago NSW 2322
**Ph:** 02 4964 8270
**F:** 02 4964 8522
**Email sales@tanksolutions.com.au**
**www.tanksolutions.com.au**

**John Watson**
M: 0410 556 770

**Robert Butterfield**
M: 0413 310 172

Unit 3, 40 Ingleston Road
Wakerley, QLD 4154
**Ph:** 07 3390 4800
**F:** 07 3390 4667
**Email sales@tanksolutions.com.au**
**www.tanksolutions.com.au**

TANK SOLUTIONS
FUEL · CHEMICALS · WATER

# AQUATOR Commercial Oil Water Separator

## Technical Data Sheet

F 998 REV A

## AQUATOR DOUBLE WALL OR SINGLE WALL DUAL CHAMBER FIBREGLASS OIL WATER SEPARATOR

Tank Solutions Pty Ltd is the market leader in the manufacture of Double Wall and Single Wall Fibreglass Storage Tanks. Our Double Wall Fibreglass Tanks offer a full 360-degree secondary containment with a variety of monitoring devices, which can be installed in the interstitial space between the two walls. Due to Tank Solutions' unique integral rib design, Double Wall Fibreglass Tanks are the strongest, most robust underground tanks available. They are rust-proof, maintenance free and formulated to be compatible with all petroleum fuel products, alcohols and alcohol-gasoline mixtures. By choosing a Tank Solutions Double Wall Fibreglass Tank, you can be assured of maximum protection in the unlikely event of a leak in the primary wall therefore preventing ground water contamination. Total Capacities range from 3,500 litres to 150,000 litres. Flow rates processing abilities from 1.5LPS up to 500LPS.

Double Wall and Single Wall Dual Chamber AQUATOR Commercial Oil Water Separators are also available in a wide variety of sizes and feature a choice of two or three completely separate compartments within one tank. This enables Hydrocarbon & Silt capture and storage in the first chamber, Hydrocarbon Filtration in the second chamber, with the option of a third Pump Out chamber within the same tank.

Fibreglass Tanks

## SINGLE WALL FIBREGLASS TANK FEATURES

Suitable for a wide range of liquids:

- Petroleum, Petrochemical and Chemical applications

Strength, Durability and Safety:

- All Tank Solutions Fibreglass Tanks are constructed of virgin resin and glass fibre reinforcement
- All Tank Solutions Tanks incorporate integral ribs for maximum strength
- All Tank Solutions Fibreglass Tanks undergo stringent testing during manufacture
- All Tank Solutions Tanks carry a one year warranty against structural failure, internal and external corrosion

A standard of consistent quality:

- Manufactured to meet or exceed industry and statutory requirements:
  - UL 1316
  - AS1692

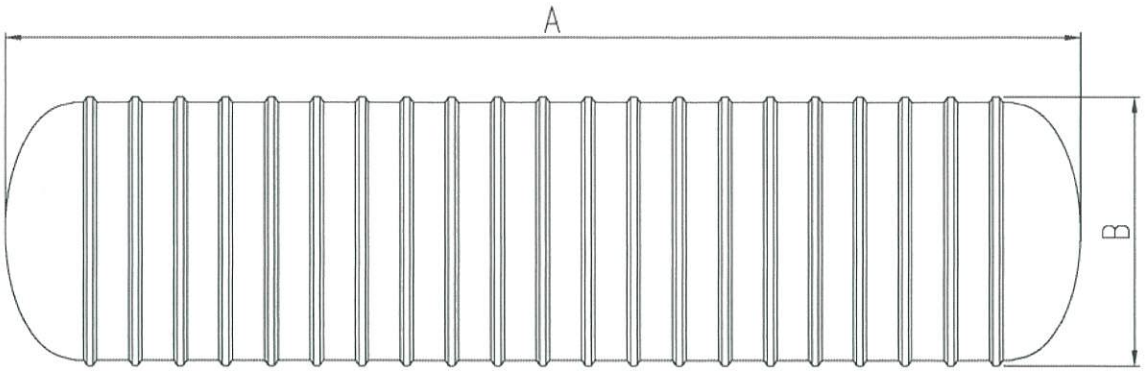
## COMPANY FEATURES

- Australian owned and operated
- Application and installation technical support
- Extensive manufacturing experience
- Full range of optional equipment and accessories to suit the complete project

TANK SOLUTIONS
FUEL · CHEMICALS · WATER

# AQUATOR Commercial Oil Water Separator

## DIMENSIONS AND CAPACITIES




| Type | Overall Total Capacity Litres | Spill Capture Capacity Litres | Silt Capture Capacity Litres | Length Overall 'A' mm | External Diameter 'B' mm | Single Wall Shipping Weight Kg | No. of Straps |
|---|---|---|---|---|---|---|---|
| SW T3.5 | 3,500 | 1,700 | 400 | 2,600 | 1,470 | 1,000 | 2 |
| SW T20 | 20,000 | 10,000 | 4,000 | 7,395 | 2,140 | 1,600 | 4 |
| SW T30 | 30,000 | 15,000 | 6,000 | 9,950 | 2,140 | 2,000 | 4 |
| SW T35 | 35,000 | 17,500 | 7,000 | 7,970 | 2,600 | 2,200 | 4 |
| SW T40 | 40,000 | 20,000 | 8,000 | 8,820 | 2,600 | 2,400 | 4 |
| SW T50 | 50,000 | 25,000 | 10,000 | 10,945 | 2,600 | 2,900 | 6 |
| SW T100 | 100,000 | 50,000 | 20,000 | 14,194 | 3,275 | 3,500 | 6 |
| SW T150 | 150,000 | 75,000 | 30,000 | 20,074 | 3,275 | 6,000 | 13 |

Weights, Capacities & Dimensions are nominal only

***Custom manufactured tanks can be supplied upon request***

**Aquator Tanks are supplied as standard with:**

- Driveway Covers, Inlet and Outlet Points, Stop Valve, Oil – Silt – Water Alarms, Coalescer Insert
- Lifting Lugs, Hold Down Straps, Concrete Anchors and Hold Down Hardware for bottom anchoring
- Manholes, Collars, Risers and Standard Covers

**Options and accessories available on request include:**

- Water Tight Riser Cover ▪ Driveway Covers
- Pump Out Third Chamber option with Guide Rails, etc.
- Manhole Fabricated Steel Cover complete with 5 Sockets

Tank Solutions Pty Ltd
ABN 59 142 807 949
e sales@tanksolutions.com.au w www.tanksolutions.com.au
**New South Wales:** 513 Tomago Road, Tomago, NSW 2322. PO Box 623, Raymond Terrace, NSW 2324. p **61 2 4964 8270** f 61 2 4964 8522
**Queensland:** Unit 3, 40 Ingleston Road, Wakerly, Qld 4154. p **61 7 3390 4800** f 61 7 3390 4667

# Approval certificate

## Trade waste pre-treatment product


**Applicant:** Tank Solutions Pty Ltd
**Postal address:** PO Box 623 Raymond Terrace, NSW, 2324

**Attention:** Trevor Clarke
**Web:** tanksolutions.com.au
**Email:** sales@tanksolutions.com.au

**Manufacturer:** Tank Solutions Pty Ltd
**Address:** PO Box 623 Raymond Terrace, NSW, 2324


## Product/device description

The Tank Solutions AQUATOR Class 1 oil water separator is a full retention separator that can contain and prevent light liquid pollutants from discharging into sewers. It has two chambers, a coalescing unit and is fitted with an automatic closure device designed to treat and contain significant oil spills.

Treatable flow rates range from 6 L/s to 60 L/s. Above and below ground installations are possible.

The approval certificate applies to the pre-treatment products of the following sizes:

| Approval Number | Model | Max Flow (L/s) | Max Silt Litres | Max Oil Litres | Total Litres | Working Litres | Inlet / Outlet Diameter (mm) | Inlet Height (mm) | Outlet Height (mm) |
|---|---|---|---|---|---|---|---|---|---|
| AN-082-01 | Aquator T3.5 | 6 | 100 | 1,700 | 4,100 | 3,200 | 150 / 150 | 1,283 | 1,183 |
| AN-082-02 | Aquator T20 | 60 | 6,000 | 9,000 | 20,800 | 21,000 | 300 / 300 | 1,869 | 1.779 |

## Special conditions of approval

1. The product shall be *supplied* with manufacturer's following installation instructions and recommended procedures for operation and maintenance:
   a. AQUATOR Commercial OWS Operating, Installation & Maintenance Manual (TD IM 009, Rev 3).
   b. Fibreglass Single & Double Wall Tanks – Installation Manual (Form F 935, Rev B).
2. The product shall be *installed* strictly in accordance with the manufacturer's written instructions and the *Plumbing Standards*, with particular emphasis on the following:
   a. Waste must not be pumped directly into the tank. Waste needs to be gravity fed.
   b. A Trade Waste Sampling Point (TWSP) must be installed according to the Corporation's typical drawings.
   c. Expansion joints must be used. Loop joints are not permitted.
3. A maintenance contract is to be in place to ensure the ongoing reliability of the product.
4. Water Corporation must be notified within fourteen (14) days upon installation of the product
5. The use of emulsifying agents upstream of the product must not occur. Such instructions must be noted on operating documentation.
6. The product chosen must be suitably sized to avoid surge conditions.
7. Clear access for the purposes of maintenance or servicing of the pre-treatment device must be maintained at all times.
8. This approval certificate is not an endorsement of the product by Water Corporation, and no claim shall be made in advertising, promotion or other manner to the effect.
9. Water Corporation accepts no responsibility for the effective operation, performance or efficiency of the product. This approval is not an engineering approval or structural endorsement.
10. The proponent of the approved product must formally seek a request for re-approval of the product no later than three (3) months before the assigned **Validity Period** has expired from the **Date Issued** of this approval certificate.
11. Water Corporation reserves the right to vary any requirements at any time. Any application of this condition normally occurs after consultation with the manufacturer, supplier and end business user connected to Water Corporation's sewer.
12. Water Corporation shall be notified in writing if the pre-treatment device is withdrawn from sale.
13. The proponent of the approved product accepts that the information provided in this document shall be made publically available.

# Approval certificate

## Trade waste pre-treatment product

### General conditions of approval

Approval shall be **suspended** where any of the following conditions are not met:

1. If there is a breach of the Special Conditions.
2. The assigned **Validity Period** has expired from the **Date Issued** of this approval certificate.
3. The product shall be manufactured in accordance with Water Corporation's requirements at the time of approval.
4. The product shall be manufactured to comply according to the details noted in the drawings below, in addition to any further details provided by the proponent when seeking this approval.
5. The product supplied for use in Water Corporation's area of operations shall comply with the requirements shown on this approval certificate. Sizes, classes, lengths or other product variables which are available with the product but which are not approved as listed on this approval certificate shall not be offered by the supplier for use in Water Corporation's area of operations.
6. All discharges to sewer associated with this product must not exceed Water Corporation's *Trade Waste Acceptance Criteria*.
7. Prior to any business (which is connected to Water Corporation's sewer) installing this product the business must apply to Water Corporation for a *Trade Waste Permit* for approval to discharge.
8. If this certificate has been issued to the manufacturer of this product then it is the responsibility of the manufacturer to ensure all current and future suppliers / vendors of this product are provided a copy of this approval certificate.

Approval shall be **reviewed** where any of the following conditions occur:

1. The product is manufactured with either different materials, methods of manufacture, location of manufacture, source of raw materials, component subcontractors or models to that at the time of approval.
2. The ownership of the primary manufacturer or any subcontractors is varied from that at time of approval.
3. The standards and/or specifications to which the product was required to comply with at the time of approval have been amended or revised.
4. The product has been found to sustain damage or provide unsatisfactory performance on occasions of number considered excessive by Water Corporation, when handled, stored, assembled or installed in accordance with the supplier's or manufacturer's written instructions.

| | |
|---|---|
| **Approved drawing(s):** | T3.5 6LPS (drawing number SEP-0025, Rev C, dated 31 July 2017)<br>T3.5 6LPS (drawing number SEP-0027, Rev A, dated 16 November 2017)<br>T20 60LPS (drawing number SEP-0016, Rev E, dated 18 October 2016)<br>T20 60LPS (drawing number SEP-0017, Rev A, dated 10 October 2017) |
| **Authorising person:** | Stephen Jerkovic (Teal Leader – Investigations) |
| **Date issued** | 06 December 2017 |
| **Validity period:** | Two (2) years |

# *Appendix D*

Rational Method Calculations

PROCON DEVELOPMENTS

# STORMWATER DRAINAGE COMPUTATIONS

**PROJECT:** Proposed Mixed Use Development
3 Larsen Road
Byford, WA 6122

**JOB NO.** J0217

**CLIENT:** Procon Developments

**DESIGN ENGINEER:** Darren Griffiths
BE(Hons), MIE (Aust), CP Eng,
NER (Civil/Structural), RPEQ, RBP

**DATE:** 08 May 2018

Note:
These computations have been prepared to indicate design intent. Where appropriate and necessary, shop drawings describing the detailed construction proposals shall be prepared and submitted to the Design Engineer for approval.

*Procon Developments (Australia) Pty Ltd as Trustee for*
***Procon Developments Unit Trust***
*ABN: 94 364 564 982*
*P.O. Box 522 Kilsyth, Victoria 3137*
*820 Mountain Hwy Bayswater VIC 3153*
***Telephone (03) 9720 0817 Facsimile (03) 9720 0827***

[PRICON DEVELOPMENTS]

| JOB No. J0217 | PAGE No. 1 |
|---|---|
| PROJECT BYFORD SWD | |
| BY DC | DATE 7/5/18 |

PSD : 5 YR ARI

$t_c$ = 6 MINS, $^5I_6$ = 101 MM/HR

$A_{TOT.}$ = 11,630 $m^2$

C = 0.45 (RESIDENTIAL)

$Q_{OUT} \Rightarrow 0.45 \times \frac{101}{3600} \times 11,630$

= 146.8 L/S

---

ADOPT ϕ225 ORIFICE

$C_d$ = 0.6

$\Delta H$ = 1.0m (T.B.C.)

$A_o$ = 0.0397 $m^2$

$Q_{CAP} \Rightarrow 0.6 \times 0.0397 \times (2 \times 9.81 \times 1.0)^{\frac{1}{2}}$

= 105.5 L/S.

< 146.8 o.k!

CHECK ORIFICE NOT DROWNED.

$Q_{CAP} \Rightarrow 105.5 \times \frac{1.0}{0.6}$ = 175.8 L/S.

TOO HIGH

ADOPT ϕ200 ORIFICE IN PIT W/ BAFFLE.

$Q_{OUT}$ = 139 L/S.

[PRICON] DEVELOPMENTS

| JOB No. 30217 | PAGE No. 2 |
|---|---|
| PROJECT BYFORD SWD | |
| BY DC | DATE 7/5/18 |

ADOPT 60,000 L TANK STORAGE x 2

= 120,000 L x 0.67 = 85,000 L

W/ 35,000 L FOR TOILETS & TREE WATERING

AROOFS = 2,523 $m^2$

ADOPT 10 YR, 3 HR MAX. STORM

$$Q_{IN} \Rightarrow 1.0 \times \frac{15.1}{3600} \times 2{,}523$$

= 10.6 L/S.

$$V_{IN} \Rightarrow \frac{10.6 \times 180 \times 60}{1000}$$

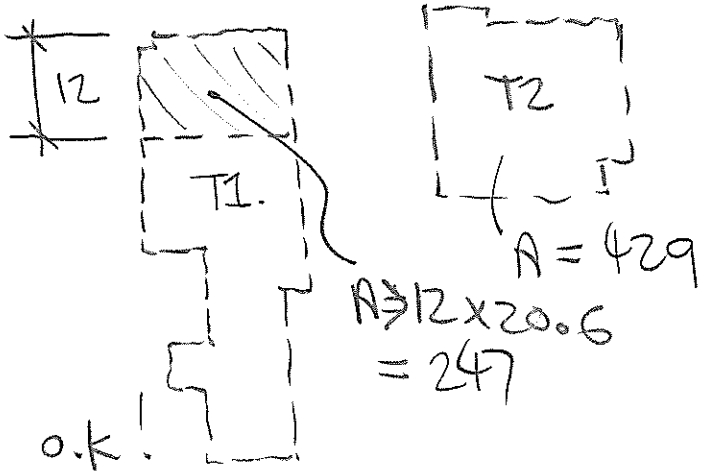
= 114 $m^3$ > 80 $m^3$ N.G.

REDUCE ROOF AREA BY REMOVING T2 & PART OF T1.

AREDUCED = 1,847 $m^2$

$Q_{IN}$ = 7.8 L/S

$V_{IN}$ = 83.7 $m^3$ < 85 $m^3$ o.k!



[PROCON] DEVELOPMENTS

| JOB No. | J0217 | PAGE No. | 3 |
|---|---|---|---|
| PROJECT | BYFORD | | |
| | SWD | | |
| BY DG | DATE 7/5/18 | | |

DRAINAGE CONCEPT : $A_{TOTAL} = 11,630\ m^2$

APPROX. LANDSCAPE : $38 \times 25 + 69 \times 20 + 4 \times 75 = 2,630.$

APPROX. ROOFS – SHOP $38.4 \times 19 = 730\ m^2$

T1 $20.7 \times 25 + 14 \times 29 = 924$

T2 $26.4 \times 18.6 = 492$

CAR-WASH $11 \times 7 = 77$

TRUCK CANOPY $13.6^2 \times \pi/4 = 146$

CAR CANOPY $4 \times 7^2 \times \pi/4 = 154$

TOTAL : $2,523\ m^2$

FROM IFD CHART : $^{100}I_5 = 216$ mm/hr

$^{5}I_6 = 101$ mm/hr.

$^{10}I_5 = 126$ mm/hr

| | |
|---|---|
| 10 | = 91.5 |
| 20 | = 61.5 |
| 30 | = 47.8 |
| 60 | = 30.6 |
| 120 | = 19.6 |
| 180 | = 15.1 |

∴ ROOF RUN-OFF TO ABOVE GROUND RAINWATER TANKS, PAVEMENT TO U/GROUND PIPEWORK.

[PROCON DEVELOPMENTS]

| JOB No. J0217 | PAGE No. 4 |
|---|---|
| PROJECT BYFORD SWD | |
| BY DC | DATE 7/5/18 |

CHECK 1 in 10 YR ARI U/GROUND STORAGE:

$A_{ROOFS} \Rightarrow 2,523 - 1847$ $(C=1.0) = 676\ m^2$

$A_{LANDSCAPE}$ $(C=0.35) = 2,630\ m^2$

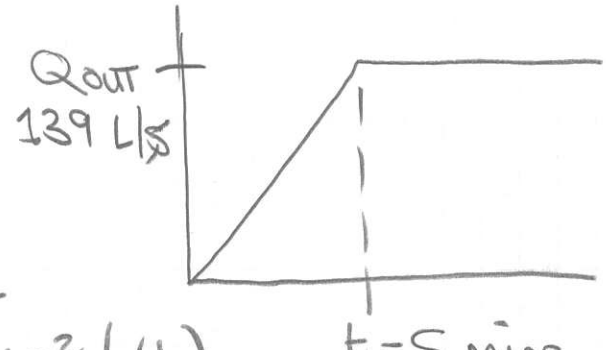
$A_{PAVEMENT} \Rightarrow 11,630 - 2,523 - 2,630$

$(C=0.9) = 6,477\ m^2$

| t | 10 It | $Q_{IN}$ | $V_{IN}$ | $V_{OUT}$ t=5 | $V_{OUT}$ t=t$-5 | V$ |
|---|---|---|---|---|---|---|
| 5 | 126 | 260 | 78 | 20.8 | – | 57.2 |
| 6 | 117 | 211 | 76 | 20.8 | 8.3 | 46.9 |
| 10 | 91.5 | 189 | 113 | 20.8 | 41.7 | 50.5 |
| 20 | 61.5 | 127 | 152 | 20.8 | 125.1 | 6.1 |
| 30 | 47.8 | 99 | 178 | 20.8 | 208.5 | – |
| 60 | 30.6 | 64 | 230 | 20.8 | | – |
| 120 | 19.6 | 41 | 295 | 20.8 | | – |
| 180 | 15.1 | 32 | 345 | 20.8 | | – |

$\Sigma CA \Rightarrow 676 \times 1.0 + 2,630 \times 0.35 + 6,477 \times 0.9$

$= 7,426\ m^2$.




ADOPT $\phi$450 U/GROUND STORAGE PIPE

$L_{PIPE\ REQD} \Rightarrow \frac{57.2}{(\pi \times 0.45^2/4)}$

$= 360\ m$

[PRICOIN] DEVELOPMENTS

| | |
|---|---|
| JOB No. J0217 | PAGE No. 5 |
| PROJECT BYFORD SWD | |
| BY DG | DATE 7/5/18 |

ALT. U/GROUND STORAGE PIPE CONFIG. :

ADOPT ~~50~~ 100 m $\phi$ 600 (0.283) $V_s$ = ~~16.96~~ 28.3 $m^3$

$\therefore$ $\phi$450 (0.159) $\Rightarrow$ ~~40.3~~ 28.9 / 0.159 = ~~253~~ 182 m REQD.

ie ~~313~~ 282 m TOTAL PIPE LENGTH.

[PRICON] DEVELOPMENTS

| JOB No. | J0217 | PAGE No. | 6 |
|---|---|---|---|
| PROJECT | BYFORD SWD | | |
| BY | DG | DATE | 7/5/18 |

CHECK PIPEWORK TO TANKS:

ADOPT $\phi$ 225 mm, 1 in 200 Fall.

$Q_{CAP}$ = 48.2 L/s, $v$ = 1.2 m/s

$Q_{IN}$ ⇒ A ⇒ 730 + 146 + 154 = 1,030 $m^2$

$^{100}I_5$ = 216 mm/hr

C = 1.0

$Q_{IN}$ = 61.8 L/s

> 48.2 N.G.

SHOP ONLY ⇒ $Q_{IN}$ = 43.8 L/s

ADOPT $\phi$300 uPVC, 1 in 200

$\phi$ CAP. = 102 L/s. > 61.8 o.k!

Australian Government
Bureau of Meteorology

LOCATION 32.225 S 116.000 E * NEAR.. Byford WA

LIST OF COEFFICIENTS TO EQUATIONS OF THE FORM

$$ln(I) = A + B \times (ln(T)) + C \times (ln(T))^2 + D \times (ln(T))^3 + E \times (ln(T))^4 + F \times (ln(T))^5 + G \times (ln(T))^6$$

T = TIME IN HOURS AND I = INTENSITY IN MILLIMETRES PER HOUR

| RETURN PERIOD | A | B | C | D | E | F | G |
|---|---|---|---|---|---|---|---|
| 1 | 2.856591 | -0.61453E+0 | -0.12856E-1 | 0.74336E-2 | -0.11231E-2 | -0.83986E-4 | 0.57480E-5 |
| 2 | 3.104695 | -0.62113E+0 | -0.10450E-1 | 0.70348E-2 | -0.11972E-2 | 0.71488E-5 | -0.83005E-5 |
| 5 | 3.306305 | -0.63654E+0 | -0.53755E-2 | 0.61334E-2 | -0.13563E-2 | 0.18440E-3 | -0.33261E-4 |
| 10 | 3.421955 | -0.64641E+0 | -0.23705E-2 | 0.60194E-2 | -0.15119E-2 | 0.23754E-3 | -0.36675E-4 |
| 20 | 3.568968 | -0.65412E+0 | 0.47850E-3 | 0.51498E-2 | -0.15560E-2 | 0.38310E-3 | -0.59208E-4 |
| 50 | 3.747839 | -0.66466E+0 | 0.37339E-2 | 0.48445E-2 | -0.17055E-2 | 0.46658E-3 | -0.68375E-4 |
| 100 | 3.874993 | -0.67110E+0 | 0.55678E-2 | 0.40525E-2 | -0.16489E-2 | 0.58695E-3 | -0.89900E-4 |

RAINFALL INTENSITY IN mm/h FOR VARIOUS DURATIONS AND RETURN PERIODS

RETURN PERIOD (YEARS)

| DURATION | 1 | 2 | 5 | 10 | 20 | 50 | 100 |
|---|---|---|---|---|---|---|---|
| 5 mins | 63.9 | 83.7 | 108. | 126. | 150. | 185. | 216. |
| 6 mins | 59.6 | 78.1 | 101. | 117. | 139. | 173. | 201. |
| 10 mins | 47.6 | 62.2 | 79.5 | 91.5 | 109. | 134. | 155. |
| 20 mins | 33.3 | 43.1 | 54.0 | 61.5 | 72.1 | 87.6 | 100. |
| 30 mins | 26.4 | 34.0 | 42.2 | 47.8 | 55.7 | 67.2 | 76.8 |
| 1 hour | 17.4 | 22.3 | 27.3 | 30.6 | 35.5 | 42.4 | 48.2 |
| 2 hours | 11.3 | 14.5 | 17.5 | 19.6 | 22.6 | 26.8 | 30.4 |
| 3 hours | 8.79 | 11.2 | 13.6 | 15.1 | 17.4 | 20.6 | 23.3 |
| 6 hours | 5.72 | 7.29 | 8.78 | 9.76 | 11.2 | 13.3 | 14.9 |
| 12 hours | 3.72 | 4.75 | 5.72 | 6.36 | 7.30 | 8.64 | 9.73 |
| 24 hours | 2.40 | 3.07 | 3.72 | 4.14 | 4.78 | 5.67 | 6.41 |
| 48 hours | 1.51 | 1.94 | 2.37 | 2.66 | 3.09 | 3.69 | 4.19 |
| 72 hours | 1.12 | 1.44 | 1.77 | 2.00 | 2.34 | 2.80 | 3.20 |

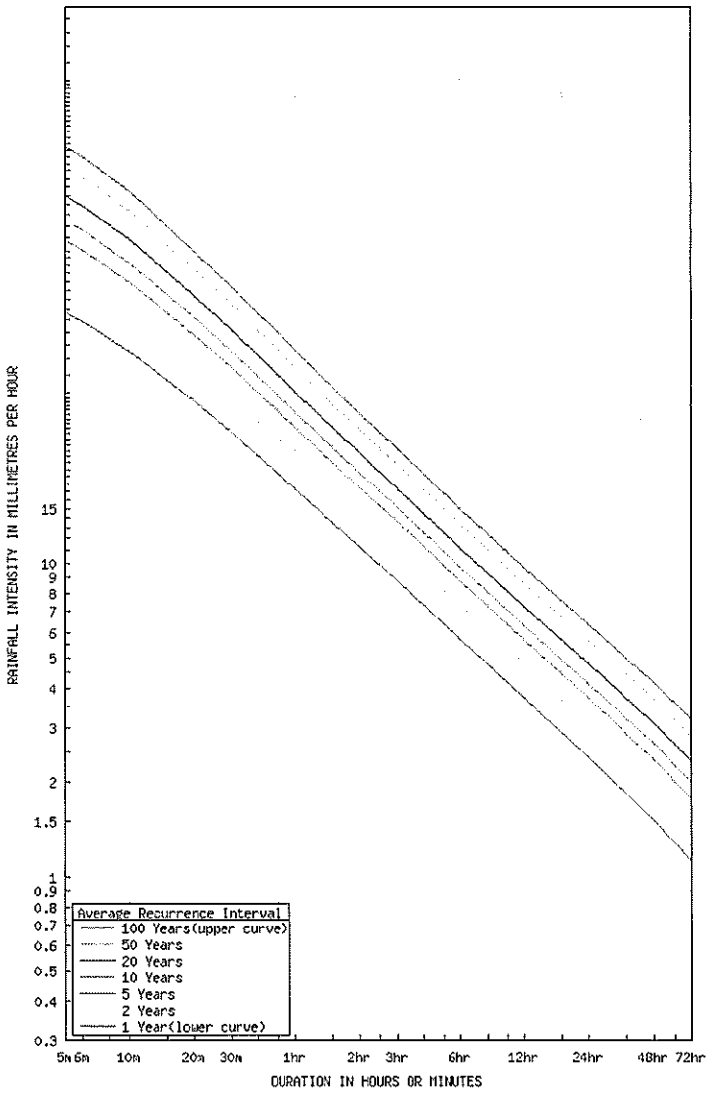
(Raw data. 22.85, 4.89, 1.49, 37.47, 7.76, 2.51,skew= 0.680)

**HYDROMETEOROLOGICAL ADVISORY SERVICE**



* ENSURE THE COORDINATES ARE THOSE REQUIRED SINCE DATA IS BASED ON THESE AND NOT LOCATION NAME

BYFORD




Help

[View Documentation: Opens new window]

Try another

This page was created at **on**

BYFORD

VINIDEX STORMPRO CHARTS

| Gradient | Velocity/ Discharge | DN 150 Di = 0.148 m | | | |
|---|---|---|---|---|---|
| H/L | k (mm) | 0.003 | 0.006 | 0.015 | 0.03 |
| 1/10 | m/s | 4.8 | 4.7 | 4.6 | 4.4 |
| | L/s | 82.2 | 81 | 78.4 | 75.3 |
| 1/20 | m/s | 3.3 | 3.2 | 3.2 | 3 |
| | L/s | 56.4 | 55.8 | 54.3 | 52.5 |
| 1/30 | m/s | 2.6 | 2.6 | 2.5 | 2.5 |
| | L/s | 45.2 | 44.8 | 43.7 | 42.4 |
| 1/40 | m/s | 2.2 | 2.2 | 2.2 | 2.1 |
| | L/s | 38.6 | 38.3 | 37.5 | 36.4 |
| 1/50 | m/s | 2 | 2 | 1.9 | 1.9 |
| | L/s | 34.2 | 33.9 | 33.2 | 32.4 |
| 1/60 | m/s | 1.8 | 1.8 | 1.8 | 1.7 |
| | L/s | 30.9 | 30.7 | 30.1 | 29.4 |
| 1/70 | m/s | 1.7 | 1.6 | 1.6 | 1.6 |
| | L/s | 28.4 | 28.2 | 27.7 | 27 |
| 1/80 | m/s | 1.5 | 1.5 | 1.5 | 1.5 |
| | L/s | 26.4 | 26.2 | 25.8 | 25.2 |
| 1/90 | m/s | 1.4 | 1.4 | 1.4 | 1.4 |
| | L/s | 24.7 | 24.6 | 24.2 | 23.6 |
| 1/100 | m/s | 1.4 | 1.3 | 1.3 | 1.3 |
| | L/s | 23.3 | 23.2 | 22.8 | 22.3 |
| 1/120 | m/s | 1.2 | 1.2 | 1.2 | 1.2 |
| | L/s | 21.1 | 21 | 20.7 | 20.3 |
| 1/140 | m/s | 1.1 | 1.1 | 1.1 | 1.1 |
| | L/s | 19.4 | 19.3 | 19 | 18.6 |
| 1/160 | m/s | 1 | 1 | 1 | 1 |
| | L/s | 18 | 17.9 | 17.7 | 17.3 |
| 1/180 | m/s | 1 | 1 | 1 | 0.9 |
| | L/s | 16.9 | 16.8 | 16.6 | 16.3 |
| 1/200 | m/s | 0.9 | 0.9 | 0.9 | 0.9 |
| | L/s | 15.9 | 15.8 | 15.6 | 15.4 |
| 1/250 | m/s | 0.8 | 0.8 | 0.8 | 0.8 |
| | L/s | 14 | 14 | 13.8 | 13.6 |
| 1/300 | m/s | 0.7 | 0.7 | 0.7 | 0.7 |
| | L/s | 12.7 | 12.6 | 12.5 | 12.3 |
| 1/400 | m/s | 0.6 | 0.6 | 0.6 | 0.6 |
| | L/s | 10.8 | 10.8 | 10.7 | 10.5 |
| 1/500 | m/s | 0.6 | 0.6 | 0.5 | 0.5 |
| | L/s | 9.5 | 9.5 | 9.4 | 9.3 |

1IN. IPE RADE.

| Gradient | Velocity/ Discharge | DN 225 Di = 0.226 m | | | |
|---|---|---|---|---|---|
| H/L | k (mm) | 0.003 | 0.006 | 0.015 | 0.03 |
| 1/10 | m/s | 6.2 | 6.2 | 5.9 | 5.7 |
| | L/s | 250.7 | 246.9 | 238.3 | 228.6 |
| 1/20 | m/s | 4.3 | 4.2 | 4.1 | 4 |
| | L/s | 172.4 | 170.4 | 165.5 | 159.6 |
| 1/30 | m/s | 3.5 | 3.4 | 3.3 | 3.2 |
| | L/s | 138.4 | 137 | 133.5 | 129.2 |

BYFORD

J0217 10

| Gradient | Velocity/ Discharge | DN 225 Di = 0.226 m | | | |
|---|---|---|---|---|---|
| 1/40 | m/s | 3 | 2.9 | 2.9 | 2.8 |
| | L/s | 118.4 | 117.3 | 114.6 | 111.1 |
| 1/50 | m/s | 2.6 | 2.6 | 2.5 | 2.5 |
| | L/s | 104.8 | 104 | 101.7 | 98.8 |
| 1/60 | m/s | 2.4 | 2.3 | 2.3 | 2.2 |
| | L/s | 94.9 | 94.2 | 92.3 | 89.7 |
| 1/70 | m/s | 2.2 | 2.2 | 2.1 | 2.1 |
| | L/s | 87.2 | 86.6 | 84.9 | 82.7 |
| 1/80 | m/s | 2 | 2 | 2 | 1.9 |
| | L/s | 81.1 | 80.5 | 79.1 | 77.1 |
| 1/90 | m/s | 1.9 | 1.9 | 1.8 | 1.8 |
| | L/s | 76 | 75.5 | 74.2 | 72.4 |
| 1/100 | m/s | 1.8 | 1.8 | 1.7 | 1.7 |
| | L/s | 71.8 | 71.3 | 70.1 | 68.4 |
| 1/120 | m/s | 1.6 | 1.6 | 1.6 | 1.5 |
| | L/s | 64.9 | 64.6 | 63.5 | 62.1 |
| 1/140 | m/s | 1.5 | 1.5 | 1.5 | 1.4 |
| | L/s | 59.7 | 59.3 | 58.5 | 57.2 |
| 1/160 | m/s | 1.4 | 1.4 | 1.4 | 1.3 |
| | L/s | 55.5 | 55.2 | 54.4 | 53.3 |
| 1/180 | m/s | 1.3 | 1.3 | 1.3 | 1.2 |
| | L/s | 52 | 51.7 | 51 | 50 |
| 1/200 | m/s | 1.2 | 1.2 | 1.2 | 1.2 |
| | L/s | 49.1 | 48.8 | 48.2 | 47.3 |
| 1/250 | m/s | 1.1 | 1.1 | 1.1 | 1 |
| | L/s | 43.4 | 43.2 | 42.7 | 41.9 |
| 1/300 | m/s | 1 | 1 | 1 | 0.9 |
| | L/s | 39.2 | 39.1 | 38.6 | 38 |
| 1/400 | m/s | 0.8 | 0.8 | 0.8 | 0.8 |
| | L/s | 33.5 | 33.3 | 33 | 32.5 |
| 1/500 | m/s | 0.7 | 0.7 | 0.7 | 0.7 |
| | L/s | 29.6 | 29.5 | 29.2 | 28.8 |

MIN GRADE!

| Gradient | Velocity/ Discharge | DN 300 Di = 0.3 m | | | |
|---|---|---|---|---|---|
| H/L | k (mm) | 0.003 | 0.006 | 0.015 | 0.03 |
| 1/10 | m/s | 7.5 | 7.3 | 7.1 | 6.8 |
| | L/s | 527.7 | 519.1 | 500.1 | 479.4 |
| 1/20 | m/s | 5.1 | 5.1 | 4.9 | 4.7 |
| | L/s | 363.6 | 359 | 348 | 335.2 |
| 1/30 | m/s | 4.1 | 4.1 | 4 | 3.8 |
| | L/s | 292.1 | 288.9 | 281.1 | 271.6 |
| 1/40 | m/s | 3.5 | 3.5 | 3.4 | 3.3 |
| | L/s | 250 | 247.5 | 241.4 | 233.8 |
| 1/50 | m/s | 3.1 | 3.1 | 3 | 2.9 |
| | L/s | 221.5 | 219.5 | 214.4 | 208 |
| 1/60 | m/s | 2.8 | 2.8 | 2.8 | 2.7 |
| | L/s | 200.6 | 198.9 | 194.6 | 189 |
| 1/70 | m/s | 2.6 | 2.6 | 2.5 | 2.5 |
| | L/s | 184.5 | 183 | 179.2 | 174.3 |
| 1/80 | m/s | 2.4 | 2.4 | 2.4 | 2.3 |

| Gradient | Velocity/ Discharge | DN 300 Di = 0.3 m | | | |
|---|---|---|---|---|---|
| | L/s | 171.5 | 170.2 | 166.9 | 162.5 |
| 1/90 | m/s | 2.3 | 2.3 | 2.2 | 2.2 |
| | L/s | 160.9 | 159.7 | 156.7 | 152.7 |
| 1/100 | m/s | 2.1 | 2.1 | 2.1 | 2 |
| | L/s | 151.9 | 150.8 | 148.1 | 144.4 |
| 1/120 | m/s | 1.9 | 1.9 | 1.9 | 1.9 |
| | L/s | 137.5 | 136.6 | 134.3 | 131.1 |
| 1/140 | m/s | 1.8 | 1.8 | 1.7 | 1.7 |
| | L/s | 126.4 | 125.6 | 123.6 | 120.8 |
| 1/160 | m/s | 1.7 | 1.7 | 1.6 | 1.6 |
| | L/s | 117.5 | 116.8 | 115 | 112.5 |
| 1/180 | m/s | 1.6 | 1.6 | 1.5 | 1.5 |
| | L/s | 110.2 | 109.6 | 107.9 | 105.7 |
| 1/200 | m/s | 1.5 | 1.5 | 1.4 | 1.4 |
| | L/s | 104 | 103.4 | 102 | 99.9 |
| 1/250 | m/s | 1.3 | 1.3 | 1.3 | 1.3 |
| | L/s | 92 | 91.6 | 90.4 | 88.7 |
| 1/300 | m/s | 1.2 | 1.2 | 1.2 | 1.1 |
| | L/s | 83.2 | 82.9 | 81.9 | 80.4 |
| 1/400 | m/s | 1 | 1 | 1 | 1 |
| | L/s | 71.1 | 70.8 | 70 | 68.9 |
| 1/500 | m/s | 0.9 | 0.9 | 0.9 | 0.9 |
| | L/s | 62.8 | 62.6 | 62 | 61.1 |

MIN. GRADE

| Gradient | Velocity/ Discharge | DN 375 Di = 0.374 m | | | |
|---|---|---|---|---|---|
| H/L | k (mm) | 0.003 | 0.006 | 0.015 | 0.03 |
| 1/10 | m/s | 8.6 | 8.4 | 8.1 | 7.8 |
| | L/s | 940.8 | 924.8 | 889.8 | 852.4 |
| 1/20 | m/s | 5.9 | 5.8 | 5.6 | 5.4 |
| | L/s | 649 | 640.3 | 619.9 | 596.7 |
| 1/30 | m/s | 4.7 | 4.7 | 4.6 | 4.4 |
| | L/s | 521.8 | 515.7 | 501.1 | 483.8 |
| 1/40 | m/s | 4.1 | 4 | 3.9 | 3.8 |
| | L/s | 446.8 | 442.1 | 430.6 | 416.6 |
| 1/50 | m/s | 3.6 | 3.6 | 3.5 | 3.4 |
| | L/s | 396 | 392.2 | 382.7 | 370.8 |
| 1/60 | m/s | 3.3 | 3.2 | 3.2 | 3.1 |
| | L/s | 358.8 | 355.6 | 347.4 | 337.1 |
| 1/70 | m/s | 3 | 3 | 2.9 | 2.8 |
| | L/s | 330 | 327.2 | 320.1 | 311 |
| 1/80 | m/s | 2.8 | 2.8 | 2.7 | 2.6 |
| | L/s | 307 | 304.5 | 298.1 | 289.9 |
| 1/90 | m/s | 2.6 | 2.6 | 2.5 | 2.5 |
| | L/s | 287.9 | 285.7 | 280 | 272.5 |
| 1/100 | m/s | 2.5 | 2.5 | 2.4 | 2.3 |
| | L/s | 271.9 | 269.9 | 264.7 | 257.8 |
| 1/120 | m/s | 2.2 | 2.2 | 2.2 | 2.1 |
| | L/s | 246.2 | 244.6 | 240.1 | 234.2 |
| 1/140 | m/s | 2.1 | 2 | 2 | 2 |
| | L/s | 226.4 | 225 | 221.1 | 215.9 |

[PROCON DEVELOPMENTS]

| JOB No. | J0217 | PAGE No. | 12 |
|---|---|---|---|
| PROJECT | BYFORD, WA | | |
| | SWD | | |
| BY | DC | DATE | 9/5/19 |

CALCULATE U/GROUND STORAGE:

$57.2\ m^3$ REQD

$V_{PIPE} \Rightarrow 2.54 + 0.52 = 3.1\ m^3$

$V_{TOTAL}$ (ϕ600 PIPES + PITS) $= 39.8\ m^3$

$A = 0.275$

S2.20

S60.

ϕ600.

TOP OF BAFFLE IN 002

$A = 0.227\ m^2$

450

S1.75

CP14

1 in 1000

$\Delta = 110.$

$L = 102\ m$

$C_{AVE.}$

002 → CP14

CP3 → CP6.

$V_{STORAGE\,①} \Rightarrow 0.251 \times 102 = 25.6\ m^3$

$V_{STORAGE\,②} \Rightarrow 0.251 \times 44.4 = 11.1\ m^3$

S1.64

002

[PROCON DEVELOPMENTS]

| JOB No. | J0217 | PAGE No. | 13 |
|---|---|---|---|
| PROJECT | BYFORD, WA | | |
| | SWD | | |
| BY | DC. | DATE | 9/5/18 |

REMAINDER OF STORAGE VIA Φ450 PIPES

AVAIL = 197 m.

$V_R \Rightarrow 0.159 \times 0.75 \times 197$ (NOT ALL IN 4)

$= 23.5\ m^3$

$\Rightarrow 9.6$ REQ'D.

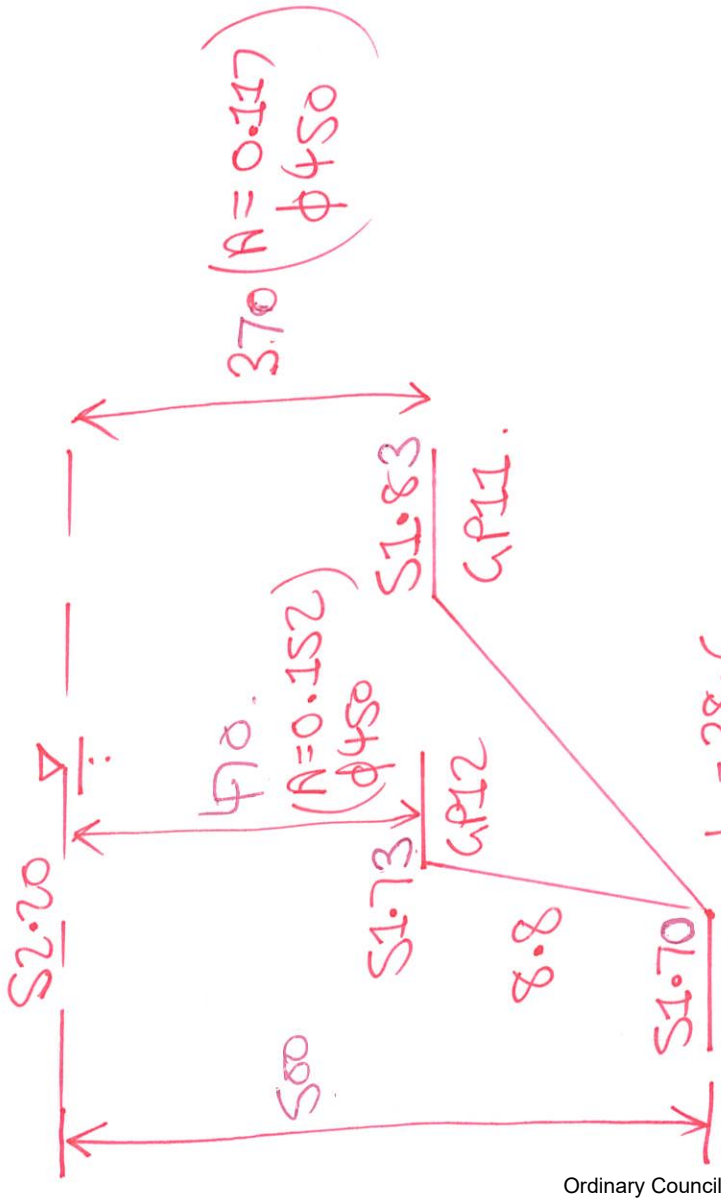
ADOPT. $5.3m$ @ Φ450 $= 6.4\ m^3$

$143.2m$ @ Φ300 $= 7.5\ m^3$

$V_R$ TOT. $= 13.9\ m^3$

$\Sigma$ 13

U/GROUND STORAGE CALC (CONT.):




$V_R \Rightarrow 0.159 \times 8.8 \times 0.157 \times 38.6 + 0.159 \times 0.6 \times 0.6 \times 0.375 \times 3$

$= 7.4\ m^3$

$V_R \Rightarrow 0.6 \times 0.6 \times 0.375 \times 3 = 0.40\ m^3$

# *Appendix E*

Stormwater Drainage Plan

RAILWAY RESERVE.

ORIFICE PIT.
$Q_{OUT}$ = 139 L/S
(< PSD = 146 L/S)

LPOD - EXISTING PIT IN GEORGE ST

GENERALLY, UNDERGROUND PIPES ARE OVERSIZED TO PROVIDE FLOOD STORAGE.
$V_{STORAGE}$ = 57.2 m³.

2 No. WATER TANKS
$V_{STORAGE}$ = 116.0 m³

← DENOTES DIRECTION OF FLOW.

20,000 L HYDRO CARBON SEPARATOR

WARNING
BEWARE OF UNDERGROUND SERVICES
THE LOCATIONS OF UNDERGROUND SERVICES ARE APPROXIMATE ONLY AND THEIR EXACT SIZE, DEPTH AND LOCATION MUST BE PROVEN ON SITE. NO GUARANTEE IS GIVEN THAT ALL EXISTING SERVICES ARE SHOWN.

