QueenslandRail

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12 April 2013

Mr Ryan Huelin
General Manager - Policy and Planning
Department of Transport and Main Roads
GPO Box 213
Brisbane Qld 4001

Dear Mr Huelin

Stockland Masterplan Development in Rockhampton

In response to your correspondence dated 28 March 2013 regarding the Stockland Masterplan Development the suggested solution is to install an at-grade open level crossing (OLC) at Olive Street and then close the William Palfrey Road level crossing. It is also noted that the proposal includes 3 traffic lanes over the OLC in each direction - 2 vehicle lanes and 1 bicycle lane. A median strip is to divide the east and west bound lanes on each approach to the crossing.

Queensland Rail has undertaken a preliminary Australian Level Crossing Assessment Model (ALCAM) assessment pertaining to this proposal and the assessment places this crossing in the Medium Risk Band (*Medium Risk Band* - indicates a level above which there is likely to be safety hazards that require priority attention to mitigate the level of risk to road and rail users. This may require short-term and long-term actions to reduce the identified risks). The assessment has been based on a traffic volume that does not exceed 18,000 vehicles per day (including background traffic) for the completed development.

If this is the supported solution then we would suggest the following conditions should be included in the Olive Street OLC proposal:

1. The OLC to have active protection controls (flashing lights and boom gates) for each vehicle traffic lane - the configuration of the OLC active protection system will be determined when the design is finalised by Queensland Rail's Signalling Design Unit.
2. In addition to the installation of RX-5 flashing light assemblies at the OLC, cantilevered overhead flashing light assemblies (including signage) is to be installed to cover multiple traffic lanes.
3. The OLC active controls are to be coordinated with the proposed traffic light system at the intersection of Olive Street and the Bruce Highway.
4. Heavy vehicles, up to 19m in length, will comprise less than 5% of the total road vehicles over the OLC.
5. Olive Street is not to be an approved B-Double route.
6. A Pedestrian Crossing with active protection controls and mazes is to be constructed on each side of the OLC.
7. The installations of the Pedestrian Crossings and the OLC are to be in accordance with the Manual of Uniform Traffic Control Devices - AS1742 Part 7 - Railway Crossings.
8. When the Olive Street OLC is constructed, the William Palfrey level crossing is to be decommissioned and closed in accordance with Queensland Rail standards and requirements.

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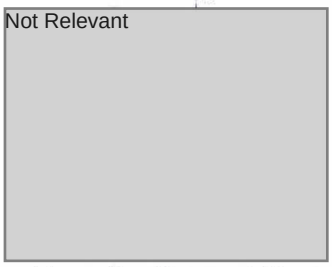
We support this proposal and will continue to work with the Department of Transport and Main Roads to assist in this development.

Yours sincerely



Executive General Manager
Access and Business Strategy
Queensland Rail

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Queensland Government

Our ref E52812 - ITP
Enquiries Darren McDonald

Department of
Transport and Main Roads

15 April 2013

NR
Stockland
PO Box 10160
Brisbane Qld 4000

Dear NR

I refer to the ongoing work between the Department of Transport and Main Roads (TMR), Queensland Rail (QR) and Stockland to investigate options for vehicle access over the North Coast Railway Line to facilitate the master planned development at Parkhurst Rockhampton.

TMR supports the proposed at-grade level crossing solution to Olive Street, noting no further crossings will be added to the network as the existing level crossing at William Palfrey Road will be relocated and upgraded. TMR are not in a position to contribute funding to these infrastructure works.

QR has also endorsed this solution subject to a number of conditions. These conditions require specific crossing infrastructure and controls to address the risks identified in the level crossing risk assessment. A copy of QR's conditions is outlined in the attached letter (**Attachment 1**). It is requested that Stockland continue to work with QR during the design, construction and implementation phases of the railway crossing to ensure these requirements are fully complied with and meet the relevant QR standards.

TMR and QR appreciate the collaborative work undertaken with Stockland to deliver this solution and facilitate development in regional Queensland. If you require further information please call Mr Darren McDonald, Principal Planner (Planning Management) on 3066 1549. Mr McDonald will be pleased to assist.

Yours sincerely

NR
Ryan Huelin
General Manager
Policy and Planning

Department of Transport and Main Roads
Office of the General Manager
Policy and Planning Branch
Level 3 Terrica Place
140 Creek Street Brisbane 4000
GPO Box 213 Brisbane
Queensland 4001 Australia

Telephone +61 7 3066 1400
Facsimile +61 7 3066 1402
Website www.tmr.qld.gov.au
Email ryan.e.huelin@tmr.qld.gov.au
ABN 39 407 690 291

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IDAS technical advice – Rail

TMR Reference No.	TMR13-005882	**Due date**	19/04/2013
Street Address	Yaamba Road, Parkhurst QLD 4702	**Officer coordinating TMR response**	Byron Jones
Lot on Plan	Lot 1RP602376, 22SP134380, 23SP134380, 2RP608099, 37RP600698, 38RP600698, 41SP226571, 49SP129857, 5SP238731, 6SP238731	**Technical Specialist**	Victoria Stavar – 3066 1580
Recommendation (check box) *Note: To check a box, double click the box, under 'default value' select 'checked' and then press 'ok'*		☐	Information request
		☒	Concurrence agency response

PLEASE NOTE:
When the applicant provides their response to TMR's information request, please send a new request to this technical advice group to review the response material. This applies even if the applicant has refused to provide the information.

SECTION A. INFORMATION REQUEST

1. Rail level crossing

The Department of Transport and Main Roads (the department), Queensland Rail (QR) and Stockland have collaboratively worked to develop a solution that enables access for the development across the North Coast Line. Correspondence from the department, dated 15 April 2013, provided written endorsement to Stockland for the proposed level crossing solution to Olive Street, subject to QR's conditions and at no cost to the state. This proposal will ensure no further crossings are added to the network through the closure of the existing William Palfrey Road crossing and its relocation and upgrade to Olive Street in accordance with the *Queensland Level Crossing Safety Strategy 2012-2021.*

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The submitted Traffic Impact Assessment reports prepared by Cambray Consulting, for the proposed master planned community and reconfiguration stages 1 to 3, indicate that Olive Street will form the main access road to the proposed development from the Bruce Highway and is intended to be constructed in two stages. Stages 1 to 3 of the proposed development will entail the initial construction of a two lane entry road configuration, with this being upgraded to a four lane entry once traffic volumes exceed 13,000 vehicles per day or approximately 1,450 detached dwellings.

The staged development of the Olive Street level crossing must be appropriately designed to ensure the safety and operational integrity of the North Coast Line. The applicant is therefore requested to provide conceptual engineering plans and associated documents for the Olive Street level crossing for both the initial and ultimate designs of the Olive Street/Bruce Highway intersection. These conceptual engineering designs must:

- be developed in collaboration with the department, QR and Rockhampton City Council to deliver an integrated solution that considers all relevant state and local government requirements;
- address the conditions and requirements set out in the attached correspondence from QR dated 12 April 2013; and
- give consideration to the potential for future bus movements through the intersection and over the level crossing.

As part of the information request response the applicant is required to provide a written agreement (or in principle agreement) from QR as to the conceptual design of both stages of the Olive Street level crossing. Please contac[NR] of QR on 3235 1229 or [NR]@qr.com.au in relation to this matter.

Advice:
Please be advised that once constructed, the Olive Street level crossing will become a public crossing under section 253 of the *Transport Infrastructure Act 1994*. This requires the local government to take responsibility for maintaining the road and crossing over the North Coast Line. As per the *Memorandum of Understanding between the Local Government Association of Queensland and Queensland Rail and the Department of Transport and Main Roads with respect to the Management and Funding Responsibility for Level Crossing Safety,* the local government will be responsible for any safety upgrades to the level crossing in the future if the change in risk to the level crossing is due to changes in nearby land uses which have been authorised by local government. This is managed by an Interface Agreement between QR and the local government in accordance with the *Transport (Rail Safety) Act 2010.*

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Railway Noise
The applicant has submitted a Noise Amenity Assessment report prepared by MWA Environmental and dated 27 February 2013 for stages 1 to 3 of the proposed development. However, section 2.2.2 of this report states that internal railway noise amenity is regulated by the Queensland Development Code Mandatory Part 4.4 – *Buildings in a Transport Noise Corridor*, assumes that this matter will be dealt with at the building works stage and references an outdated 'QT Planning for Rail noise document'. The report's recommendations concerning railway noise also refer to an optional acoustic barrier, however, there is no certainty provided regarding the height of the barrier and the altered acoustic attenuation requirements that would result for future residential dwellings within the development.