EXISTING Ø375 REINFORCED CONCRETE PIPE. DISCHARGE TO RAILWAY RESERVE.
Ø300 uPVC OUTLET PIPE CONNECT TO EXISTING PIT
EXISTING 750 x 600 R.C. PIT.
TOP OF EXIST PIT 52.40
EXP1
TITLE BOUNDARY
EX 52.64
EX 52.35
Ø150 uPVC
Ø150 uPVC, TYP
GP2
DP
2000 x 1200 ORIFICE PIT WITH Ø200mm ORIFICE IN CENTRAL BAFFLE WALL
T1
FFL 52.75
T2
FFL 52.70
Ø600 STORMPRO
GP3
GP4
GP5
GP6
GP7
GP8
JP9
Ø150 HDPE, TYP.
Ø150 HDPE
Ø150 uPVC TYP.
Ø300 uPVC
SERVICE CENTRE
FFL 54.10
Ø225 HDPE
EX 53.85
Ø100 uPVC RAINWATER TANK OVERFLOW TO PAVEMENT, TYP.
EX 54.04
WATER TANK
WATER TANK
Ø150 uPVC
Ø300 HDPE
2 No. 58,000L RHINO CORRUGATED STEEL ABOVE GROUND RAINWATER TANKS (Ø5.83m x 2.2m HIGH). NOTE: TANKS TO BE FITTED WITH AUTOMATIC LEVEL CONTROL TO ENSURE AVAILABLE STORAGE VOLUME FOR STORM EVENT RETENTION IS AT LEAST 84,000L AT ALL TIMES (IE. WITHIN 24 HOURS OF MAJOR STORM EVENTS)
GP10
GP11
GP12
GP13
Ø450 STORMPRO
Ø525 STORMPRO
50mm HIGH CONCRETE BUND
Ø150 uPVC
Ø300 INLET/ OUTLET
EX 53.58
TITLE BOUNDARY
GP17
GP18
GP19
GP20
JP16
GP15
GP14
GP21
GP22
GP23
JP31
JP32
JP33
JP34
20,000L PURACEPTOR
Ø100 UPP
Ø150 HDPE
SHOP
FFL 54.60
Ø150 HDPE, TYP.
EX 53.60
EX 54.32
LARSEN ROAD

C02

KEY PLAN - 1/2000

[PROCON DEVELOPMENTS]

820 Mountain Hwy
Bayswater, Victoria 3153
Phone: 03 9720 0817
Fax: 03 9720 0827
Web: www.procon.net.au

| Rev. | Reason | Date | Appr. |
|---|---|---|---|
| P1 | PRELIMINARY | 10.05.18 | DG |



Client.

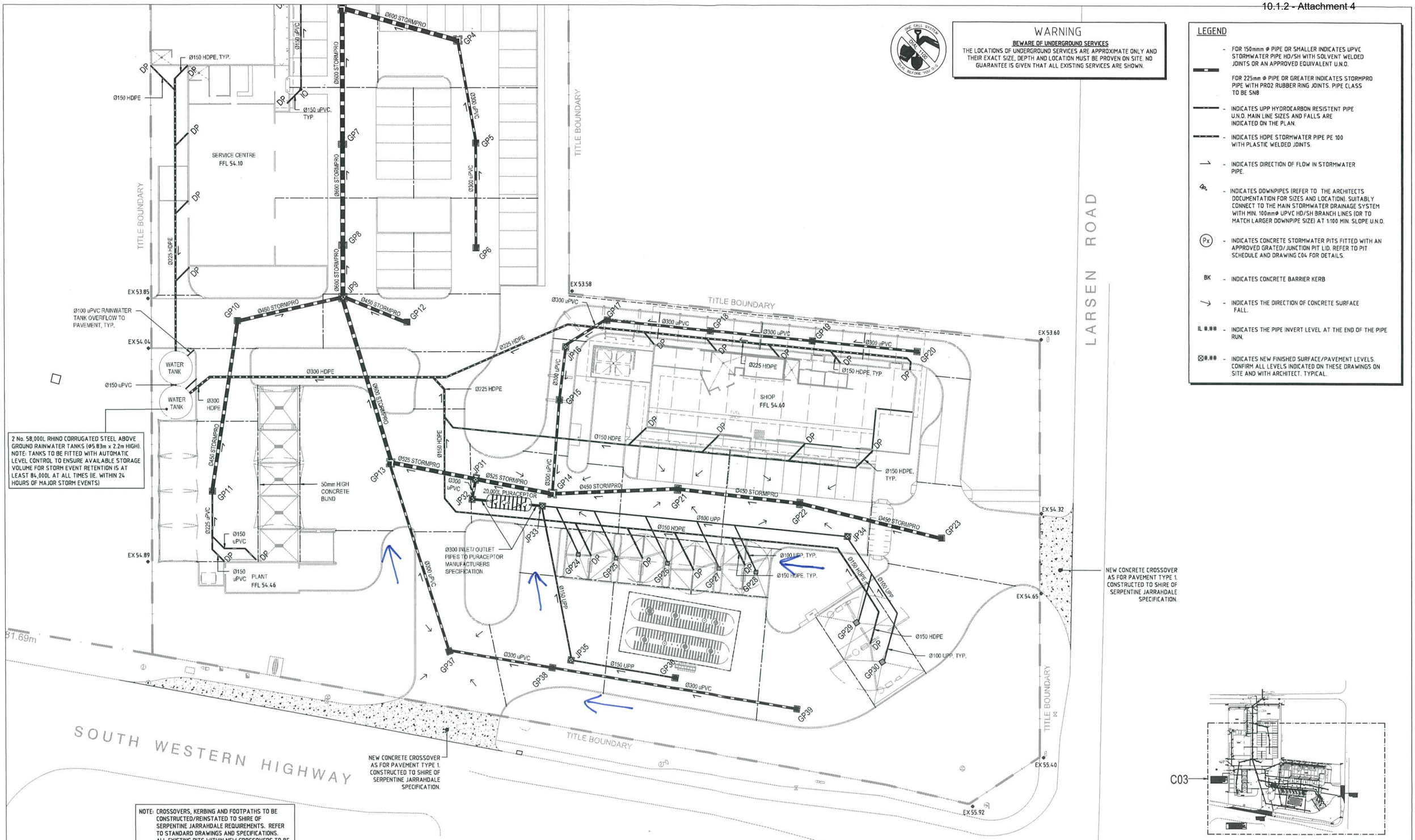
Project.
PROPOSED MIXED USE DEVELOPMENT
3 LARSEN ROAD
BYFORD, WA

Drawing.
STORMWATER DRAINAGE PLAN
SHEET 1

North.

PRELIMINARY

| Designed. | Date. |
|---|---|
| D.GRIFFITHS | MAY 2018 |
| Drawn. | Scale. |
| D.TRIEU | 1:250 @ A1 |
| Job No. | Drawing No. | Revision. |
| J0217 | C02 | P1 |




WARNING

**BEWARE OF UNDERGROUND SERVICES**

THE LOCATIONS OF UNDERGROUND SERVICES ARE APPROXIMATE ONLY AND THEIR EXACT SIZE, DEPTH AND LOCATION MUST BE PROVEN ON SITE. NO GUARANTEE IS GIVEN THAT ALL EXISTING SERVICES ARE SHOWN.

LEGEND

- FOR 150mm ø PIPE OR SMALLER INDICATES UPVC STORMWATER PIPE HD/SH WITH SOLVENT WELDED JOINTS OR AN APPROVED EQUIVALENT U.N.O.
  FOR 225mm ø PIPE OR GREATER INDICATES STORMPRO PIPE WITH PRO2 RUBBER RING JOINTS. PIPE CLASS TO BE SN8
- INDICATES UPP HYDROCARBON RESISTENT PIPE U.N.O. MAIN LINE SIZES AND FALLS ARE INDICATED ON THE PLAN.
- INDICATES HDPE STORMWATER PIPE PE 100 WITH PLASTIC WELDED JOINTS.
- INDICATES DIRECTION OF FLOW IN STORMWATER PIPE.
- 4x - INDICATES DOWNPIPES (REFER TO THE ARCHITECTS DOCUMENTATION FOR SIZES AND LOCATION). SUITABLY CONNECT TO THE MAIN STORMWATER DRAINAGE SYSTEM WITH MIN. 100mmø UPVC HD/SH BRANCH LINES (OR TO MATCH LARGER DOWNPIPE SIZE) AT 1:100 MIN. SLOPE U.N.O.
- (Px) - INDICATES CONCRETE STORMWATER PITS FITTED WITH AN APPROVED GRATED/JUNCTION PIT LID. REFER TO PIT SCHEDULE AND DRAWING C04 FOR DETAILS.
- BK - INDICATES CONCRETE BARRIER KERB
- INDICATES THE DIRECTION OF CONCRETE SURFACE FALL.
- IL #.## - INDICATES THE PIPE INVERT LEVEL AT THE END OF THE PIPE RUN.
- ⊠#.## - INDICATES NEW FINISHED SURFACE/PAVEMENT LEVELS. CONFIRM ALL LEVELS INDICATED ON THESE DRAWINGS ON SITE AND WITH ARCHITECT. TYPICAL.




KEY PLAN - 1/2000

[PROCON DEVELOPMENTS]
820 Mountain Hwy
Bayswater, Victoria 3153
Phone: 03 9720 0817
Fax: 03 9720 0827
Web: www.procon.net.au

| Rev. | Reason. | Date. | Appr. |
|---|---|---|---|
| P1 | PRELIMINARY | 10.05.18 | DG |



Client.

Project.
PROPOSED MIXED USE DEVELOPMENT
3 LARSEN ROAD
BYFORD, WA

Drawing.
STORMWATER DRAINAGE PLAN
SHEET 2

North.

PRELIMINARY

| Designed. | Date. |
|---|---|
| D.GRIFFITHS | MAY 2018 |
| Drawn. | Scale. |
| D.TRIEU | 1:250 @ A1 |
| Job No. | Drawing No. | Revision. |
| J0217 | C03 | P1 |

# Tree Survey – 3 Larsen Road (Lot 104 South West Hwy) Byford

## Prepared for

**Procon Developments**


Paperbark Technologies Pty Ltd
Zana Sheary & Steven Edwards
Arboricultural Consultant
*ISA Certified Arborist - AU0039A/AU0341A*
*Quantified Tree Risk Assessor, Licensed user 1082/3442*
*Diploma of Horticulture/Arboriculture*
PO Box 1116
Scarborough WA 6922
Mobile: 0401 817 551/0403805084
www.paperbarktechnologies.com.au
zana@paperbarktechnologies.com.au

***Tree Survey – 3 Larsen Rd, (Lot 104 South West Hwy) Byford***

## TABLE OF CONTENTS

*Tree Survey – 3 Larsen Rd, (Lot 104 South West Hwy) Byford*

**BRIEF:**

This consultant has been commissioned by Procon Developments to inspect and submit a report in respect of 48 trees within 3 Larsen Road, (Lot 104 South West Highway), Byford in relation to the proposed development site.

The survey scope requires:

- the identification of tree species
- measurement of the height & canopy spread of the trees
- measurement of trunk diameters
- a description of the trees current health and structural condition
- Advice regarding the suitability or otherwise of trees to be retained within the development
- Recommended remedial pruning or other works that may be required.

A total of 48 trees located within the site have been inspected, assessed and photographed for this report. All trees audited are over 80mm in trunk diameter.

Trees were tagged to facilitate locating individual trees and numbers have been placed upon aerial images of the site.

A photo of each tree is also included in this report.

This consultant confirms tree inspections were carried out on the 16th and 17th of April 2018.

**FORM AND APPROACH:**

Below are the definitions for the captured information provided:

## Botanical name Information:

Botanical names are listed detailing the generic name followed by the specific epithet. The variety is named where applicable. Only the scientific and botanical names should be accepted to identify an exact tree species.

The botanical name is predominantly used within this report and the common name provided for your reference within the summary.

## Tree health:

**Good**
The tree is demonstrating good or exceptional growth for the species. The tree should exhibit a full canopy of foliage and have only minor pest or diseases problems. Foliage colour, size and density should be typical of a healthy specimen of that species.

**Fair**
The tree is in reasonable condition and growing well for the species. The tree should exhibit an adequate canopy of foliage. There may be some dead wood present in the crown, some grazing by insects or animals may be evident and/or foliage colour, size or density may be atypical for a healthy specimen of that species.

**Poor**
The tree is not growing to its full capacity; extension growth of the laterals may be minimal. The canopy may be thinning or sparse. Large amounts of dead wood may be evident throughout the crown. Significant pest and disease problems may be evident or symptoms of stress indicating tree decline.

**Very poor**
The tree appears to be in a state of decline and the canopy may be very thin and sparse. A significant volume of deadwood may be present in the canopy or pest and disease problems may be causing a severe decline in tree health.

**Dead**
The tree is dead.

## Tree Structure:

Each tree surveyed was examined in detail to ascertain its overall structural condition and then placed into one of five categories:

***Good:*** The tree has a well-defined and balanced crown. Branch unions appear to be strong, with no defects evident in the trunk or the branches. Major limbs are well defined. The tree would be considered a good example of the species. Probability of significant failure is highly unlikely.

***Fair:*** The tree has some minor problems in the structure of the crown. The crown may be slightly out of balance, and some branch unions or branches may be exhibiting minor structural faults. If the tree is single trunked, this may be on a slight lean or be exhibiting minor defects. Probability of significant failure is low.

***Poor:*** The tree may have a poorly structured crown. The crown may be unbalanced or exhibit large gaps. Major limbs may not be well defined. Branches may be rubbing or crossing over. Branch unions may be poor or faulty at the point of attachment. The tree may have suffered major root damage. Probability of significant failure is moderate.

***Very Poor:*** The tree has a poorly structured crown. The crown is unbalanced or exhibits large gaps. Major limbs are not well defined. Branch unions may be poor or faulty at the point of attachment. A section of the tree has failed or is in imminent danger of failure. Active failure may be present or failure is probable in the immediate future.

***Has Failed:*** A significant section of the tree or the whole tree has failed.

**Tree Survey Details over leaf.**

***Tree Survey – 3 Larsen Rd, (Lot 104 South West Hwy) Byford***

| Tree No. | Botanical Name | Height | Spread | DBH | Health & condition | Suitable to retain Yes/No & why | Recommendations |
|---|---|---|---|---|---|---|---|
| 101 | *Eucalyptus robusta* | 13.5 | 9.5 | 500 | Displaying good health and fair structural condition, major limb forks appear sound with no separation or cracking visible, sporadic minor deadwood throughout, some excessive limb load noted over adjacent footpath. | Suitable to be retained within a garden bed. Ensure minimal root disturbance during construction. | Remove deadwood and excessive limb load over path |
| 102 | *Melia azedarach* | 8 | 7 | 480 | Displaying good health and fair structural condition with adjacent suckering growth, limb forks appear sound, sporadic minor deadwood held throughout canopy. | Invasive weed species, not suitable for retention | Remove Tree |
| 103 | *Melia azedarach* | 5.5 | 5 | 180 | Displaying good health and poor structural condition, multi stemmed form with numerous suckers located around the base. | Invasive weed species, not suitable for retention | Remove Tree |
| 104 | *Ficus elastica* | 11 | 8.5 | 550 | Displaying good health and poor structural condition, canopy consists of predominantly mature epicormic growth with multiple previous major limb failures evident. | Invasive species, not suitable for retention | Remove Tree |
| 105 | *Ficus elastica* | 5.5 | 7.5 | 430 | Displays good health and structural condition, previously heavily pruned resulting in canopy consisting of mature epicormic limbs, sporadic minor deadwood throughout. | Invasive species, not suitable for retention | Remove Tree |

***Tree Survey – 3 Larsen Rd, (Lot 104 South West Hwy) Byford***

| Tree No. | Botanical Name | Height | Spread | DBH | Health & condition | Suitable to retain Yes/No & why | Recommendations |
|---|---|---|---|---|---|---|---|
| 106 | *Corymbia calophylla* | 8.5 | 7 | 450 | Displays good health and fair structural condition, canopy suppressed by adjacent tree and leaning to the north west, limb forks sound, previous limb failures evident, major deadwood held in lower half of tree | Not suitable for retention due to being located within proposed bitumen hardstand | Remove tree |
| 107 | *Corymbia calophylla* | 10.5 | 9 | 460 | Displays good health and fair structural condition, limb forks appear sound with no separation or cracking visible, sporadic minor deadwood held throughout, excessive limb load on lower lateral limb. | Not suitable for retention due to being located within proposed bitumen hardstand | Remove tree |
| 108 | *Corymbia calophylla* | 9 | 9 | 450 | Displays good health and fair structural condition, canopy suppressed by adjacent trees and leaning in a westerly direction, sporadic minor deadwood throughout, root plate is firm. | Not suitable for retention due to being located within proposed bitumen hardstand | Remove tree |
| 109 | *Corymbia calophylla* | 12 | 8.5 | 470 | Displaying good health and fair structural condition, limb forks appear sound with no separation or cracking visible, sporadic minor deadwood held throughout. | Not suitable for retention due to being located within proposed bitumen hardstand | Remove tree |
| 110 | *Nuytsia floribunda* | 4 | 3.5 | 280 | Displaying good health and fair structural condition with a secondary stem. Minor deadwood visible, small sucker at base of tree. | Not suitable for retention due to being located within proposed bitumen hardstand | Remove tree |

***Tree Survey – 3 Larsen Rd, (Lot 104 South West Hwy) Byford***

| Tree No. | Botanical Name | Height | Spread | DBH | Health & condition | Suitable to retain Yes/No & why | Recommendations |
|---|---|---|---|---|---|---|---|
| 111 | *Corymbia calophylla* | 8.5 | 7.5 | 340 | Displaying good health and fair structural condition, limb forks appear sound with no separation or cracking visible, sporadic minor deadwood held throughout, tree is root firm. | Not suitable for retention due to being located within proposed bitumen hardstand | Remove tree |
| 112 | *Corymbia calophylla* | 5 | 0 | 780 | Main tree has died rendering only a trunk and one small sucker remaining. | Not suitable for retention. Displays very poor structure with active termites and longitudinal crack down the main stem indicating future failure imminent. | Remove tree |
| 113 | *Corymbia calophylla* | 11 | 11 | 690 | Displaying good health and fair structural condition, main limb cluster formed at 1m with resin exuding around the base, limb forks appear sound, sporadic minor deadwood held throughout. | Not suitable for retention due to being located within proposed bitumen hardstand | Remove tree |
| 114 | *Corymbia calophylla* | 11 | 8.5 | 530 | Displaying good health and fair structural condition with codominant stems formed at 1.8m, limb forks appear sound with no separation or cracking visible, sporadic minor deadwood held throughout. | Not suitable for retention due to being located within proposed bitumen hardstand | Remove tree |
| 115 | *Corymbia calophylla* | 6.5 | 6.5 | 350 | Displaying good health and fair structural condition, limb forks appear sound with no separation or cracking visible, sporadic minor deadwood visible within lower half of the tree. | Suitable to be retained within a garden bed. Ensure minimal root disturbance during construction. | Remove lower lateral branches up to 2m. Remove minor deadwood throughout. |

***Tree Survey – 3 Larsen Rd, (Lot 104 South West Hwy) Byford***

| Tree No. | Botanical Name | Height | Spread | DBH | Health & condition | Suitable to retain Yes/No & why | Recommendations |
|---|---|---|---|---|---|---|---|
| 116 | *Corymbia calophylla* | 8.5 | 11 | 460 | Displaying fair health and structural condition with a slight north westerly lean, limb forks appear sound with no separation or cracking visible, sporadic major deadwood held within the lower canopy. | Suitable to be retained within a garden bed. Ensure minimal root disturbance during construction. | Remove major deadwood throughout. |
| 117 | *Corymbia calophylla* | 9.5 | 8.5 | 650 | Displaying good health and fair structural condition, codominant stems formed at 0.7m, limb forks appear sound with no separation or cracking visible, small amount of minor deadwood visible. | Suitable to be retained within a garden bed. Ensure minimal root disturbance during construction. | Remove lower lateral branches up to 2.5m. Remove minor deadwood. |
| 118 | *Corymbia calophylla* | 9.5 | 3 | 180 | Found to be in good health and fair structural condition displaying a tall slender habit, limb forks appear sound with no separation or cracking visible, very minor deadwood evident. | Suitable to be retained within a garden bed. Ensure minimal root disturbance during construction. | No works required |
| 119 | *Corymbia calophylla* | 7 | 4.5 | 250 | Found to be in good health and fair structural condition, form displays secondary stems with suckering growth developed at the base, limb forks appear sound, small amount of minor deadwood visible. | Suitable to be retained within a garden bed. Ensure minimal root disturbance during construction. | Remove small secondary stems |
| 120 | *Eucalyptus camaldulensis* | 13.5 | 10 | 730 | Displaying good health and fair structural condition with codominant stems formed at 0.8m, major limb forks appear sound with no separation or cracking visible, very minor deadwood evident, root plate appears firm. | Suitable to be retained within a garden bed. Ensure minimal root disturbance during construction. | Remove minor deadwood, re-inspection recommended in 12 months |

***Tree Survey – 3 Larsen Rd, (Lot 104 South West Hwy) Byford***

| Tree No. | Botanical Name | Height | Spread | DBH | Health & condition | Suitable to retain Yes/No & why | Recommendations |
|---|---|---|---|---|---|---|---|
| 121 | *Corymbia calophylla* | 14 | 14.5 | 710 | Displaying good health and fair structural condition, major limb forks appear sound with no separation or cracking visible, sporadic major deadwood is visible with a dead branch hanging at 6m, multiple previous limb failures evident. | Suitable to be retained within a garden bed. Ensure minimal root disturbance during construction. | Remove hanging branch and major deadwood to sound growth points. |
| 122 | *Corymbia calophylla* | 7 | 4 | 190 | Displaying good health and fair structural condition, very minor deadwood held throughout, limb forks appear sound with no separation or cracking visible. | Suitable to be retained within a garden bed. Ensure minimal root disturbance during construction. | No works required |
| 123 | *Corymbia calophylla* | 5 | 4 | 170 | Displaying good health and fair structural condition, limb forks appear sound with no separation or cracking evident, small amount of minor deadwood visible. | Suitable to be retained within a garden bed. Ensure minimal root disturbance during construction. | No works required |
| 124 | *Corymbia calophylla* | 5.5 | 4 | 120 | Displaying good health and fair structural condition, limb forks appear sound with no separation or cracking visible, very minor deadwood held throughout | Suitable to be retained within a garden bed. Ensure minimal root disturbance during construction. | No works required |
| 125 | *Corymbia calophylla* | 7.5 | 5.5 | 270 | Found to be in good health and fair structural condition displaying a secondary stem, limb forks appear sound with no separation or cracking visible, small amount of minor deadwood evident. | Suitable to be retained within a garden bed. Ensure minimal root disturbance during construction. | No works required |

***Tree Survey – 3 Larsen Rd, (Lot 104 South West Hwy) Byford***

| Tree No. | Botanical Name | Height | Spread | DBH | Health & condition | Suitable to retain Yes/No & why | Recommendations |
|---|---|---|---|---|---|---|---|
| 126 | *Corymbia calophylla* | 8.5 | 13.5 | 560 | Displaying good health and fair structural condition with previous fire damage evident on main stem, major limb forks appear sound with no separation or cracking visible, major deadwood is sporadic held throughout to canopy. | Not suitable for retention due to being located within proposed bitumen hardstand | Remove tree |
| 127 | *Corymbia calophylla* | 10.5 | 5 | 510 | Tree is dead | Not suitable for retention due to being located within proposed bitumen hardstand | Remove tree |
| 128 | *Corymbia calophylla* | 8 | 11 | 550 | Displaying poor health and structural condition with the main stem having died, live growth remains on 1 x first order limb, major deadwood throughout. | Not suitable for retention due to poor health and structure | Remove tree |
| 129 | *Corymbia calophylla* | 6.5 | 6 | 320 | Displaying good health and fair structural condition with the canopy suppressed by adjacent tree, codominant stems have formed 1m with major limb forks appearing sound with no separation or cracking visible. | Not suitable for retention due to being located within proposed bitumen hardstand | Remove tree |
| 130 | *Corymbia calophylla* | 8.5 | 5 | 240 | Found to be in good health and fair structural condition displaying a tall slender habit due to reduced sun light levels and canopy suppression from adjacent trees, limb forks sound. | Not suitable for retention due to being located within proposed bitumen hardstand | Remove tree |

***Tree Survey – 3 Larsen Rd, (Lot 104 South West Hwy) Byford***

| Tree No. | Botanical Name | Height | Spread | DBH | Health & condition | Suitable to retain Yes/No & why | Recommendations |
|---|---|---|---|---|---|---|---|
| 131 | *Corymbia calophylla* | 11 | 9.5 | 420 | Displaying good health and fair structural condition with a small amount of fire damage on the main stem, major limb forks appear sound with no separation or cracking visible, sporadic minor deadwood is held throughout canopy. | Not suitable for retention due to being located within proposed bitumen hardstand | Remove tree |
| 132 | *Corymbia calophylla* | 13 | 14 | 690 | Displaying good health and fair structural condition with fire damage evident on the main stem, limb forks appear sound with no separation or cracking visible, previous major limb failures, sporadic minor deadwood throughout canopy. | Not suitable for retention due to being located within proposed bitumen hardstand | Remove tree |
| 133 | *Corymbia calophylla* | 13 | 11 | 910 | Displaying good health and fair structural condition with a small amount of fire damage at the base of the tree, codominant stems have formed at 2m, major limb forks appear sound with no separation or cracking visible, sporadic major deadwood is held throughout. | Suitable to be retained within a garden bed. Ensure minimal root disturbance during construction. | Remove deadwood |
| 134 | *Corymbia calophylla* | 2.5 | 1.4 | 80 | Small group of trees displaying good health and fair structural condition with the canopy suppressed by adjacent trees, codominant stems formed 1m | Suitable to be retained within a garden bed. Ensure minimal root disturbance during construction. | No works required |
| 135 | *Corymbia calophylla* | 11.5 | 5.5 | 410 | Displaying good health and fair structural condition with the canopy suppressed by adjacent tree and leaning in a northerly direction, major limb forks appear sound with no separation or cracking visible, minor deadwood evident. | Suitable to be retained within a garden bed. Ensure minimal root disturbance during construction. | No works required |

***Tree Survey – 3 Larsen Rd, (Lot 104 South West Hwy) Byford***

| Tree No. | Botanical Name | Height | Spread | DBH | Health & condition | Suitable to retain Yes/No & why | Recommendations |
|---|---|---|---|---|---|---|---|
| 136 | *Corymbia calophylla* | 12.5 | 7.5 | 620 | Found to be in good health and fair structural condition displaying a secondary stem and suckering growth at base, major limb forks appear sound with no separation or cracking visible, small amount of minor deadwood visible. | Suitable to be retained within a garden bed. Ensure minimal root disturbance during construction. | Remove small sucker and lower lateral branches up to 2m |
| 137 | *Corymbia calophylla* | 7 | 4.5 | 280 | Displaying good health and fair structural condition with the canopy suppressed by adjacent tree and leaning in a southerly direction, major limb forks appear sound, very small amount of minor deadwood visible, root plate appears firm. | Suitable to be retained within a garden bed. Ensure minimal root disturbance during construction. | Remove lower lateral branches up to 2m |
| 138 | *Corymbia calophylla* | 13 | 7.5 | 460 | Displaying good health and fair structural condition with codominant stems formed at 3m, major limb forks appear sound with no separation or cracking visible, located approximately 1m away from adjacent tree, very minor deadwood visible. | Suitable to be retained within a garden bed. Ensure minimal root disturbance during construction. | Remove small advertising sign |
| 139 | *Corymbia calophylla* | 11.5 | 7 | 630 | Displaying good health and fair structural condition with multiple stems formed at 0.3m, located approximately 1m away from adjacent tree, major limb forks appear sound with no separation or cracking visible, very minor deadwood visible | Suitable to be retained within a garden bed. Ensure minimal root disturbance during construction. | No works required |
| 140 | *Corymbia calophylla* | 9.5 | 6.5 | 350 | Displaying good health and fair structural condition with a small secondary stem, major limb forks appear sound with no separation or cracking visible, sporadic minor deadwood is held throughout. | Suitable to be retained within a garden bed. Ensure minimal root disturbance during construction. | Remove minor deadwood and stunted secondary stem |

***Tree Survey – 3 Larsen Rd, (Lot 104 South West Hwy) Byford***

| Tree No. | Botanical Name | Height | Spread | DBH | Health & condition | Suitable to retain Yes/No & why | Recommendations |
|---|---|---|---|---|---|---|---|
| 141 | *Corymbia calophylla* | 11.5 | 10 | 610 | Found to be in good health and fair structural condition with codominant stems formed at 3m displaying included bark, major limb forks appear sound with no separation or cracking visible, very minor deadwood visible, minor root girdling around base of trunk. | Suitable to be retained within a garden bed. Ensure minimal root disturbance during construction. | No works required |
| 142 | *Callistemon 'Kings Park Special'* | 4.5 | 5.5 | 430 | Found to be in good health and fair structural condition, displays a multi stemmed form and multiple inclusions with no separation or cracking visible at this time, very minor deadwood and suckering growth visible. | Suitable to be retained within a garden bed. Ensure minimal root disturbance during construction. | No works required |
| 143 | *Callistemon 'Kings Park Special'* | 5 | 5.5 | 410 | Found to be in good health and fair structural condition, the main stem is twisted and multiple unions display included bark with no separation or cracking visible at this time, small amount of minor deadwood, suckering growth visible at the base. | Suitable to be retained within a garden bed. Ensure minimal root disturbance during construction. | Remove suckering growth at base |
| 144 | *Corymbia calophylla* | 11.5 | 13 | 950 | Displaying good health and poor structural condition with a large amount of recent fire damage on the main trunk, a major limb has previously failed leaving a long stub, a column of decay has developed within the stub with active bees visible, major deadwood is held throughout, previously heavily pruned leaving long epicormic limbs. | Remove tree due to poor structure and high level or risk to new introduced targets | Remove tree |

***Tree Survey – 3 Larsen Rd, (Lot 104 South West Hwy) Byford***

| Tree No. | Botanical Name | Height | Spread | DBH | Health & condition | Suitable to retain Yes/No & why | Recommendations |
|---|---|---|---|---|---|---|---|
| 145 | *Corymbia calophylla* | 9 | 9.5 | 540 | Displaying good health and fair structural condition, major limb forks appear sound with no separation or cracking visible, lower growth starting to hang down, minor deadwood throughout with suckers developed at the base | Suitable to be retained within a garden bed. Ensure minimal root disturbance during construction. | Canopy lift required with some weight reduction pruning to lower branches which are hanging down, remove sucker and chain at base of tree. |
| 146 | *Corymbia calophylla* | 8 | 5 | 320 | Displaying good health and fair structural condition with the canopy suppressed by adjacent tree resulting in tree leaning in a south easterly direction, codominant stems have formed at 1.5m, major limb forks appear sound with no separation or cracking evident, minor deadwood visible throughout. | Suitable to be retained within a garden bed. Ensure minimal root disturbance during construction. | Remove small secondary stem and minor deadwood. |
| 147 | *Corymbia calophylla* | 13.5 | 10.5 | 680 | Displaying good health and fair structural condition with lower lateral branches hanging down, major limb forks appear sound with no separation or cracking visible, minor deadwood held throughout. | Suitable to be retained within a garden bed. Ensure minimal root disturbance during construction. | Remove lower branches hanging down to source and sound growth points. Remove deadwood throughout. |
| 148 | *Eucalyptus camaldulensis* | 5.5 | 4.5 | 160 | Found to be in good health and poor structural condition displaying a secondary stem with included bark, no separation or cracking is visible at this time however has the propensity to split out as it develops in size. | Not suitable for retention due to being located within proposed bitumen hardstand | Remove tree |

*Tree Survey – 3 Larsen Rd, (Lot 104 South West Hwy) Byford*

## Summary

This consultant confirms that the 48 trees within the proposed development site were found to be in predominately good health and fair structural condition at the time of inspection.

The trees within the site have had minimal tree surgery works carried out in previous times rendering some of the trees to experience large limb failures and poor structural condition. It was evident that a fire has damaged tree 144, rendering the trunk to display cracking and brittle wood from decay and damage.

The proposed design provided by the client has incorporated areas of green space for the retention of select trees in prominent areas and for the replanting of up to 17 additional trees to maintain a similar level of coverage. It is recommended to not change levels in these garden beds to minimise root disturbance and ensure the health of the retained trees is maintained.

**Species List**

The following seven species were identified by this consultant within the site:

**West Australian Native Species**

| **Botanical name** | **Common name** |
|---|---|
| *Callistemon 'Kings Park Special'* | Bottlebrush |
| *Corymbia calophylla* | Marri |
| *Eucalyptus camaldulensis* | River Red Gum |
| *Nuytsia floribunda* | WA Christmas Tree |

**Australian Native Species**

| **Botanical name** | **Common name** |
|---|---|
| *Eucalyptus robusta* | Swamp Mahogany |
| *Melia azedarach* | Cape Lilac |

**Exotic Species**

| | |
|---|---|
| *Ficus elastica* | Rubber Tree |

**The survey revealed:**

- The 48 trees inspected were found to be predominantly in good health and fair structural condition at this time.
- 22 trees are recommended for removal predominantly due to being located within proposed bitumen and hardstand areas according to the plan provided by Procon developments.
- 26 trees are recommended to be retained within garden beds and ensure that minimal disturbance to roots during construction is achieved.
- 16 trees are recommended for some minor remedial pruning works to remove dead wood and improve the structural condition, therefore reducing the risk to surrounding new targets.
- 10 trees require no work at this time.

*Tree Survey – 3 Larsen Rd, (Lot 104 South West Hwy) Byford*

## Tree Protection during development works

- More than 90% of trees' roots are located in the upper 1.0m of soil depth and tree roots generally extend well beyond the canopy spread of the tree.

- Machinery and vehicle movements in proximity to trees and the stock piling of building materials beneath trees can damage both tree roots and the lower sections of the canopy and need to be restricted.

- Where trees are being retained it is crucial that designers, contractors and sub-contractors are informed of the likely extent of tree roots and the potential damage to roots and lower branches from the construction of infrastructure too close to trees.

- It is therefore recommended that the identification of trees to be retained and appropriate tree protection and management measures are formulated following a more detailed consideration of the extent and proximity of proposed works in relation to the trees once the design for the POS is approved.

*Zana Sheary - Arboricultural Consultant*
*Paperbark Technologies Pty Ltd*
PO Box 1116
Scarborough WA 6922
Mob: 0401 817 551
zana@paperbarktechnologies.com.au
www.paperbarktechnologies.com.au
*ISA Certified Arborist AU-0341A*
*Quantified Tree Risk Assessor Lic-3442*
*Diploma of Horticulture/Arboriculture*



**Limitation of liability**
Trees can be managed, but they cannot be controlled. To live or work near a tree involves a degree of risk.
This report only covers identifiable defects present at the time of inspection. Paperbark Technologies accepts no responsibility and cannot be held liable for any structural defect or unforeseen event/situation or adverse weather conditions that may occur after the time of inspection.
Paperbark Technologies cannot guarantee that the tree/s contained within this report will be structurally sound under all circumstances, and is not able to detect every condition that may possibly lead to the structural failure of a tree. Paperbark Technologies cannot guarantee that the recommendations made will categorically result in the tree being made safe.
Unless specifically mentioned this report will only be concerned with above ground inspections, as such all observations have been visually assessed from ground level. Trees are living organisms and as such cannot be classified as safe under any circumstances. Trees fail in ways that the arboriculture industry does not fully understand.
The recommendations are made on the basis of what can be reasonably identified at the time of inspection therefore Paperbark Technologies accepts no liability for any recommendations made.
All care has been taken to obtain information from reliable sources, however Paperbark Technologies can neither guarantee nor be responsible for the accuracy of information provided by others.
In the event that re-inspection of the tree/s is recommended it is the client's responsibility to make arrangements with Paperbark Technologies.

## References

Mattheck, C & Breloer H, (1994) *The body language of trees, a handbook for failure analysis.* London TSO (The Stationery Office)

Lonsdale David, (1999) *Principles of Tree Hazard Assessment and Management.* London TSO (The Stationery Office).

Hayes, Ed (2007) *Evaluating Tree Defects, second edition.* Safetrees Rochester.

Australian Standard 4373-2007 *Pruning of amenity trees.*

Australian Standard 4970-2009 *Protection of trees on development sites.*

Urban, James (2008) *Up by Roots – Healthy Soils and Trees in the Built Environment* International Society of Arboriculture, Champaign, Illinois U

*Tree Survey – 3 Larsen Rd, (Lot 104 South West Hwy) Byford*

## Map indicating tree locations (Trees are tagged)

***Tree Survey – 3 Larsen Rd, (Lot 104 South West Hwy) Byford***

**Photos of trees**


Tree 101


Tree 102


Tree 103


Tree 104


Tree 105


Tree 106


Tree 107


Tree 108


Tree 109


Tree 110


Tree 111


Tree 112

***Tree Survey – 3 Larsen Rd, (Lot 104 South West Hwy) Byford***

Tree 113

Tree 114

Tree 115

Tree 116

Tree 117

Tree 118

Tree 119

Tree 120

Tree 121

Tree 122

Tree 123

Tree 124

***Tree Survey – 3 Larsen Rd, (Lot 104 South West Hwy) Byford***


Tree 125


Tree 126


Tree 127


Tree 128


Tree 129


Tree 130


Tree 131


Tree 132


Tree 133


Tree 134


Tree 135


Tree 136

***Tree Survey – 3 Larsen Rd, (Lot 104 South West Hwy) Byford***

Tree 137

Tree 138

Tree 139

Tree 140

Tree 141

Tree 142

Tree 143

Tree 144

Tree 145

Tree 146

Tree 147

Tree 148

**PLANT SCHEDULE**

All plants depicted are at estimated mature size as an indication of the future landscape.

Shrubs, grasses and ground cover to be planted at minimum 14cm pot size.

Trees to be planted at minimum 45ltr pot size.

**Trees**

| | |
|---|---|
| 12 x Callistemon hybrid 'Kings Park Special' | 5m x 4m |
| 4 x Corymbia calophylla | 15m x 8 |
| 2 x Eucalyptus camaldulensis | 40m x 12m |
| 4 x Eucalyptus lane-poolei 'Salmon White Gum' | 8m x 5m |

**Shrubs**

| | |
|---|---|
| 24 x Banksia attenuata 'Dwarf' | 2m x 2m |
| 57 x Darwinia citriodora | 1.5m x 1.5m |
| 36 x Grevillea johnsonii x wilsonii 'Bon Fire' | 2m x 1.5m |
| 72 x Hypocalymma angustifolium 'Coconut Ice' | 1m x 1m |
| 33 x Melaleuca nesophila 'Narrow Nessie' | 3m x 1m |
| 51 x Verticordia plumosa | 60cm x 1m |

**Climbing plants**

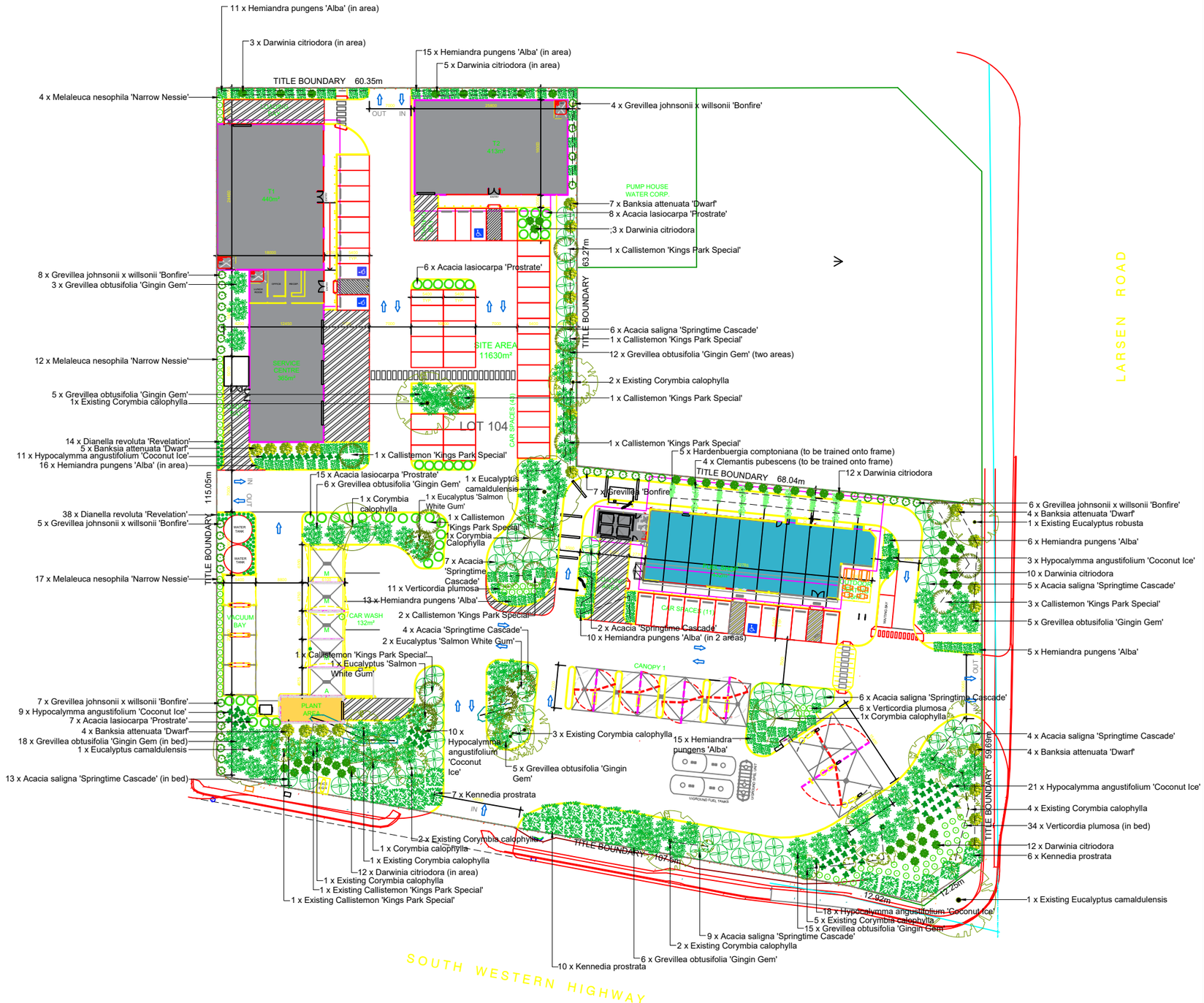
| | |
|---|---|
| 4 x Clematis pubescens | 5m x 5m |
| 5 x Hardenbergia comptoniana | 3m x 3m |

**Grasses**

| | |
|---|---|
| 52 x Dianella revoluta 'Revelation' | 50cm x 55cm |

**Ground cover**

| | |
|---|---|
| 42 x Acacia lasiocarpa 'Prostrate' | 40cm x 1.5m |
| 56 x Acacia saligna 'Springtime Cascade' | 25cm x 3m |
| 75 x Grevillea obtusifolia 'Gin Gin Gem' | 30cm x 3m |
| 91 x Hemiandra pungens 'Alba' | 20cm x 1.5m |
| 23 x Kennedia prostrata | 10cm x 3m |




DISCLAIMER

All symbols and elements depicted in this plan are artistic representations to illustrate conceptual ideas and are subject to approval by the relevant professionals or authority.

It is the client's responsibility to ensure the required certifications, licenses and approvals are held prior to installation.
Levels and measurements must be checked on site prior to construction.



CLIENT
Procon Developments

PROJECT
Proposed Development
3 Larsen Road
Byford

DRAWING Landscape Plan

DATE 02.05.2018

PROJECT NUMBER 1886

REVISION 02

DESIGNER Amelia Coleman

Scale @A3 1:750

NOTES

Landscape area measurement - 2886m2.

All planting areas to be mulched to a depth of 75mm with local stone mulch.

All landscape areas to be reticulated.

Watering schedule to be as per Water Corporation's Water Efficiency Measures guidelines.

URBAN Retreat GARDEN DESIGN

COMMERCIAL AND RESIDENTIAL
LANDSCAPE DESIGN SERVICES

E:amelia@urbanretreatgardens.com.au
M:0438 926 313 P/F:08 9242 2806
ABN: 31494997428

DEVELOPMENT ASSESSMENT PANEL
APPROVED
11-Dec-2018

i3 consultants WA

# PROPOSED MIXED USE DEVELOPMENT (SERVICE STATION + CONVENIENCE STORE + DRIVE-THRU COFFEE | VEHICLE SERVICE STORE | COMMERCIAL TENANCIES | SELF SERVICE + AUTOMATIC CAR WASH)

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

## TRANSPORT IMPACT ASSESSMENT


Final 3-0

Prepared by i3 consultants WA for

Peter Webb & Associates | Procon

Transport Impact Assessment
Proposed Mixed Use Development (Service Station + Convenience Store + Drive-Thru Coffee| Vehicle Service Store | Commercial Tenancies | Self Service + Automatic Car Wash), Lot 104 [illegible]tern Highway) Byford
Prepared for Peter Webb & Associates | Procon

DEVELOPMENT ASSESSMENT PANEL
APPROVED
11-Dec-2018

i3 consultants wa

## Project details

| | |
|---|---|
| Project | Proposed Mixed Use Development (Service Station + Convenience Store + Drive-Thru Coffee\| Vehicle Service Store \| Commercial Tenancies \| Self Service + Automatic Car Wash) |
| Location | Lot 104 (SN3) Larsen Rd, (Cnr South Western Highway) Byford |
| Project ID | 02904 |
| Client | Peter Webb & Associates \| Procon |
| Description | A Transport Impact Statement for a proposed Mixed-Use Development (Service Station + Convenience Store + Drive-Thru Coffee \| Vehicle Service Store \| Commercial Tenancies \| Self Service + Automatic Car Wash) on Lot 104 at 3 Larsen Rd on the southwest corner of South Western Hwy within the Shire of Serpentine-Jarrahdale suburb of Byford prepared in accordance with the WAPC 2016 Transport Impact Assessment Guidelines. |

## Document control

| | |
|---|---|
| Author | David Wilkins TMIEAust |
| Status | Final 3-0 |
| File name | 02904 Lot 104 SWH_Larsen_George Service TIA (F3-0) |

| Distribution & Publication Record | | | | | | Final | | |
|---|---|---|---|---|---|---|---|---|
| | 12/04/18 | 17/04/18 | 08/11/18 | 04/05/18 | 07/05/18 | 20/09/18 | 09/11/18 | |
| Recipient \| Document version | D1-0 | D2-0 | D3-0 | F1-0 | F1-1 | F2-0 | F3-0 | F3-1 |
| nik@webbplan.com.au | ☑ | ☑ | ☑ | ☑ | ☑ | ☑ | ☑ | ☐ |
| Garrick@procon.net.au | ☑ | ☑ | ☐ | ☑ | ☑ | ☑ | ☑ | ☐ |
| leon@procon.net.au | ☐ | ☐ | ☑ | ☑ | ☑ | ☑ | ☑ | ☐ |
| Dominic@procon.net.au | ☐ | ☐ | ☐ | ☐ | ☐ | ☑ | ☑ | ☐ |

Revision status comments: D1-0 incomplete report issued for review of background information by client. D2-0 includes revised access and land uses: issued for review by client. F1-0 Final Issue with SIDRA data and completed WAPC checklist. F1-0 Section 14 amended to reflect changed parking bay numbers. F2-0 completely revised to reflect revised layout with no access to or from South Western Hwy, dualling of South Western Hwy including right and left turn lanes into Larsen Rd, largest vehicle restricted to 19 m ST and associated internal layout changes. D3-0 revised and updated to reflect revised plans and comments from the October JDAP process. F3-0 issued as Final with no changes other than adding cover image.

This is not an approved document unless certified here.

Digitally signed by David Wilkins
Date: 2018.11.09 12:06:03 +08'00'



PO Box 1638 Subiaco WA 6904 | T 08 9467 7478 | dwilkins@i3consultants.com | www.i3consultants.com | ABN 53 745 566 923

## CONTENTS

## FIGURES

## ABOUT THE AUTHOR

David Wilkins is an RTA NSW Certified Level 3 Lead Auditor (RSA-08-0178) and Main Roads Western Australia (MRWA) accredited Senior Road Safety Auditor (SRSA 0101). In addition to this, David is an MRWA accredited Crash Investigation Team Leader and Roadworks Traffic Manager (MRWA-RTM-10-RTM20). David has undertaken 104 road safety audits in the last five years and 236 road safety audits since 2001 across the full range of stages from feasibility through to pre-opening, including roadworks, existing roads, schools and mine sites.

David's specialist skills are in the management and development of transport infrastructure and planning, particularly with respect to road safety engineering, roadworks traffic management, traffic engineering, crash investigation, road safety audits, alternative transport systems (TravelSmart, shared paths, cycle facilities), transport statements, transport assessments, parking demand management, local area traffic management, speed management, accessible environments and innovation.

David specialises in undertaking and preparing traffic impact assessments in accordance with either the WAPC document 'Transport Impact Assessment Guidelines' (1) or Austroads 'Guide to Traffic Management Part 12: Traffic Impacts of Developments' (2) and has personally prepared over 160 of these in the last 10 years.

# 1 INTRODUCTION & BACKGROUND

This Transport Impact Assessment report has been prepared for Peter Webb & Associates | Procon (the applicant) by David Wilkins from i3 consultants WA (the consultant) in accordance with the WAPC publication Transport Impact Assessment Guidelines (1). These guidelines indicate that a Transport Impact Assessment (TIA) is required for developments that are likely to generate more than 100 vehicle trips in the development's peak hour and therefore would have a high impact on the surrounding land uses and transport networks, as shown in Figure 1 below.

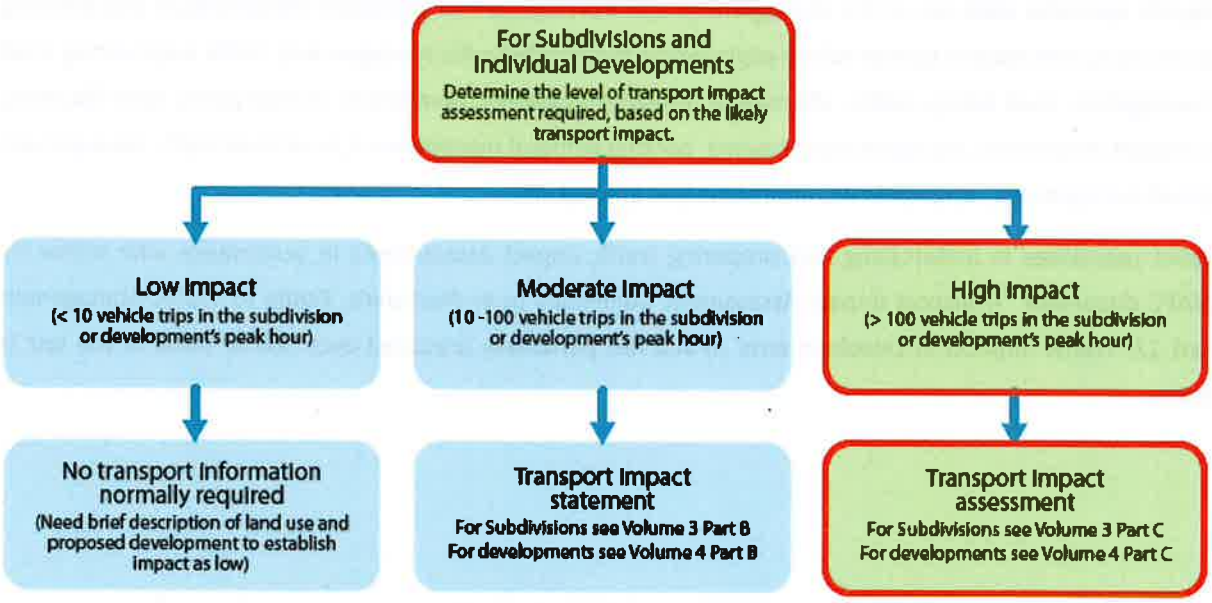



Figure 1 - Level of TIA required (Figure 2: WAPC Guidelines Vol 4)

Preliminary assessments indicate that this mixed-use development is likely to generate around 200 trips during its peak hour, mainly due to service station, drive-thru coffee and car wash land uses. More specific trip generation details are included in **Section 7**.

The location of the subject site in the context of the road and public transport network, 400 m (5-minute walk) and 800 m (10-minute walk) radii is shown in Figure 2 on the following page.

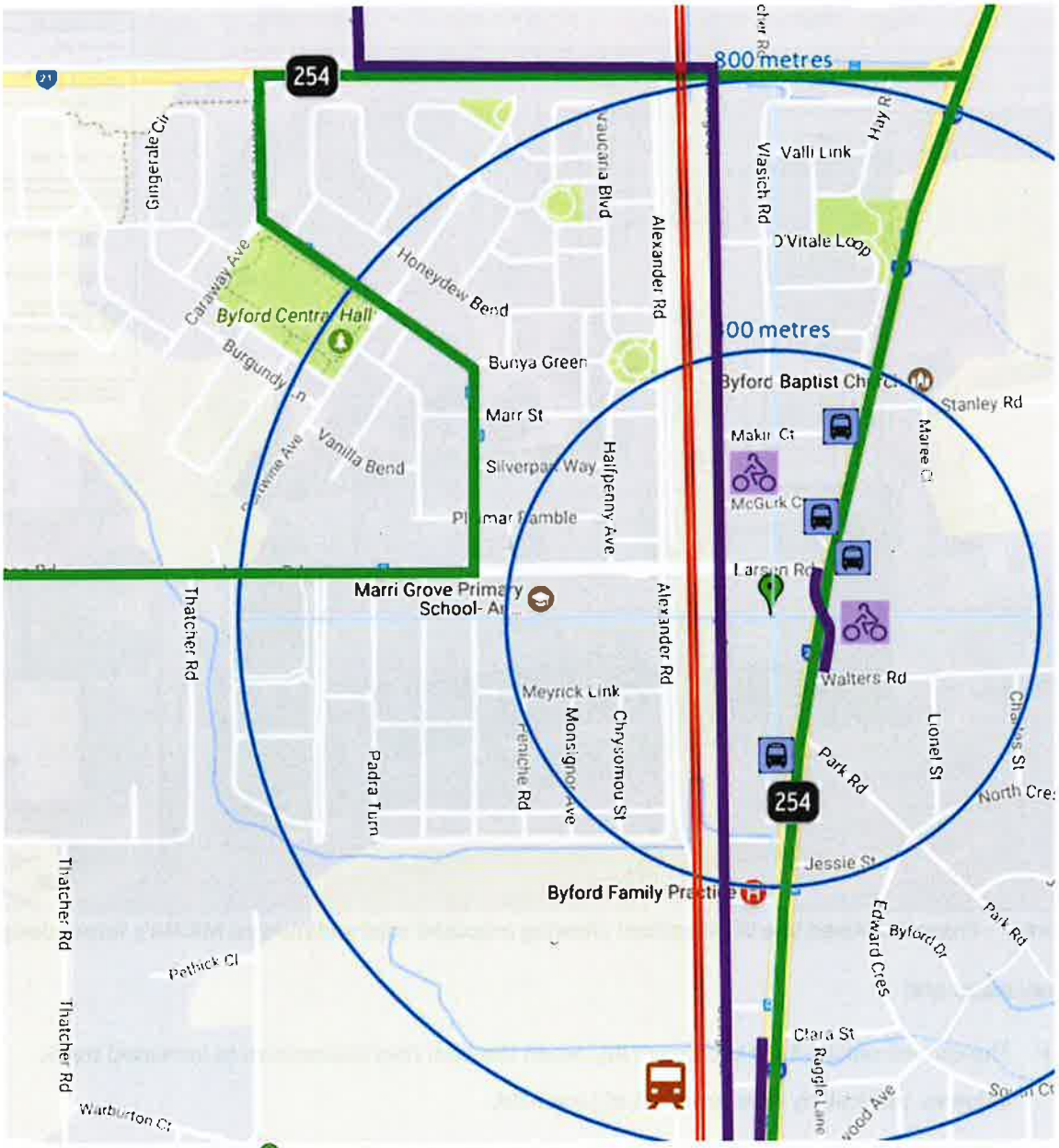



Figure 2 – Site location, road network, bus, train, cycle routes & 400 m/ 800 m walk/ cycle radii

The proposed Mixed-Use Development consists of an 8 fuelling point Service Station with a Convenience Store + Drive thru coffee, a Self Service Car wash with 4 manual bays and 1 automatic bay, a vehicle service store and two commercial tenancies, as described in Table 1 below and shown in Figure 3 on the following page.

| Land Use | GLA ($m^2$) | Number | Fuel Points |
|---|---|---|---|
| Restricted Retail | 630 | 1 | |
| Vehicle Service Centre | 400 | 1 | |
| Self Service Car Wash | 132 | 5 | |
| Service Station + Convenience Store + Drive-Thru Coffee | 400 | 1 | 8 |

Table 1 – Proposed Land Use Schedule

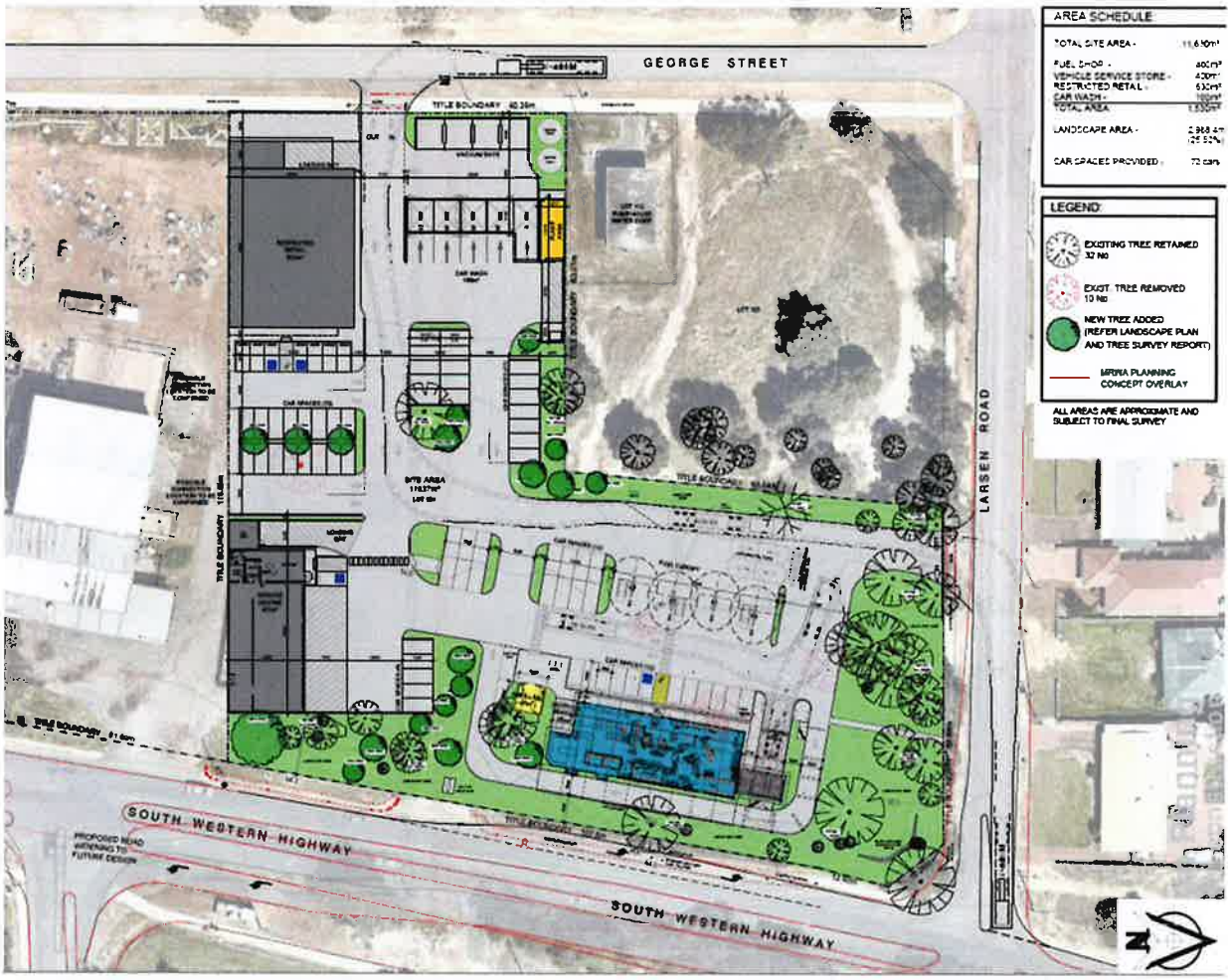



Figure 3 – Proposed Mixed Use Development showing proposed road widening to MRWA's future designs

The key issues are:

- The current sensitivity of the Larsen Rd/ South Western Hwy intersection to increased traffic volumes, particularly right turns out of Larsen Rd;
- The proposed closure of Larsen Rd at the railway level crossing just west of the subject site; and
- Accessibility by the 19 m ST fuel tanker.

In addition to the above, the Shire of Serpentine-Jarrahdale has identified its key concerns since issue of the previous version (F-2) of this TIA. These are listed and addressed in **Section 15** of this TIA.

# 2 EXISTING SITUATION

## 2.1 EXISTING SITE

The existing site is a cleared brownfield site as shown in Photograph 1 and Photograph 2 below.


Photograph 1 – Existing site conditions

Photograph 2 – Panoramic view of subject site from George St (Western Boundary)

## 2.2 EXISTING ROAD NETWORK AND HIERARCHY

A schematic representation of the existing road network, including Functional Hierarchy and traffic control on the main intersections, is provided as Figure 4 below. This shows that the site can currently be accessed from all directions and from Larsen Rd, South Western Highway and George St. It should be noted however that there are proposals to change the road network and controls, including relocating (i.e. closing) the Larsen Rd railway level crossing and this will impact on these access routes. Refer **Section 4.2** for more details.


Figure 4 – Functional Hierarchy, traffic control, subject site access points and access routes

The road classifications shown in Figure 4 on the previous page are defined in the Main Roads Functional Road Hierarchy as follows:

**Primary Distributor (South Western Highway)** *(Managed by Main Roads WA)*

These provide for major regional and inter-regional traffic movement and carry large volumes of generally fast-moving traffic. Some are strategic freight routes, and all are State roads.

**Regional Distributor (Soldiers Rd, Nettleton Rd)** *(Managed by Main Roads WA)*

These carry traffic between regional industrial, commercial and urban areas and generally connect to Primary Distributors. These are likely to carry larger volumes of generally fast-moving traffic than Local Distributors and be heavy truck routes.

**District Distributor A (Thomas Rd)** *Managed by Local Government*

These carry traffic between industrial, commercial and residential areas and generally connect to Primary Distributors. These are likely to be truck routes and provide only limited access to adjoining property.

**Local Distributors (Larsen Rd, Walters Rd, Abernethy Rd, Beenyup Rd, Briggs Rd)** *Managed by Local Government*

Carry traffic within a cell and link District/ Regional Distributors at the boundary to access roads. The route of the Local Distributor discourages through traffic so that the cell formed by the grid of Regional/District Distributors only carries traffic belonging to or serving the area. In Built Up Areas, these roads should accommodate buses, but discourage trucks.

**Access Roads** *Managed by Local Government*

Provide access to abutting properties with amenity, safety and aesthetic aspects having priority over the vehicle movement function. In Built Up Areas, these roads are bicycle and pedestrian friendly.

Based on the assessed road hierarchy and access routes, the key roads and intersection, in terms of impact of the proposed development, are Larsen Rd and South Western Hwy and its intersection.

## 2.3 EXISTING RESTRICTED ACCESS VEHICLE NETWORK

South Western Highway is classified as RAV Network 2, 3 and 4 and connects with other roads classified as RAV Network 2, 3 and 4 including Thomas Road to the north. RAV Networks 2, 3 and 4 all permit access by various heavy vehicle combinations up to 27.5m long. Larsen Rd and George St are not part of the RAV Network and hence the largest design vehicle that is permitted to use these roads and access the site, is the 19 m Semi Trailer.

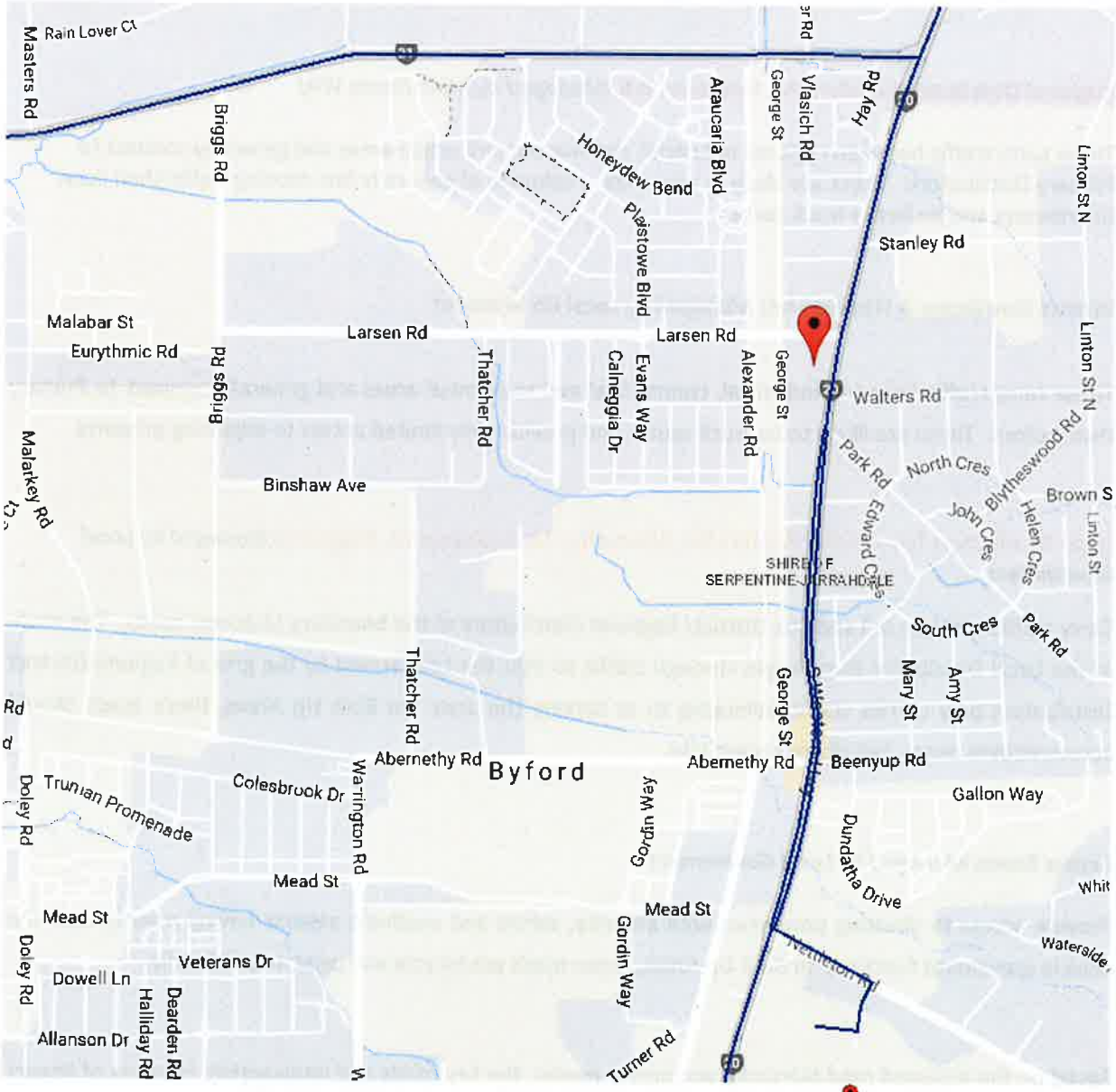



Figure 5 – RAV access routes in vicinity of the subject site ( )

## 2.4 KEY ROADS & INTERSECTIONS

### 2.4.1 South Western Highway

South Western Highway is a major north-south road connecting Byford with Bunbury and Busselton and other areas in the southwest of the state with Perth, via either Albany Highway or Tonkin Hwy.

South Western Highway is designated as National Highway 1 and is located on the eastern boundary of the subject site. It consists of single sealed and kerbed carriageway with one lane in each direction although this changes to a median separated dual carriageway with two lanes in each direction just south of the subject site, i.e. between Park Road and Nettleton Rd. South Western Highway is classified as a "Primary Distributor" road under the Main Roads Functional Hierarchy (3) and is subject to a posted speed limit of 60 km/h and a variable speed limit of 50 km/h between Abernethy Rd and Larsen Rd*. The 50 km/h variable speed limit signs at the northern end are shown in Photograph 3 below. A typical cross section in the vicinity of the subject site is shown in Photograph 4 on the following page, along with the latest available traffic volume data for South Western Highway south of Thomas Rd, i.e. Figure 6 (Mon-Fri) and Figure 7 (Sat). The traffic volumes are taken from SCATS data obtained from the traffic signals at South Western Hwy/ Thomas Rd (TCS 876) as they are more up-to-date than the latest midblock counts undertaken in September 2016 and include weekend data.

There is a short section of cycle path that travels between Larson Rd and Walters Rd that starts on the west (development) side and finishes on the east side via a refuge island as shown in Figure 2 on page 9 and Photograph 4 on the following page.


Photograph 3 – Looking south on South Western Hwy to 50 km/h variable speed limit signs before Larsen Rd

* The 50km/h speed limit operates between 7.30 am and 10 pm seven days a week. The 60 km/h applies outside these hours.

Photograph 4 – Looking south on South Western Hwy south of Larsen Rd (subject site on right)

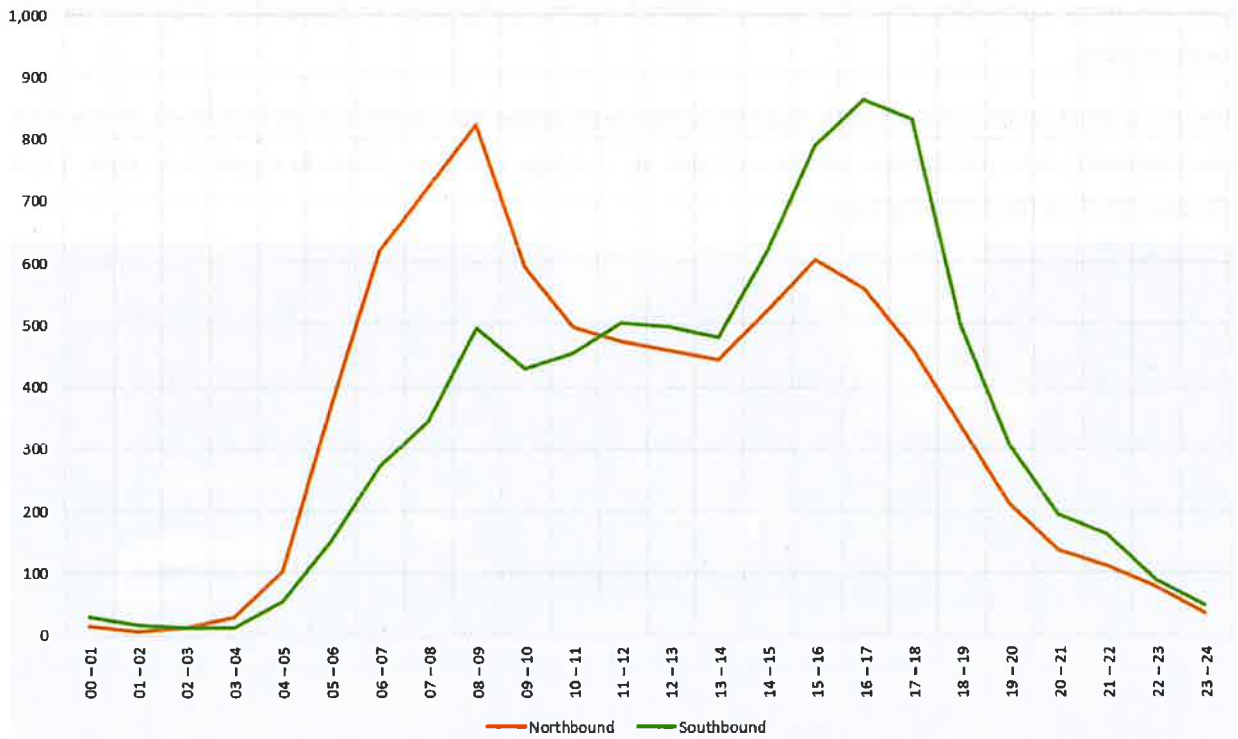



Figure 6 – Mon-Fri hourly traffic volume data for South Western Hwy south of Thomas Rd (March 2018)

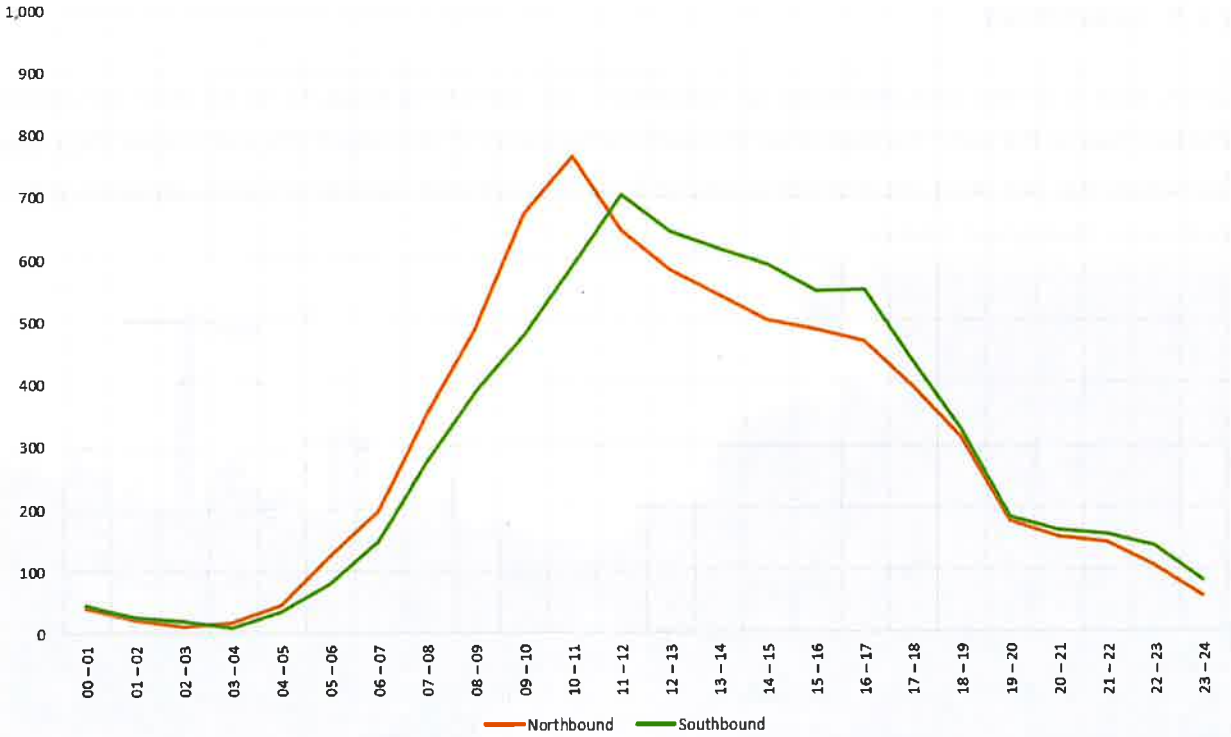



Figure 7 – Saturday hourly traffic volume data for South Western Hwy south of Thomas Rd (March 2018)

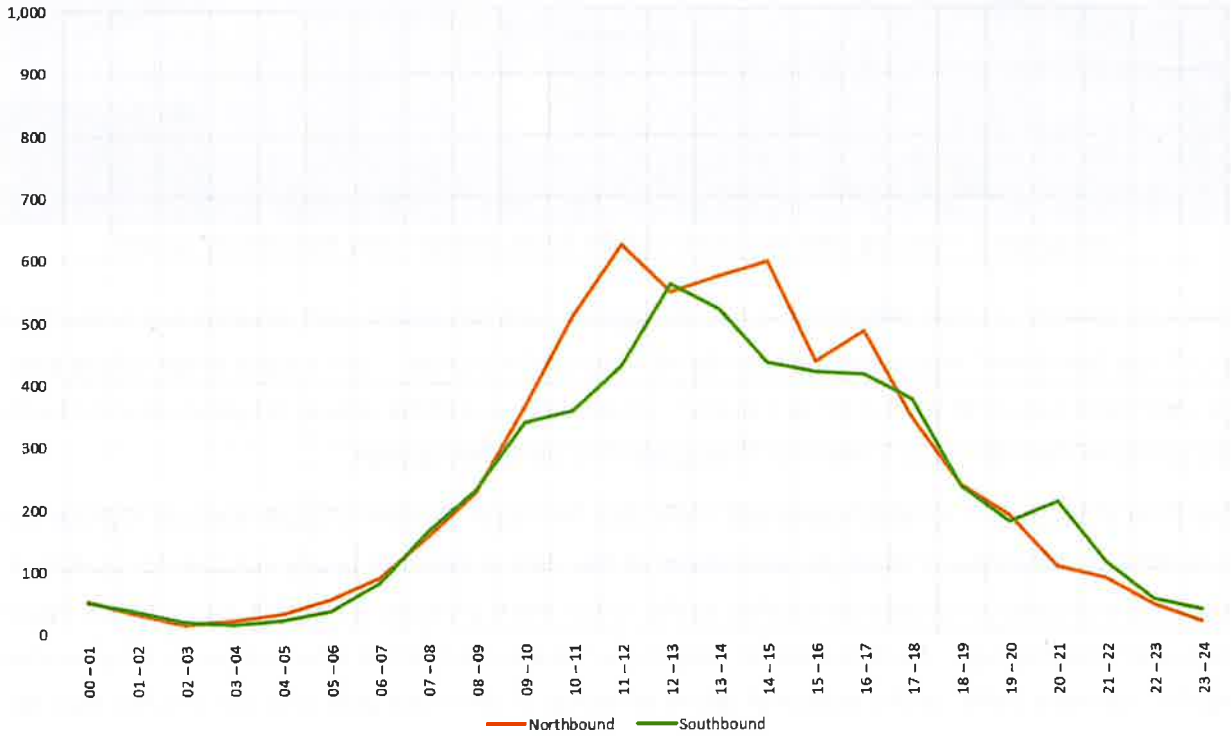



Figure 8 – Sunday hourly traffic volume data for South Western Hwy south of Thomas Rd (March 2018)

Existing midweek PM and Saturday mid-day peak hour turning volumes are included in **Section 2.3**.

Refer **Section 4.3** for proposed changes to South Western Highway.

### 2.4.2 Larsen Road

Larson Road is an east-west distributor (or connector) road connecting Briggs Rd to the west with South Western Hwy to the east. It is located on the northern boundary of the subject site and crosses the single line railway that runs along the west side of George St via an active level crossing with lights and boom gates, as shown in Photograph 5 below.

Photograph 5 – Looking west on Larsen Rd from South Western Hwy (subject site on left)

Larsen Rd consists of single sealed and kerbed carriageway with one lane in each direction and is classified as a "Local Distributor" road under the Main Roads Functional Hierarchy (3). It is subject to the default built-up area speed limit of 50 km/h and has a 40 km/h school zone west of the railway. A typical cross section in the vicinity of the subject site is shown in Photograph 6 on the following page.

The Shire of Serpentine-Jarrahdale provided traffic data for Larsen Rd west of South Western Highway for June 2014 on November 7th2018. An assessment of this data in terms of hourly volumes for weekdays, Saturdays and Sundays has been undertaken by the author and is provided as Figure 9, Figure 10 and Figure 11 on the following page. This data does not support the Shire's view that the school on Larsen Rd generates significantly more traffic on this section of Larsen Rd during its afternoon peak hour (i.e. 3-4 PM) than the adopted road network PM peak hour of 4-5 PM. The 4-5 PM peak hour was selected by the author based on the recorded March 2018 South Western Hwy peak hour.

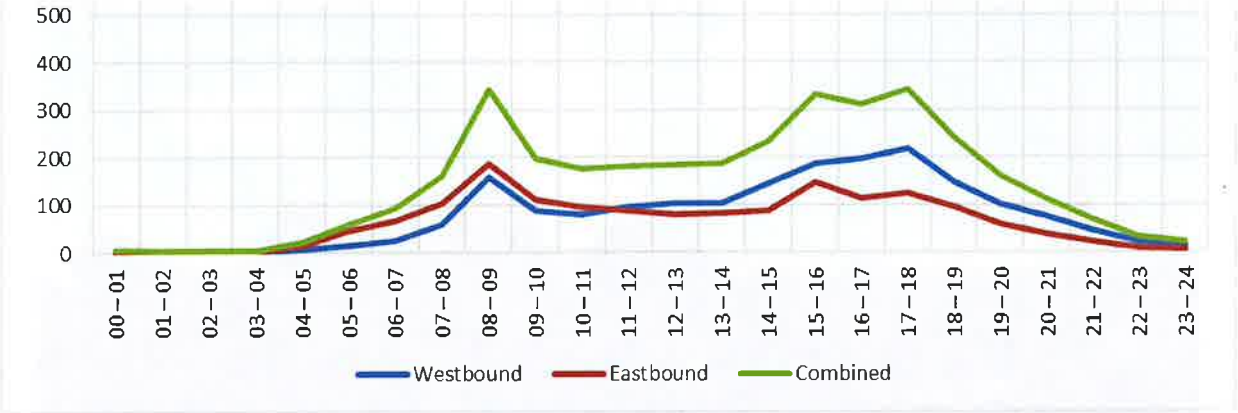



Figure 9 – Larsen Rd west of South Western Hwy Midweek volumes June 2014

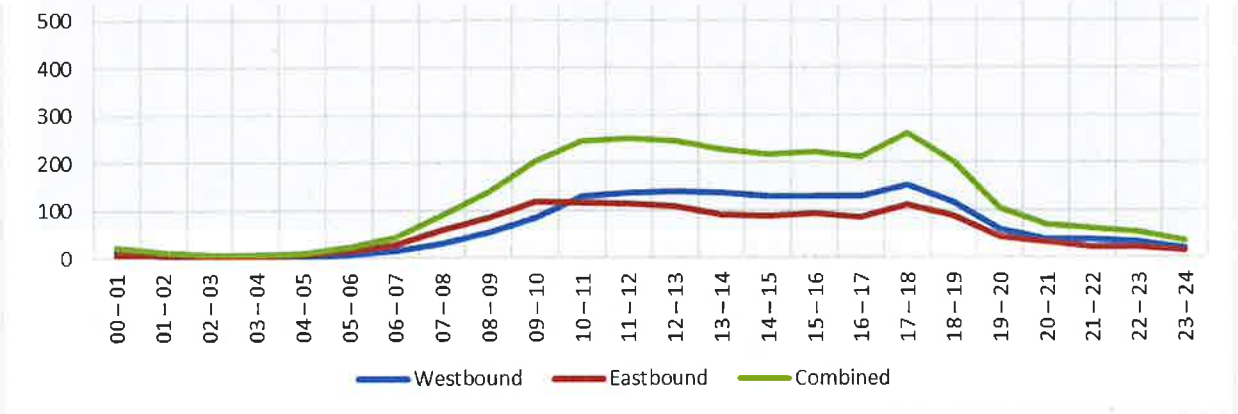



Figure 10 – Larsen Rd west of South Western Hwy Saturday volumes June 2014

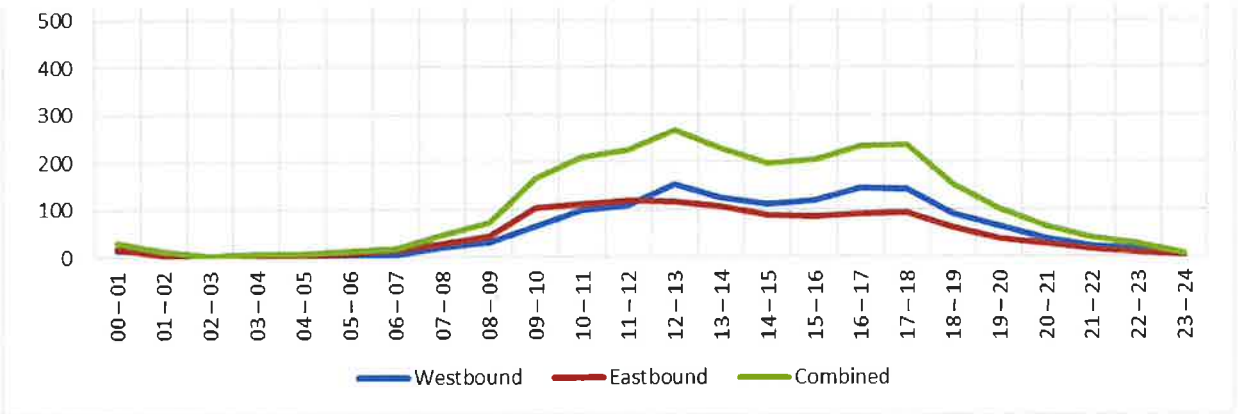



Figure 11 – Larsen Rd west of South Western Hwy Sunday volumes June 2014

More up-to-date (i.e. 2018) midweek PM and Saturday mid-day peak hour volumes are included in **Section 2.5**.

There are no existing or proposed designated cycle paths along Larsen Rd (refer **Section 14**). Cyclist were observed to use the road and the paths on either side.


Photograph 6 – Typical cross section of Larsen Rd

### 2.4.3 George Street

George St is a north-south local access road that currently terminates approximately 250 m south of Larsen Rd and is located on the western boundary of the subject site. It is proposed to construct George St for the full length of its road reserve sometime in the future (refer **Sections 4.2** and **4.4**).

George St consists of a single sealed carriageway for approximately 250 m south of Larsen Rd where it then becomes an unsealed road with pedestrian but not vehicular access to the south. It has a kerb on the east (development) side and is classified as an "Access Road" under the Main Roads Functional Hierarchy (3). It is subject to the default built-up area speed limit of 50 km/h. A typical cross section in the vicinity of the subject site is shown in Photograph 7 below.

Existing midweek PM and Saturday mid-day peak hour volumes (low due to lack of existing development south of Larsen Rd) are shown in **Section 2.3**.

There is an existing cycle path along the east (development) side of George St (refer **Section 14**).

Local Planning Policy No 53: George Street Construction Costs allows for "the contribution of funding for the construction of George Street from Pitman Way to Larsen Road in a coordinated manner by detailing the costs, method of apportionment and method of collecting contributions."

Lot 104 Larsen Road (the subject site) has an indicated percentage of construction cost liability of 10.22% based on a 61.1 m frontage to George St.

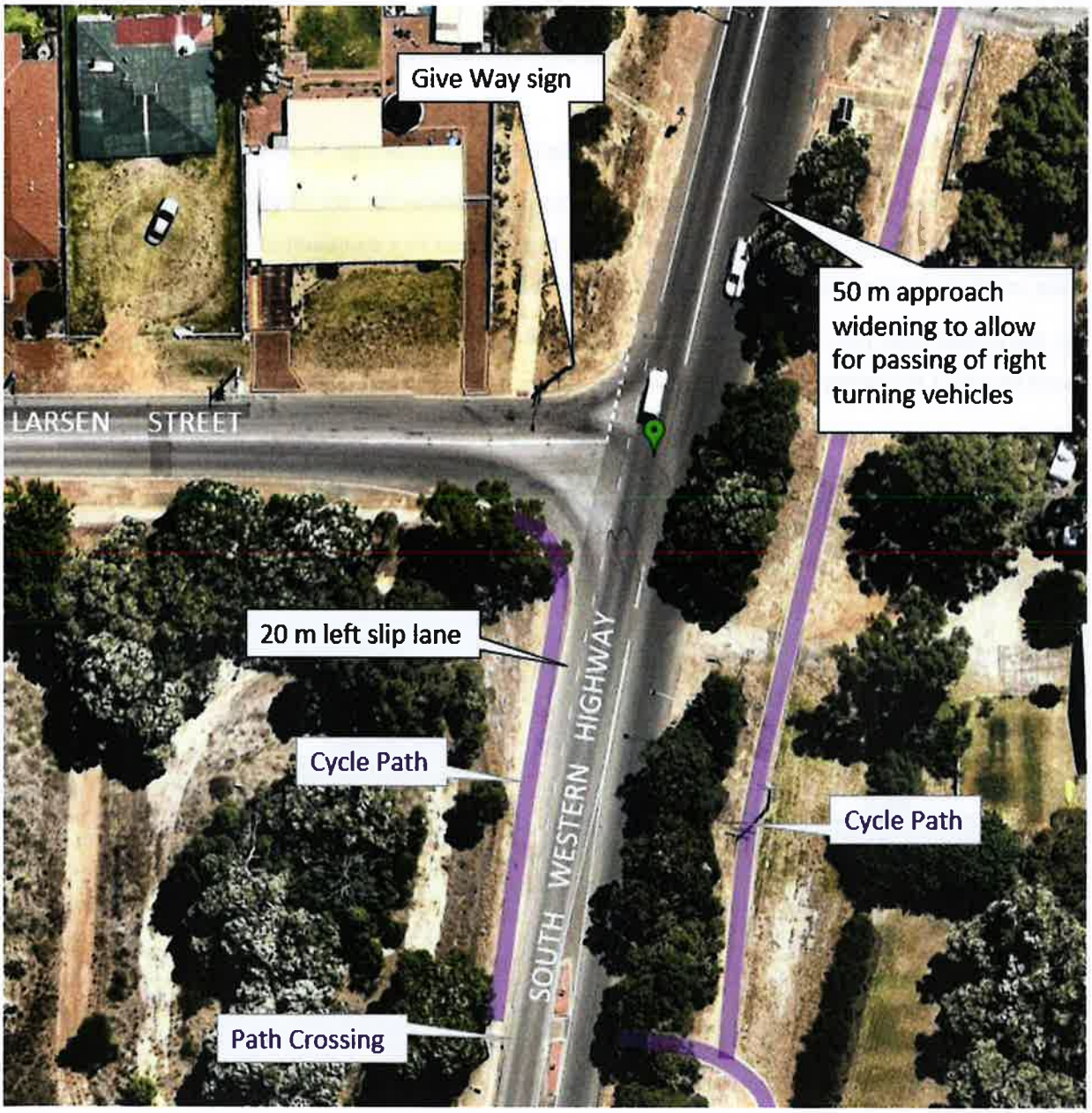
Refer **Section 4.4** for proposed changes to George St.


Photograph 7 – Typical cross section of George St

### 2.4.4 Key intersection 1 (Ki1): Larsen Rd/ South Western Hwy

This intersection has been identified as a Key intersection as the majority of traffic likely to be generated by the proposed development will perform right turn movements at this intersection.

The layout of this Give Way controlled 'T' intersection is best described through the annotated aerial photograph dated 14 February 2018 provided as Photograph 8 below. A street view of the Larsen Rd approach to South Western Hwy is provided as Photograph 9 on the following page. Existing midweek PM and Saturday mid-day peak hour turning and through volumes are included in **Section 2.3**.




Photograph 8 – Layout of Key intersection 1 as at 14 February 2018


Photograph 9 – Larsen Rd approach to South Western Hwy (peak hour conditions)

As shown in Photograph 9 above, drivers currently find it difficult to turn right into South Western Hwy during peak times. This is described and assessed in more detail in **Section 9**.

Refer **Section 4.3** for proposals to upgrade this intersection as part of the South Western Highway upgrade proposal.

### 2.4.5 Secondary intersection 1 (Si1): Larson Rd/ George St

This intersection has been identified as a Secondary intersection as it may experience a high proportion of right turning volumes associated with the development compared to existing volumes.

The layout of this Give Way controlled '4-way' intersection is best described through the annotated aerial photograph dated 14 February 2018 provided as Photograph 10 below. A street view of the railway level crossing is shown in Photograph 5 on page 18. Existing midweek PM and Saturday mid-day peak hour turning and through volumes are included in **Section 2.3**.


Photograph 10 – Layout of Secondary intersection 1 as at 14 February 2018

## 2.5 EXISTING PEAK HOUR TRAFFIC VOLUMES

Peak hour traffic volumes around the site and through the identified Key and Secondary intersections were compiled by the author for a Thursday (4 PM – 5 PM) and a Saturday (11 AM – 12 noon) in March 2018 with adjustments made for the Easter Holiday traffic. The assessment of this data in the draft report indicated that the key intersection of Larsen Rd and South Western Hwy was very sensitive to any increases in right turning traffic and it was therefore determined that further detailed traffic turning surveys for a weekday between 1 and 2 PM and 4 and 5 PM as well as a Saturday between 12 noon and 1 PM in April was warranted. Video surveys were undertaken by i3 on 13th and 14th April 2017 in order to develop the existing (2018) traffic volume diagrams provided as Figure 12 below and Figure 13 and Figure 14 on the following page.