Consequently, the applicant is required to submit an amended Noise Amenity Assessment report for stages 1 to 3 addressing the following:

(a) The transport chief executive has not yet gazetted land as transport noise corridors for railways under section 246Z (Designation of transport noise corridor – transport chief executive) of the *Building Act 1975*. This means that new sensitive land uses impacted on by railway noise will be addressed at the material change of use and reconfiguring a lot stages of the development;

(b) The department's current environmental emission criteria for noise are set out in the *Department of Transport and Main Roads Policy Position Statement: Development on Land Affected by Environmental Emissions from Transport and Transport Infrastructure*; Version 1.0 dated 31 March 2011, which is available at: http://www.tmr.qld.gov.au/Community-and-environment/Planning-and-development/Planning-policy/Policy-statements-guidelines-and-development-codes/Development-on-Land-Affected-by-Environmental-Emissions.aspx. In particular, the relevant noise criteria for all accommodation activities and residential care facilities exposed to railway noise are:

- external noise criteria of ≤ 65 dB(A) L_{eq} (24hr) facade corrected,
- external noise criteria of ≤ 87 dB(A) (single event maximum sound pressure level) facade corrected,
- internal noise criteria for sleeping areas of ≤ 45 dB(A) single event maximum sound pressure level, and
- internal noise criteria for habitable rooms of ≤ 50 dB(A) single event maximum sound pressure level.

The amended Noise Amenity Assessment should address the relevant noise criteria for all new sensitive land uses that may be developed within stages 1 to 3 of the development. It should also address the relevant internal noise criteria as well as the external noise criteria for railways.

(c) The recommended mitigation measures for railway noise should adequately address the internal noise criteria for railways by:

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r_RTI-3295 file1 Release.pdf - Page Number: 6 of 672

- clearly specifying the recommended building attenuation treatments required for future noise sensitive uses both with and without a barrier, including maps specifying the areas of the development where building attenuation of different types is required and detailing what the required attenuation treatments include in each of these areas. It is noted that if the applicant wishes to pursue the optional noise barrier, sufficient details will need to be provided regarding the associated building attenuation and noise barrier specifications;
- address the technical requirement CIVIL-SR-014 (Design of noise barriers adjacent to railways) which is available in the *Guide for Development in a Railway Environment* which is available at: http://www.tmr.qld.gov.au/Business-industry/Technical-standards-publications.aspx and demonstrate the required height of the optional noise barrier.

The applicant is also requested to amend the proposed Ellida Local Plan in accordance with the findings of the amended Noise Amenity Assessment, the *Department of Transport and Main Roads Policy Position Statement: Development on Land Affected by Environmental Emissions from Transport and Transport Infrastructure* and QR technical requirements for noise barriers.

INTERNAL TECHNICAL ASSESSMENT (for TMR only)

Jurisdiction

This development application was properly made to the local government 11 March 2013. It is therefore triggered to the Department of Transport and Main Roads for a reconfiguration of a lot for residential purposes of 100 or more allotments (1 into 199 lots and balance lot) under schedule 7, table 2, item 34 and schedule 10 of the *Sustainable Planning Regulation 2009* (superseded). It is also triggered for preliminary approval for a material change of use under schedule 7, table 13, item 15 and schedule 13 of the *Sustainable Planning Regulation 2009* (superseded) for land that is completely or partly within a corridor, having a total site area of greater than 5ha and land that abuts rail corridor land.

Assessment

This application is for a preliminary approval for a MCU for a master planned residential estate of ultimately 2350 allotments and a ROL for stages 1 – 3 of 199 lots. The development is considered a 'complex project' with the Department of State Development Infrastructure Planning (DSDIP), and is being facilitated by their Industry Support Unit. There have been a number of workshops and pre-lodgement meetings with the developer, Department of Transport and Main Roads, Queensland Rail and the Minister's office since November 2012 regarding this development's impact on the rail corridor and associated level crossing proposals.

Rail Level Crossing

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The initial position of both DTMR and QR was for a grade separated crossing of the North Coast line. A number of negotiations between the developer, DTMR, Queensland Rail and the Minister's office deduced that this option was not viable and as such an at-grade crossing would be accepted based on a number of conditions.

12 April 2013 – Queensland Rail supported the proposal for an at-grade crossing of the North Coast line at Olive Street, providing a number of conditions were met by the developer and that the existing crossing of the rail corridor by William Palfrey Drive is decommissioned and closed upon completion of the new crossing.

15 April 2013 - Department of Transport and Main Roads provided confirmation to the developer of their support for the proposed at-grade level crossing proposal of the North Coast Line at Olive Street.

The applicant is proposing to provide the at-grade crossing at Olive Street in 2 stages. Olive Street will form the main entry road to the development and there is an associated need to upgrade the Olive Street/Bruce Highway intersection. Initially 2 lanes will traverse the rail corridor, and then the crossing will be duplicated to 4 lanes once traffic volumes increase to a certain threshold. Although there is general endorsement for the level crossing, no concept engineering plans have been provided and therefore there is nothing that can confirm the design of the crossing for conditioning purposes. These concept drawings have been requested as part of an information request.

Stormwater and Drainage

The site is not floodprone and stormwater will generally be discharged away from the rail corridor. The applicant has submitted stormwater management plans for stages 1 – 3 as well as for the whole preliminary approval master planned area. The stormwater report for stages 1 – 3 states that flows from the railway corridor will be captured within the development's stormwater system and there will be no upstream impacts on the rail corridor. There is a hydraulic analysis by way of a flood management report for the whole master plan site. It provides a catchment plan that indicates only a small portion of external catchment (~0.97ha) flows to the site which will be captured by drainage systems of stage 1 – 3 and drained to the creek. All other sub-catchments, external to the site, flow directly to Ramsey Creek. Furthermore, E&T Hydraulics have confirmed that the hydraulic modelling in the flood study ensures no worsening impact on state infrastructure (the rail and the highway), see below. Therefore, it is not necessary to request any further information regarding stormwater for this site.

Victoria,

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r_RTI-3295 file1 Release.pdf - Page Number: 8 of 672

Thanks for referring the DA for a residential development at Parkhurst North for Hydraulics Technical Advice.
We refer Brown Consulting (Qld) Pty Ltd's Version C Jan 2013 Flood Management Report.
The proposed development is on Ramsey Creek, downstream of the North Coast Railway (Glen Geddes to Parkhurst) and the state-controlled 10F Bruce Highway.
A small portion of the site in the north receives tributary discharge from the railway reserve. The site layout shows that this portion will not be developed and hence will not impede runoff from state controlled infrastructure.
All other parts of the site runoff away from the state-controlled network and have no external catchment crossing that network. Flood modelling of Ramsey Creek for a range of ARIs from 5 to 100 years, results in flood levels at the upstream cross-section (some 75m downstream of the railway crossing) in the developed case being equal to that for the existing case. Hence there is no worsening of flood level at the state-controlled network.
Hence TMR should have no objection to this development on stormwater drainage grounds.

Kind regards,

Tina O'Connell
Principal Engineer (Hydraulics) | Structures
Engineering & Technology | Department of Transport and Main Roads

Floor 16 | Brisbane City - 313 Adelaide Street | 313 Adelaide Street | Brisbane City Qld 4000
GPO Box 1412 | Brisbane City Qld 4001
P: (07) 30661035 | F: (07) 30662065
E: tina.m.o'connell@tmr.qld.gov.au
W: www.tmr.qld.gov.au

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Noise

The submitted noise report is required to be amended to more adequately address the internal railway noise criteria and to provide more certainty for conditioning should the applicant wish to proceed with the optional noise barrier. The noise report also assumes transport noise corridors for railways have been gazetted and is placing a heavy reliance on noise being addressed through the QDC MP4.4 at the building works stage.

Owners Consent

The applicant has provided the appropriate owners consent documents for the purposes of rail.