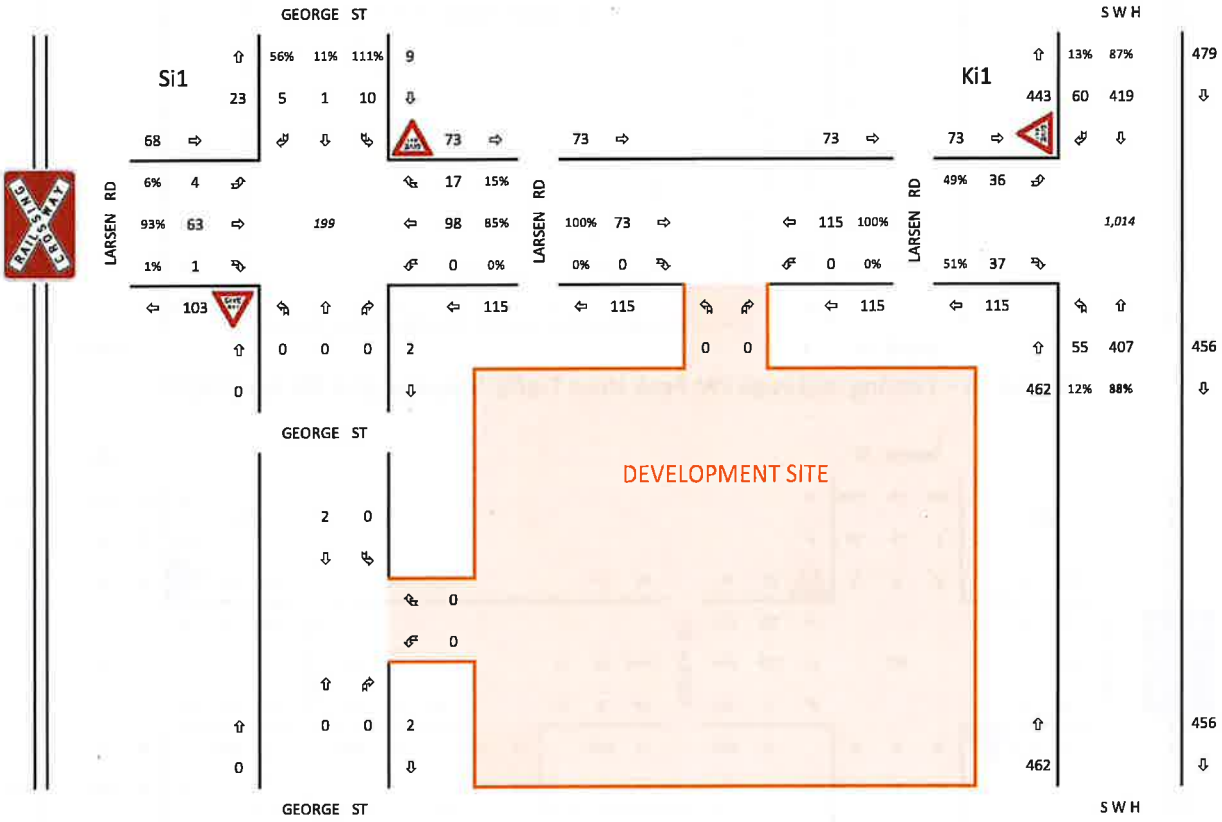



Figure 12 – Existing midweek PM Peak Hour Traffic Volumes (1-2 PM April 2018)

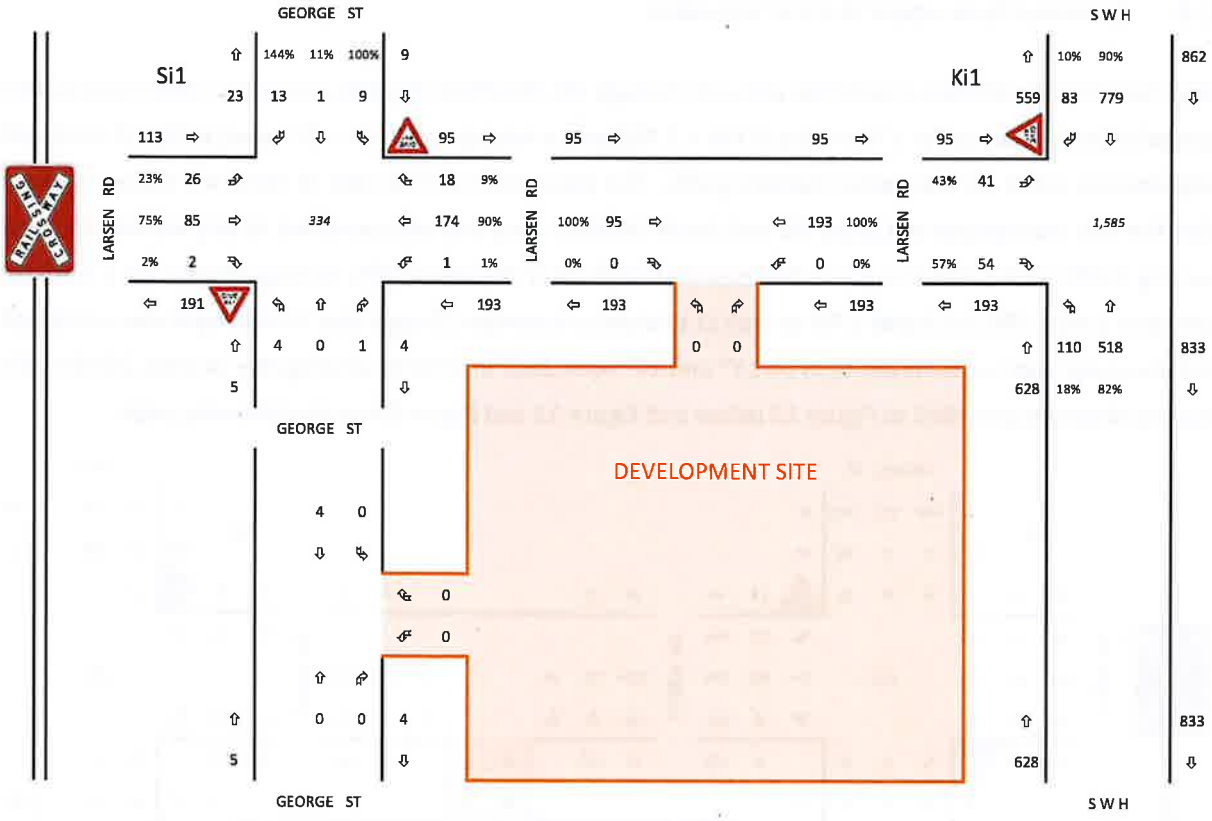



Figure 13 – Existing midweek PM Peak Hour Traffic Volumes (4-5 PM April 2018)

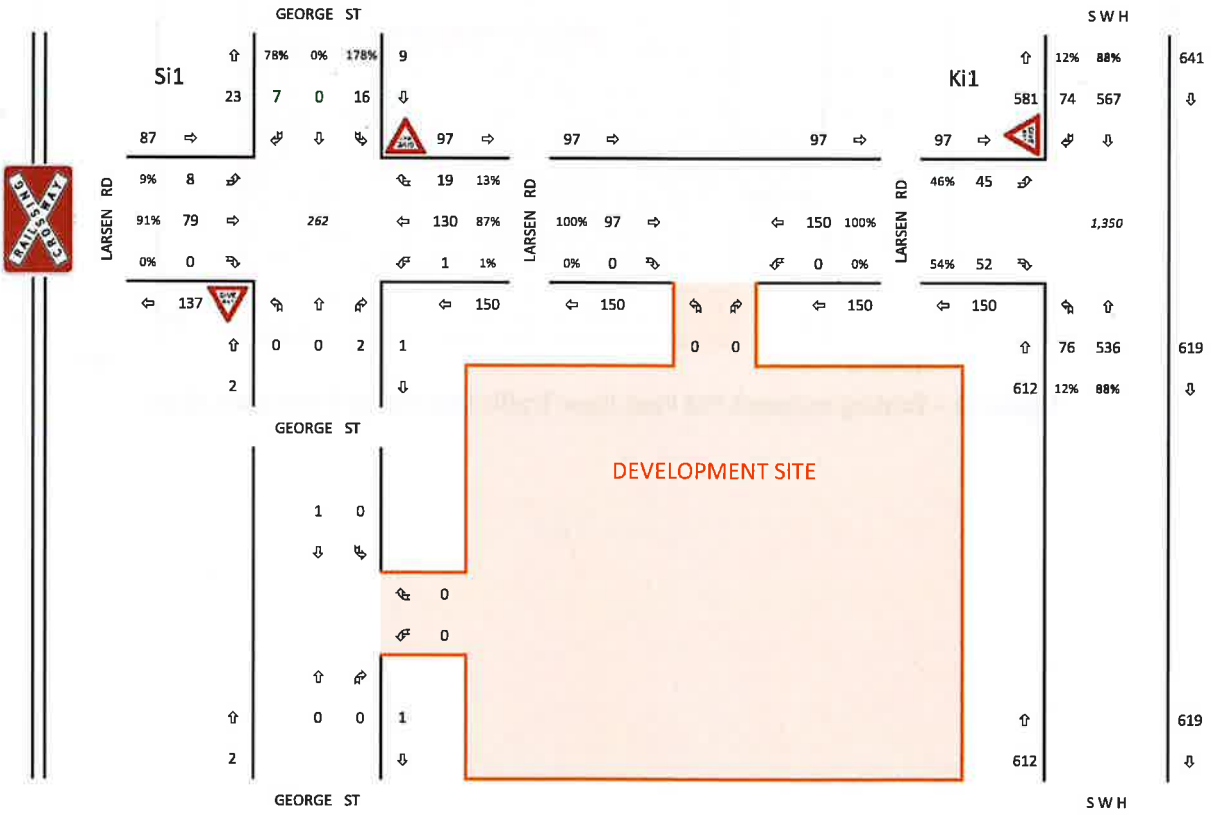



Figure 14 – Existing Saturday mid-day Peak Hour Traffic Volumes (12 noon – 1 PM April 2018)

# 3 DEVELOPMENT PROPOSAL

It is proposed to demolish all existing buildings on site and construct 4 buildings with parking and service areas throughout as shown in Figure 3 on page 10. The site will comprise of 630 $m^2$ Gross Floor Area of Restricted Retail, 400 $m^2$ Gross Floor Area of Vehicle Service Centre, a self-service car wash with 4 manual wash bays and 1 automatic wash bay and an 8 fuel-point service station with a Convenience Store + Drive-Thru Coffee. The car park comprises of 71 standard bays, 3 ACROD bays, 1 waiting bay and 3 loading bays.

The proposed development will not have fuel facilities for large vehicles. As such, the largest vehicles expected to access and egress the site is the 19 m Semi Trailer Fuel Tanker servicing the site at intervals of 2-3 times per week for a maximum duration of 1 hour for each service. The 12.5 m Heavy Rigid Vehicle will be the typical delivery and service vehicle for waste collection and stock deliveries to all tenancies.

It is proposed to provide full vehicular access off Larsen Rd and George St, i.e. no direct access off South Western Highway, in accordance with the agreed Main Roads WA/ Shire of Serpentine-Jarrahdale Access Strategy, as discussed in **Section 4.3**.

# 4 DEVELOPMENT + TRANSPORT PROPOSALS

## 4.1 PROPOSED DEVELOPMENTS

There is a current proposal for a Service Station and takeaway food outlet on Lots 30 & 31 (SN 801 & 803) on the west side of South Western Hwy approximately 250 m south of the subject site, as shown in Figure 15 below.

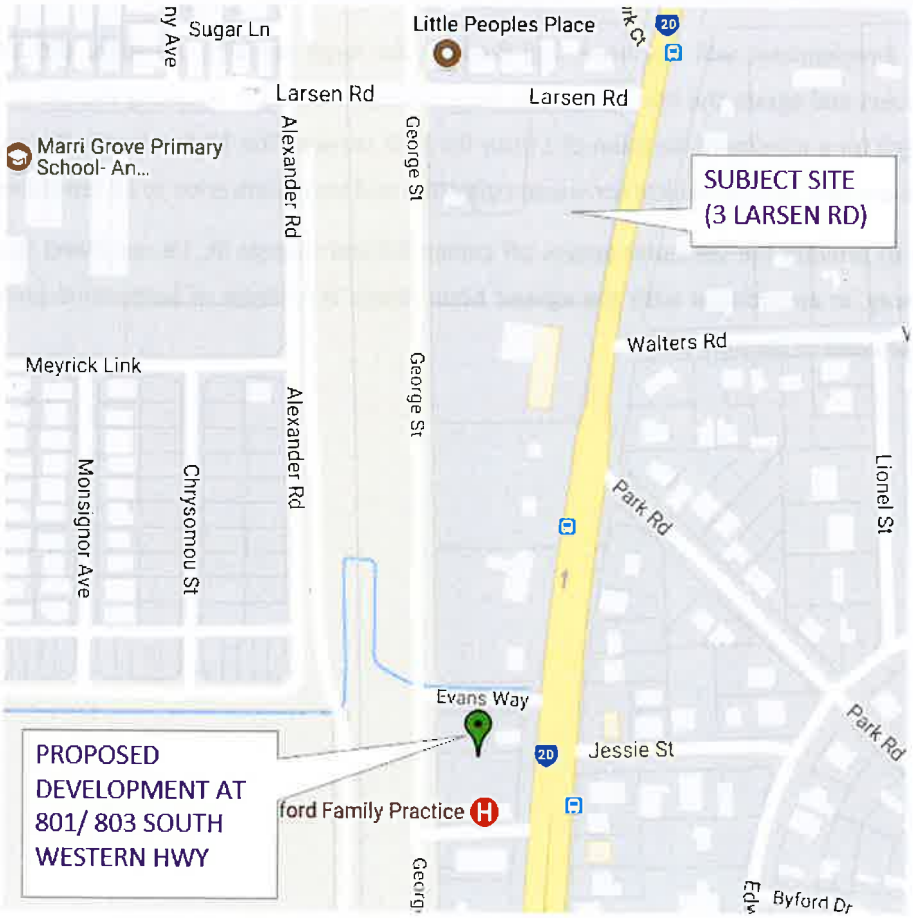



Figure 15 – Proposed development in vicinity of subject site

A Transport Impact Assessment report was prepared by Transcore for this development (Report No t17.170-3). The TIA for the subject site at 3 Larson Rd, i.e. this TIA, considers the cumulative traffic impacts associated with the proposed development at 801 and 803 based on the findings within the Transcore TIA.

An Aldi supermarket is nearing completion at 845 South Western Hwy which is approximately 900 m south of the subject site. Trip generation associated with this has been accommodated by applying 1% per annum growth on George St and Larsen Rd. Increased traffic on South Western Hwy is included in the 1% per annum growth applied to this road.

Refer **Sections 4.2** and **4.3** for details regarding proposed changes to the road network and public transport network respectively.

## 4.2 Proposed Road Network Changes

A review of various planning documents and discussions with the Shire of Serpentine Jarrahdale's planning officer on 9th March 2018 has revealed that there are a number of proposed changes to the road and public transport network that need to be considered as part of this traffic impact assessment report. A summary of these changes has been prepared by the author and is provided as Figure 16 below. In addition to the network changes, there are proposals to upgrade South Western Hwy north of Park Rd, including upgrading the Larsen Rd intersection and proposals to upgrade George St. Refer **Sections 4.3** and **4.4** respectively for more details.


Figure 16 – Summary of road and public transport network proposals in vicinity of the subject site

It is important to note that all of the above are subject to approval and change and that there are no firm dates for implementation. The biggest impact on the subject site is considered to be the proposal to relocate the railway level crossing on Larsen Rd further south, which will necessitate the full construction of George St as well as the closure of Larsen Rd on both sides of the railway, effectively changing the existing 4-way intersection with Larsen Rd as the through road (Si1) to a 'T' intersection with George St as the through road.

## 4.3 SOUTH WESTERN HIGHWAY UPGRADE PROPOSAL

Main Roads WA has an agreed Vehicle Access Strategy for South Western Highway with the Shire of Serpentine-Jarrahdale, as confirmed in its formal submission to Local Planning Policy No 31 (LPP 31) – Byford Town Centre – Built Form Guidelines. This Access Strategy articulates that "no vehicle access is available from South Western Highway where there is an alternate access point."

The proponent has held extensive discussions with Main Roads WA officers which resulted in altering the initial design to remove all direct vehicular access off South Western Highway, as per the Development Drawings included in **Appendix A**. The proponent has secured support for the development subject to upgrading the intersection at Larsen Rd consistent with the conceptual layout shown on the Main Roads WA Access Strategy drawings as shown in the extract provided as Figure 17. The Development Drawings in **Appendix A** show the same outlines in red. The formal MRWA approval conditions are reproduced on the following page.


Figure 17 – Extract from Main Roads WA South Western Highway Access Strategy drawing

Main Roads WA Approval Conditions (sourced from Metro East JDAP Agenda 17 October 2018)

"Main Roads advises that it has no objection subject to the following conditions being imposed:

1. Redundant crossover on South Western Highway shall be removed and the verge reinstated at the applicant's cost. The applicant is to advise Main Roads when this has been completed.
2. Modifications to South Western Highway must be in accordance with Main Roads Supplement to Austroads Guide to Road Design - Part 4 and Part 4A dated 18 September 2018 and consistent with future widening to South Western Highway as depicted on Main Roads Plan 2012-0002 dated approved 4 April 2012 and overlayed on Draft Master Plan Revision P3 dated 22 August 2018 (both attached). In particular:
    a. Left and right turn auxiliary lanes from South Western Highway onto Larsen Road, as depicted on Drawing No. TP03.1 Revision dated 14 September 2018 (reproduced as Figure 18 on the following page) must be designed in accordance with Main Roads Supplement to Austroads - Part 4, Section 5 and Appendix A.6 Auxiliary Lane Turn Treatments.
    b. The median on Larsen Road, as depicted on Drawing No. TP03.1 Revision dated 14 September 2018 (attached) must be as per Main Road Supplement to Austroads - Part 4A, Section 6.

Advertising Signage

3. The type of signs, size, content and location must comply with all relevant by-laws and planning schemes made by Council.
4. The signs and sign structures are to be placed on private property and shall not over hang or encroach upon the road reserve.
5. For the signs that are illuminated, it must be of a low-level not exceeding 300cd/m2, not flash, pulsate or chase.
6. The device shall not contain fluorescent, reflective or retro reflective colours or materials.

**In accordance with the above conditions, the proponent has confirmed that these conditions will be met during the detailed design stage and in discussion with Main Roads WA. This TIA includes assessment of the development with the intersection upgraded in accordance with the above stated conditions.**

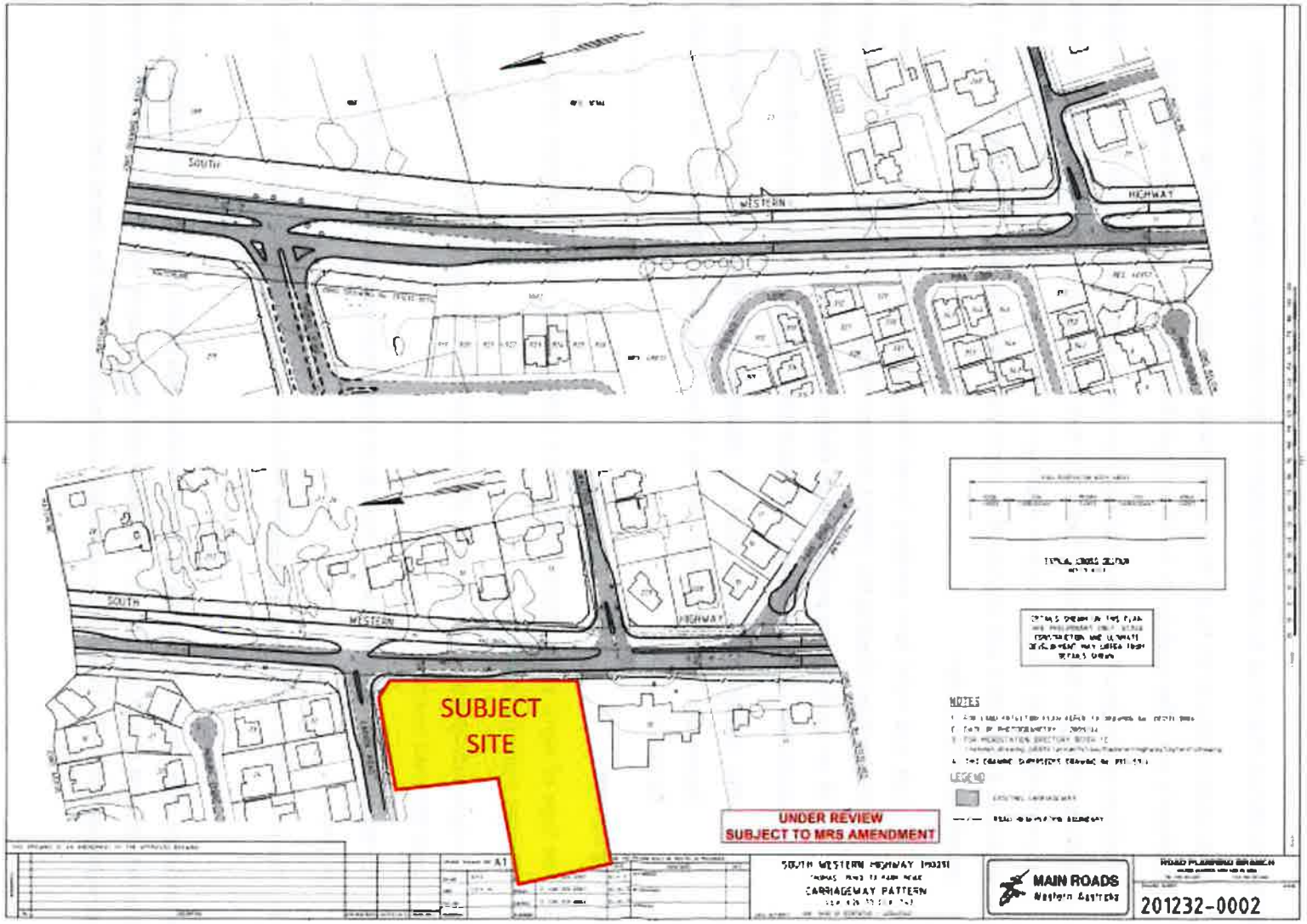



Figure 18 – Main Roads WA Drawing No. TP03.1 Revision dated 14 September 2018 (with 'Subject Site' overlaid)

DEVELOPMENT ASSESSMENT PANEL
APPROVED
11-Dec-2018

## 4.4 GEORGE STREET UPGRADE PROPOSAL

The Shire of Serpentine-Jarrahdale has advised, in an email dated 25 October 2018, that:

"George Street is planned to be the high street in Byford by the shire. Main roads recent access policy has been to discourage direct access to the highway and to favour access off George Street. Whilst George St is not line marked the shire does not consider it safe to have service vehicles sweeping across the total George street pavement when entering and exiting the development. George St is intended to be passenger vehicle and pedestrian in nature. Service Vehicles entering and exiting the development should be lane compliant when making turning manoeuvres on George St."

The above statement is not consistent with providing the required access for the adopted design vehicles as there are many properties between South Western Highway and George St that only have frontages to these streets. Main Roads WA has indicated that the Shire has agreed to restricting access off South Western Hwy which in turn requires that the majority of properties between George St and South Western Hwy will only have vehicular access off George Street. Many of these properties are zoned commercial and have a requirement for servicing by heavy vehicles up to the standard 19 m semi-trailer. To require that commercial vehicular access is provided off George St is not consistent with the statement that "George St is intended to be passenger vehicle and pedestrian in nature". It will be regularly used by commercial vehicles and requires to be designed in accordance with this function. The alternative is to provide commercial vehicular access off South Western Highway.

The Shire's statement that it "does not consider it safe to have service vehicles sweeping across the total George street pavement when entering and exiting the development" and that "Service Vehicles entering and exiting the development should be lane compliant when making turning manoeuvres on George St." is not consistent with currently approved developments along George St, as shown in Photograph 11 on the following page.

The practice of allowing service vehicles to enter and leave access driveways within the boundaries of the roadway, i.e. kerb lines, is permitted in Section 3.4.1(a) of Australian Standard AS 2890.2 (4), i.e.:

"On a minor public road, vehicles shall be able to enter and leave the access driveway without infringing the boundaries of the roadway. Local authorities may place further limits and controls on the extent to which movement across the centre-line of the roadway is allowed."

Refer further comment and assessment regarding the access to and from the site in **Section 15**.


Photograph 11 – Recently approved Aldi service area off George Street showing swept path of 19 m ST leaving the site and turning left or right into George St

## 4.5 PROPOSED PUBLIC TRANSPORT NETWORK

Planning work is underway to extend the Armadale Line approximately eight kilometres south to Byford.

This early planning and research takes into account a range of considerations, such as station location, precinct development opportunities, connections, constructability and community impact.

The METRONET Office is working closely with the Shire of Serpentine-Jarrahdale on developing a number of viable options for a transport solution which provides opportunities for urban development, however at this point there is no confirmed or preferred location for the station.

The intent of thorough planning is to identify the best location and alignment of the extension so that it supports plans for growth in the area, as well as creating an employment hub and boosting residential development.

Details on the construction method and timeframe will be developed during the planning phase. It is estimated the project business case and Project Definition Plan will be completed in late 2018.

The rail proposals are driven by population numbers, as shown in the following extract from the Perth and Peel @ 3.5 Million and Beyond publication.


Figure 19 – Public Transport Rail Network @3.5 Million and Beyond (showing Byford as No 5)

# 5 INTEGRATION WITH SURROUNDING AREA

Figure 2 on page 9, Figure 4 on page 12 and Figure 5 on page 14 all indicate that the proposed development is well connected to public transport, freight, cycling and walking facilities.

The provision of services such as the Service Station, Convenience Store, Drive-Thru Coffee, Car Wash, Vehicle Service Store and Retail are likely to be well patronised by passing traffic on South Western Highway (up to 70%) which in turn will reduce the overall impact of the development in terms of increased traffic volumes.

Byford is a town within the Shire of Serpentine-Jarrahdale community halls, two state schools, clubs, sporting oval, trotting complex, a range of shops and businesses, a flour mill, and farms in the surrounding rural areas.

In 1977, the local government responsibilities for Byford were transferred from the Shire of Armadale-Kelmscott (now the City of Armadale) to the Shire of Serpentine-Jarrahdale. Recently, Byford has become an extension of the Perth metropolitan area, connected to the Kwinana Freeway by Thomas Road, and has experienced a substantial rise in population. Historically, Byford's rural land supported sheep, beef and dairy cattle, orchards, and a vineyard (Sunrays, owned by the Vlasich family) but in recent decades there has been an increase in hobby farms geared to equine pursuits, and more recently housing estates with generous lot sizes.

# 6 ASSESSMENT YEARS AND TIME PERIODS

The WAPC Transport Impact Assessment Guidelines recommends that the appropriate assessment years include the year of opening of the development and 10 years after opening.

The subject site is expected to be fully developed and operational by 2020 and hence it is reasonable to adopt a 2020 'Operating Year' and 2030 'Horizon Year' (10 years later).

A review of historical traffic volume data for South Western Highway (Figure 20 below) has indicated that a Compound Annual Traffic Growth Rate (CATGR) of 1% is appropriate for this road up to the 'Horizon Year' of 2030 although there is a possibility of a reduction in this growth rate due to the provision of the Metronet rail extension to Byford, including a new train station (refer **Section 4.3**).

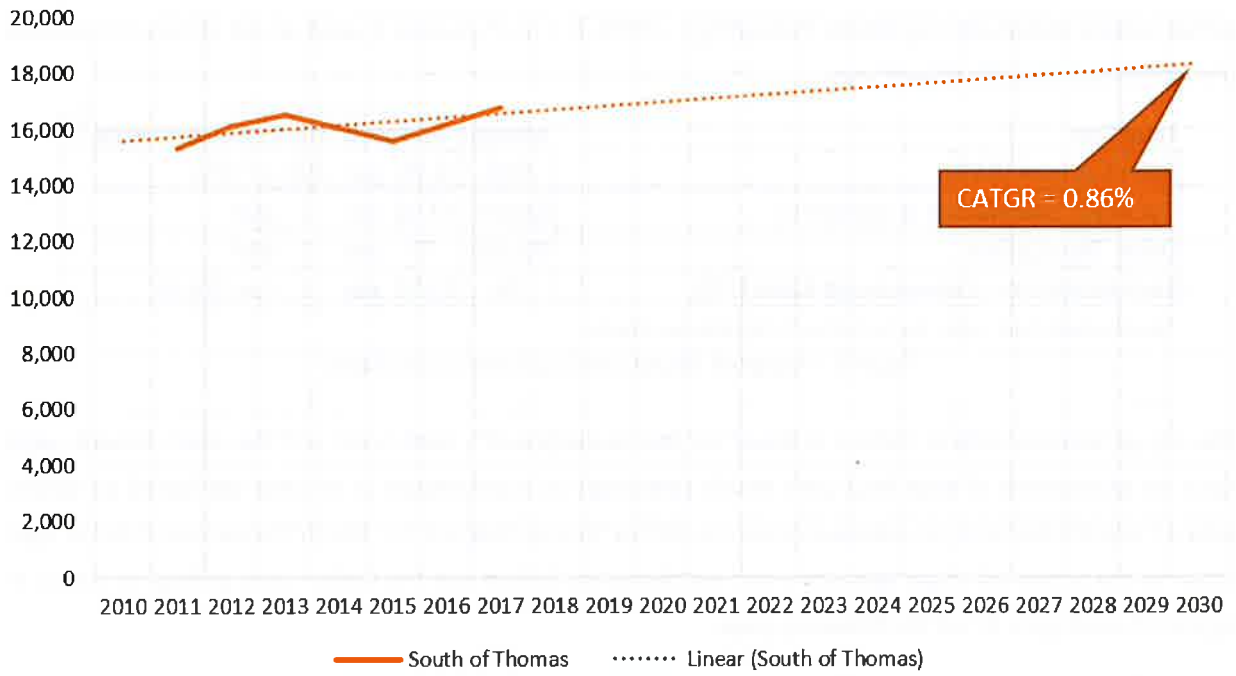



Figure 20 – Existing and forecast Annual Daily Traffic volumes on South Western Hwy past the subject site

Note that the above determination considers that South Western Hwy remains as a single lane in each direction mid-block and hence traffic volumes are constrained to around 20,000 vehicles per day (or 1,000 vehicles per lane per hour).

# 7 DEVELOPMENT GENERATION AND DISTRIBUTION

It is not considered appropriate to use standard trip generation rates for each element within developments with different land uses and then add these up as there can be significant differences in each land use's peak traffic generation times and days as well as a high likelihood of 'shared trips', i.e. a single trip to or from two or more different land uses.

Trip generation data for each of the proposed land uses, including source notes, are shown in Table 2 below. RMS refers to updated data to the Roads and Traffic Authority NSW document Guide to Traffic Generating Developments provided by the RTA's subsequent authority, i.e.: Roads and Maritime Services Guide to Traffic Generating Developments' Updated traffic surveys (4). ITE refers to the Institution of Transport Engineers (USA) (5) and SpackC refers to Spack Consulting, an open source trip generation service based on ITE and additional traffic surveys and data. Bitzios refers to a comprehensive trip generation study of 10 drive-thru coffee outlets undertaken by Bitzios Consulting in 2016. A mix of sources is used as not all sources contain trip generation data for all land uses.

| Land Use | Source | Adopted Trip Generation Rate* |
|---|---|---|
| Business Park (RMS) | RMS | 0.78 per 100 $m^2$ GFA |
| Car Wash (standalone automated) | SpackC | 17.00 per 1 stall |
| Drive-Thru Coffee | Bitzios | 70 per 1 site |
| Service Station + Convenience Store (ITE) | ITE | 13.51 per 1 Fuel Point |

*Development Peak - Refer Hourly Profiles for Road Network Peaks

Table 2 – Adopted Mixed Use Trip Generation Rates

The trip generation data in Table 2 is based on the development's peak hour, not the road network peak hour. An assessment of each land use's hourly patronage as a percentage of its peak use based on survey data of local similar land use developments (i.e. Caltex Service Station/ Car Wash/ Convenience store/ Tyre Store on the corner of South Western Hwy/ Nettleton Rd, Byford and the Coffee Club, Byford) is shown in Figure 21 and Figure 22 on the following page.

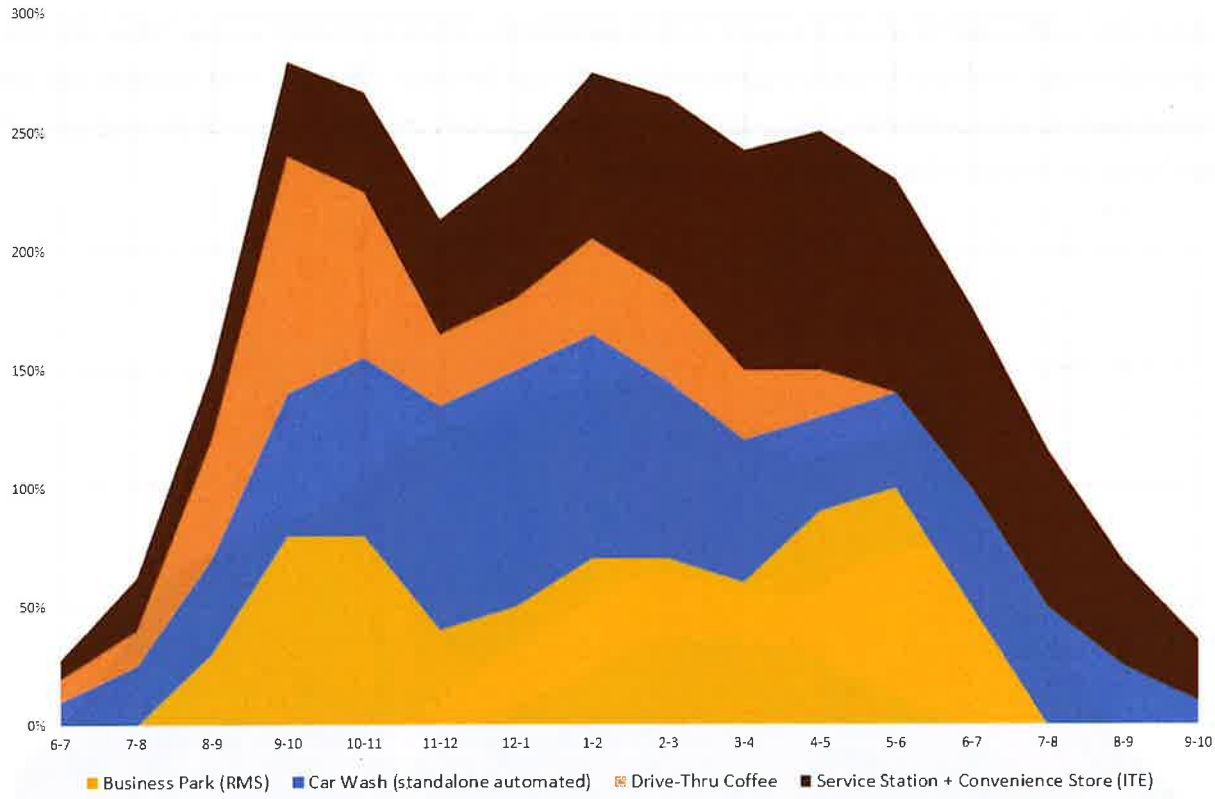



Figure 21 – Assessed weekday mixed-use development cumulative hourly trip generation profile

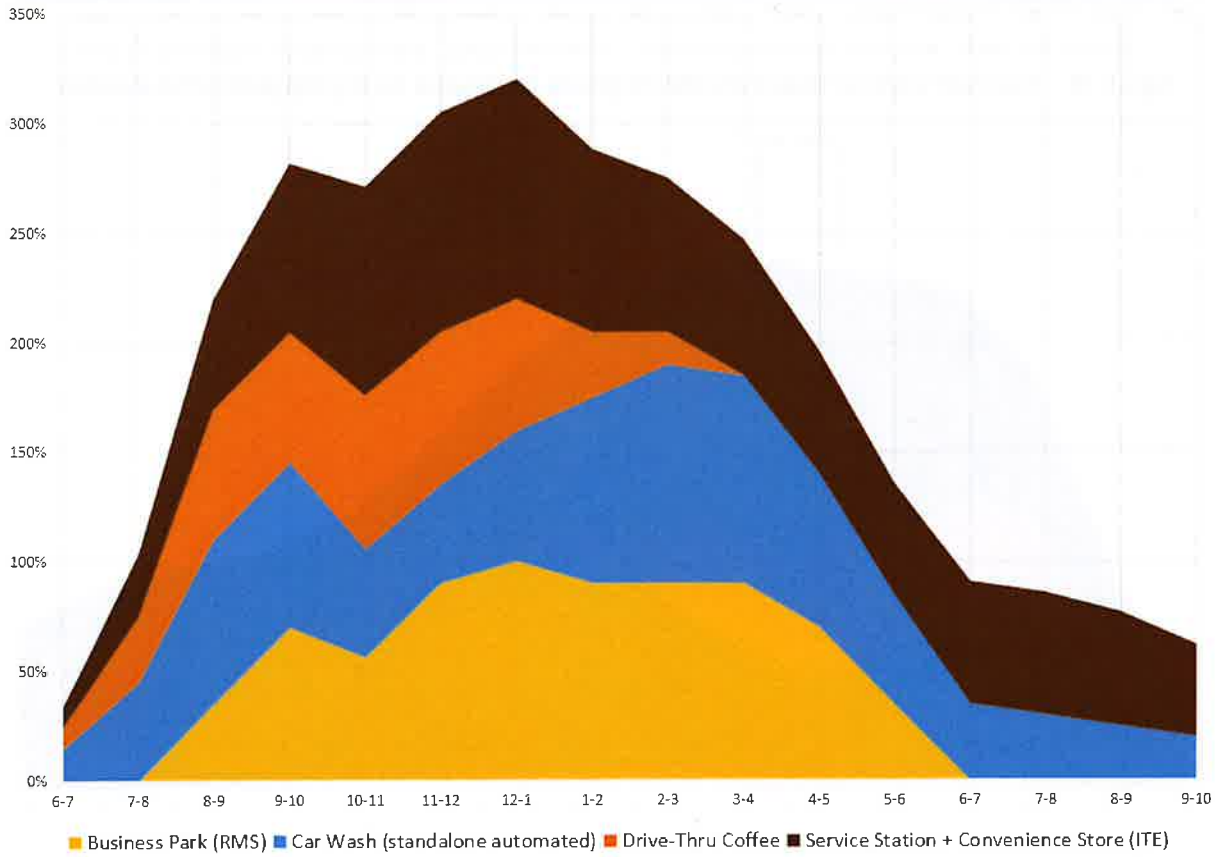



Figure 22 – Assessed Saturday mixed-use development cumulative hourly trip generation profile

Applying the profiles on the previous page to the trip generation indicated in Table 2 on page 38 results in an assessed forecast maximum hourly trip generation of **190** trips between 1 PM and 2 PM midweek and **209** trips between 12 noon and 1 PM on Saturdays. Full hourly assessment volumes, along with the road network peak hours, are shown in Figure 23 and Figure 24 below.

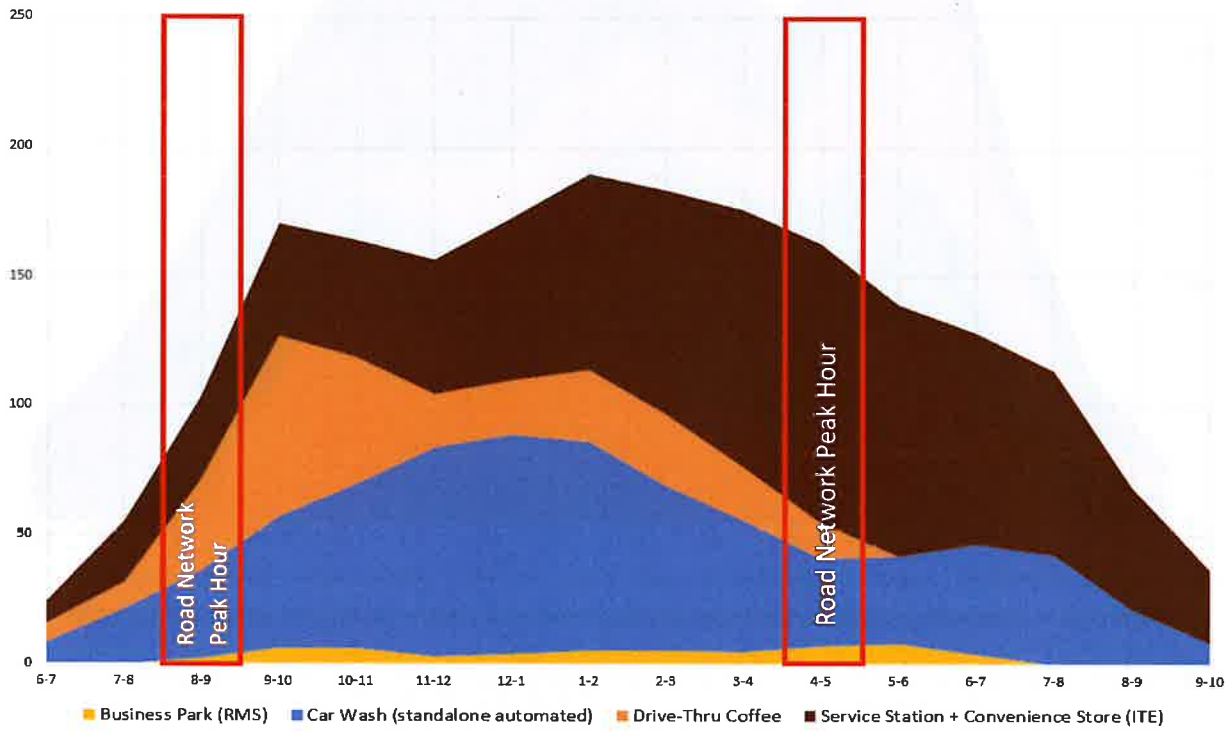



Figure 23 – Assessed weekday mixed-use development cumulative hourly trip generation volumes

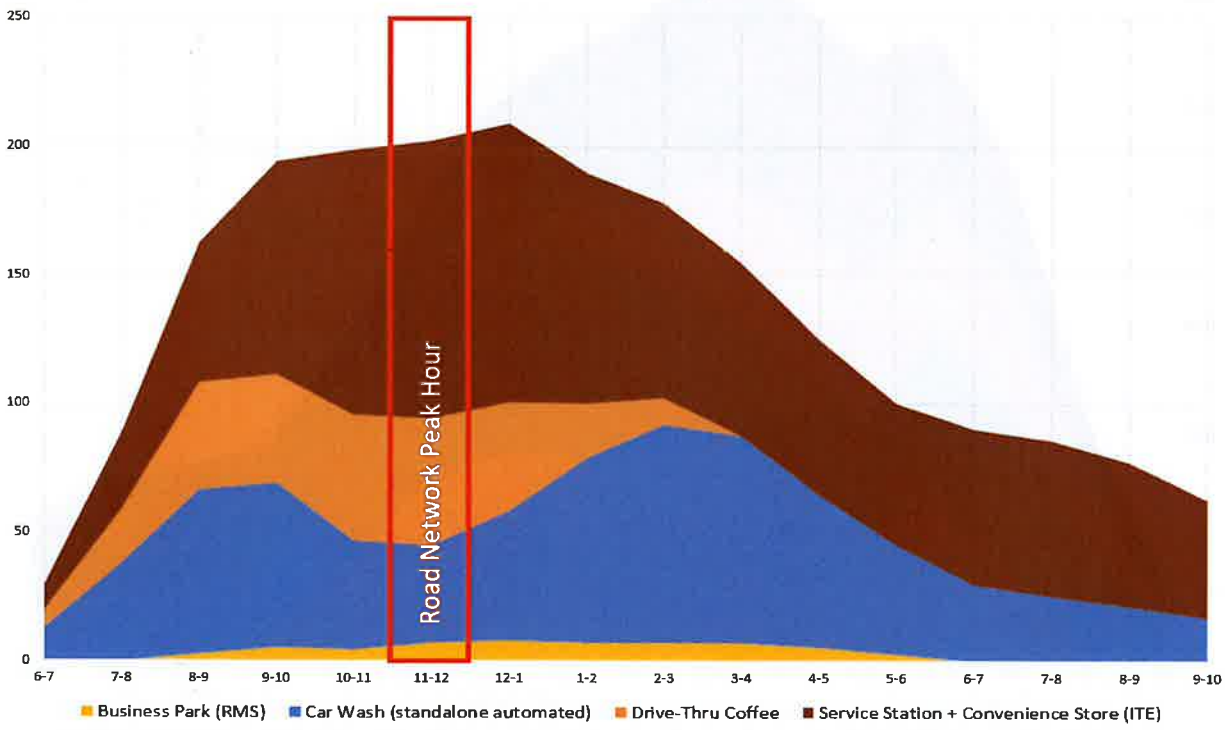



Figure 24 – Assessed weekend mixed-use development cumulative hourly trip generation volumes

In order to add value to the forecast data, the author undertook detailed surveys of traffic into and out of the existing Caltex Service St/ Convenience Store/ Car Wash and Tyre Outlet/ Repair Centre with additional commercial tenancies on the corner of South Western Hwy and Nettleton Rd which is located approximately 1.5 kms south of the subject site, as shown in Photograph 12 below.


Photograph 12 – Existing similar development on South Western Hwy 1.5 km south of subject site

A survey of all traffic in and out of this development site (including the car wash at the rear and the adjacent tyre shop) between 2 PM and 3 PM on Saturday 14th April indicated that 61 vehicles entered the site and 65 vehicles left the site during this time, a total of 126 vehicles. Using the adopted trip generation rates and hourly profiles in this TIA report, the forecast trip generation (minus the drive-thru coffee land use) would be 167 trips. On this basis, the adopted rates are a conservative estimate and hence appropriate.

# 8 DESIGN TRAFFIC FLOWS

The assessment in **Section 7** has indicated that the midweek development and road network peak hours are separated by 2-3 hours and have significantly different volumes. The Saturday development and road network peak hours are only an hour apart. Based on this it is considered appropriate to model and assess the following three peak hours:

- Midweek 1 PM- 2 PM (Development peak hour);
- Midweek 4 PM- 5 PM (Road Network peak hour); and
- Saturday 12 noon – 1 PM (Combined Development and Road Network maximum volumes).

The assessed trip generation, distribution (IN/ OUT split) and assignment for each of these peak hours is shown in Figure 25 below, and Figure 26 and Figure 27 on the following page.