RE: TMR13-005882 - Parkhurst - please review by 5pm today

NR

to:
Rebecca.Z.Kalianiotis@tmr.qld.gov.au
03/05/2013 11:51 AM
Cc:
"Darren.Y.McDonald@tmr.qld.gov.au"
Hide Details
From: NR @qr.com.au>

To: "Rebecca.Z.Kalianiotis@tmr.qld.gov.au" <Rebecca.Z.Kalianiotis@tmr.qld.gov.au>

Cc: "Darren.Y.McDonald@tmr.qld.gov.au" <Darren.Y.McDonald@tmr.qld.gov.au>

History: This message has been replied to.

2 Attachments

image001.gif image002.png

Hi Rebecca,

We had to enter into Interface Agreements with all local governments, which covered all level crossings within their jurisdiction, as part of the Transport (Rail Safety) Act 2010.

I would imagine the proposed level crossing will be added to this document for the Rockhampton Regional Council once constructed. I believe the advice paragraph is sufficient; however I believe we should add the following after the last sentence.

'This is managed by an Interface Agreement between QR and the local government in accordance with the *Transport (Rail Safety) Act 2010.*

Thanks,

QueenslandRail

NR
Principal Planner
Cent Conc-Lower, 290 Ann Street
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NR @qr.com.a

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twitter.com/queenslandrail



From: Rebecca.Z.Kalianiotis@tmr.qld.gov.au [mailto:Rebecca.Z.Kalianiotis@tmr.qld.gov.au]
Sent: Friday, 3 May 2013 11:43
To: NR Darren.Y.McDonald@tmr.qld.gov.au
Cc: mark.s.kanowski@tmr.qld.gov.au; Victoria.L.Stavar@tmr.qld.gov.au
Subject: TMR13-005882 - Parkhurst - please review by 5pm today

Hi Darren and NR

I have finalised my review of the Parkhurst information request. Can you please both now review the Section A - Information Request part by 5pm today as I need to get this to PD&O on Monday. There are only subtle changes to the rail level crossing part but, in particular, I need NR to please review the paragraph in yellow highlighter. Is there an existing Interface Agreement with Rockhampton City Council? We have also asked for the applicant to provide evidence that QR agree to the concept engineering plans, because if they don't it could present a problem for conditioning. Also, as PD&O is putting together the information request, I see no need to put Byron's contact details here, only those of QR, because I imagine they will be inserting a state-controlled road information request.

I have reviewed the noise report and discussed this with E&T in detail - so this section has been amended to focus on a few key issues.

(See attached file: 130429_FINAL Amendments to DTMR Info Request_RK.docx)

Kind regards,

Rebecca Kalianiotis
Manager (Development Support) | Planning Management
Planning and Policy | Department of Transport and Main Roads

Floor 12 | Brisbane - Terrica Place | 140 Creek Street | Brisbane Qld 4000
GPO Box 213 | Brisbane Qld 4001
P: (07) 30661456 | F: (07) 31462008
M NR
E: rebecca.z.kalianiotis@tmr.qld.gov.au
W: www.tmr.qld.gov.au

****
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****

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27/5/13

NR - QR, NR All

NR — Stocklands

NR — Brown

NR — Stocklands

Rail level Crossing

- conceptual for conditioning
  interim solution & ultimate layout
  ↳ 1450 lots. ↳ after that
  MUTCD's RPDM requirements.

- QR get civil people to review by email & note with conditions with standards noted.
- can pre-qualified consultants do signaled design.
- Calibre group has ex-QR staff.
- How long does QR design take and what is the process? A.A said about 9 mths. procurement of infra v. lengthy and another lead time of 9 mths. would be given a project manager
- timing clause's standards.
- PM would organise interface agreement — would become public crossing. interface with local council's maintenance agreement. NR ask whether they can get a PM earlier.
- Pre-qualified contractors? QR like to construct their own. QR constructing using QR in-house at applicant's expense.
  NR to look into whether construction could be pre-qualified.
- NR to get CIVIL engineers to check all standards for DS.
- Anything post DA QR deals directly with client.
  NR get confirmation that signalling can be coordinated/phased.