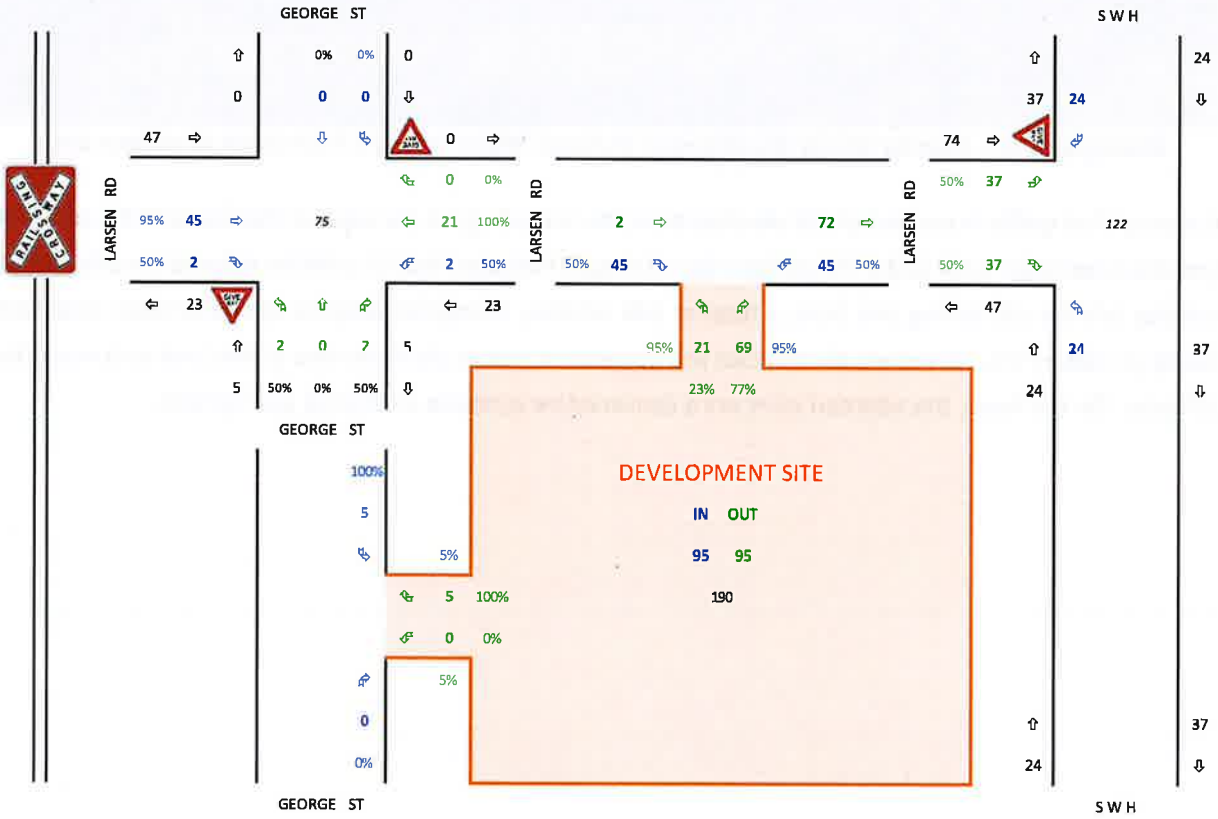



Figure 25 – Forecast 1 PM – 2 PM midweek Trip Generation, Distribution and Assignment

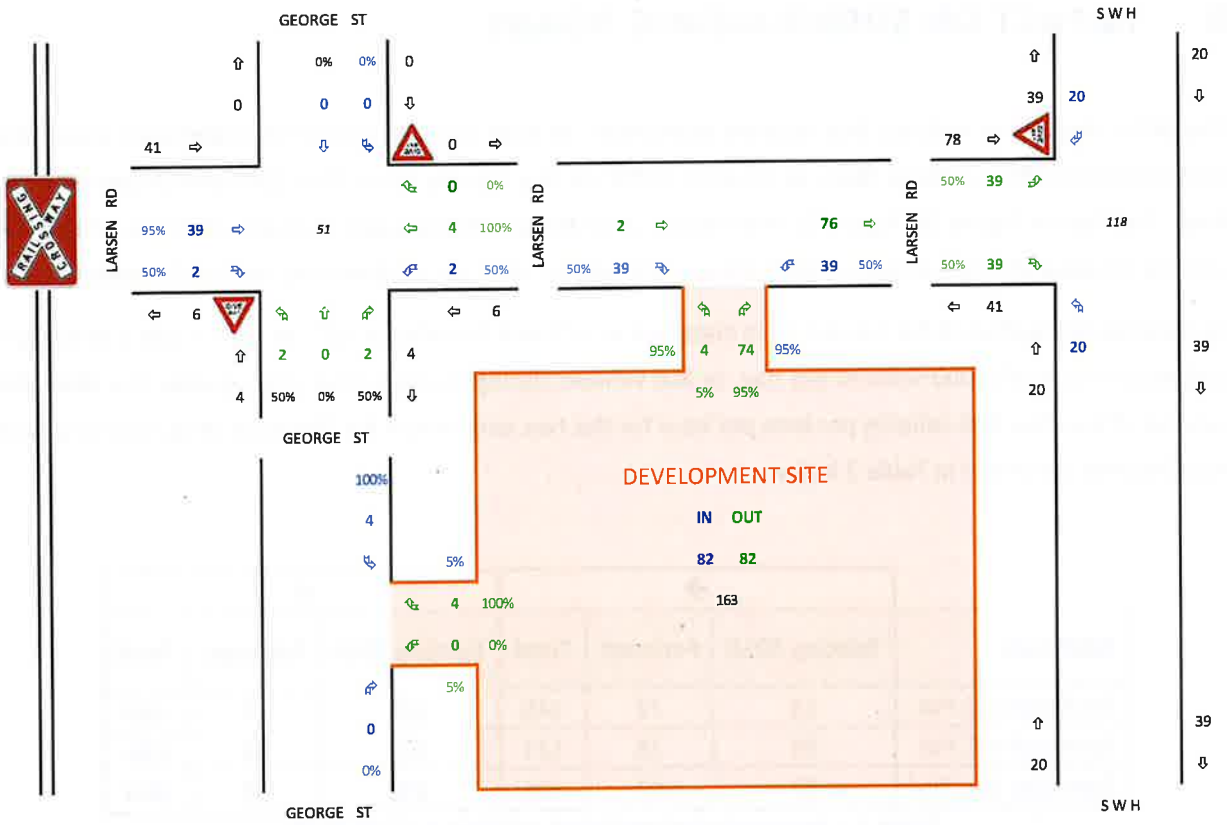



Figure 26 – Forecast 4 PM – 5 PM midweek Trip Generation, Distribution and Assignment

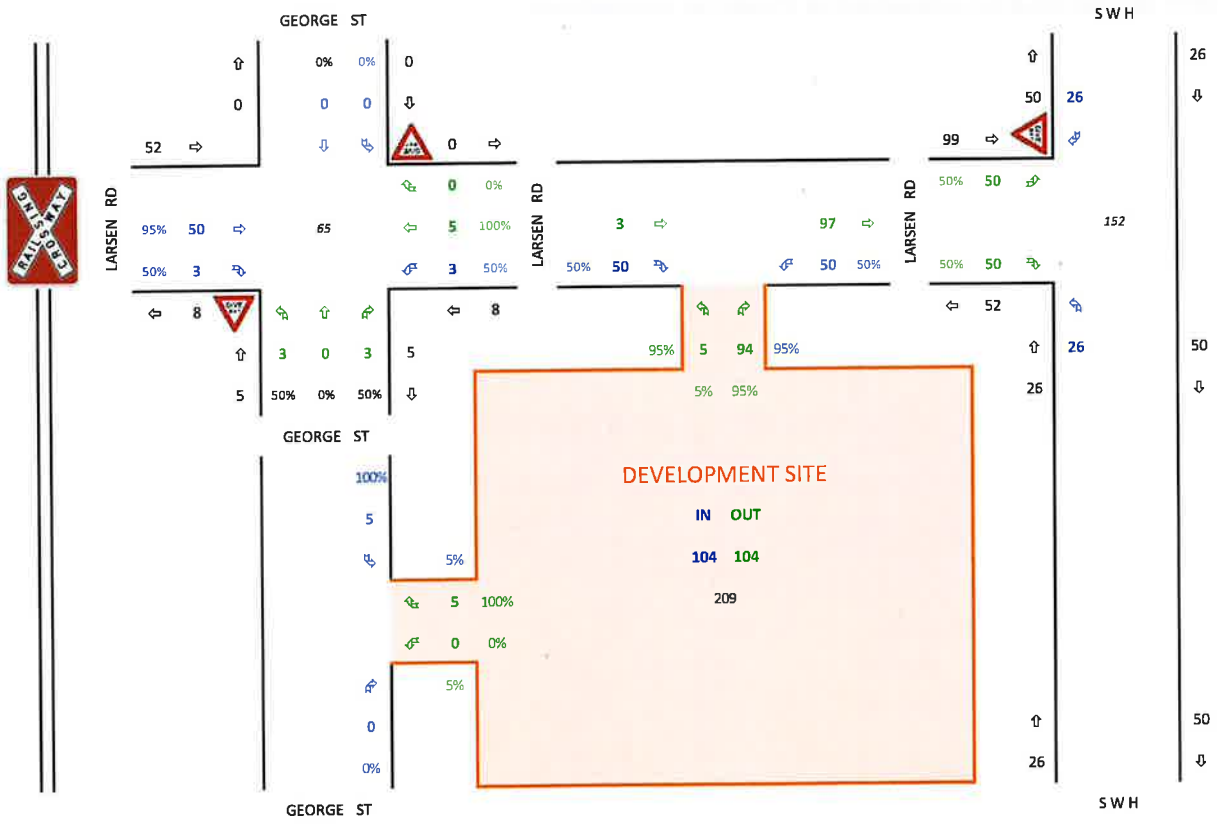



Figure 27 – Forecast 12 noon 1 PM Saturday Trip Generation, Distribution and Assignment

# 9 IMPACT ON SURROUNDING ROADS

The WAPC Guidelines indicate that detailed assessment of road sections should be undertaken where the development traffic would be likely to increase traffic on any lane by more than 100 vehicles per lane per hour. The data in Figure 25, Figure 26 and Figure 27 on the preceding pages indicates that this will be the case for eastbound traffic on Larsen Rd between the subject site's access driveway and South Western Hwy.

As indicated in **Section 2.2.2**, Larsen Rd is classified as a "Local Distributor Rd", as such it has a maximum desirable volume of 6,000 vehicles per day, or 600 vehicles during its peak hour. This equates to a desirable volume of less than 300 vehicles per lane per hour for the two-lane Larsen Rd. The total peak hour volume is less than this, as shown in Table 3 below.

| | → | | | ← | | |
|---|---|---|---|---|---|---|
| **Midblock** | **Existing 2018** | **Forecast** | **Total** | **Existing 2018** | **Forecast** | **Total** |
| Midweek 1-2 PM | 73 | 72 | 145 | 115 | 45 | 160 |
| Midweek 4-5 PM | 95 | 76 | 171 | 193 | 39 | 232 |
| Saturday 12-1 PM | 97 | 97 | 194 | 150 | 50 | 200 |

Table 3 – Assessed total mid-block volumes on Larsen Rd

Refer **Section 10.2** for assessment of impact on intersections.

# 10 IMPACT ON INTERSECTIONS

## 10.1 ASSESSED INTERSECTIONS AND TIMES

The WAPC Guidelines recommend that all intersections where flows are likely to increase by 10% should be assessed in detail. An assessment of increased flows through both of the assessed intersections has been undertaken and is shown in Table 4 and Table 5 below.

| Ki1 | Midweek | | Saturday |
|---|---|---|---|
| | 1 PM - 2 PM | 4 PM - 5 PM | 12 noon - 1 PM |
| Existing | 1,014 | 1,585 | 1,350 |
| Additional | 122 | 118 | 152 |
| Impact | 12.0% | 7.5% | 11.2% |

Table 4 – Assessed volume impacts at Ki1: Larsen Rd/ South Western Hwy

| Si1 | Midweek | | Saturday |
|---|---|---|---|
| | 1 PM - 2 PM | 4 PM - 5 PM | 12 noon - 1 PM |
| Existing | 199 | 334 | 262 |
| Additional | 75 | 51 | 65 |
| Impact | 37.8% | 15.2% | 24.8% |

Table 5 – Assessed volume impacts at Si1: Larsen Rd/ George St

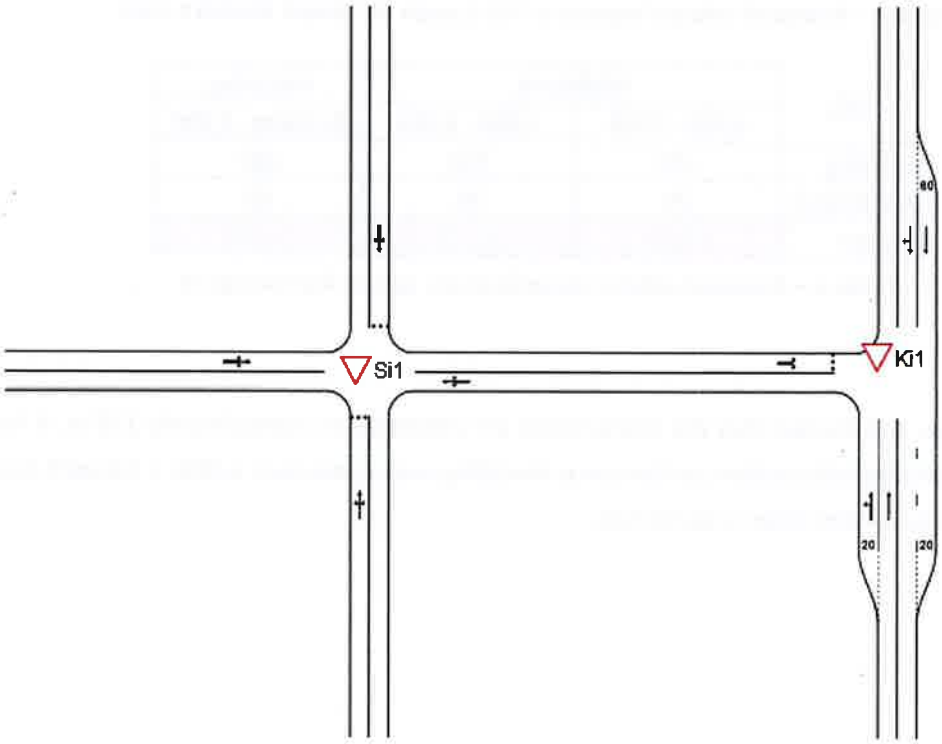
Based on the above, and the fact that the intersections are separated by approximately 150 m, it has been determined that detailed intersection performance modelling and assessment within a network model for each of the three assessment times is warranted.

## 10.2 NETWORK MODELLING

The existing traffic data has been used to develop a network model within SIDRA Intersection 6.1.

SIDRA Intersection is a "Signalised (and unsignalised) Intersection Design and Research Aid". The SIDRA Intersection software (older versions known as SIDRA and aaSIDRA) is an advanced lane-based micro-analytical tool for the design and evaluation of individual intersections and networks of intersections including modelling of separate Movement Classes (Light Vehicles, Heavy Vehicles, Buses, Bicycles, Large Trucks, Light Rail / Trams etc...). It provides estimates of capacity, level of service and a wide range of performance measures including delay, queue length and stops for vehicles and pedestrians, as well as fuel consumption, pollutant emissions and operating cost.

The SIDRA Intersection Network model is shown in Figure 28 below.




| SITES IN NETWORK | |
|---|---|
| Site ID | Site Name |
| Ki1 | Ki1: Larsen Rd/ South West Hwy Existing PM |
| Si1 | Si1: Larsen Rd/ George St Existing PM |

SIDRA INTERSECTION 6.1 | Copyright © 2000-2015 Akcelik and Associates Pty Ltd | sidrasolutions.com
Organisation: I3 CONSULTANTS WA | Created: Wednesday, 11 April 2018 20:05:57
Project: D:\Users\David\Documents\i3\i3c 2015_17 Projects\WIP\Peter Webb & Associates (029)\09204 Lot 104 SWH_Larsen Rd Byford TIS\Technical \SIDRA\09204 SN3 Larsen Rd Byford.sip6

Figure 28 – SIDRA Intersection 6.1 Si1 & Ki1 network model layout

An explanation of the various intersection performance criteria assessed and reported within this TIA is provided as Table 6 below.

| SIDRA v/c & colour code | LoS | Average Delay per vehicle (d) in seconds | | | | v/c Range | Performance Comments |
|---|---|---|---|---|---|---|---|
| | | Unsignalised intersections | Roundabouts | Signalised intersections | All (RTA) | | |
| <0.6 | A | d ≤ 10 | d ≤ 10 | d ≤ 10 | d ≤ 14.5 | ≤ 0.44 | **Good operation and plenty of spare capacity** *Stable free flow conditions where drivers are able to select desired speeds and to easily manoeuvre within the traffic stream.* |
| | B | 10 < d ≤ 15 | 10 < d ≤ 20 | 10 < d ≤ 20 | 14.5 < d ≤ 28.5 | | |
| | C | 15 < d ≤ 25 | 20 < d ≤ 35 | 20 < d ≤ 35 | 28.5 < d ≤ 42.5 | 0.45 - 0.64 | **Acceptable delays and spare capacity** *Stable flow but most drivers are restricted to some extent in their ability to select their desired speed and to manoeuvre within the traffic stream.* |
| 0.6 - 0.7 | D | 25 < d ≤ 35 | 35 < d ≤ 50 | 35 < d ≤ 55 | 42.5 < d ≤ 56.5 | 0.65 - 0.84 | **Acceptable delays** (Expected typical peak hour conditions) *Close to the limit of stable flow. All drivers are restricted in their ability to select their desired speed and to manoeuvre within the traffic stream. Small increases in traffic flow may cause operational problems.* |
| 0.7 - 0.8 | | | | | | | |
| 0.8 - 0.9 | E | 35 < d ≤ 50 | 50 < d ≤ 70 | 55 < d ≤ 80 | 56.5 < d ≤ 70.5 | 0.85 - 1.04 | **Near capacity and senstive to disturbances in flows** *Traffic volumes are close to capacity and there is virtually no freedom to select desired speeds. Flow is unstable and minor disturbances within the traffic stream will cause breakdown leading to long queues and delays.* |
| 0.9 - 1.0 | | | | | | | |
| >1.0 | F | 50 < d | 70 < d | 80 < d | 70.5 < d | >1.25 | **At Capacity** - Requires other control mode and/ or additional lanes *In the zone of forced flow where the amount of traffic approaching the point under consideration exceeds that which can pass. Flow breakdown occurs and extensive queues and delays result.* |

Table 6 – Assessed intersection performance criteria

### 10.2.1 Existing Performance

The existing Degree of Saturation of the two intersections during the midweek and Saturday road network peak hours is shown in Figure 29 below. Assessment of other intersection performance criteria is included in the SIDRA Intersection summary tables in **Appendix B.**

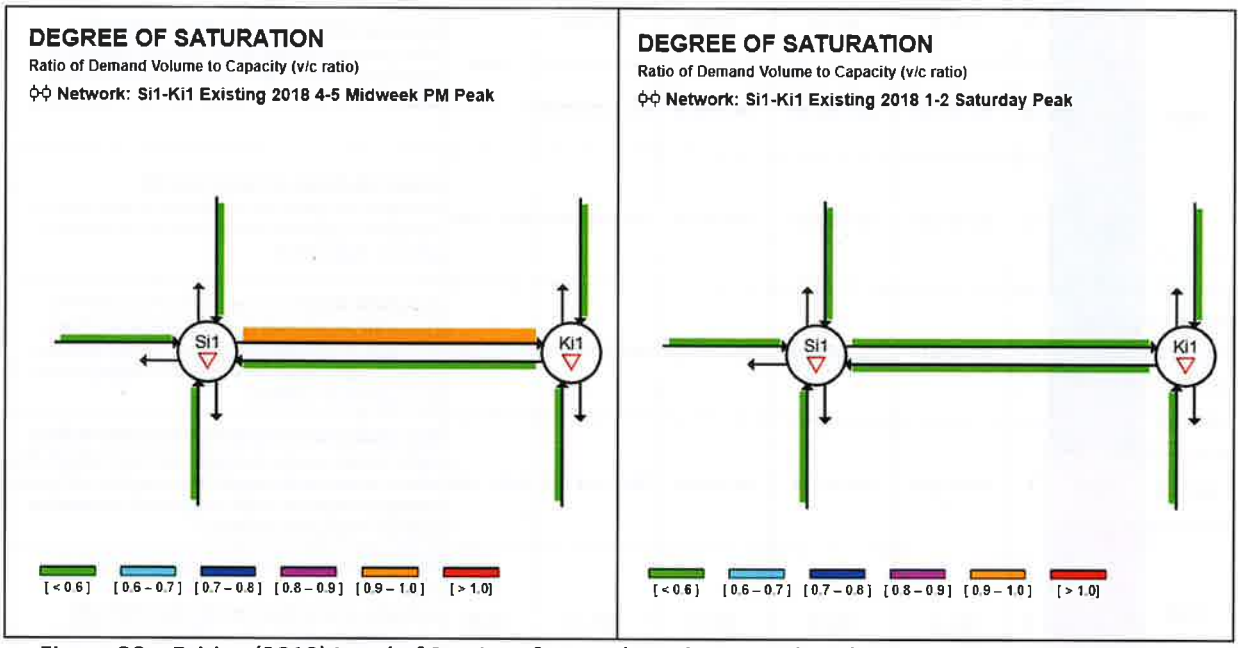



Figure 29 – Exiting (2018) Level of Service of Si1 and Ki1 during midweek PM and Saturday peak hours

Figure 29 indicates that both intersections currently perform with no delays to through movements on South Western Hwy and good operation of the Larsen Rd/ George St intersection with plenty of spare capacity. The Larsen Rd approach to South Western Hwy operates with acceptable delays and spare capacity during the Saturday peak hour but approaches capacity and is sensitive to disturbances in flows during the midweek afternoon peak hour. Any increased traffic flows through the intersection is therefore likely to result in capacity concerns.

### 10.2.2 Forecast 2020 Performance

The forecast Degree of Saturation of the two intersections during the midweek and Saturday road network and development peak hours is shown in Figure 30 below. Assessment of other intersection performance criteria is included in the SIDRA Intersection summary tables in **Appendix B.**

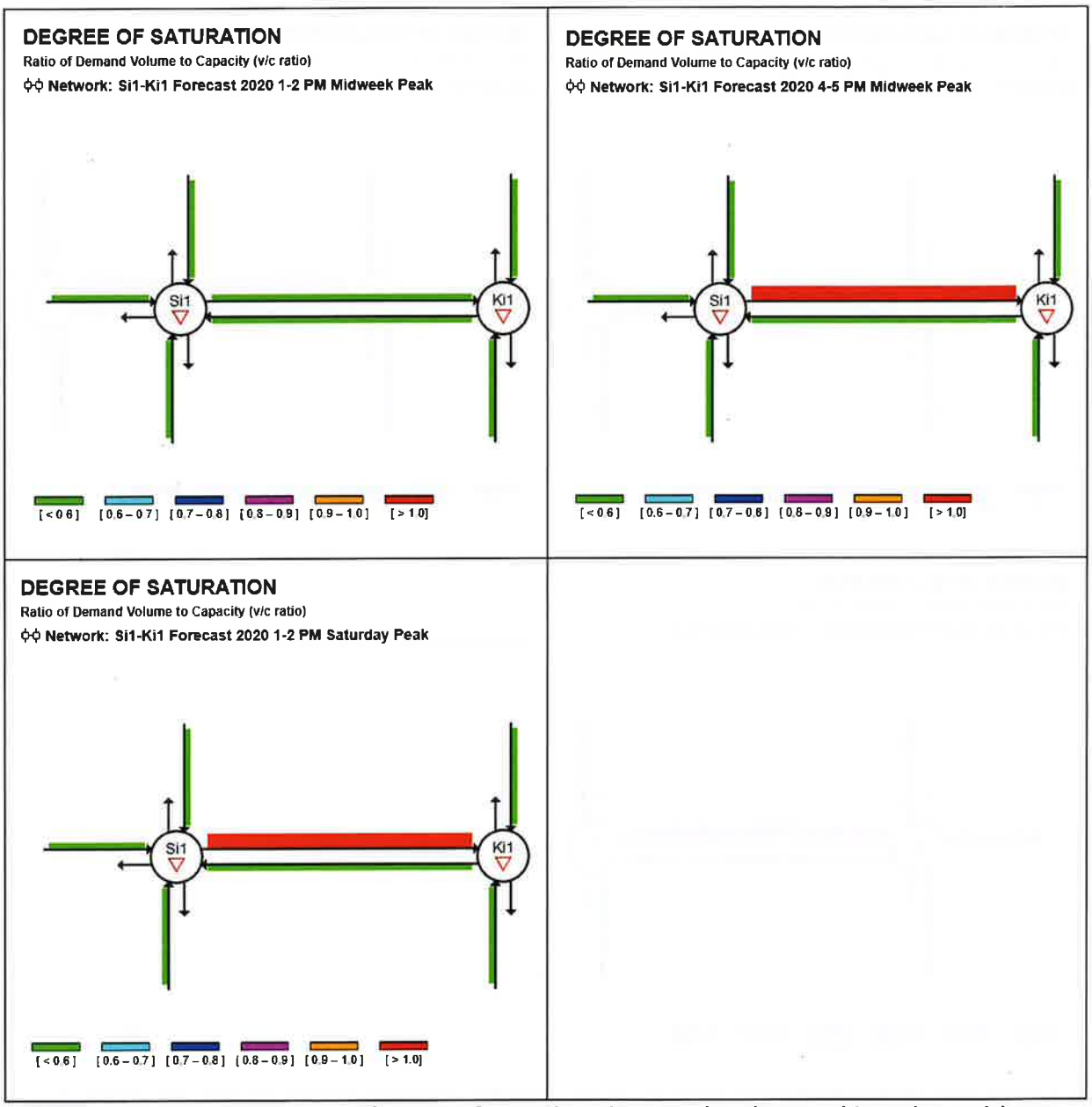



Figure 30 – Forecast 2020 Level of Service of Si1 and Ki1 during midweek PM and Saturday peak hours

Figure 30 indicates that the Larsen Rd approach to South Western Hwy is forecast to experience unacceptable delays during the midweek afternoon and Saturday road network peak hours. If not addressed, it is likely that drivers will avoid accessing the subject site and local and through traffic will experience significant delays resulting in frustrated drivers taking smaller gaps in traffic resulting in a poor safety performance.

### 10.2.3 Forecast 2030 Performance

The forecast Degree of Saturation of the two intersections during the midweek and Saturday road network and development peak hours is shown in Figure 31 below. Assessment of other intersection performance criteria is included in the SIDRA Intersection summary tables in **Appendix B.**

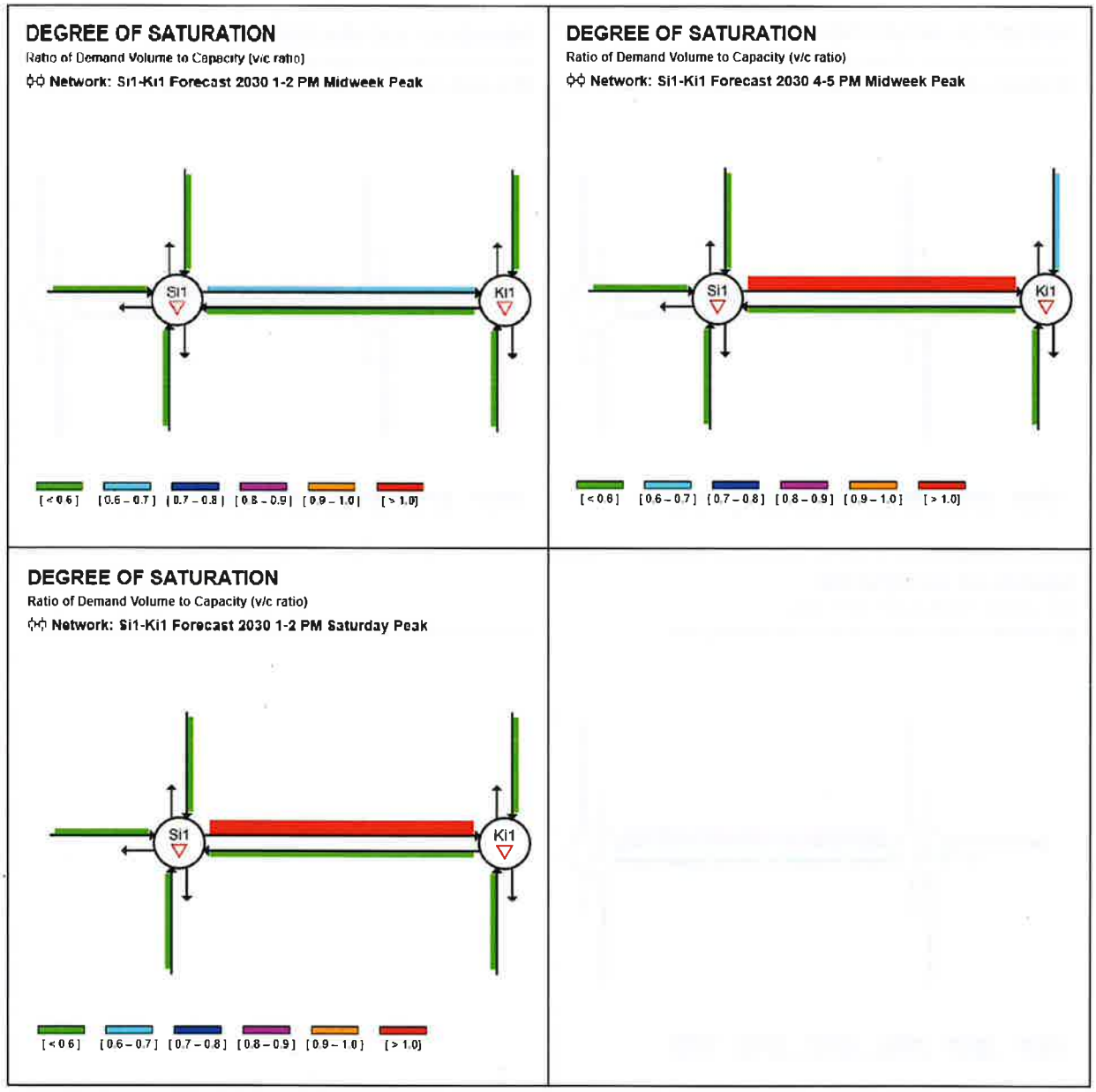



Figure 31 – Forecast 2030 Level of Service of Si1 and Ki1 during midweek PM and Saturday peak hours

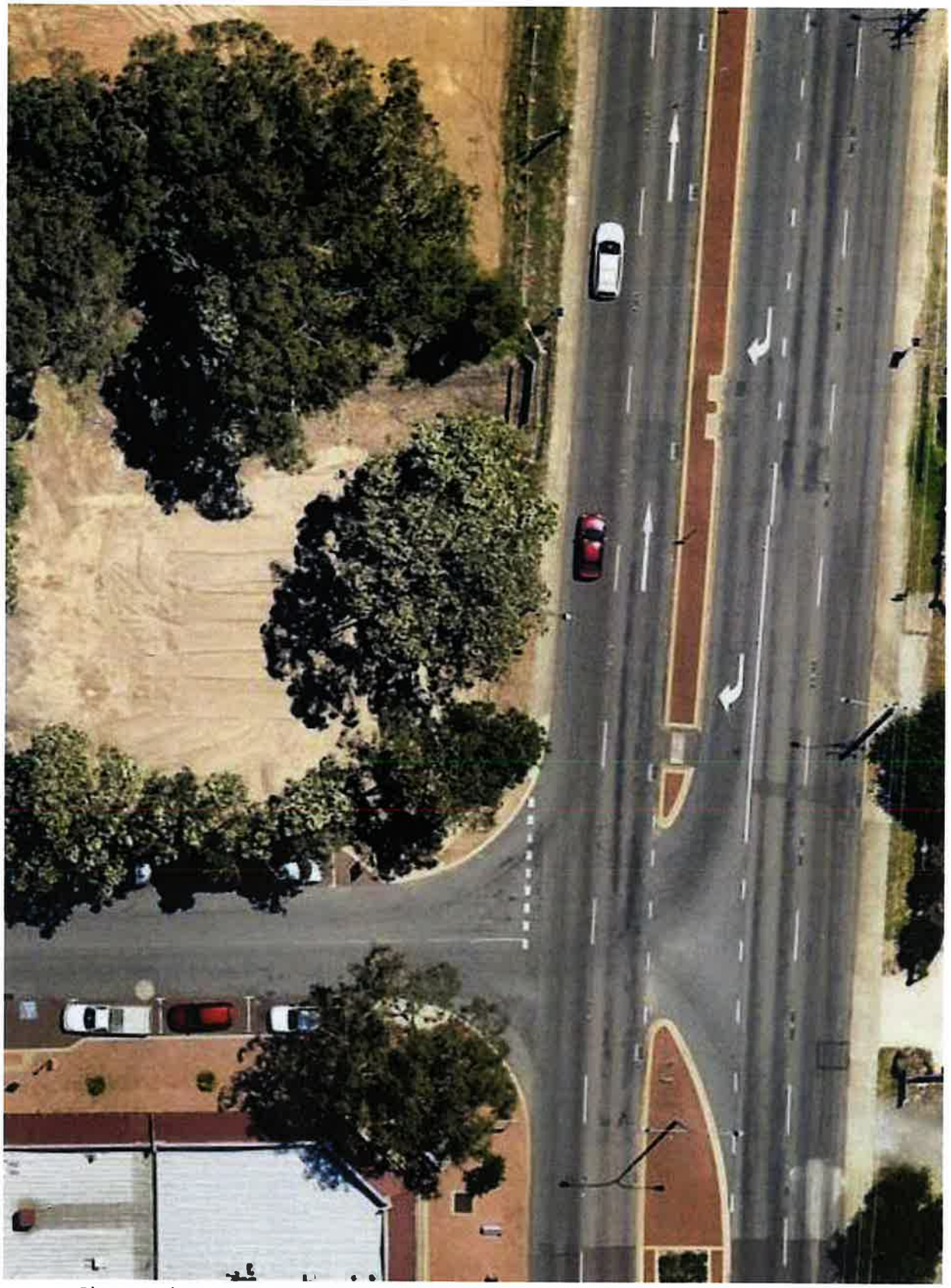
Figure 31 indicates that the Larsen Rd approach to South Western Hwy is forecast to experience unacceptable delays during the midweek afternoon and Saturday road network peak hours. If not addressed, it is likely that drivers will avoid accessing the subject site and local and through traffic will experience significant delays resulting in frustrated drivers taking smaller gaps in traffic resulting in a poor safety performance.

### 10.2.4 Remedial Measure

The previous sections have indicated that there are likely to be unacceptable delays on the Larsen Rd approach to South Western Highway as a result of the current sensitivity to increased traffic (refer Figure 29 on page 48).

Given the uncertainty with timing of the road closure, this TIA needs to identify and assess a suitable remedial measure that would address this concern without the closure of Larsen Rd.

The option of extending the existing dual lane dual carriageway on South Western Hwy south of Park Rd to just north of Larson Rd, including a median break and auxiliary right turn lane similar to that provided at Pitam Way (as shown in Photograph 13 on the following page) has been examined. The Development Drawings in **Appendix A** show two variants of this, one with a single lane Larsen Rd approach and the other with a dual lane, i.e. left and right turn lane, approach. For the purpose of this assessment these two layouts have been called Option 1 and Option 2. These two options have been assessed in SIDRA for the busiest period, i.e. 4-5 PM mid-week, and are forecast to operate at good levels, i.e., Degree of Saturation less than 0.6, as shown in Figure 32 and Figure 33 on page 53.



Photograph 13 – Example of dual lane dual carriageway with median break (Pitman/ SWH)

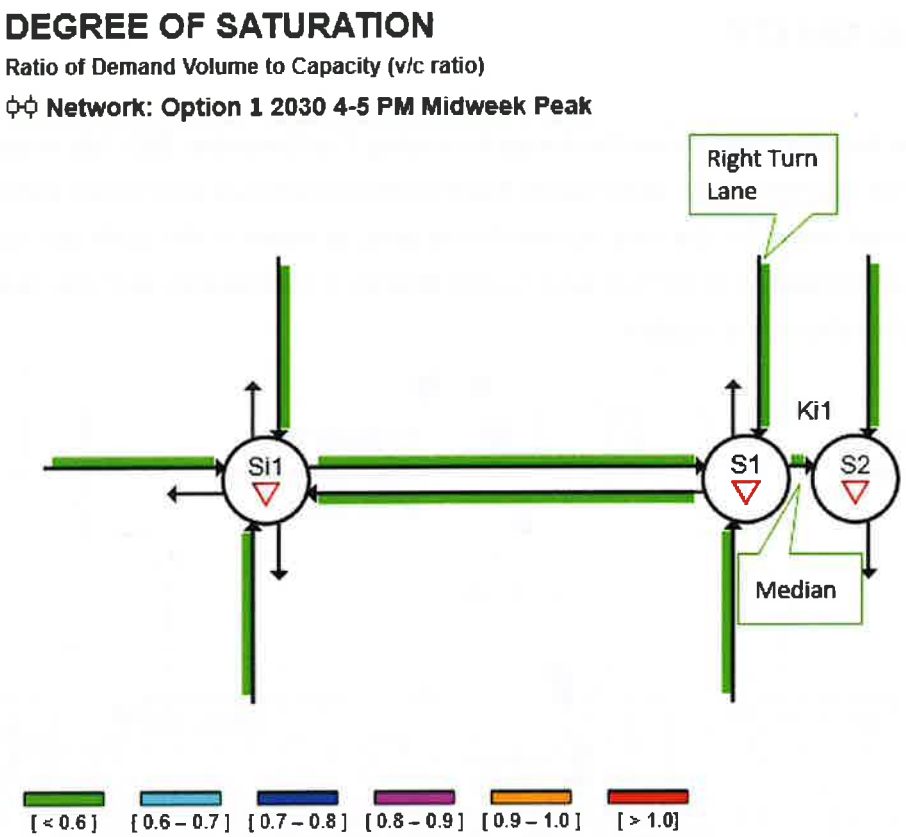



Figure 32 – Forecast 2030 Level of Service with Option 1 layout

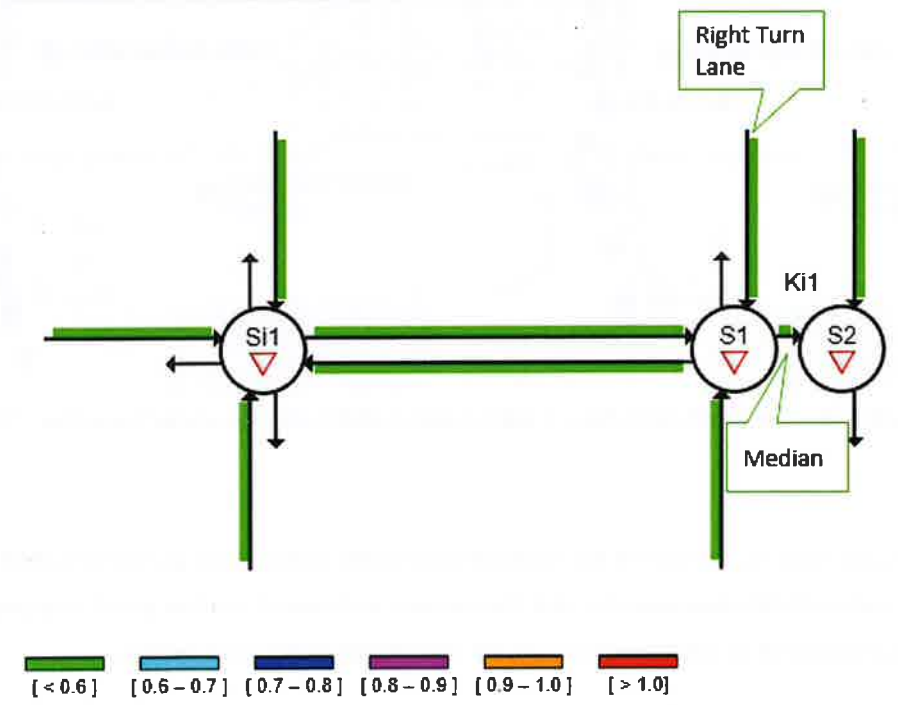



Figure 33 – Forecast 2030 Level of Service with Option 2 layout

# 11 ROAD SAFETY

A review of the five-year crash record for the period ending 31st December 2017 has revealed that there have been five (5) reported crashes at the Larsen Road/ South Western Hwy intersection and that this is fairly typical of the crash record for the road network in this area, as shown in the crash plot map provided as Figure 34 below. It should be noted that each marker denotes a crash location and may represent a single crash or several crashes at this location.

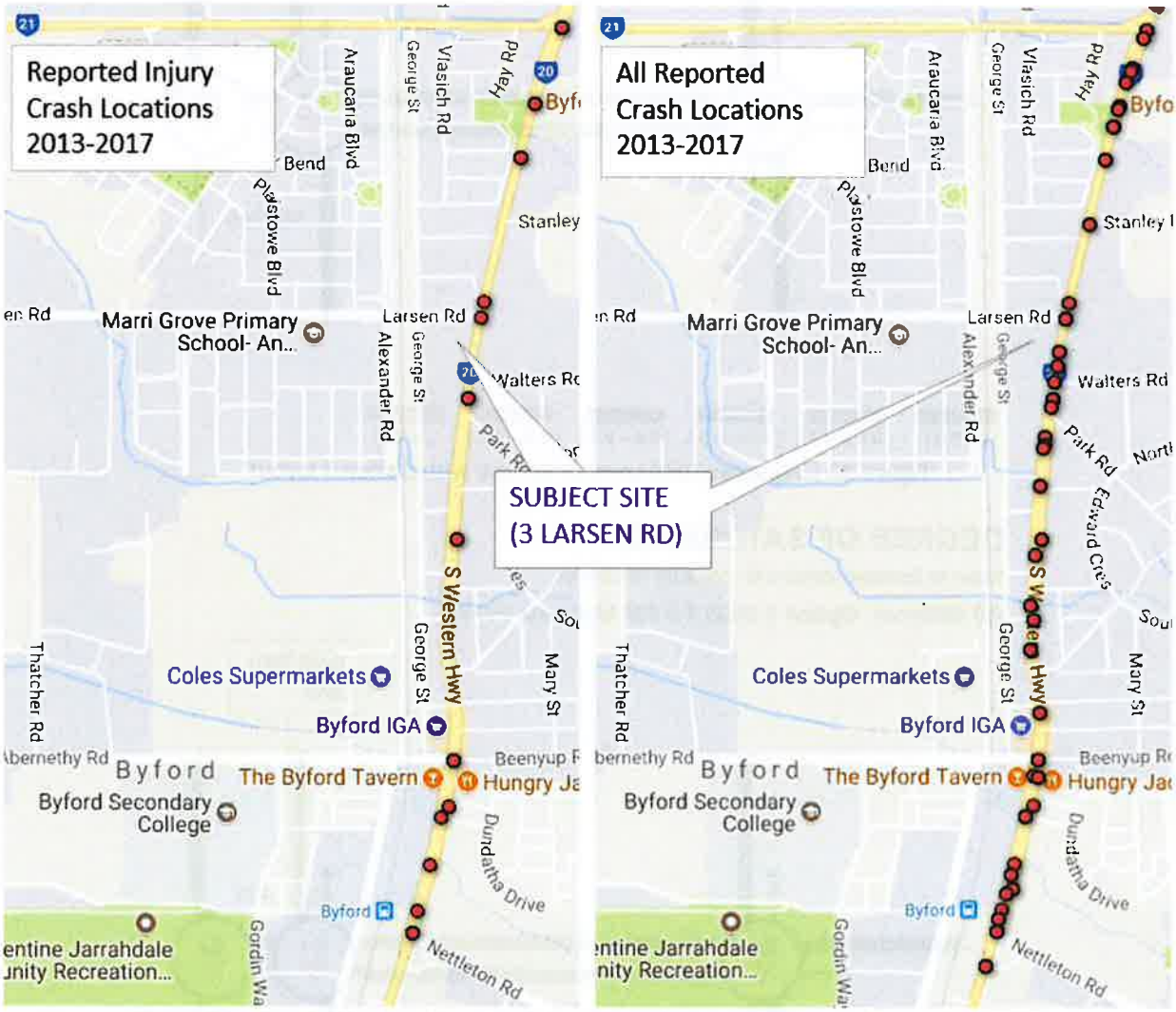



Figure 34 – South Western Hwy Crash Location plot map: 5 years to December 2017

Analysis of the crash data for the Larsen Rd/ South Western Hwy intersection using the MRWA Crash Analysis and Reporting System (CARS) has revealed that the number and type of crashes at this intersection is too low to allow for an assessment of the crash record to be undertaken within the system.

Prior to undertaking the crash review, the author, who is a MRWA accredited Senior Road Safety Auditor and Crash Investigation Team Leader, inspected the site and observed that sight lines are good in all directions but that there may be potential for some drivers to take smaller gaps in traffic that they normally would when there is a steady stream of traffic on South Western Hwy. The implementation of the variable 50 km/s speed limit assists in keeping impact forces low in the event of a crash, which is reflected in the crash severity data (i.e. 5 crashes, 0 Fatal, 0 Hospital, 1 Medical and 4 Property Damage Only). The medical injury resulted from a single car travelling south on South Western Hwy running off the road to the left out-of-control and hitting an electricity pole.

Subsequent crash analysis has revealed that there have not been more than 1 type of crash at the intersection in the five-year reporting period, as shown in the crash plot generated by CARS provided as Figure 35 below.

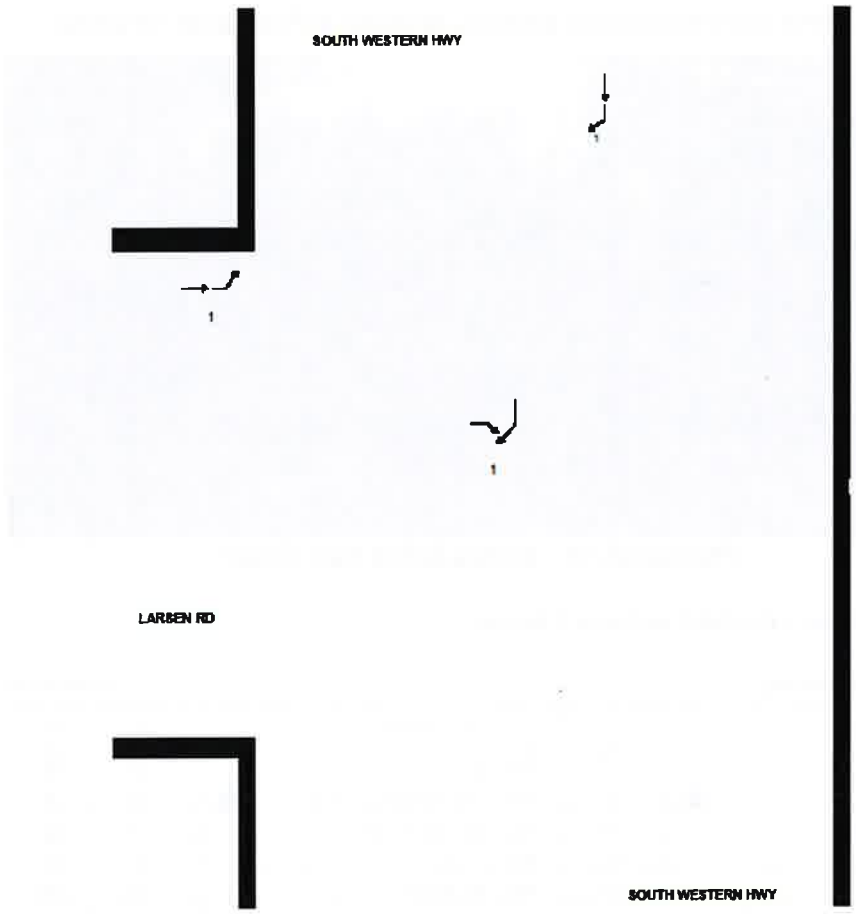



Figure 35 – Larsen Rd/ South Western Hwy Crash Plot (run-off road crashes not shown)

This road safety assessment has not identified any existing deficiency with the layout and control of South Western Hwy, Larsen Rd, George St or any of their intersections that warrants attention or raises concern with the proposed development. It is acknowledged however, that closing Larsen Rd at the railway level crossing will result in a significant reduction in traffic volumes on Larsen Rd at South Western Hwy which will result in reduced delays and the associated likelihood of drivers taking risks with identifying gaps in traffic.

# 12 PUBLIC TRANSPORT ACCESS

## 12.1 EXISTING TRAIN NETWORK

The closest metropolitan train station to the subject site is at Armadale, approximately 6.5 kms north.

As indicated in **Section 4.3**, it is intended to extend the Pert-Armadale line south to Byford, although at this stage the exact location of the new Byford Train station is yet to be determined.

A single line railway currently extends south from Armadale to Bunbury and is used by the Australind service. Passengers can board and alight at the existing Byford train station at the southern end of Byford near Nettleton Road but only if they give prior notice, otherwise the Australind train does not stop here. The existing train station is little more than a small platform, as shown in Photograph 14 below.


Photograph 14 – Existing Byford train station

The Australind Timetable is provided as Table 7 below.

**Perth to Bunbury** **Australind**

| From Perth | | 103 | 105 | From Bunbury | | 102 | 108 |
|---|---|---|---|---|---|---|---|
| | | Daily AM | Daily PM | | | Daily AM | Daily PM |
| **Perth Station** | ♿ Dep | 9:30 | **5:55** | **Bunbury Passenger Terminal** | ♿ Dep | 6:00 | **2:45** |
| **Armadale Station** | Dep | 9:56 | **6:25** | Brunswick Junction* | Dep | 6:17 | **3:02** |
| Byford* | Dep | 10:07 | **6:36** | Harvey* | Dep | 6:32 | **3:17** |
| Mundijong* | Dep | 10:14 | **6:43** | Cookernup** | Dep | 6:39 | **3:24** |
| Serpentine* | Dep | 10:21 | **6:50** | Yarloop** | Dep | 6:46 | **3:29** |
| North Dandalup** | Dep | 10:32 | **7:01** | Waroona* | Dep | 6:56 | **3:38** |
| Pinjarra* | Dep | **10:42** | **7:11** | Pinjarra* | Dep | 7:12 | **3:55** |
| Waroona* | Dep | **11:00** | **7:29** | North Dandalup** | Dep | 7:22 | **4:07** |
| Yarloop** | Dep | 11:11 | **7:40** | Serpentine* | Dep | 7:34 | **4:18** |
| Cookernup** | Dep | 11:15 | **7:44** | Mundijong* | Dep | 7:42 | **4:24** |
| Harvey* | Dep | 11:21 | **7:50** | Byford* | Dep | 7:49 | **4:32** |
| Brunswick Junction* | Dep | 11:36 | **8:05** | **Armadale Station** | Arr | 7:55 | **4:39** |
| **Bunbury Passenger Terminal** | ♿ Arr | 11:55 | **8:25** | **Perth Station** | ♿ Arr | 8:30 | **5:15** |

* Trains only stop at intermediate stations if advance bookings are made.

Table 7 – Australind Timetable

## 12.2 Existing Bus Network

There are two bus stops on either side of South Western Hwy that are within a 2-minute walk of the site. Each bus stop has a shelter, seat and tactile pavers and is serviced by Transport Bus Routes 251, 252 and 253, which run between Armadale Train Station to the north and Mundijong and Jarrahdale to the south via Byford. The location of the two bus stops, as well as photographs, are shown in Figure 36 below. The timetable is shown in Table 8 on the following page.

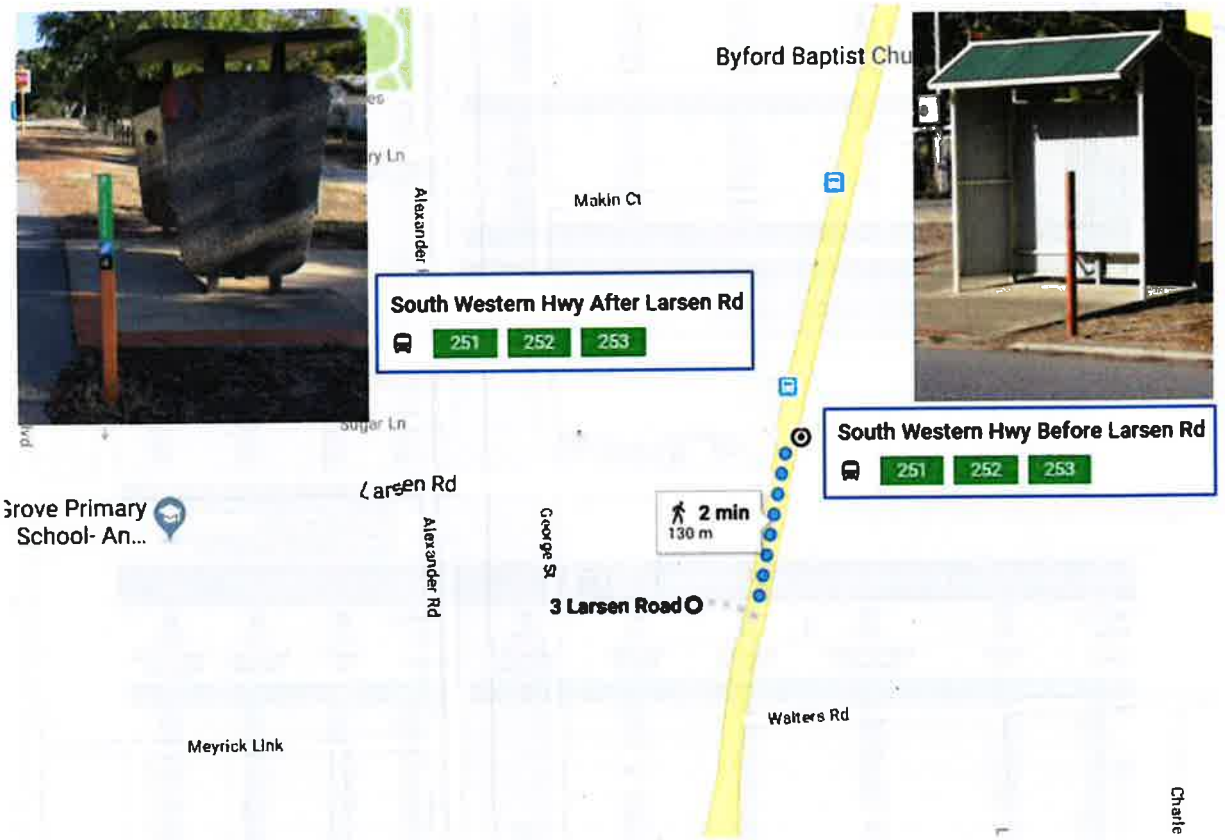



Figure 36 – Existing bus stops within a 2-minute walk of the subject site

## Route 251, 252, 253 - To Armadale

| Timed Stops | | | | | |
|---|---|---|---|---|---|
| Stop No. | 27109 | 23912 | 27650 | 13105 | 13192 |
| Route No. | Kingsbury Dr / Jacaranda Av | Paterson Rd / Whitby St | Benalla Cr / Limpet Wy | South Western Hwy / Blytheswood Av | Armadale Stn |
| **Monday to Friday** | | | | | |
| am 251 * | - | - | * 6:15 | 6:19 | 6:33 |
| 253 | 6:23 | 6:36 | 6:45 | 6:49 | 7:03 |
| 251 * | - | - | * 7:15 | 7:19 | 7:33 |
| 252 | - | 7:38 | 7:48 | 7:53 | 8:07 |
| 253 S | 7:33 | 7:48 | 7:59 | 8:08 | 8:23 |
| 253 H | 7:40 | 7:55 | 8:04 | 8:08 | 8:23 |
| 252 B | - | 8:09 | 8:20 | 8:30 | 8:46 |
| 252 | - | 8:57 | 9:06 | 9:10 | 9:24 |
| 251 * | - | - | * 9:36 | 9:40 | 9:54 |
| 252 | - | 10:27 | 10:36 | 10:40 | 10:54 |
| 251 * | - | - | * 11:36 | 11:40 | 11:54 |
| pm 252 | - | 1:27 | 1:36 | 1:40 | 1:54 |
| 252 A | - | 3:14 | 3:26 | 3:30 | 3:48 |
| 252 H | - | 3:18 | 3:26 | 3:30 | 3:48 |
| 252 | - | 5:08 | 5:16 | 5:20 | 5:34 |
| 252 | - | 6:28 | 6:36 | 6:40 | 6:54 |
| **Saturday** | | | | | |
| am 253 | 6:59 | 7:12 | 7:20 | 7:24 | 7:39 |
| 252 | - | 8:12 | 8:20 | 8:24 | 8:39 |
| 251 * | - | - | * 10:20 | 10:24 | 10:39 |
| pm 251 * | - | - | * 12:20 | 12:24 | 12:39 |
| 252 | - | 2:12 | 2:20 | 2:24 | 2:39 |
| 251 * | - | - | * 4:20 | 4:24 | 4:36 |
| 251 * | - | - | * 5:53 | 5:57 | 6:09 |

**No Sunday & Public Holidays service**

**Legend**

| | |
|---|---|
| 251 * | Time shown in Benalla Cr / Limpet Wy column is for timing point 25727 - Clondyke Dr after Burgess Dr. |
| 252 A | Operates on school days only and deviates via Serpentine Jarrahdale Grammar School. |
| 252 B | Operates on school days only and deviates via Byford Secondary College. |
| 253 S | Operates on school days only and deviates via Serpentine Jarrahdale Grammar School and Byford Secondary College. |
| H | Operates on school holidays only. |

## Route 254 - To Armadale

| Timed Stops | | | |
|---|---|---|---|
| Stop No. | 26510 | 26511 | 13192 |
| Route No. | Clifton St / South Western Hwy | Ballawarra Av / Fawcett Rd | Armadale Stn |
| **Monday to Friday** | | | |
| am 254 | 5:50 | 5:58 | 6:17 |
| 254 | 6:18 | 6:28 | 6:48 |
| 254 | 6:48 | 6:58 | 7:17 |
| 254 | 7:03 | 7:13 | 7:32 |
| 254 | 7:15 | 7:25 | 7:48 |
| 254 | 7:50 | 8:00 | 8:22 |
| 254 | 8:07 | 8:17 | 8:40 |
| 254 | 8:40 | 8:50 | 9:10 |
| 254 | 9:10 | 9:20 | 9:39 |
| 254 | 9:56 | 10:06 | 10:24 |
| 254 | 10:56 | 11:06 | 11:24 |
| 254 | 11:56 | 12:06 | 12:24 |
| pm 254 | 12:56 | 1:06 | 1:24 |
| 254 | 1:56 | 2:06 | 2:24 |
| 254 A | 3:10 | 3:30 | 3:55 |
| 254 S | 3:33 | 3:45 | 4:06 |
| 254 | 3:50 | 4:00 | 4:19 |
| 254 | 5:00 | 5:09 | 5:26 |
| 254 | 5:45 | 5:54 | 6:11 |
| 254 | 6:45 | 6:54 | 7:11 |
| **Saturday** | | | |
| am 254 | 6:42 | 6:50 | 7:09 |
| 254 | 7:42 | 7:50 | 8:09 |
| 254 | 8:42 | 8:50 | 9:09 |
| 254 | 9:42 | 9:50 | 10:09 |
| 254 | 10:42 | 10:50 | 11:11 |
| 254 | 11:42 | 11:50 | 12:11 |
| pm 254 | 12:42 | 12:50 | 1:11 |
| 254 | 1:42 | 1:50 | 2:09 |
| 254 | 2:42 | 2:50 | 3:09 |
| 254 | 3:42 | 3:50 | 4:09 |
| 254 | 4:42 | 4:50 | 5:09 |
| **Sunday and Public Holidays** | | | |
| am 254 | 8:58 | 9:06 | 9:26 |
| 254 | 10:58 | 11:06 | 11:26 |
| pm 254 | 12:58 | 1:06 | 1:26 |
| 254 | 2:58 | 3:06 | 3:26 |
| 254 | 4:58 | 5:06 | 5:26 |

**Legend**

| | |
|---|---|
| 254 A | Operates on school days only and deviates via Byford Secondary College. |
| 254 S | Departs from Serpentine Jarrahdale Grammer School at 3.25pm on school days only. |

## Route 251, 252, 253 - To Mundijong & Jarrahdale

| Timed Stops | | | | | |
|---|---|---|---|---|---|
| Stop No. | 13192 | 13138 | 25727 | 13165 | 27108 |
| Route No. | Armadale Stn | South Western Hwy / Blytheswood Av | Clondyke Dr / Burgess Dr | Paterson Rd / Whitby St | Kingsbury Dr / Jacaranda Av |
| **Monday to Friday** | | | | | |
| am 252 | 7:11 | 7:20 | 7:24 | 7:36 | - |
| 252 A | 8:12 | 8:23 | 8:27 | 8:41 | - |
| 252 | 9:56 | 10:06 | 10:10 | 10:21 | - |
| 251 | 10:56 | 11:06 | 11:14 | - | - |
| pm 252 | 12:55 | 1:05 | 1:09 | 1:20 | - |
| 251 | 1:56 | 2:06 | 2:14 | - | - |
| 252 | 2:40 | 2:51 | 2:55 | 3:06 | - |
| 252 B | - | - | 3:24 | 3:38 | - |
| 253 D | 3:05 | 3:17 | 3:28 | 3:40 | 3:59 |
| 253 S | 3:40 | 3:52 | 3:56 | 4:06 | 4:23 |
| 252 E | 4:11 | 4:23 | 4:27 | 4:40 | - |
| 252 | 4:40 | 4:51 | 4:55 | 5:06 | - |
| 253 | 5:13 | 5:25 | 5:29 | 5:37 | 5:52 |
| 252 | 5:54 | 6:05 | 6:09 | 6:20 | - |
| **Saturday** | | | | | |
| am 252 | 7:43 | 7:53 | 7:57 | 8:07 | - |
| 251 | 9:56 | 10:06 | 10:12 | - | - |
| 251 | 11:56 | 12:06 | 12:12 | - | - |
| pm 252 | 1:41 | 1:51 | 1:55 | 2:09 | - |
| 251 | 3:41 | 3:51 | 3:57 | - | - |
| 253 | 4:41 | 4:51 | 4:55 | 5:04 | 5:20 |
| 252 | 5:41 | 5:51 | 5:55 | 6:09 | - |

**No Sunday & Public Holidays service**

**Legend**

| | |
|---|---|
| 252 A | Deviates via Serpentine Jarrahdale Grammar School on school days only. |
| 252 B | Operates on school days only and departs Byford Secondary College at 3.17pm. |
| 252 E | Operates on school days only. |
| 253 D | Departs from Armadale Senior High School at 3.00pm, then deviates via Byford Secondary College and Serpentine Jarrahdale Grammar School on school days only. |
| 253 S | Deviates via Serpentine Jarrahdale Grammar School on school days only. |

## Route 254 - To Byford

| Timed Stops | | | | |
|---|---|---|---|---|
| Stop No. | 13192 | 26512 | 26510 |
| Route No. | Armadale Stn | Ballawarra Av / Fawcett Rd | Clifton St / South Western Hwy |
| **Monday to Friday** | | | |
| am 254 | 7:12 | 7:28 | 7:42 |
| 254 S | 7:53 | 8:14 | 8:30 |
| 254 | 8:27 | 8:44 | 8:58 |
| 254 | 9:25 | 9:41 | 9:54 |
| 254 | 10:26 | 10:42 | 10:54 |
| 254 | 11:26 | 11:42 | 11:54 |
| pm 254 | 12:25 | 12:42 | 12:54 |
| 254 | 1:25 | 1:42 | 1:54 |
| 254 | 2:26 | 2:43 | 3:00 |
| 254 A | 3:10 | 3:29 | 3:45 |
| 254 | 3:40 | 3:58 | 4:13 |
| 254 | 4:25 | 4:43 | 4:58 |
| 254 | 5:13 | 5:30 | 5:43 |
| 254 | 5:28 | 5:44 | 5:58 |
| 254 | 5:43 | 5:59 | 6:13 |
| 254 | 5:58 | 6:14 | 6:27 |
| 254 | 6:14 | 6:30 | 6:43 |
| 254 | 6:29 | 6:44 | 6:57 |
| 254 | 6:44 | 6:59 | 7:12 |
| 254 | 7:14 | 7:29 | 7:42 |
| **Saturday** | | | |
| am 254 | 8:13 | 8:28 | 8:40 |
| 254 | 9:11 | 9:26 | 9:39 |
| 254 | 10:11 | 10:26 | 10:39 |
| 254 | 11:11 | 11:26 | 11:40 |
| pm 254 | 12:11 | 12:26 | 12:40 |
| 254 | 1:11 | 1:26 | 1:40 |
| 254 | 2:11 | 2:26 | 2:40 |
| 254 | 3:11 | 3:26 | 3:40 |
| 254 | 4:11 | 4:26 | 4:40 |
| 254 | 5:11 | 5:26 | 5:39 |
| 254 | 6:11 | 6:26 | 6:39 |
| **Sunday and Public Holidays** | | | |
| am 254 | 8:28 | 8:43 | 8:56 |
| 254 | 10:28 | 10:43 | 10:56 |
| pm 254 | 12:28 | 12:43 | 12:56 |
| 254 | 2:28 | 2:43 | 2:56 |
| 254 | 4:28 | 4:43 | 4:56 |

**Legend**

| | |
|---|---|
| 254 A | Departs from Armadale Senior High School at 3.05pm on school days only. |
| 254 S | Extends to Serpentine Jarrahdale Grammar School on school days only. |

Table 8 – Transperth Routes 251, 252 and 253 Timetables

# 13 PEDESTRIAN AND CYCLE ACCESS/ AMENITY

As indicated in Figure 2 on page 9 and shown in Photograph 8 on page 22, there is an existing cycle route along George St and a short section of cycle path with associated crossing facility on South Western Hwy between Larsen Rd and Walters Rd. There are good paths along Larsen Rd and George St but the path on the development side of South Western Hwy south of the ped/ cycle crossing island is substandard and, in some locations, presents a hazard to people using wheeled devices such as skateboards, gophers, wheelchairs and prams as it can direct these devices into the path of vehicles on South Western Highway, as shown in the example provided as Photograph 15 below.

Photograph 15 – Example of South Western Hwy path on west side sloping towards traffic

There is a lack of continuous tactile ground surface indicators on the informal ped/ cycle crossing on South Western Hwy south of Larsen Rd as shown in Photograph 16 on the following page.

Photograph 16 – Existing ped/ cycle crossing on South Western Hwy south of Larsen Rd

A review of the paths around the recently developed Caltex Service Station on the corner of South Western Hwy and Nettleton Rd has revealed that paths and ramps in accordance with the latest standards have been provided to, from and around this site, as shown in the example provided as Photograph 17 below.


Photograph 17 – Caltex Service Station ped/ cycle facilities, South Western Hwy/ Nettleton Rd

# 14 PARKING AND SERVICING

As indicated in **Section 3**, it is proposed to provide a total of 71 standard car parking bays, 3 ACROD bays, 1 waiting bay and 3 loading bays on site.

The planning report assesses the statutory requirement and provision of parking bays. From a practical point of view, it is important to note that many of the trips to the site will be shared between the different land uses on the site, hence there is a high probability that each parking bay would be used for more than one land use trip. This was evidenced in the survey of the existing Caltex Service Station on the corner of South Western Hwy and Nettleton Rd.

The largest vehicle expected to service and the site is the 19 m Semi Trailer, as shown in Figure 37 below.

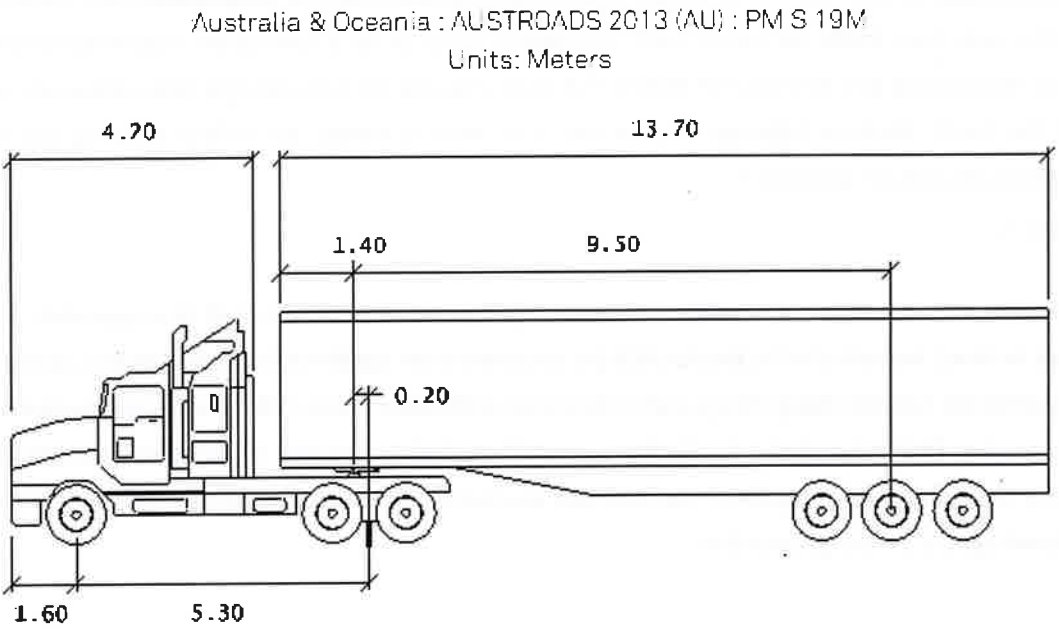



Figure 37 – 19 m Semi Trailer Design Vehicle

The assessed swept path of the above design vehicle, i.e. fuel tanker servicing the site, is shown in the Development Drawings included in **Appendix A**.

# 15 SITE SPECIFIC ISSUES

The Shire of Serpentine-Jarrahdale's Coordinator Subdivisions has provided a list of the Shire's concerns regarding the development proposal in the previously issued TIA (i.e. version 2.0) in an email dated 25th October 2018. In order to ensure that each of these issues is clearly addressed, this section reproduces those concerns and provides comment and assessment accordingly.

### ISSUE 1: LARSEN RD/ SOUTH WESTERN HIGHWAY INTERSECTION

"The shire is concerned by the midweek peak level of saturation on Larsen Road. This indicates we currently have unacceptable delays. The traffic impact Assessment indicates that the development will approximately double the peak hour traffic on Larsen road. To address issues around Saturation in addition to the works shown on the drawing and agreed with MRWA the shire requires the left and right channelisation on Larsen road at the South Western highway intersection. This work is shown on MRWA drawing 022 which is referenced In the MRWA decision."

### RESPONSE 1

The Development Drawings in **Appendix A** show it is proposed to provide a dual lane approach on Larsen Road (red outline). As indicated in **Section 4.3** the proponent has confirmed that the MRWA conditions will be met during the detailed design stage and in discussion with Main Roads WA. This TIA has assessed a single lane approach as Option 1 and the double lane approach as Option 2 as part of the assessment process. The proponent has indicated that Option 2, the dual lane approach, has been adopted and this has been included in the Development Drawings provided.

## Issue 2: Development Access from Larsen Road

"Larsen Road is a local distributer Road. While it is preferred to not have large vehicles on Local Distributor roads they can host 19m semi-trailers. It is unclear from the traffic impact assessment if it is proposed to have service facilities for large vehicles or if the 19m semi-trailers entering and exiting the site are purely service vehicles. The shire generally has adopted a policy of not supporting high-flo diesel or services for 19m semi-trailers on the south western highway in the Byford town site.

Concerning the service vehicle access the shire will not accept vehicles departing their lane to enter and exit the site. It is not considered safe at this location with proximity to the highway intersection and access driveways opposite creating an environment where uncertainty in decision making could occur. The shire also notes Larsen road has centre line road markings and therefore it is against the road traffic code for vehicles to not be lane compliant whilst performing turning manoeuvres.

The shire would like to see some assessment of the vehicle stacking on Larsen road related to the entry into the development to determine the necessary access arrangements. Noting there is around 90 vehicles per hour entering In the Saturday peak and plus 200 vehicles on Larsen road according to the 2014 count".

## Response 2

As indicated in **Section 3**, the proposed development will not have fuel facilities for large vehicles. As such, the largest vehicles expected to access and egress the site is the 19 m Semi Trailer (19 m ST) Fuel Tanker servicing the site. The 19 m ST is the design vehicle that all roads and intersections are designed for as it is the largest vehicle that is permitted to use all public roads without a permit. This also ensures that other large vehicles such as those associated with removalists, waste collection and emergency services can negotiate the road network.

The statement that "Concerning the service vehicle access, the shire will not accept vehicles departing their lane to enter and exit the site" is not consistent with currently approved developments along similar Local Distributor roads, as shown in Figure 38 and Photograph 18 on the following page. It is also not consistent with the Shire's reasoning, i.e. "It is not considered safe at this location with proximity to the highway intersection and access driveways opposite creating an environment where uncertainty in decision making could occur." The development access off Larsen Rd is the only access on this side of the road between the Highway and George St hence it will be very clear to other drivers where an indicating vehicle will be turning off Larsen Rd to access the site. The proposed access is located midway between the two intersections to minimise influence on movements at either of these intersections. It is also located as far away from the South Western Hwy intersection as is physically possible.

The Shire's statement that "Larsen road has centre line road markings and therefore it is against the road traffic code for vehicles to not be lane compliant whilst performing turning manoeuvres" is incorrect. Section 116 of the Road Traffic Code states that "a driver shall not permit any portion of the vehicle to travel on,

over, or to the right of, the dividing line except for the purpose of making a right turn or a U turn, where permissible." This is consistent with statements within AS 2890.1 that require left turns to be undertaken from the kerb lane but allow for the full width of the roadway to be used. The examples provided below show centre line road markings on Abernethy Road and the approved development that requires service vehicles to cross this line.

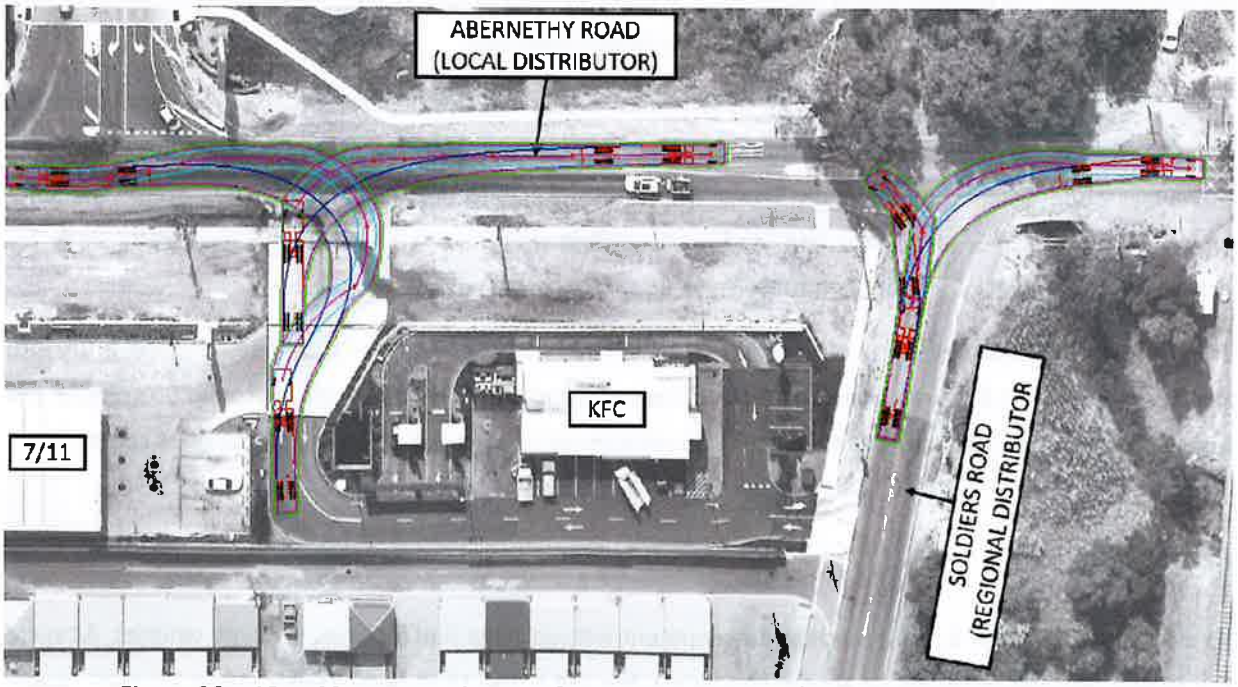



Figure 38 – 19 m ST swept paths out of Soldiers Rd and KFC/ 7eleven into Abernethy Rd


Photograph 18 – Looking west along Abernethy Rd (Local Distributor) to KFC/ 7eleven development on left

The practice of allowing service vehicles to enter and leave access driveways within the boundaries of the roadway, i.e. kerb lines, is permitted in Section 3.4.1(a) of Australian Standard AS 2890.2 (4), i.e.: "On a minor

public road, vehicles shall be able to enter and leave the access driveway without infringing the boundaries of the roadway. Local authorities may place further limits and controls on the extent to which movement across the centre-line of the roadway is allowed."

The shire has indicated that it would "like to see some assessment of the vehicle stacking on Larsen road related to the entry into the development to determine the necessary access arrangements. Noting there is around 90 vehicles per hour entering In the Saturday peak and plus 200 vehicles on Larsen road according to the 2014 count".

200 vehicles per hour is not a lot for a Local Distributor Rd and does not warrant assessment. Nevertheless, an assessment has been carried out as requested based on the forecast 2030 volumes and is shown in Figure 39 below and in Figure 40 and Figure 41 on the following page. Average and 95%ile back of queue lengths do not exceed more than 1 vehicle for any movement in any peak hour.

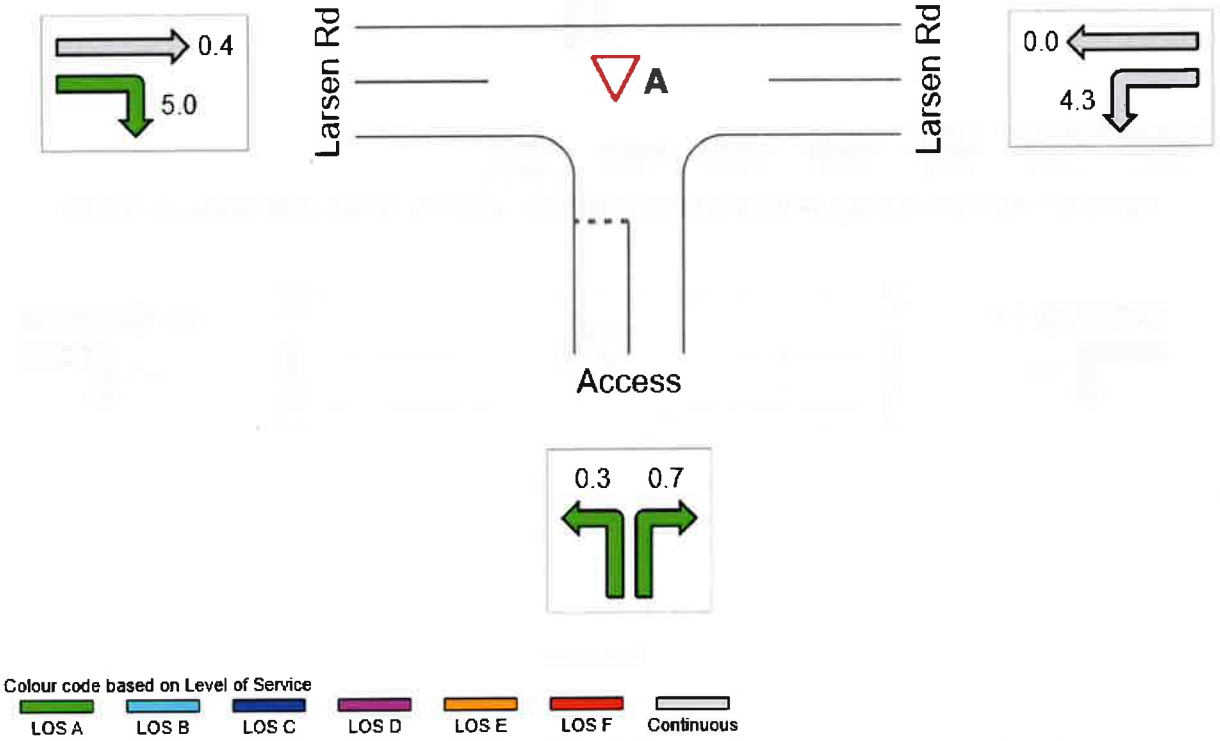



Figure 39 – Forecast Average Delay and Level of Service Larsen Rd Access 2030 Midweek 1-2 PM

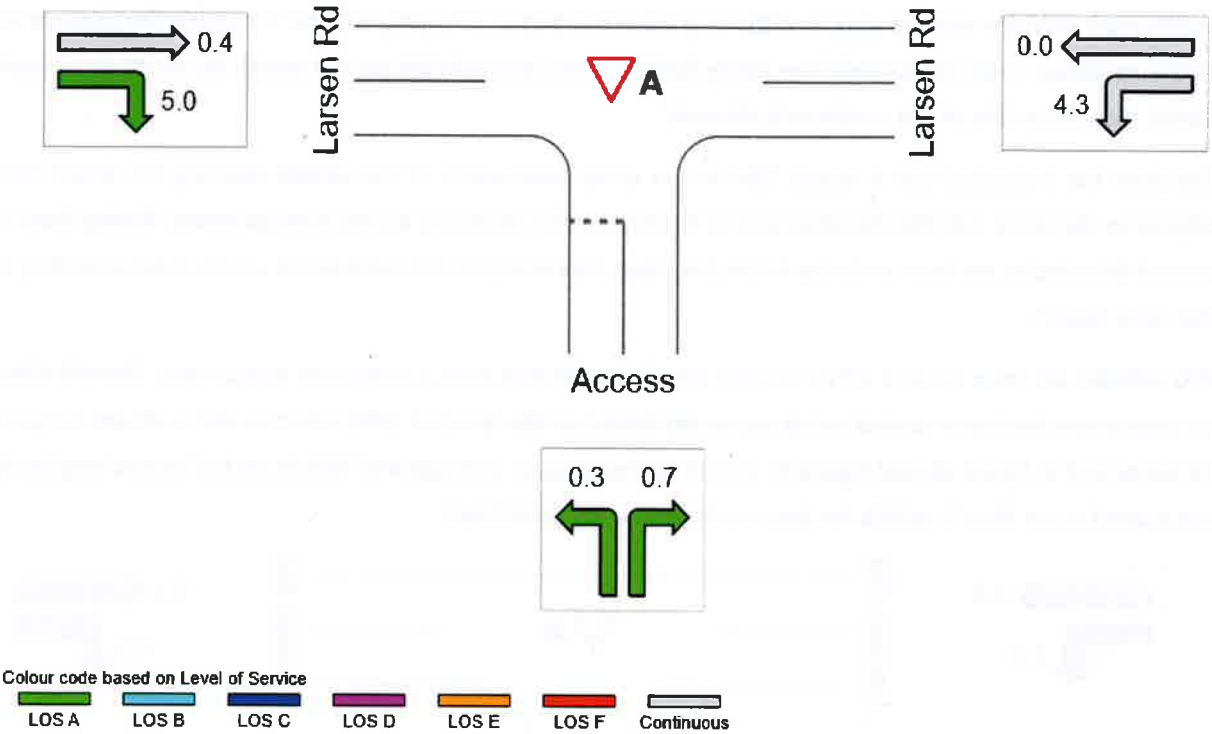



Figure 40 – Forecast Average Delay and Level of Service Larsen Rd Access 2030 Midweek 4-5 PM

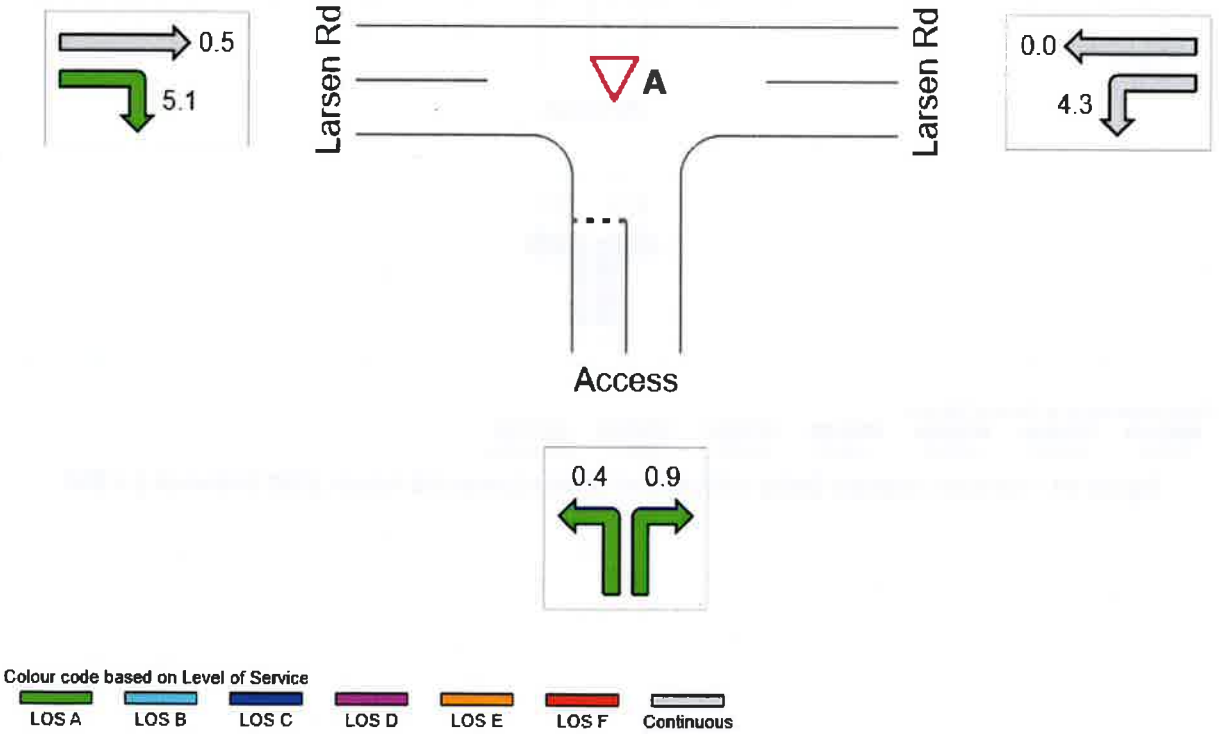



Figure 41 – Forecast Average Delay and Level of Service Larsen Rd Access 2030 Sat 12-1 PM

## Issue 3: Larsen Rd/ George St Intersection

"This intersection is a four way line marked intersection with priority to east – west traffic movements. The intersection is located 25m east of a rail level crossing. The TIA indicates that service vehicles will be moving through the Larsen road George Street intersection. No Swept path analysis of the service vehicle movements at this intersection have been presented. It will be necessary for all vehicles to remain lane compliant and to the left of the centre line at this intersection. Widening and upgrade works as necessary to support service vehicles using this intersection."

## Response 3

It is the Shire's and Main Roads WA's directive that servicing of all lots between George St and South Western Hwy must be via George St. It is therefore incumbent on the Shire to ensure that its road network supports these movements and/ or seek contributions for upgrades where required. As indicated in **Section 2.4.3**, the Shire has adopted Local Planning Policy No 53: George Street Construction Costs which allows for "the contribution of funding for the construction of George Street from Pitman Way to Larsen Road in a coordinated manner by detailing the costs, method of apportionment and method of collecting contributions."

Swept paths were not included in the TIA for this intersection as the largest service vehicle is the 19 m Semi Trailer which is the design vehicle for all intersections. Nevertheless, an assessment of the swept path of the 19 m ST turning into and out of George St is provided as Figure 42 below.

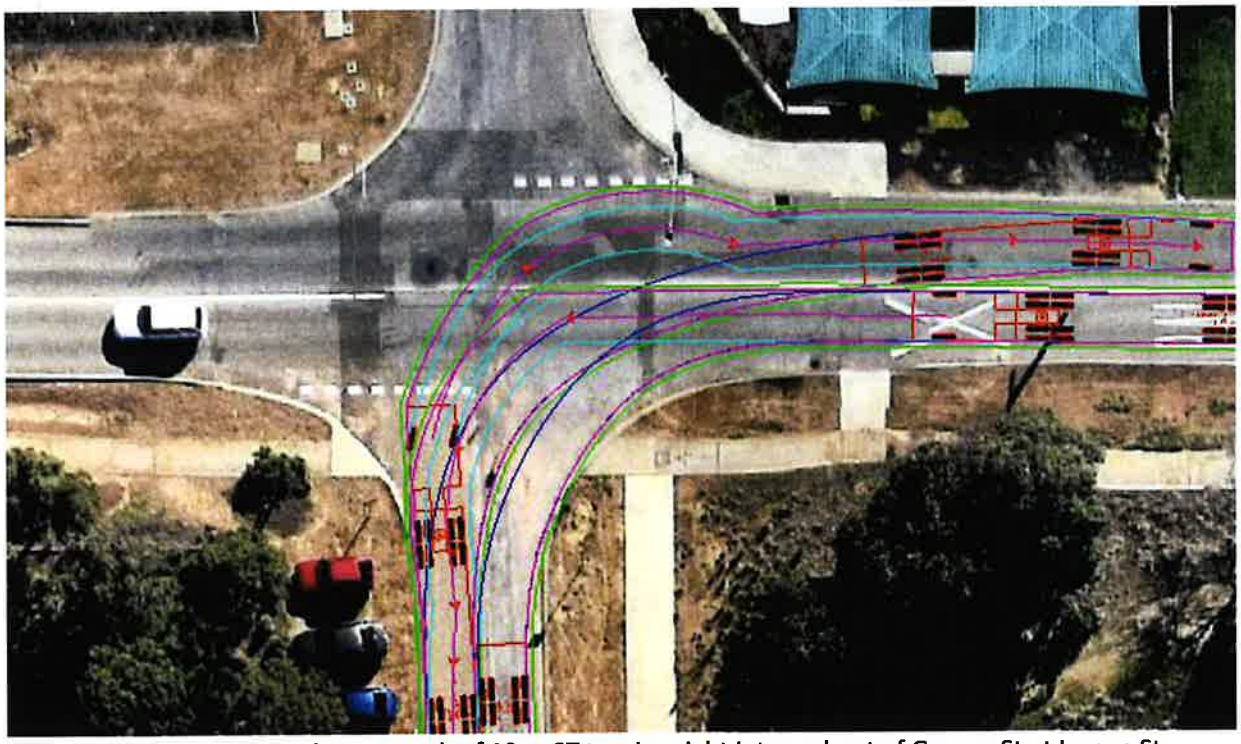


Figure 42 – Assessed swept path of 19 m ST turning right into and out of George St at Larsen St

The Shire's statement that "It will be necessary for all vehicles to remain lane compliant and to the left of the centre line at this intersection." Is not consistent with WAPC Operational Policy Liveable Neighbourhoods (7) which states, in Section R58 of Element 2, that "At intersections, turning vehicles must be accommodated using Standards Association of Australia Design Vehicles and turning templates, to enable turns to be made in a single forward movement as follows: ....**for turns between neighbourhood connector (i.e. Larsen Rd)...and an access street (i.e. George St), the design heavy rigid vehicle, using any part of the pavement**."

The assessment shown in Figure 42 is for the larger 19 m ST Design Vehicle as this is the largest service vehicle for all properties along George St and this larger vehicle has been shown to be able to complete all turn movements using any part of the pavement.

## Issue 4: George St Access Driveways

"George Street is planned to be the high street in Byford by the shire. Main roads recent access policy has been to discourage direct access to the highway and to favour access off George Street. Whilst George St is not line marked the shire does not consider it safe to have service vehicles sweeping across the total George street pavement when entering and exiting the development. George St is intended to be passenger vehicle and pedestrian in nature. Service Vehicles entering and existing the development should be lane complaint when making turning manoeuvres on George St."

## Response 4

Refer assessment **in Section 4.4**.

The Shire refers to Main Roads access policy. This access policy has been agreed with the Shire.

Subsequent to undertaking this assessment, the author requested and received from the Shire the latest "Movement Network Plan", provided as Figure 43 on the following page. Whilst this shows the intention for George St to be part of the Town Centre and hence a "High Street in Byford" it does not include the section of George St north of the indicated Town Centre which includes the section of George St adjacent to the development site.

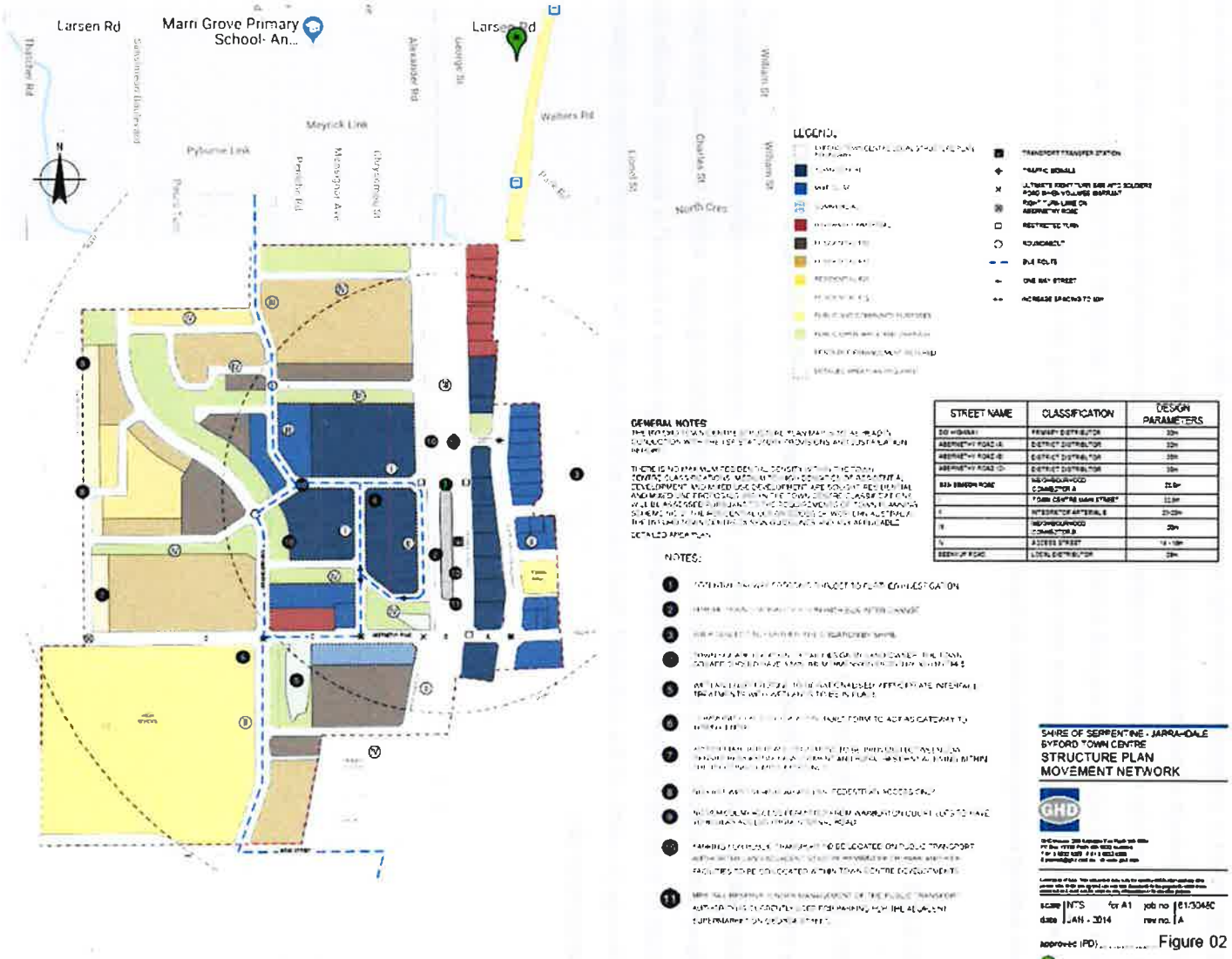



Figure 43 – SoSJ Byford Town Centre 'Movement Network Plan' with development site show as

DEVELOPMENT ASSESSMENT PANEL
APPROVED
11-Dec-2018

## Issue 5: Loading Bay Orientation and Access Arrangements

"The loading bays currently proposed running parallel to George St require vehicles entering and exiting the loading area to drive across the main access driveway and to reverse onto the access driveway. The shire considers the current proposed loading bay arrangements to be unsafe. The loading bays should be reconfigured to eliminate reversing of large vehicles where interaction with the public is possible. Vehicles entering and exiting the loading bays should be able to do so without moving across the driveway intersection. As an example of a preferred arrangement on George St please see below an aerial of the Aldi development. Aldi have separated the loading from the customer with an additional George St Access."

## Response 5

It appears that the Shire's officer may not be using the correct terminology for the elements of an off-street parking area as the development plans never showed a requirement for vehicles "to reverse onto the access driveway". For clarification, the terminology used in this TIA is the same as that used in the Australian Standards, as shown in Figure 44 below.

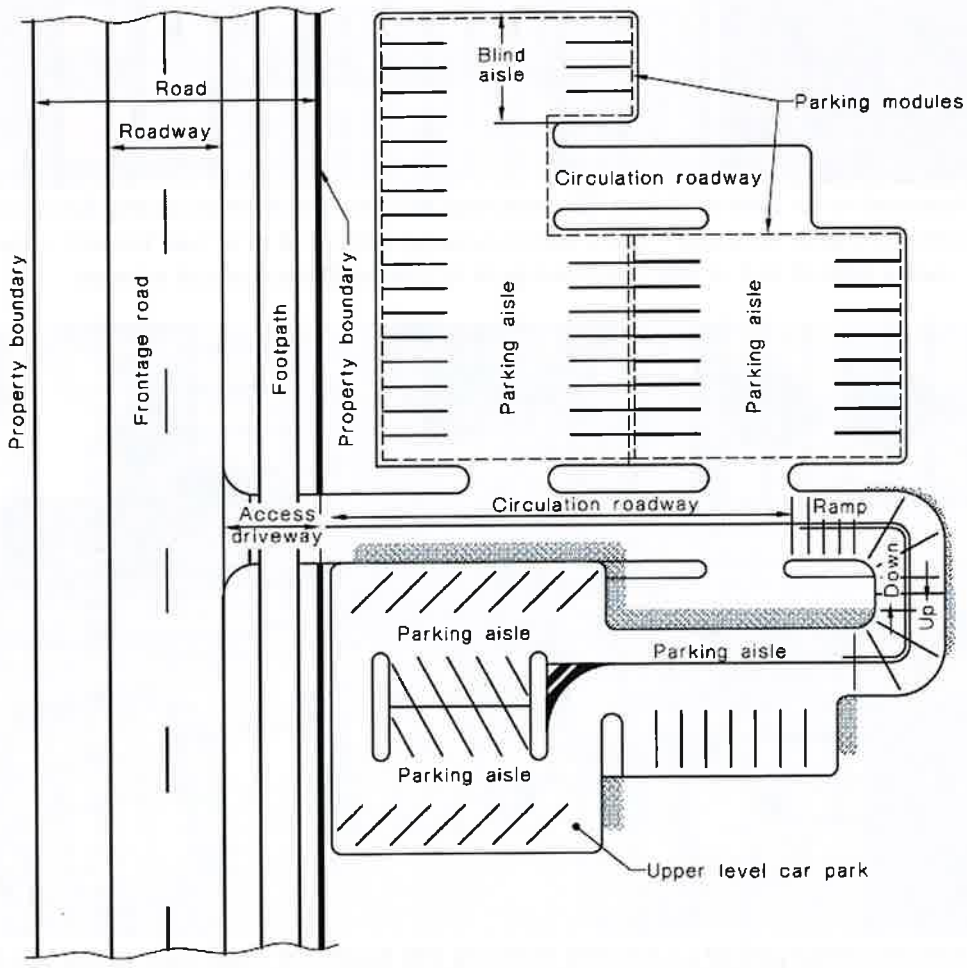



Figure 44 – Off-street car park elements and definitions

The development drawings have been amended since issue of the last version of the TIA (F2.0).

As indicated in **Section 3**, the 12.5 m Heavy Rigid Vehicles will be the typical delivery and service vehicle for waste collection and stock deliveries to all tenancies. An assessment of the swept paths of the 12.5 m HRV accessing and egressing each Loading Bay is shown in Figure 45 and Figure 46 below.

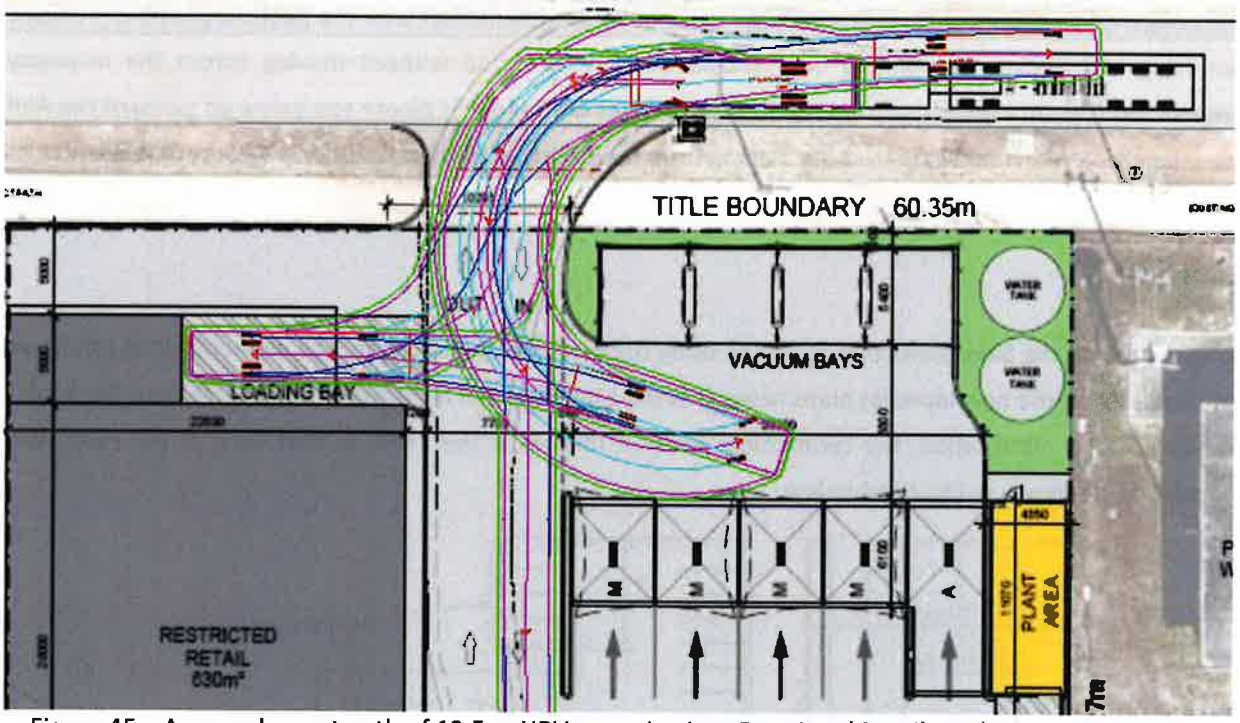



Figure 45 – Assessed swept path of 12.5 m HRV reversing into Restricted Retail Loading Bay and driving forward out onto George St (in colour – black outline is swept path of 19 m ST Fuel Tanker) – also shows swept path of 12.5 m HRV from George St to Loading Zone assessed in below

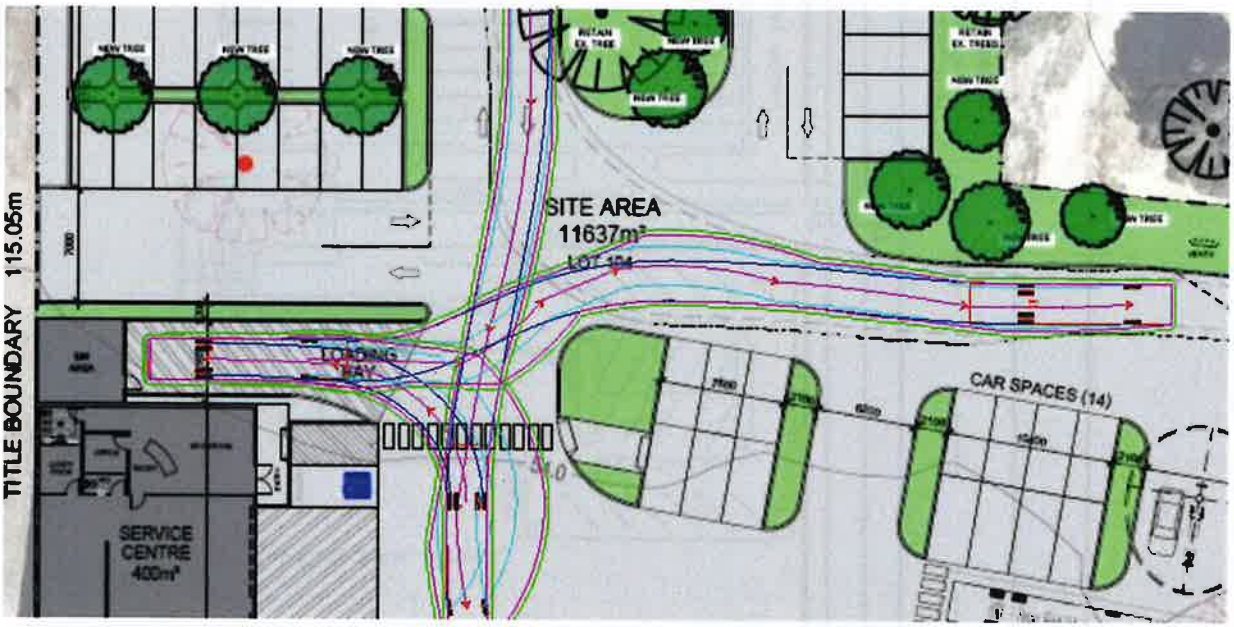



Figure 46 - Assessed swept path of 12.5 m HRV reversing into Restricted Retail Loading Bay and driving forward out onto George St (in colour – black outline is swept path of 19 m ST Fuel Tanker)

## Peak Hour Traffic on Larsen Rd

An assessment of the turning volume data collected on Wednesday 22nd August 2018 provided to the author by the Shire on 25th October 2018 has indicated maximum 'peak hour' volumes through this intersection occur between 3.15 and 4.15 PM as shown in Figure 47 below.

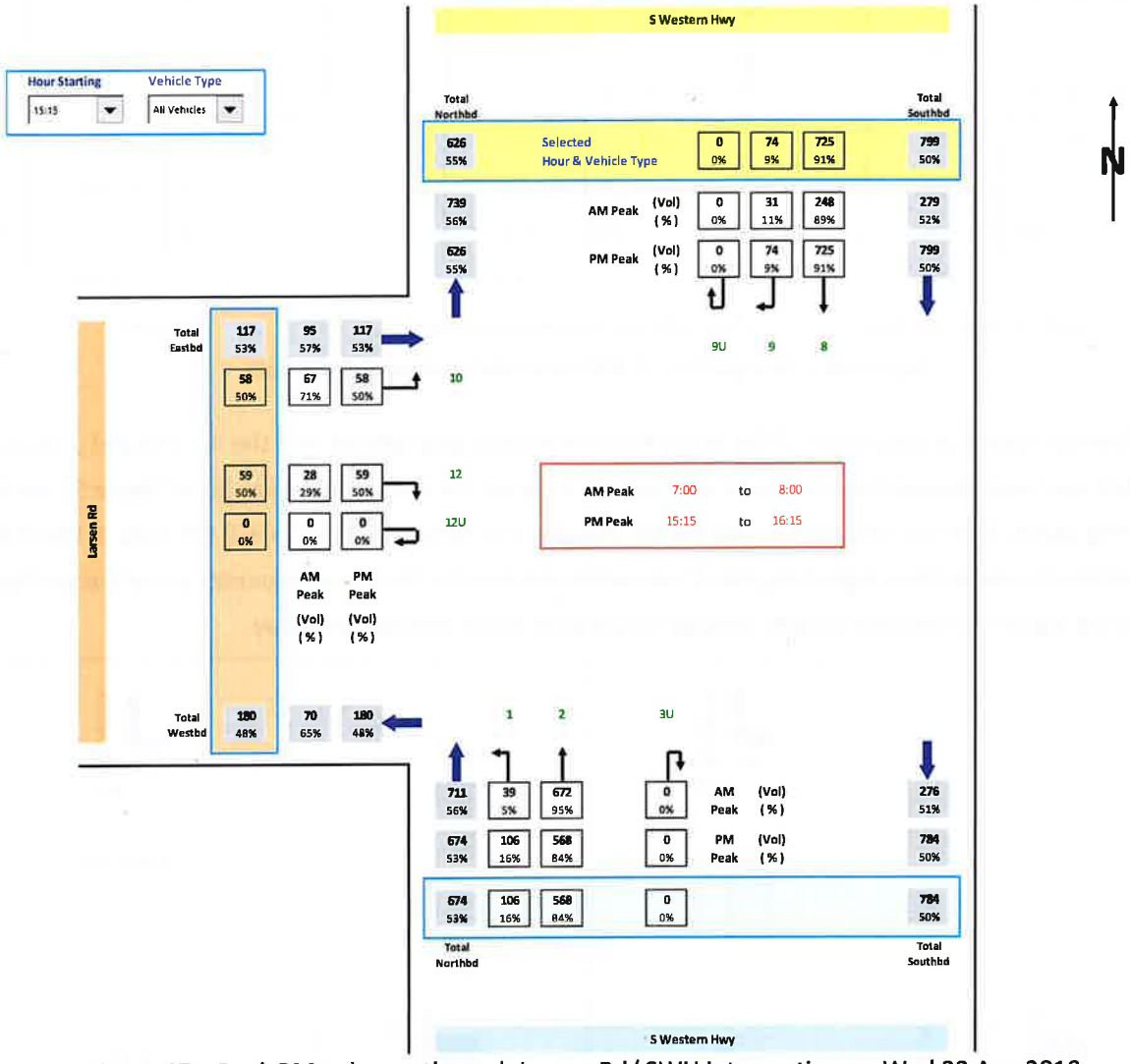



Figure 47 – Peak PM volumes through Larsen Rd/ SWH intersection on Wed 22 Aug 2018

A comparison between PM peak hour turning volume data collected on Wednesday 22nd August 2018 collected by the Shire and the PM peak hour data collected by the author in April 2018 and used for the assessment is provided as Figure 48 on the following page. This shows the total difference is 5 vehicles. There are higher volumes on Larsen Rd in the SoSJ data that may warrant assessment in order to provide stakeholders with confidence that the assessment is robust.

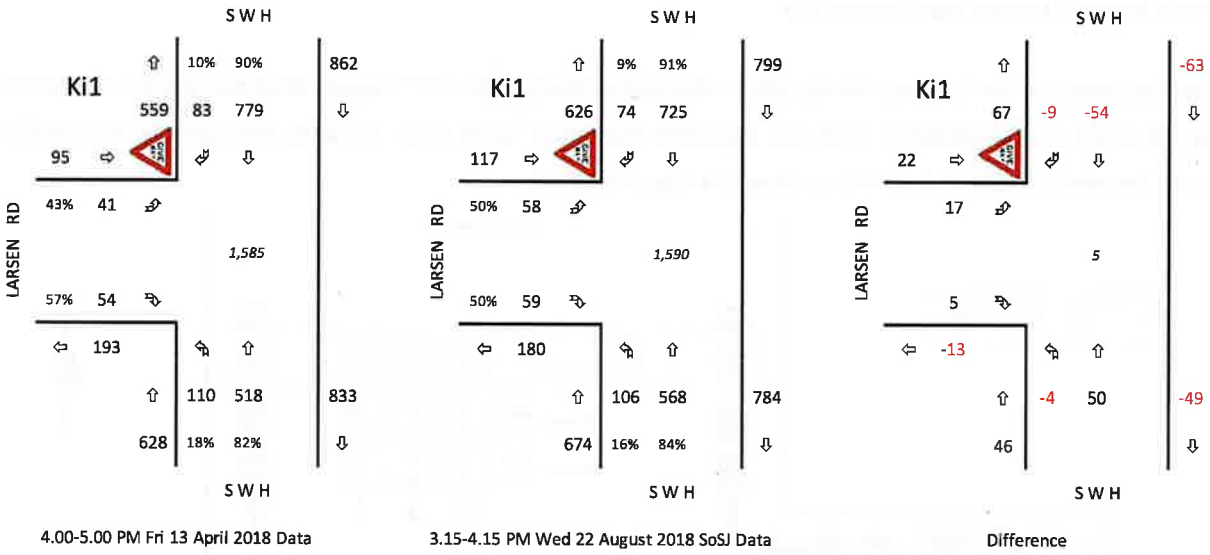



Figure 48 – Comparison of different midweek peak hour data

The forecast Degree of Saturation of the assessed intersections and options with the 4-5 PM and 3.15-4.15 PM data has been assessed and is shown side by side in Figure 49 below and Figure 50 to Figure 52 on the following pages. This has revealed no significant changes and indicates that the 4-5 PM data is the most appropriate to use as it has higher degree of saturation volumes for the key movements out of Larsen Road due to the higher northbound straight through volumes on South Western Highway.

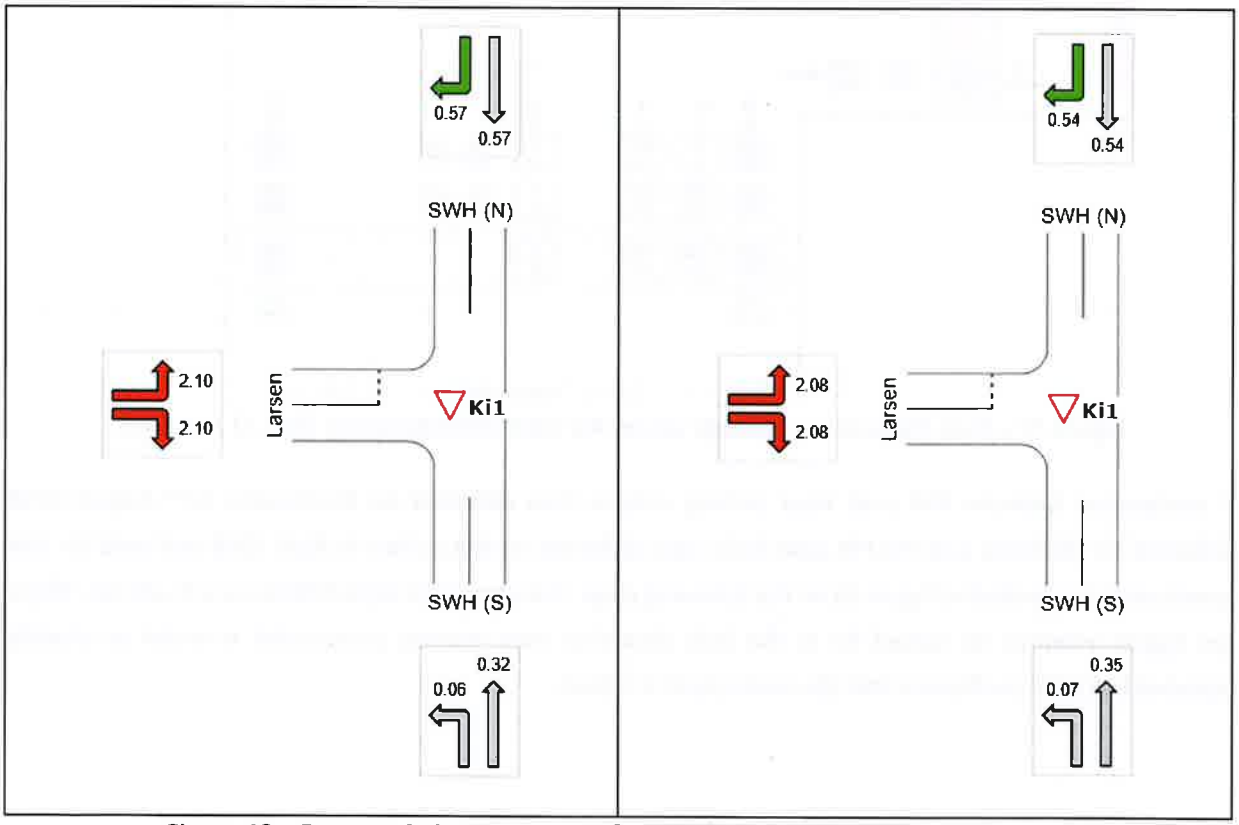



Figure 49 – Forecast 2020 Ki1 Degree of Saturation 4-5 PM v 3.15-4.15 PM data

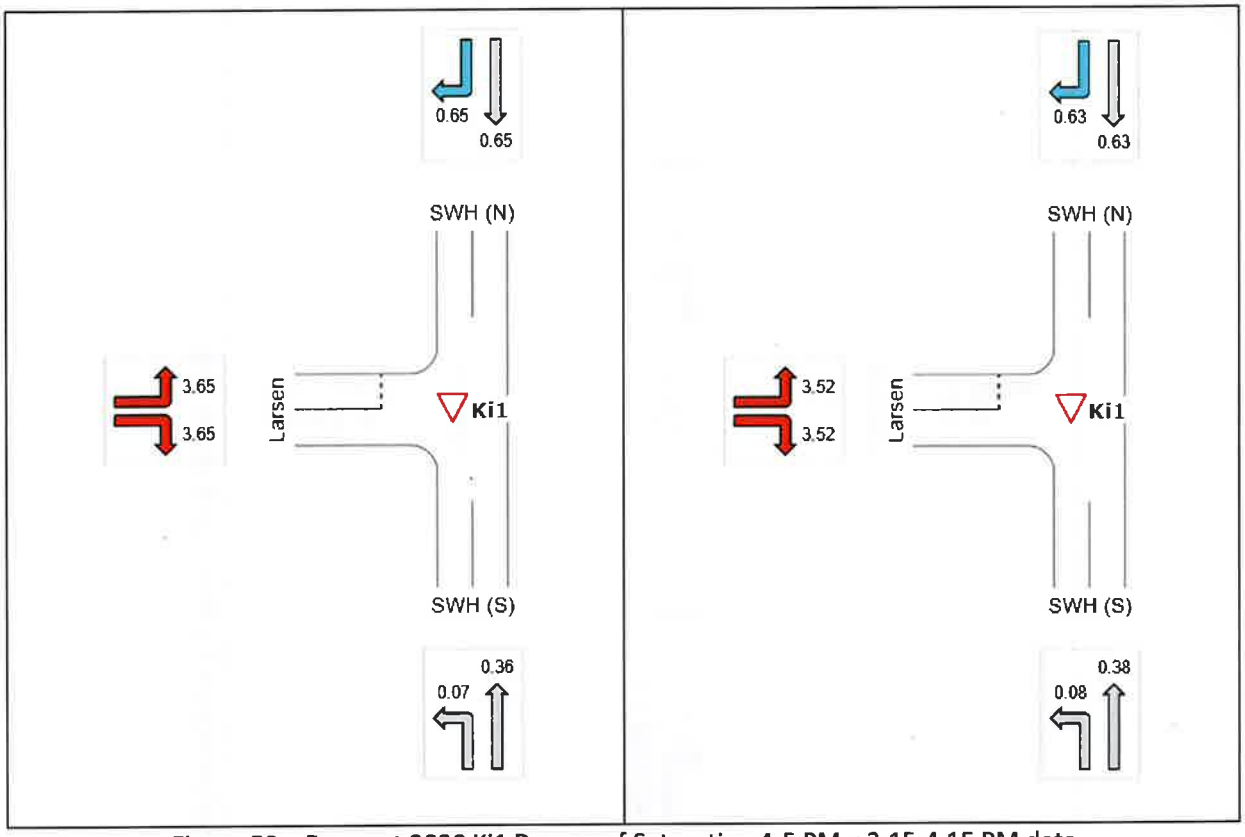



Figure 50 – Forecast 2030 Ki1 Degree of Saturation 4-5 PM v 3.15-4.15 PM data

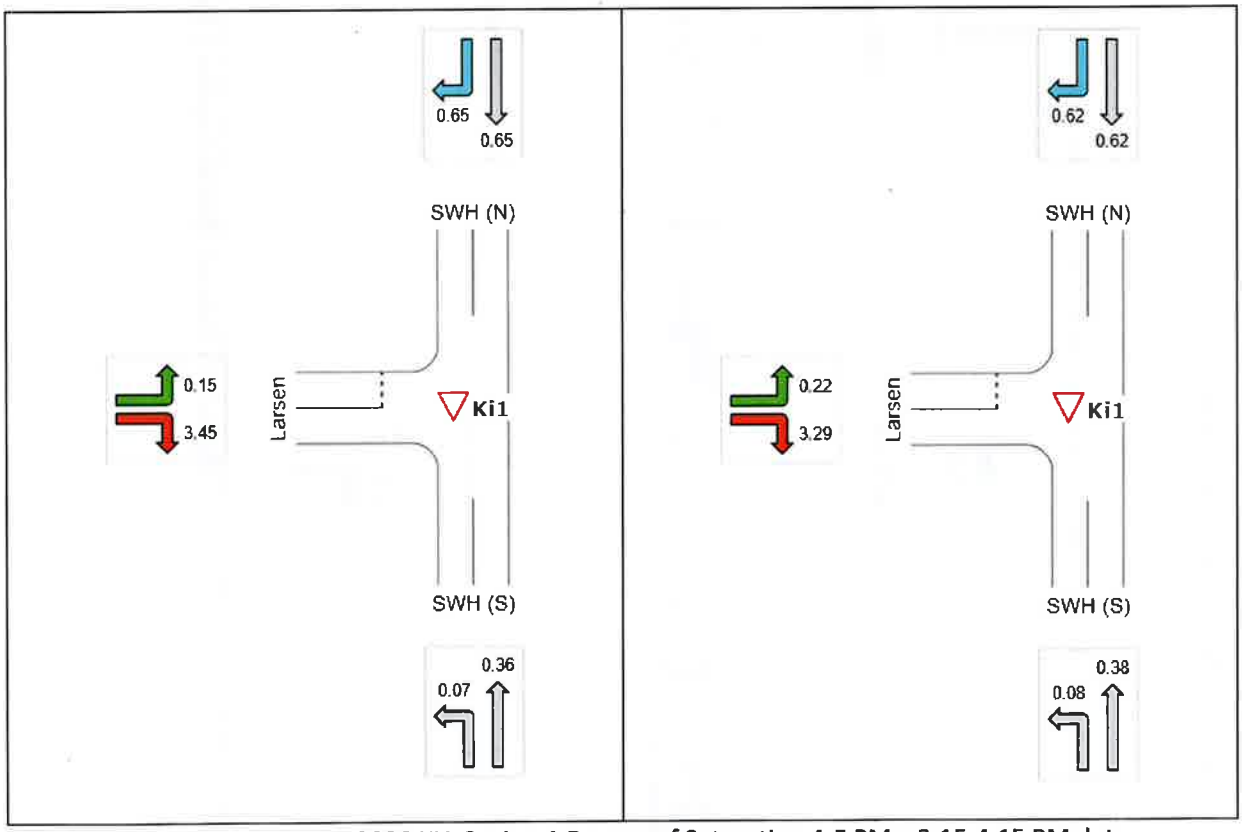



Figure 51 – Forecast 2030 Ki1 Option 1 Degree of Saturation 4-5 PM v 3.15-4.15 PM data

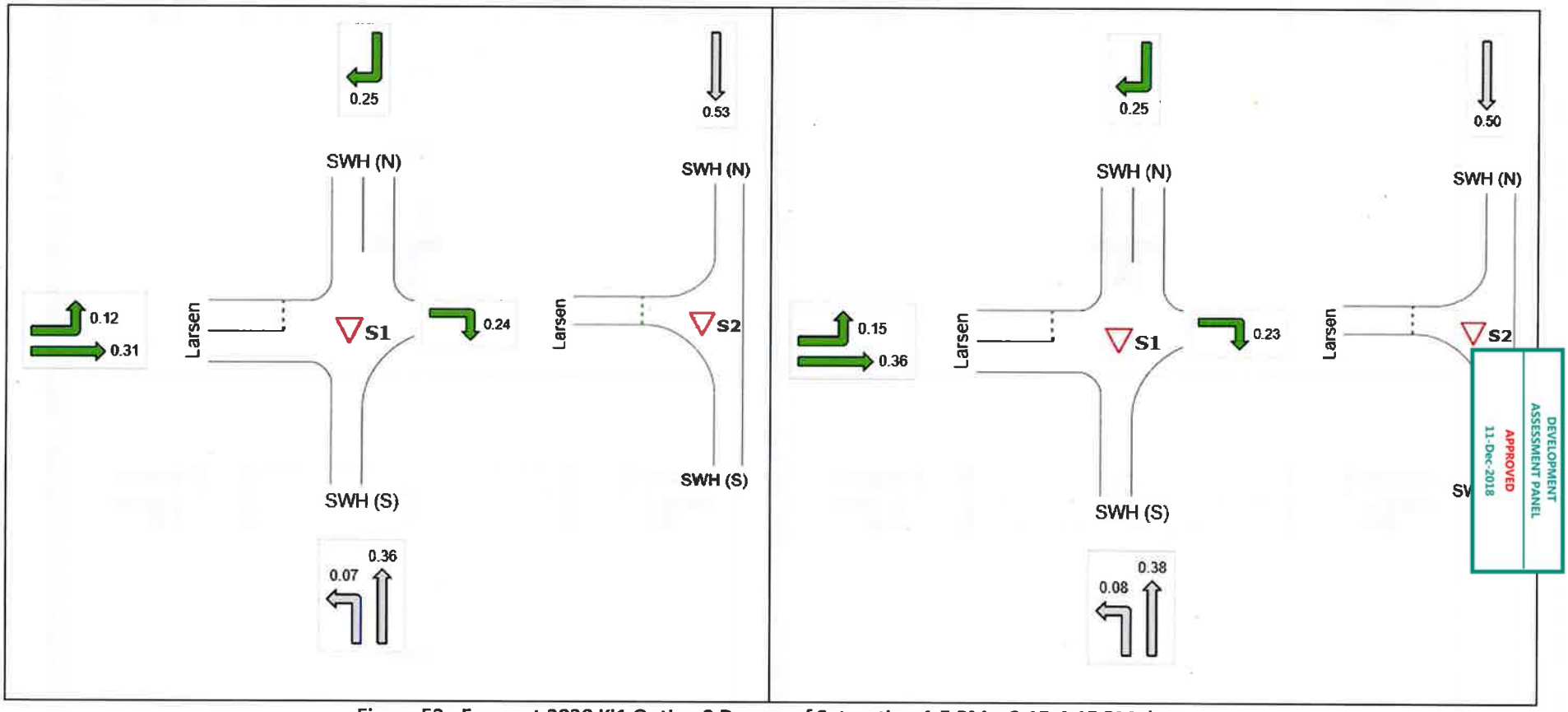



Figure 52– Forecast 2030 Ki1 Option 2 Degree of Saturation 4-5 PM v 3.15-4.15 PM data

# 16 CONCLUSIONS

This TIA has determined that the proposed development is likely to generate up to 200 trips during its busiest hours. Up to 70% of these trips are likely to be from passing traffic. The existing Larsen Rd approach to South Western Hwy is currently very close to capacity during the road network midweek PM and Saturday peak hours, hence any increase in traffic, including that associated with annual growth and other development in the area, is likely to push this to capacity unless changes are made to this intersection.

Two options to address the capacity concerns have been assessed and have demonstrated that the intersection is forecast to perform better than the existing layout despite the increased traffic. This is due to the improved intersection layout, i.e. a two-stage crossing for right turns out of Larsen Rd and protected right and left turn lanes into Larsen Rd.

# References

1. **Western Australian Planning Commission.** *Transport Impact Assessment Guidelines.* Department of Planning, Government of Western Australia. Perth, Western Australia : Western Australian Planning Commission, August 2016. p. 182, Revised August 2016. The current version of the TIA guidelines (August 2016) has been endorsed by the WAPC..

2. **Austroads.** *Guide to Traffic Management Part 12: Traffic Impacts of Developments.* [ed.] Gary Veith, et al. 1st edition. Sydney : Austroads, 2009. p. 115. Vol. 12. ISBN 978-1-921551-61-1.

3. **Main Roads Western Australia.** Perth Metropolitan Area Functional Road Hierarchy. [ed.] Asset & Network Information. Perth, WA, Australia : Main Roads Western Australia, August 1997.

4. **Standards Australia.** *AS 2890.2-2002 Parking facilities Part 2: Off-street commercial vehcile facilities.* Second. Sydney : Standards Australia International, 2002. p. 49. Vol. 2. ISBN 0 7337 4870 8.

5. **NSW Government.** *Guide to Traffic Generating Developments Updated traffic surveys.* Transport, Roads & Maritime Services. Sydney : NSW Government, August 2013. p. 22, Technical Direction. RMS.13.298.

6. **Institute of Transportation Engineers (USA).** *Trip Generation Manual, 9th Edition.* 9th Edition. Washington : Institute of Transportation Engineers (USA), September 2012. ISBN-13: 978-1-933452-64-7; ISBN-10: 1-933452-64-1.

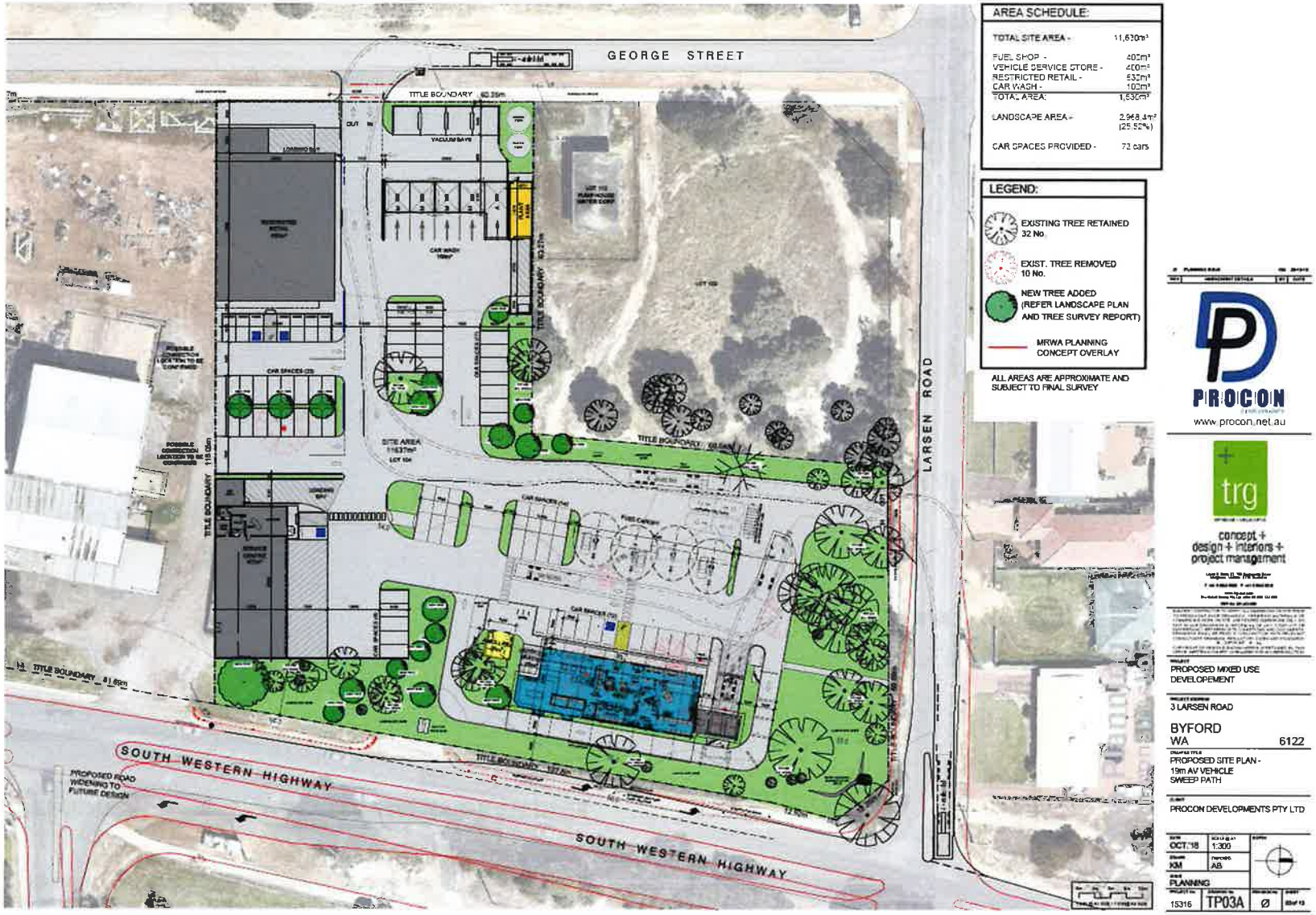
7. **Western Australian Planning Commisssion.** *Liveable Neighbourhoods.* Jan 2009 Update 02. Perth : Western Australian Planning Commisssion, 2009 Update. p. 178. ISBN 0 7309 9649 0.

8. **Standards Australia.** *AS/NZS 2890.1 - 2004 Parking facilities Part 1: Off-street car parking.* Sydney : Standards Australia/ Standards New Zealand, 2004. p. 77. (Incorporating Ammendment No 1). ISBN 0 7337 5742 1.

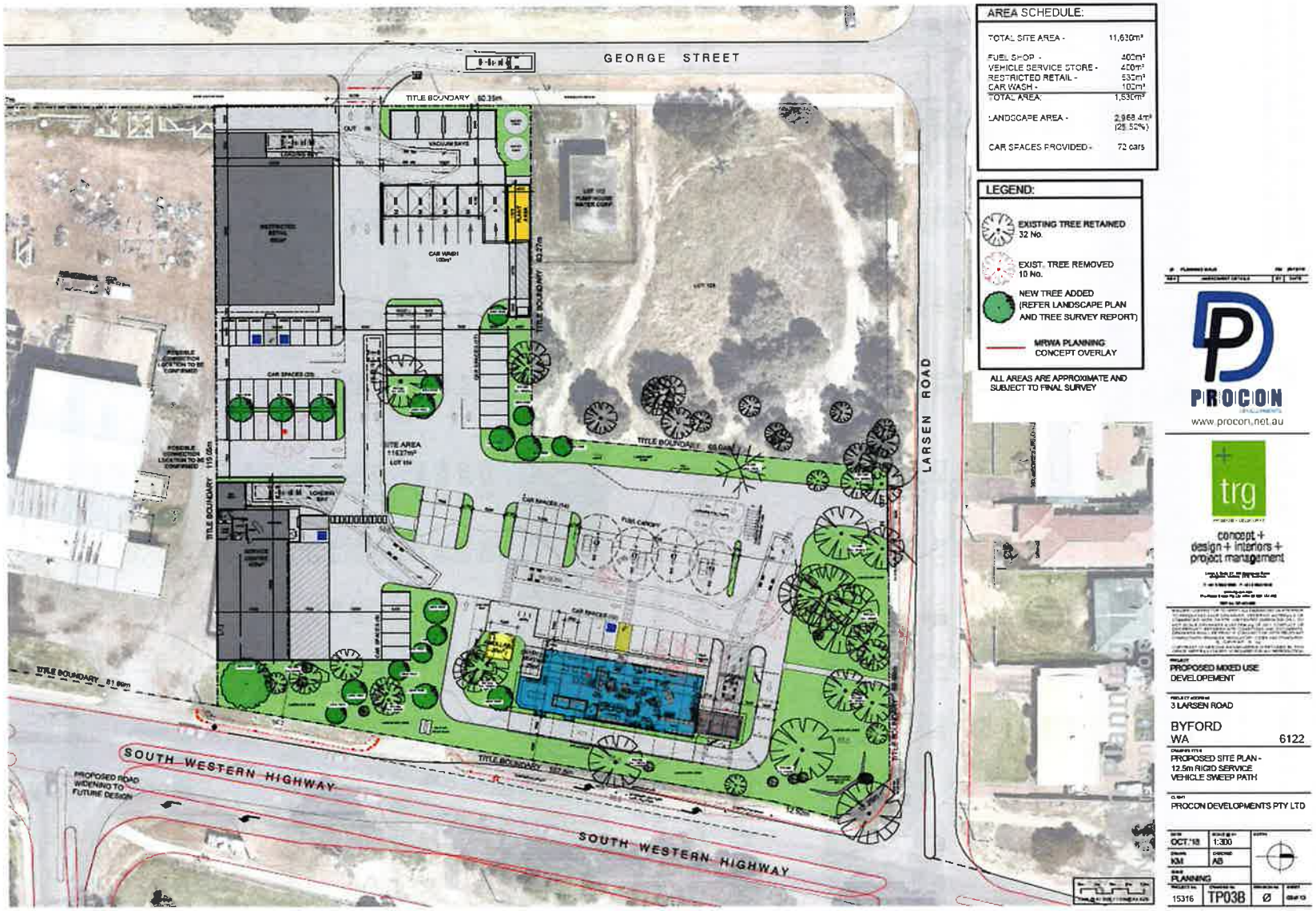
9. **Roads and Traffic Authority NSW.** *Guide to Traffic Generating Developments.* Transport Planning Section. Sydney : Roads and Traffic Authority NSW, October 2002. p. 174. Version 2.2. ISBN 0 7305 9080 1.

10. **Austroads.** *Guide to Traffic Management Part 3: Traffic Studies and Analysis.* Sydney : Austroads Incorporated, 2009. p. 196. Vol. 3. ISBN 978-1-921551-77-2.

# APPENDIX A DEVELOPMENT DRAWINGS




DEVELOPMENT ASSESSMENT PANEL
APPROVED
11-Dec-2018


GEORGE STREET
LARSEN ROAD
SOUTH WESTERN HIGHWAY
SOUTH WESTERN HIGHWAY
TITLE BOUNDARY
PROPOSED ROAD WIDENING TO FUTURE DESIGN
AREA SCHEDULE:
TOTAL SITE AREA - 11,630m²
FUEL SHOP - 400m²
VEHICLE SERVICE STORE - 400m²
RESTRICTED RETAIL - 53m²
CAR WASH - 100m²
TOTAL AREA: 1,530m²
LANDSCAPE AREA - 2,968.4m² (25.52%)
CAR SPACES PROVIDED - 72 cars
LEGEND:
EXISTING TREE RETAINED 32 No.
EXIST. TREE REMOVED 10 No.
NEW TREE ADDED (REFER LANDSCAPE PLAN AND TREE SURVEY REPORT)
MRWA PLANNING CONCEPT OVERLAY
ALL AREAS ARE APPROXIMATE AND SUBJECT TO FINAL SURVEY
PROCON
www.procon.net.au
trg
concept + design + interiors + project management
PROPOSED MIXED USE DEVELOPEMENT
3 LARSEN ROAD
BYFORD
WA 6122
PROPOSED SITE PLAN - 12.5m RIGID SERVICE VEHICLE SWEEP PATH
PROCON DEVELOPMENTS PTY LTD
OCT.'18
1:300
KM
AB
PLANNING
15316
TP03B
DEVELOPMENT ASSESSMENT PANEL
APPROVED
11-Dec-2018

## APPENDIX B SIDRA INTERSECTION DATA

# MOVEMENT SUMMARY

## Site: Ki1: Larsen Rd/ South West Hwy Existing PM

## Network: Si1-Ki1 Existing 2018 4-5 Midweek PM Peak


Giveway / Yield (Two-Way)

**Movement Performance - Vehicles**

| Mov ID | ODMov | Demand Flows Total veh/h | HV % | Arrival Flows Total veh/h | HV % | Deg. Satn v/c | Average Delay sec | Level of Service | 95% Back of Queue Vehicles veh | Distance m | Prop. Queued | Effective Stop Rate per veh | Average Speed km/h |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| South: SWH (S) | | | | | | | | | | | | | |
| 1 | L2 | 116 | 1.0 | 116 | 1.0 | 0.063 | 5.6 | LOS A | 0.0 | 0.0 | 0.00 | 0.58 | 49.1 |
| 2 | T1 | 545 | 13.0 | 545 | 13.0 | 0.303 | 0.0 | LOS A | 0.0 | 0.0 | 0.00 | 0.00 | 59.9 |
| Approach | | 661 | 10.9 | 661 | 10.9 | 0.303 | 1.0 | NA | 0.0 | 0.0 | 0.00 | 0.10 | 59.0 |
| North: SWH (N) | | | | | | | | | | | | | |
| 3 | T1 | 820 | 13.0 | 820 | 13.0 | 0.493 | 1.8 | LOS A | 2.9 | 22.3 | 0.26 | 0.08 | 57.6 |
| 4 | R2 | 87 | 1.0 | 87 | 1.0 | 0.493 | 13.4 | LOS B | 2.9 | 22.3 | 0.33 | 0.10 | 55.5 |
| Approach | | 907 | 11.8 | 907 | 11.8 | 0.493 | 3.0 | NA | 2.9 | 22.3 | 0.26 | 0.08 | 57.4 |
| West: Larsen | | | | | | | | | | | | | |
| 5 | L2 | 43 | 1.0 | 43 | 1.0 | 0.914 | 87.9 | LOS F | 5.9 | 41.8 | 0.95 | 1.47 | 18.8 |
| 6 | R2 | 57 | 1.0 | 57 | 1.0 | 0.914 | 144.3 | LOS F | 5.9 | 41.8 | 0.95 | 1.47 | 13.0 |
| Approach | | 100 | 1.0 | 100 | 1.0 | 0.914 | 120.0 | LOS F | 5.9 | 41.8 | 0.95 | 1.47 | 15.7 |
| All Vehicles | | 1668 | 10.8 | 1668 | 10.8 | 0.914 | 9.2 | NA | 5.9 | 41.8 | 0.20 | 0.17 | 52.4 |

# MOVEMENT SUMMARY

## Site: Si1: Larsen Rd/ George St Existing PM

## Network: Si1-Ki1 Existing 2018 4-5 Midweek PM Peak


Giveway / Yield (Two-Way)

**Movement Performance - Vehicles**

| Mov ID | ODMov | Demand Flows Total veh/h | HV % | Arrival Flows Total veh/h | HV % | Deg. Satn v/c | Average Delay sec | Level of Service | 95% Back of Queue Vehicles veh | Distance m | Prop. Queued | Effective Stop Rate per veh | Average Speed km/h |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| South: George (S) | | | | | | | | | | | | | |
| 1 | L2 | 4 | 0.0 | 4 | 0.0 | 0.005 | 6.1 | LOS A | 0.0 | 0.1 | 0.28 | 0.54 | 51.0 |
| 2 | T1 | 1 | 0.0 | 1 | 0.0 | 0.005 | 5.4 | LOS A | 0.0 | 0.1 | 0.28 | 0.54 | 52.1 |
| 3 | R2 | 1 | 0.0 | 1 | 0.0 | 0.005 | 6.9 | LOS A | 0.0 | 0.1 | 0.28 | 0.54 | 42.7 |
| Approach | | 6 | 0.0 | 6 | 0.0 | 0.005 | 6.1 | LOS A | 0.0 | 0.1 | 0.28 | 0.54 | 50.6 |
| East: Larsen (E) | | | | | | | | | | | | | |
| 4 | L2 | 1 | 0.0 | 1 | 0.0 | 0.107 | 5.9 | LOS A | 0.1 | 0.9 | 0.05 | 0.06 | 54.5 |
| 5 | T1 | 183 | 1.0 | 183 | 1.0 | 0.107 | 0.0 | LOS A | 0.1 | 0.9 | 0.05 | 0.06 | 58.9 |
| 6 | R2 | 19 | 0.0 | 19 | 0.0 | 0.107 | 5.8 | LOS A | 0.1 | 0.9 | 0.05 | 0.06 | 56.1 |
| Approach | | 203 | 0.9 | 203 | 0.9 | 0.107 | 0.6 | NA | 0.1 | 0.9 | 0.05 | 0.06 | 58.5 |
| North: George (N) | | | | | | | | | | | | | |
| 7 | L2 | 9 | 0.0 | 9 | 0.0 | 0.024 | 5.8 | LOS A | 0.1 | 0.6 | 0.23 | 0.58 | 51.0 |
| 8 | T1 | 1 | 0.0 | 1 | 0.0 | 0.024 | 5.4 | LOS A | 0.1 | 0.6 | 0.23 | 0.58 | 52.0 |
| 9 | R2 | 14 | 0.0 | 14 | 0.0 | 0.024 | 7.0 | LOS A | 0.1 | 0.6 | 0.23 | 0.58 | 53.0 |
| Approach | | 24 | 0.0 | 24 | 0.0 | 0.024 | 6.5 | LOS A | 0.1 | 0.6 | 0.23 | 0.58 | 52.4 |
| West: Larsen (W) | | | | | | | | | | | | | |
| 10 | L2 | 27 | 0.0 | 27 | 0.0 | 0.062 | 5.6 | LOS A | 0.0 | 0.1 | 0.02 | 0.15 | 57.3 |
| 11 | T1 | 89 | 1.0 | 89 | 1.0 | 0.062 | 0.0 | LOS A | 0.0 | 0.1 | 0.02 | 0.15 | 57.3 |
| 12 | R2 | 2 | 0.0 | 2 | 0.0 | 0.062 | 6.0 | LOS A | 0.0 | 0.1 | 0.02 | 0.15 | 55.4 |
| Approach | | 119 | 0.8 | 119 | 0.8 | 0.062 | 1.4 | NA | 0.0 | 0.1 | 0.02 | 0.15 | 57.2 |
| All Vehicles | | 353 | 0.8 | 353 | 0.8 | 0.107 | 1.4 | NA | 0.1 | 0.9 | 0.06 | 0.13 | 57.3 |

# MOVEMENT SUMMARY

## Site: Ki1: Larsen Rd/ South West Hwy Existing SAT

## Network: Si1-Ki1 Existing 2018 1-2 Saturday Peak


Giveway / Yield (Two-Way)

**Movement Performance - Vehicles**

| Mov ID | ODMov | Demand Flows Total veh/h | HV % | Arrival Flows Total veh/h | HV % | Deg. Satn v/c | Average Delay sec | Level of Service | 95% Back of Queue Vehicles veh | 95% Back of Queue Distance m | Prop. Queued | Effective Stop Rate per veh | Average Speed km/h |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| South: SWH (S) | | | | | | | | | | | | | |
| 1 | L2 | 80 | 1.0 | 80 | 1.0 | 0.060 | 5.6 | LOS A | 0.0 | 0.0 | 0.00 | 0.43 | 51.3 |
| 2 | T1 | 564 | 13.0 | 564 | 13.0 | 0.298 | 0.0 | LOS A | 0.0 | 0.0 | 0.00 | 0.02 | 59.7 |
| Approach | | 644 | 11.5 | 644 | 11.5 | 0.298 | 0.7 | NA | 0.0 | 0.0 | 0.00 | 0.07 | 59.3 |
| North: SWH (N) | | | | | | | | | | | | | |
| 3 | T1 | 597 | 13.0 | 597 | 13.0 | 0.375 | 1.6 | LOS A | 2.0 | 15.1 | 0.25 | 0.09 | 57.7 |
| 4 | R2 | 78 | 1.0 | 78 | 1.0 | 0.375 | 11.8 | LOS B | 2.0 | 15.1 | 0.32 | 0.12 | 55.7 |
| Approach | | 675 | 11.6 | 675 | 11.6 | 0.375 | 2.8 | NA | 2.0 | 15.1 | 0.26 | 0.09 | 57.5 |
| West: Larsen | | | | | | | | | | | | | |
| 5 | L2 | 47 | 1.0 | 47 | 1.0 | 0.510 | 16.9 | LOS C | 2.1 | 15.0 | 0.87 | 1.06 | 37.2 |
| 6 | R2 | 55 | 1.0 | 55 | 1.0 | 0.510 | 45.3 | LOS E | 2.1 | 15.0 | 0.87 | 1.06 | 29.8 |
| Approach | | 102 | 1.0 | 102 | 1.0 | 0.510 | 32.2 | LOS D | 2.1 | 15.0 | 0.87 | 1.06 | 33.8 |
| All Vehicles | | 1421 | 10.8 | 1421 | 10.8 | 0.510 | 4.0 | NA | 2.1 | 15.1 | 0.18 | 0.15 | 56.4 |

# MOVEMENT SUMMARY

## Site: Si1: Larsen Rd/ George St Existing SAT

## Network: Si1-Ki1 Existing 2018 1-2 Saturday Peak


Giveway / Yield (Two-Way)

**Movement Performance - Vehicles**

| Mov ID | ODMov | Demand Flows Total veh/h | HV % | Arrival Flows Total veh/h | HV % | Deg. Satn v/c | Average Delay sec | Level of Service | 95% Back of Queue Vehicles veh | 95% Back of Queue Distance m | Prop. Queued | Effective Stop Rate per veh | Average Speed km/h |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| South: George (S) | | | | | | | | | | | | | |
| 1 | L2 | 1 | 0.0 | 1 | 0.0 | 0.004 | 5.9 | LOS A | 0.0 | 0.1 | 0.28 | 0.55 | 51.2 |
| 2 | T1 | 1 | 0.0 | 1 | 0.0 | 0.004 | 5.0 | LOS A | 0.0 | 0.1 | 0.28 | 0.55 | 52.2 |
| 3 | R2 | 2 | 0.0 | 2 | 0.0 | 0.004 | 6.6 | LOS A | 0.0 | 0.1 | 0.28 | 0.55 | 43.0 |
| Approach | | 4 | 0.0 | 4 | 0.0 | 0.004 | 6.1 | LOS A | 0.0 | 0.1 | 0.28 | 0.55 | 49.3 |
| East: Larsen (E) | | | | | | | | | | | | | |
| 4 | L2 | 1 | 0.0 | 1 | 0.0 | 0.084 | 5.8 | LOS A | 0.1 | 0.9 | 0.06 | 0.08 | 54.1 |
| 5 | T1 | 137 | 1.0 | 137 | 1.0 | 0.084 | 0.1 | LOS A | 0.1 | 0.9 | 0.06 | 0.08 | 58.5 |
| 6 | R2 | 20 | 0.0 | 20 | 0.0 | 0.084 | 5.7 | LOS A | 0.1 | 0.9 | 0.06 | 0.08 | 55.9 |
| Approach | | 158 | 0.9 | 158 | 0.9 | 0.084 | 0.8 | NA | 0.1 | 0.9 | 0.06 | 0.08 | 58.1 |
| North: George (N) | | | | | | | | | | | | | |
| 7 | L2 | 17 | 0.0 | 17 | 0.0 | 0.020 | 5.8 | LOS A | 0.1 | 0.5 | 0.18 | 0.55 | 51.4 |
| 8 | T1 | 1 | 0.0 | 1 | 0.0 | 0.020 | 5.1 | LOS A | 0.1 | 0.5 | 0.18 | 0.55 | 52.3 |
| 9 | R2 | 7 | 0.0 | 7 | 0.0 | 0.020 | 6.6 | LOS A | 0.1 | 0.5 | 0.18 | 0.55 | 53.2 |
| Approach | | 25 | 0.0 | 25 | 0.0 | 0.020 | 6.0 | LOS A | 0.1 | 0.5 | 0.18 | 0.55 | 52.2 |
| West: Larsen (W) | | | | | | | | | | | | | |
| 10 | L2 | 8 | 0.0 | 8 | 0.0 | 0.048 | 5.6 | LOS A | 0.0 | 0.1 | 0.01 | 0.06 | 58.0 |
| 11 | T1 | 83 | 1.0 | 83 | 1.0 | 0.048 | 0.0 | LOS A | 0.0 | 0.1 | 0.01 | 0.06 | 58.8 |
| 12 | R2 | 1 | 0.0 | 1 | 0.0 | 0.048 | 5.9 | LOS A | 0.0 | 0.1 | 0.01 | 0.06 | 56.3 |
| Approach | | 93 | 0.9 | 93 | 0.9 | 0.048 | 0.6 | NA | 0.0 | 0.1 | 0.01 | 0.06 | 58.6 |
| All Vehicles | | 280 | 0.8 | 280 | 0.8 | 0.084 | 1.3 | NA | 0.1 | 0.9 | 0.06 | 0.12 | 57.4 |

# MOVEMENT SUMMARY

## Site: Ki1: Larsen Rd/ South West Hwy 2030 1-2 PM

**Network: Si1-Ki1 Forecast 2030 1-2 PM Midweek Peak**


Giveway / Yield (Two-Way)

**Movement Performance - Vehicles**

| Mov ID | OD Mov | Demand Flows Total veh/h | HV % | Arrival Flows Total veh/h | HV % | Deg. Satn v/c | Average Delay sec | Level of Service | 95% Back of Queue Vehicles veh | Distance m | Prop. Queued | Effective Stop Rate per veh | Average Speed km/h |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| South: SWH (S) | | | | | | | | | | | | | |
| 1 | L2 | 89 | 1.0 | 89 | 1.0 | 0.056 | 5.6 | LOS A | 0.0 | 0.0 | 0.00 | 0.50 | 50.2 |
| 2 | T1 | 520 | 13.0 | 520 | 13.0 | 0.281 | 0.0 | LOS A | 0.0 | 0.0 | 0.00 | 0.01 | 59.8 |
| Approach | | 609 | 11.2 | 609 | 11.2 | 0.281 | 0.8 | NA | 0.0 | 0.0 | 0.00 | 0.09 | 59.2 |
| North: SWH (N) | | | | | | | | | | | | | |
| 3 | T1 | 534 | 13.0 | 534 | 13.0 | 0.376 | 2.0 | LOS A | 2.3 | 17.9 | 0.30 | 0.14 | 57.2 |
| 4 | R2 | 107 | 1.0 | 107 | 1.0 | 0.376 | 11.2 | LOS B | 2.3 | 17.9 | 0.40 | 0.18 | 54.6 |
| Approach | | 641 | 11.0 | 641 | 11.0 | 0.376 | 3.5 | NA | 2.3 | 17.9 | 0.32 | 0.14 | 56.9 |
| West: Larsen | | | | | | | | | | | | | |
| 5 | L2 | 81 | 1.0 | 81 | 1.0 | 0.670 | 20.9 | LOS C | 3.6 | 25.5 | 0.87 | 1.18 | 36.6 |
| 6 | R2 | 82 | 1.0 | 82 | 1.0 | 0.670 | 46.4 | LOS E | 3.6 | 25.5 | 0.87 | 1.18 | 29.2 |
| Approach | | 163 | 1.0 | 163 | 1.0 | 0.670 | 33.7 | LOS D | 3.6 | 25.5 | 0.87 | 1.18 | 33.4 |
| **All Vehicles** | | **1414** | **9.9** | **1414** | **9.9** | **0.670** | **5.8** | **NA** | **3.6** | **25.5** | **0.24** | **0.24** | **54.6** |

# MOVEMENT SUMMARY

## Site: Si1: Larsen Rd/ George St 2030 1-2 PM

**Network: Si1-Ki1 Forecast 2030 1-2 PM Midweek Peak**


Giveway / Yield (Two-Way)

**Movement Performance - Vehicles**

| Mov ID | OD Mov | Demand Flows Total veh/h | HV % | Arrival Flows Total veh/h | HV % | Deg. Satn v/c | Average Delay sec | Level of Service | 95% Back of Queue Vehicles veh | Distance m | Prop. Queued | Effective Stop Rate per veh | Average Speed km/h |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| South: George (S) | | | | | | | | | | | | | |
| 1 | L2 | 2 | 0.0 | 2 | 0.0 | 0.020 | 5.9 | LOS A | 0.1 | 0.5 | 0.33 | 0.60 | 50.7 |
| 2 | T1 | 1 | 0.0 | 1 | 0.0 | 0.020 | 5.3 | LOS A | 0.1 | 0.5 | 0.33 | 0.60 | 51.8 |
| 3 | R2 | 15 | 0.0 | 15 | 0.0 | 0.020 | 6.9 | LOS A | 0.1 | 0.5 | 0.33 | 0.60 | 42.0 |
| Approach | | 18 | 0.0 | 18 | 0.0 | 0.020 | 6.7 | LOS A | 0.1 | 0.5 | 0.33 | 0.60 | 45.2 |
| East: Larsen (E) | | | | | | | | | | | | | |
| 4 | L2 | 14 | 0.0 | 14 | 0.0 | 0.091 | 5.8 | LOS A | 0.2 | 1.1 | 0.08 | 0.11 | 53.3 |
| 5 | T1 | 137 | 1.0 | 137 | 1.0 | 0.091 | 0.1 | LOS A | 0.2 | 1.1 | 0.08 | 0.11 | 57.9 |
| 6 | R2 | 20 | 0.0 | 20 | 0.0 | 0.091 | 5.8 | LOS A | 0.2 | 1.1 | 0.08 | 0.11 | 55.4 |
| Approach | | 171 | 0.8 | 171 | 0.8 | 0.091 | 1.2 | NA | 0.2 | 1.1 | 0.08 | 0.11 | 57.3 |
| North: George (N) | | | | | | | | | | | | | |
| 7 | L2 | 12 | 0.0 | 12 | 0.0 | 0.016 | 5.9 | LOS A | 0.1 | 0.4 | 0.23 | 0.56 | 51.2 |
| 8 | T1 | 1 | 0.0 | 1 | 0.0 | 0.016 | 5.3 | LOS A | 0.1 | 0.4 | 0.23 | 0.56 | 52.1 |
| 9 | R2 | 6 | 0.0 | 6 | 0.0 | 0.016 | 6.8 | LOS A | 0.1 | 0.4 | 0.23 | 0.56 | 53.1 |
| Approach | | 19 | 0.0 | 19 | 0.0 | 0.016 | 6.2 | LOS A | 0.1 | 0.4 | 0.23 | 0.56 | 52.1 |
| West: Larsen (W) | | | | | | | | | | | | | |
| 10 | L2 | 4 | 0.0 | 4 | 0.0 | 0.067 | 5.8 | LOS A | 0.0 | 0.2 | 0.02 | 0.03 | 58.2 |
| 11 | T1 | 121 | 1.0 | 121 | 1.0 | 0.067 | 0.0 | LOS A | 0.0 | 0.2 | 0.02 | 0.03 | 59.2 |
| 12 | R2 | 3 | 0.0 | 3 | 0.0 | 0.067 | 5.9 | LOS A | 0.0 | 0.2 | 0.02 | 0.03 | 56.6 |
| Approach | | 128 | 0.9 | 128 | 0.9 | 0.067 | 0.3 | NA | 0.0 | 0.2 | 0.02 | 0.03 | 59.0 |
| **All Vehicles** | | **336** | **0.8** | **336** | **0.8** | **0.091** | **1.5** | **NA** | **0.2** | **1.1** | **0.08** | **0.13** | **57.0** |

# MOVEMENT SUMMARY

## Site: Ki1: Larsen Rd/ South West Hwy 2030 4-5 PM

**Network: Si1-Ki1 Forecast 2030 4-5 PM Midweek Peak**


Giveway / Yield (Two-Way)

**Movement Performance - Vehicles**

| Mov ID | OD Mov | Demand Flows Total veh/h | HV % | Arrival Flows Total veh/h | HV % | Deg. Satn v/c | Average Delay sec | Level of Service | 95% Back of Queue Vehicles veh | Distance m | Prop. Queued | Effective Stop Rate per veh | Average Speed km/h |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| South: SWH (S) | | | | | | | | | | | | | |
| 1 | L2 | 151 | 1.0 | 151 | 1.0 | 0.082 | 5.6 | LOS A | 0.0 | 0.0 | 0.00 | 0.58 | 49.1 |
| 2 | T1 | 651 | 13.0 | 651 | 13.0 | 0.362 | 0.0 | LOS A | 0.0 | 0.0 | 0.00 | 0.00 | 59.9 |
| Approach | | 801 | 10.7 | 801 | 10.7 | 0.362 | 1.1 | NA | 0.0 | 0.0 | 0.00 | 0.11 | 58.9 |
| North: SWH (N) | | | | | | | | | | | | | |
| 3 | T1 | 957 | 13.0 | 957 | 13.0 | 0.656 | 4.4 | LOS A | 6.9 | 52.6 | 0.44 | 0.12 | 55.2 |
| 4 | R2 | 131 | 1.0 | 131 | 1.0 | 0.656 | 19.2 | LOS C | 6.9 | 52.6 | 0.59 | 0.16 | 51.1 |
| Approach | | 1087 | 11.6 | 1087 | 11.6 | 0.656 | 6.2 | NA | 6.9 | 52.6 | 0.46 | 0.13 | 54.9 |
| West: Larsen | | | | | | | | | | | | | |
| 5 | L2 | 89 | 1.0 | 89 | 1.0 | 3.737 | 2506.4 | LOS F | 52.8 | 372.8 | 1.00 | 3.64 | 1.3 |
| 6 | R2 | 104 | 1.0 | 104 | 1.0 | 3.737 | 2661.5 | LOS F | 52.8 | 372.8 | 1.00 | 3.64 | 0.8 |
| Approach | | 194 | 1.0 | 194 | 1.0 | 3.737 | 2589.8 | LOS F | 52.8 | 372.8 | 1.00 | 3.64 | 1.0 |
| **All Vehicles** | | **2082** | **10.3** | **2082** | **10.3** | **3.737** | **244.6** | **NA** | **52.8** | **372.8** | **0.33** | **0.45** | **12.3** |

# MOVEMENT SUMMARY

## Site: Ki1: Larsen Rd/ South West Hwy 2030 4-5 PM

**Network: Si1-Ki1 Forecast 2030 4-5 PM Midweek Peak**

© i3 consultants WA | www.i3consultants.com
Giveway / Yield (Two-Way)

**Movement Performance - Vehicles**

| Mov ID | OD Mov | Demand Flows Total veh/h | HV % | Arrival Flows Total veh/h | HV % | Deg. Satn v/c | Average Delay sec | Level of Service | 95% Back of Queue Vehicles veh | Distance m | Prop. Queued | Effective Stop Rate per veh | Average Speed km/h |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| South: SWH (S) | | | | | | | | | | | | | |
| 1 | L2 | 151 | 1.0 | 151 | 1.0 | 0.082 | 5.6 | LOS A | 0.0 | 0.0 | 0.00 | 0.58 | 49.1 |
| 2 | T1 | 651 | 13.0 | 651 | 13.0 | 0.362 | 0.0 | LOS A | 0.0 | 0.0 | 0.00 | 0.00 | 59.9 |
| Approach | | 801 | 10.7 | 801 | 10.7 | 0.362 | 1.1 | NA | 0.0 | 0.0 | 0.00 | 0.11 | 58.9 |
| North: SWH (N) | | | | | | | | | | | | | |
| 3 | T1 | 957 | 13.0 | 957 | 13.0 | 0.656 | 4.4 | LOS A | 6.9 | 52.6 | 0.44 | 0.12 | 55.2 |
| 4 | R2 | 131 | 1.0 | 131 | 1.0 | 0.656 | 19.2 | LOS C | 6.9 | 52.6 | 0.59 | 0.16 | 51.1 |
| Approach | | 1087 | 11.6 | 1087 | 11.6 | 0.656 | 6.2 | NA | 6.9 | 52.6 | 0.46 | 0.13 | 54.9 |
| West: Larsen | | | | | | | | | | | | | |
| 5 | L2 | 89 | 1.0 | 89 | 1.0 | 3.737 | 2506.4 | LOS F | 52.8 | 372.8 | 1.00 | 3.64 | 1.3 |
| 6 | R2 | 104 | 1.0 | 104 | 1.0 | 3.737 | 2661.5 | LOS F | 52.8 | 372.8 | 1.00 | 3.64 | 0.8 |
| Approach | | 194 | 1.0 | 194 | 1.0 | 3.737 | 2589.8 | LOS F | 52.8 | 372.8 | 1.00 | 3.64 | 1.0 |
| **All Vehicles** | | **2082** | **10.3** | **2082** | **10.3** | **3.737** | **244.6** | **NA** | **52.8** | **372.8** | **0.33** | **0.45** | **12.3** |

# MOVEMENT SUMMARY

## Site: Ki1: Larsen Rd/ South West Hwy 2030 1-2 Sat

**Network: Si1-Ki1 Forecast 2030 1-2 PM Saturday Peak**


Giveway / Yield (Two-Way)

**Movement Performance - Vehicles**

| Mov ID | OD Mov | Demand Flows Total veh/h | HV % | Arrival Flows Total veh/h | HV % | Deg. Satn v/c | Average Delay sec | Level of Service | 95% Back of Queue Vehicles veh | 95% Back of Queue Distance m | Prop. Queued | Effective Stop Rate per veh | Average Speed km/h |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| South: SWH (S) | | | | | | | | | | | | | |
| 1 | L2 | 117 | 1.0 | 117 | 1.0 | 0.073 | 5.6 | LOS A | 0.0 | 0.0 | 0.00 | 0.51 | 50.1 |
| 2 | T1 | 672 | 13.0 | 672 | 13.0 | 0.364 | 0.0 | LOS A | 0.0 | 0.0 | 0.00 | 0.01 | 59.8 |
| Approach | | 788 | 11.2 | 788 | 11.2 | 0.364 | 0.9 | NA | 0.0 | 0.0 | 0.00 | 0.09 | 59.1 |
| North: SWH (N) | | | | | | | | | | | | | |
| 3 | T1 | 708 | 13.0 | 708 | 13.0 | 0.531 | 4.0 | LOS A | 4.8 | 36.8 | 0.42 | 0.15 | 55.6 |
| 4 | R2 | 126 | 1.0 | 126 | 1.0 | 0.531 | 16.2 | LOS C | 4.8 | 36.8 | 0.57 | 0.20 | 51.5 |
| Approach | | 835 | 11.2 | 835 | 11.2 | 0.531 | 5.8 | NA | 4.8 | 36.8 | 0.44 | 0.15 | 55.1 |
| West: Larsen | | | | | | | | | | | | | |
| 5 | L2 | 105 | 1.0 | 105 | 1.0 | 1.985 | 921.4 | LOS F | 52.8 | 372.8 | 1.00 | 4.44 | 3.3 |
| 6 | R2 | 114 | 1.0 | 114 | 1.0 | 1.985 | 992.9 | LOS F | 52.8 | 372.8 | 1.00 | 4.44 | 2.0 |
| Approach | | 219 | 1.0 | 219 | 1.0 | 1.985 | 958.5 | LOS F | 52.8 | 372.8 | 1.00 | 4.44 | 2.6 |
| **All Vehicles** | | **1842** | **10.0** | **1842** | **10.0** | **1.985** | **116.9** | **NA** | **52.8** | **372.8** | **0.32** | **0.63** | **20.9** |

# MOVEMENT SUMMARY

## Site: Si1: Larsen Rd/ George St 2030 1-2 Sat

**Network: Si1-Ki1 Forecast 2030 1-2 PM Saturday Peak**


Giveway / Yield (Two-Way)

**Movement Performance - Vehicles**

| Mov ID | OD Mov | Demand Flows Total veh/h | HV % | Arrival Flows Total veh/h | HV % | Deg. Satn v/c | Average Delay sec | Level of Service | 95% Back of Queue Vehicles veh | 95% Back of Queue Distance m | Prop. Queued | Effective Stop Rate per veh | Average Speed km/h |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| South: George (S) | | | | | | | | | | | | | |
| 1 | L2 | 3 | 0.0 | 3 | 0.0 | 0.048 | 29.9 | LOS D | 0.3 | 2.4 | 0.78 | 0.68 | 38.8 |
| 2 | T1 | 1 | 0.0 | 1 | 0.0 | 0.048 | 19.8 | LOS C | 0.3 | 2.4 | 0.78 | 0.68 | 40.6 |
| 3 | R2 | 18 | 0.0 | 18 | 0.0 | 0.048 | 22.2 | LOS C | 0.3 | 2.4 | 0.78 | 0.68 | 24.2 |
| Approach | | 22 | 0.0 | 22 | 0.0 | 0.048 | 23.2 | LOS C | 0.3 | 2.4 | 0.78 | 0.68 | 28.8 |
| East: Larsen (E) | | | | | | | | | | | | | |
| 4 | L2 | 16 | 0.0 | 16 | 0.0 | 0.104 | 5.9 | LOS A | 0.2 | 1.3 | 0.08 | 0.11 | 53.2 |
| 5 | T1 | 158 | 1.0 | 158 | 1.0 | 0.104 | 0.1 | LOS A | 0.2 | 1.3 | 0.08 | 0.11 | 57.9 |
| 6 | R2 | 22 | 0.0 | 22 | 0.0 | 0.104 | 6.0 | LOS A | 0.2 | 1.3 | 0.08 | 0.11 | 55.4 |
| Approach | | 196 | 0.8 | 196 | 0.8 | 0.104 | 1.2 | NA | 0.2 | 1.3 | 0.08 | 0.11 | 57.3 |
| North: George (N) | | | | | | | | | | | | | |
| 7 | L2 | 19 | 0.0 | 19 | 0.0 | 0.041 | 27.2 | LOS D | 0.5 | 3.3 | 0.80 | 0.55 | 35.9 |
| 8 | T1 | 1 | 0.0 | 1 | 0.0 | 0.041 | 17.3 | LOS C | 0.5 | 3.3 | 0.80 | 0.55 | 39.9 |
| 9 | R2 | 8 | 0.0 | 8 | 0.0 | 0.041 | 19.8 | LOS C | 0.5 | 3.3 | 0.80 | 0.55 | 42.7 |
| Approach | | 28 | 0.0 | 28 | 0.0 | 0.041 | 24.7 | LOS C | 0.5 | 3.3 | 0.80 | 0.55 | 38.7 |
| West: Larsen (W) | | | | | | | | | | | | | |
| 10 | L2 | 9 | 0.0 | 9 | 0.0 | 0.158 | 27.6 | LOS D | 0.7 | 4.9 | 0.22 | 0.04 | 53.7 |
| 11 | T1 | 145 | 1.0 | 145 | 1.0 | 0.158 | 4.1 | LOS A | 0.7 | 4.9 | 0.22 | 0.04 | 50.1 |
| 12 | R2 | 3 | 0.0 | 3 | 0.0 | 0.158 | 33.9 | LOS D | 0.7 | 4.9 | 0.22 | 0.04 | 50.6 |
| Approach | | 158 | 0.9 | 158 | 0.9 | 0.158 | 6.1 | NA | 0.7 | 4.9 | 0.22 | 0.04 | 50.5 |
| **All Vehicles** | | **404** | **0.8** | **404** | **0.8** | **0.158** | **6.0** | **NA** | **0.7** | **4.9** | **0.23** | **0.15** | **51.0** |

# MOVEMENT SUMMARY

## Site: Ki1: Option 1: Larsen Rd/ South West Hwy 2030 4-5 PM S1 - Copy

## Network: Option 1: 2030 4-5 PM Midweek Peak


Giveway / Yield (Two-Way)

**Movement Performance - Vehicles**

| Mov ID | OD Mov | Demand Flows Total veh/h | HV % | Arrival Flows Total veh/h | HV % | Deg. Satn v/c | Average Delay sec | Level of Service | 95% Back of Queue Vehicles veh | 95% Back of Queue Distance m | Prop. Queued | Effective Stop Rate per veh | Average Speed km/h |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **South: SWH (S)** | | | | | | | | | | | | | |
| 1 | L2 | 151 | 1.0 | 151 | 1.0 | 0.082 | 5.6 | LOS A | 0.0 | 0.0 | 0.00 | 0.58 | 49.3 |
| 2 | T1 | 651 | 13.0 | 651 | 13.0 | 0.362 | 0.0 | LOS A | 0.0 | 0.0 | 0.00 | 0.00 | 59.9 |
| Approach | | 801 | 10.7 | 801 | 10.7 | 0.362 | 1.1 | NA | 0.0 | 0.0 | 0.00 | 0.11 | 58.6 |
| **North: SWH (N)** | | | | | | | | | | | | | |
| 4 | R2 | 131 | 1.0 | 131 | 1.0 | 0.257 | 12.4 | LOS B | 1.0 | 7.2 | 0.71 | 0.91 | 47.3 |
| Approach | | 131 | 1.0 | 131 | 1.0 | 0.257 | 12.4 | NA | 1.0 | 7.2 | 0.71 | 0.91 | 47.3 |
| **West: Larsen** | | | | | | | | | | | | | |
| 5 | L2 | 89 | 1.0 | 89 | 1.0 | 0.436 | 11.7 | LOS B | 2.2 | 15.4 | 0.78 | 1.00 | 45.7 |
| 6 | T1 | 104 | 0.0 | 104 | 0.0 | 0.436 | 18.8 | LOS C | 2.2 | 15.4 | 0.78 | 1.00 | 23.2 |
| Approach | | 194 | 0.5 | 194 | 0.5 | 0.436 | 15.5 | LOS C | 2.2 | 15.4 | 0.78 | 1.00 | 39.2 |
| **All Vehicles** | | **1125** | **7.8** | **1125** | **7.8** | **0.436** | **4.9** | **NA** | **2.2** | **15.4** | **0.22** | **0.35** | **54.6** |

# MOVEMENT SUMMARY

## Site: Ki1: Option 1: Larsen Rd/ South West Hwy 2030 4-5 PM S2 - Copy

## Network: Option 1: 2030 4-5 PM Midweek Peak


Giveway / Yield (Two-Way)

**Movement Performance - Vehicles**

| Mov ID | OD Mov | Demand Flows Total veh/h | HV % | Arrival Flows Total veh/h | HV % | Deg. Satn v/c | Average Delay sec | Level of Service | 95% Back of Queue Vehicles veh | 95% Back of Queue Distance m | Prop. Queued | Effective Stop Rate per veh | Average Speed km/h |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **North: SWH (N)** | | | | | | | | | | | | | |
| 7 | T1 | 957 | 13.0 | 957 | 13.0 | 0.532 | 0.2 | LOS A | 0.0 | 0.0 | 0.00 | 0.00 | 59.8 |
| Approach | | 957 | 13.0 | 957 | 13.0 | 0.532 | 0.2 | NA | 0.0 | 0.0 | 0.00 | 0.00 | 59.8 |
| **West: Larsen** | | | | | | | | | | | | | |
| 3 | R2 | 104 | 1.0 | 104 | 1.0 | 0.243 | 9.5 | LOS A | 0.8 | 5.4 | 0.76 | 0.91 | 40.3 |
| Approach | | 104 | 1.0 | 104 | 1.0 | 0.243 | 9.5 | LOS A | 0.8 | 5.4 | 0.76 | 0.91 | 40.3 |
| **All Vehicles** | | **1061** | **11.8** | **1061** | **11.8** | **0.532** | **1.1** | **NA** | **0.8** | **5.4** | **0.07** | **0.09** | **58.7** |

# MOVEMENT SUMMARY

## Site: Ki1: Option 2: Larsen Rd/ South West Hwy 2030 4-5 PM S1

## Network: Option 2: 2030 4-5 PM Midweek Peak


Giveway / Yield (Two-Way)

| Movement Performance - Vehicles | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Mov ID | OD Mov | Demand Flows Total veh/h | HV % | Arrival Flows Total veh/h | HV % | Deg. Satn v/c | Average Delay sec | Level of Service | 95% Back of Queue Vehicles veh | Distance m | Prop. Queued | Effective Stop Rate per veh | Average Speed km/h |
| South: SWH (S) | | | | | | | | | | | | | |
| 1 | L2 | 151 | 1.0 | 151 | 1.0 | 0.082 | 5.6 | LOS A | 0.0 | 0.0 | 0.00 | 0.58 | 49.3 |
| 2 | T1 | 651 | 13.0 | 651 | 13.0 | 0.362 | 0.0 | LOS A | 0.0 | 0.0 | 0.00 | 0.00 | 59.9 |
| Approach | | 801 | 10.7 | 801 | 10.7 | 0.362 | 1.1 | NA | 0.0 | 0.0 | 0.00 | 0.11 | 58.6 |
| North: SWH (N) | | | | | | | | | | | | | |
| 4 | R2 | 131 | 1.0 | 131 | 1.0 | 0.257 | 12.4 | LOS B | 1.0 | 7.2 | 0.71 | 0.90 | 47.5 |
| Approach | | 131 | 1.0 | 131 | 1.0 | 0.257 | 12.4 | NA | 1.0 | 7.2 | 0.71 | 0.90 | 47.5 |
| West: Larsen | | | | | | | | | | | | | |
| 5 | L2 | 89 | 1.0 | 89 | 1.0 | 0.117 | 9.0 | LOS A | 0.4 | 3.0 | 0.57 | 0.80 | 50.3 |
| 6 | T1 | 104 | 0.0 | 104 | 0.0 | 0.319 | 17.3 | LOS C | 1.4 | 9.5 | 0.80 | 0.96 | 21.4 |
| Approach | | 194 | 0.5 | 194 | 0.5 | 0.319 | 13.4 | LOS B | 1.4 | 9.5 | 0.70 | 0.88 | 41.0 |
| All Vehicles | | 1125 | 7.8 | 1125 | 7.8 | 0.362 | 4.5 | NA | 1.4 | 9.5 | 0.20 | 0.33 | 55.0 |

# MOVEMENT SUMMARY

## Site: Ki1: Option 2: Larsen Rd/ South West Hwy 2030 4-5 PM S2

## Network: Option 2: 2030 4-5 PM Midweek Peak


Giveway / Yield (Two-Way)

| Movement Performance - Vehicles | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Mov ID | OD Mov | Demand Flows Total veh/h | HV % | Arrival Flows Total veh/h | HV % | Deg. Satn v/c | Average Delay sec | Level of Service | 95% Back of Queue Vehicles veh | Distance m | Prop. Queued | Effective Stop Rate per veh | Average Speed km/h |
| North: SWH (N) | | | | | | | | | | | | | |
| 7 | T1 | 957 | 13.0 | 957 | 13.0 | 0.532 | 0.2 | LOS A | 0.0 | 0.0 | 0.00 | 0.00 | 59.8 |
| Approach | | 957 | 13.0 | 957 | 13.0 | 0.532 | 0.2 | NA | 0.0 | 0.0 | 0.00 | 0.00 | 59.8 |
| West: Larsen | | | | | | | | | | | | | |
| 3 | R2 | 104 | 1.0 | 104 | 1.0 | 0.243 | 9.5 | LOS A | 0.8 | 5.4 | 0.76 | 0.91 | 40.3 |
| Approach | | 104 | 1.0 | 104 | 1.0 | 0.243 | 9.5 | LOS A | 0.8 | 5.4 | 0.76 | 0.91 | 40.3 |
| All Vehicles | | 1061 | 11.8 | 1061 | 11.8 | 0.532 | 1.1 | NA | 0.8 | 5.4 | 0.07 | 0.09 | 58.7 |

# MOVEMENT SUMMARY

## ▽ Site: Larsen Rd/ Access 2030 Midweek 1-2


Giveway / Yield (Two-Way)

| Movement Performance - Vehicles | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Mov ID | OD Mov | Demand Flows Total veh/h | HV % | Deg. Satn v/c | Average Delay sec | Level of Service | 95% Back of Queue Vehicles veh | Distance m | Prop. Queued | Effective Stop Rate per veh | Average Speed km/h |
| South: Access | | | | | | | | | | | |
| 1 | L2 | 22 | 2.0 | 0.081 | 0.3 | LOS A | 0.3 | 2.0 | 0.22 | 0.12 | 24.9 |
| 2 | R2 | 73 | 2.0 | 0.081 | 0.7 | LOS A | 0.3 | 2.0 | 0.22 | 0.12 | 22.6 |
| Approach | | 95 | 2.0 | 0.081 | 0.6 | LOS A | 0.3 | 2.0 | 0.22 | 0.12 | 23.1 |
| East: Larsen Rd | | | | | | | | | | | |
| 3 | L2 | 47 | 2.0 | 0.067 | 4.3 | LOS A | 0.0 | 0.0 | 0.00 | 0.19 | 42.1 |
| 4 | T1 | 87 | 2.0 | 0.067 | 0.0 | LOS A | 0.0 | 0.0 | 0.00 | 0.19 | 44.0 |
| Approach | | 135 | 2.0 | 0.067 | 1.5 | NA | 0.0 | 0.0 | 0.00 | 0.19 | 43.2 |
| West: Larsen Rd | | | | | | | | | | | |
| 5 | T1 | 15 | 2.0 | 0.037 | 0.4 | LOS A | 0.2 | 1.2 | 0.24 | 0.39 | 35.7 |
| 6 | R2 | 47 | 2.0 | 0.037 | 5.0 | LOS A | 0.2 | 1.2 | 0.24 | 0.39 | 26.4 |
| Approach | | 62 | 2.0 | 0.037 | 3.9 | NA | 0.2 | 1.2 | 0.24 | 0.39 | 27.8 |
| All Vehicles | | 292 | 2.0 | 0.081 | 1.7 | NA | 0.3 | 2.0 | 0.12 | 0.21 | 30.4 |

# MOVEMENT SUMMARY

## ▽ Site: Larsen Rd/ Access 2030 Midweek 4-5


Giveway / Yield (Two-Way)

| Movement Performance - Vehicles | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Mov ID | OD Mov | Demand Flows Total veh/h | HV % | Deg. Satn v/c | Average Delay sec | Level of Service | 95% Back of Queue Vehicles veh | Distance m | Prop. Queued | Effective Stop Rate per veh | Average Speed km/h |
| South: Access | | | | | | | | | | | |
| 1 | L2 | 4 | 2.0 | 0.074 | 0.3 | LOS A | 0.2 | 1.7 | 0.24 | 0.14 | 24.8 |
| 2 | R2 | 78 | 2.0 | 0.074 | 0.7 | LOS A | 0.2 | 1.7 | 0.24 | 0.14 | 22.5 |
| Approach | | 82 | 2.0 | 0.074 | 0.7 | LOS A | 0.2 | 1.7 | 0.24 | 0.14 | 22.7 |
| East: Larsen Rd | | | | | | | | | | | |
| 3 | L2 | 41 | 2.0 | 0.066 | 4.3 | LOS A | 0.0 | 0.0 | 0.00 | 0.17 | 42.6 |
| 4 | T1 | 92 | 2.0 | 0.066 | 0.0 | LOS A | 0.0 | 0.0 | 0.00 | 0.17 | 44.6 |
| Approach | | 133 | 2.0 | 0.066 | 1.3 | NA | 0.0 | 0.0 | 0.00 | 0.17 | 43.9 |
| West: Larsen Rd | | | | | | | | | | | |
| 5 | T1 | 15 | 2.0 | 0.033 | 0.4 | LOS A | 0.2 | 1.1 | 0.24 | 0.38 | 36.0 |
| 6 | R2 | 41 | 2.0 | 0.033 | 5.0 | LOS A | 0.2 | 1.1 | 0.24 | 0.38 | 26.5 |
| Approach | | 56 | 2.0 | 0.033 | 3.8 | NA | 0.2 | 1.1 | 0.24 | 0.38 | 28.1 |
| All Vehicles | | 271 | 2.0 | 0.074 | 1.6 | NA | 0.2 | 1.7 | 0.12 | 0.20 | 30.9 |

# MOVEMENT SUMMARY

## Site: Larsen Rd/ Access 2030 Sat 12-1


Giveway / Yield (Two-Way)

**Movement Performance - Vehicles**

| Mov ID | OD Mov | Demand Flows Total veh/h | HV % | Deg. Satn v/c | Average Delay sec | Level of Service | 95% Back of Queue Vehicles veh | Distance m | Prop. Queued | Effective Stop Rate per veh | Average Speed km/h |
|---|---|---|---|---|---|---|---|---|---|---|---|
| South: Access | | | | | | | | | | | |
| 1 | L2 | 5 | 2.0 | 0.097 | 0.4 | LOS A | 0.3 | 2.3 | 0.27 | 0.18 | 24.7 |
| 2 | R2 | 99 | 2.0 | 0.097 | 0.9 | LOS A | 0.3 | 2.3 | 0.27 | 0.18 | 22.4 |
| Approach | | 104 | 2.0 | 0.097 | 0.8 | LOS A | 0.3 | 2.3 | 0.27 | 0.18 | 22.5 |
| East: Larsen Rd | | | | | | | | | | | |
| 3 | L2 | 53 | 2.0 | 0.083 | 4.3 | LOS A | 0.0 | 0.0 | 0.00 | 0.17 | 42.5 |
| 4 | T1 | 114 | 2.0 | 0.083 | 0.0 | LOS A | 0.0 | 0.0 | 0.00 | 0.17 | 44.5 |
| Approach | | 166 | 2.0 | 0.083 | 1.4 | NA | 0.0 | 0.0 | 0.00 | 0.17 | 43.8 |
| West: Larsen Rd | | | | | | | | | | | |
| 5 | T1 | 16 | 2.0 | 0.042 | 0.5 | LOS A | 0.2 | 1.4 | 0.27 | 0.40 | 35.3 |
| 6 | R2 | 53 | 2.0 | 0.042 | 5.1 | LOS A | 0.2 | 1.4 | 0.27 | 0.40 | 26.2 |
| Approach | | 68 | 2.0 | 0.042 | 4.0 | NA | 0.2 | 1.4 | 0.27 | 0.40 | 27.6 |
| All Vehicles | | 339 | 2.0 | 0.097 | 1.7 | NA | 0.3 | 2.3 | 0.14 | 0.22 | 30.6 |

## APPENDIX C WAPC TRANSPORT IMPACT ASSESSMENT CHECKLIST

Checklist for a Transport Impact Assessment for individual development

- Tick the provided column for items for which information is provided.
- Enter N/A in the provided column if the item is not appropriate and enter reason in comment column.
- Provide brief comments on any relevant issues.
- Provide brief description of any proposed transport improvements, for example, new bus routes or signalisation of an existing intersection.

| ITEM | PROVIDED | COMMENTS/PROPOSALS |
|---|---|---|
| **Summary** | | |
| **Introduction/Background** | | |
| name of applicant and consultant | ✓ | Section 1 |
| development location and context | ✓ | Section 1 & Figure 2 |
| brief description of development proposal | ✓ | Section 1 & Table 1 |
| key issues | ✓ | Section 1 |
| background information | ✓ | Section 1 |
| **Existing situation** | | |
| existing site uses (if any) | ✓ | Section 2.1, Photograph 1 & Photograph 2 |
| existing parking and demand (if appropriate) | NA | Vacant site |
| existing access arrangements | ✓ | Off South Western Hwy (Photograph 1) |
| existing site traffic | NA | Vacant site |
| surrounding land uses | ✓ | Sections 4.1 and 5 |
| surrounding road network | ✓ | Section 2.4 |
| traffic management on frontage roads | ✓ | Section 2.4 |
| traffic flows on surrounding roads (usually AM and PM peak hours) | ✓ | Section 2.5, Figure 12, Figure 13 and Figure 14 |
| traffic flows at major intersections (usually AM and PM peak hours) | ✓ | Section 2.5, Figure 12, Figure 13 and Figure 14 |
| operation of surrounding intersections | ✓ | Section 10.2.1, Figure 29 & Appendix B |
| existing pedestrian/cycle networks | ✓ | Sections 1 & 14 & Figure 2 |
| existing public transport services surrounding the development | ✓ | Sections 1 & 13, Figure 2, Table 7 & Table 8 |
| crash data | ✓ | Section 11, Figure 34 and Figure 35. |

| ITEM | PROVIDED | COMMENTS/PROPOSALS |
|---|---|---|
| **Development proposal** | | |
| regional context | ✓ | Section 5 |
| proposed land uses | ✓ | Section 3, Table 1 & Appendix A |
| table of land uses and quantities | ✓ | Table 1 |
| access arrangements | ✓ | Section 3 & Appendix A |
| parking provision | ✓ | Section 14 & Appendix A |
| end of trip facilities | × | No end of cycle trip facilities shown |
| any specific issues | ✓ | Section 15 |
| road network | ✓ | Sections 2.2 & 4.2, Figure 4 & Figure 16 |
| intersection layouts and controls | ✓ | Sections 2.4.4 & 2.4.5 |
| pedestrian/cycle networks and crossing facilities | ✓ | Section 13, Figure 2 & Photograph 8 |
| public transport services | ✓ | Sections 1 & 13, Figure 2, Table 7 & Table 8 |
| **Integration with surrounding area** | | |
| surrounding major attractors/ generators | ✓ | Section 5 |
| committed developments and transport proposals | ✓ | Section 4 |
| proposed changes to land uses within 1200 metres | ✓ | Section 4 |
| travel desire lines from development to these attractors/ generators | ✓ | Section 13, Figure 2 & Photograph 8 |
| adequacy of existing transport networks | ✓ | Section 12 |
| deficiencies in existing transport networks | ✓ | Section 12 |
| remedial measures to address deficiencies | ✓ | Section 4.3 |
| **Analysis of transport networks** | | |
| assessment years | ✓ | Section 6 |
| time periods | ✓ | Section 8 |
| development generated traffic | ✓ | Section 8, Figure 25, Figure 26 & Figure 27. |
| distribution of generated traffic | ✓ | Section 8, Figure 25, Figure 26 & Figure 27. |
| parking supply and demand | ✓ | Section 14 |
| base and 'with development' traffic flows | ✓ | Sections 10.2.2 & 10.2.3 |
| analysis of development accesses | NA | Left-in only off South Western Hwy |
| impact on surrounding roads | ✓ | Section 9 & Table 3. |
| impact on intersections | ✓ | Section 10, Table 4 & Table 5 |

DEVELOPMENT ASSESSMENT PANEL
APPROVED
11-Dec-2018

| ITEM | PROVIDED | COMMENTS/PROPOSALS |
|---|---|---|
| **Analysis of transport networks (cont.)** | | |
| impact on neighbouring areas | ✓ | Sections 9 & 10 |
| road safety | ✓ | Section 11 |
| public transport access | ✓ | Section 12 |
| pedestrian access/amenity | ✓ | Section 13 |
| cycle access/amenity | ✓ | Section 13 |
| analysis of pedestrian/cycle networks | ✓ | Section 13 |
| safe walk/cycle to school (for residential and school site developments only) | NA | |
| traffic management plan (where appropriate) | NA | |
| **Conclusions** | ✓ | Section 16 |

**Proponent's name** .....

**Company** Procon Developments **Date** .....

**Transport assessor's name** David Wilkins

**Company** i3 consultants WA **Date** 09/11/18