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- keen to respond to IR by end of June.
- ? construction process eg pre-start, closures etc
Need early PM.
- decommissioning other crossing → condition be closed.
work with QR about what you need to do. Remove infrastructure & fencing? to prevent road access.
- church's substation need to retain access over railway line.
Can't block access — easements & staging.
- MOU council. check where delineation of where ISCR ends after intersection.
- TIA tenure to be organised after construction.
- ped — need ~~activ~~ maze with gates & lights. MUTCD.
- NR could organise another meeting with crossing upgrade people in a few weeks time.

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RE: QR Plans for Concept Approval

NR

to:
Victoria.L.Stavar@tmr.qld.gov.au
29/08/2013 02:16 PM
Hide Details
From: NR @qr.com.au>

To: "Victoria.L.Stavar@tmr.qld.gov.au" <Victoria.L.Stavar@tmr.qld.gov.au>

History: This message has been replied to.

3 Attachments

image001.gif image002.png image003.png

Hey,

The Crossing ID for William Palfrey is 5412.

No ID is provided to crossing until it's built.

Thanks,

QueenslandRail

NR
Senior Property Planner
Cent Conc-Lower, 290 Ann Street
GPO Box 1429 • Brisbane, QLD 4000
T: +61 7 3072 1229 M: NR F:
NR @qr.com.au
queenslandrail.com.au
facebook.com/queenslandrail
twitter.com/queenslandrail

From: Victoria.L.Stavar@tmr.qld.gov.au [mailto:Victoria.L.Stavar@tmr.qld.gov.au]
Sent: Thursday, 29 August 2013 08:37
To: NR
Subject: RE: QR Plans for Concept Approval

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Hi NR

Do you have a crossing ID for the William Palfrey Drive crossing at all? And also, Olive Street wouldn't have one yet would it?

Kind regards,

Victoria Stavar
Project Officer (Development Support) | Planning Management
Policy and Planning Branch | Department of Transport and Main Roads

Floor 12 | Terrica Place | 140 Creek Street | Brisbane Qld 4001
GPO Box 213 | Brisbane Qld 4001
P: (07) 3066 1580 | F: (07) 3146 2008
E: victoria.l.stavar@tmr.qld.gov.au
W: www.tmr.qld.gov.au

From: NR qr.com.au>
To: "Victoria.L.Stavar@tmr.qld.gov.au" <Victoria.L.Stavar@tmr.qld.gov.au>
Date: 28/08/2013 11:41 AM
Subject: RE: QR Plans for Concept Approval

Hi Tori,

Here's a copy.

QueenslandRail
Not Relevant
Senior Property Planner
Cent Conc-Lower, 290 Ann Street
GPO Box 1429 • Brisbane, QLD 4000
T: +61 7 3072 1229 M: Not Relevant F:
NR @qr.com.au
queenslandrail.com.au
facebook.com/queenslandrail
twitter.com/queenslandrail

From: Victoria.L.Stavar@tmr.qld.gov.au [mailto:Victoria.L.Stavar@tmr.qld.gov.au]
Sent: Wednesday, 28 August 2013 11:33
To: NR
Subject: RE: QR Plans for Concept Approval

Hey NR

Have you got a copy of the letter that you refer to in your approval in principle, dated 13 April 2013??

Kind regards,

Victoria Stavar
Project Officer (Development Support) | Planning Management
Policy and Planning Branch | Department of Transport and Main Roads

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Floor 12 | Terrica Place | 140 Creek Street | Brisbane Qld 4001
GPO Box 213 | Brisbane Qld 4001
P: (07) 3066 1580 | F: (07) 3146 2008
E: victoria.l.stavar@tmr.qld.gov.au
W: www.tmr.qld.gov.au

From: NR qr.com.au>
To: NR @stockland.com.au>
Date: 28/08/2013 10:59 AM
Subject: RE: QR Plans for Concept Approval

Hi NR

As requested, please find attached in-principle approval for both concept crossing designs.

Thanks,

QueenslandRail
NR
Senior Property Planner
Cent Conc-Lower, 290 Ann Street
GPO Box 1429 • Brisbane, QLD 4000
T: +61 7 3072 1229 M: NR F:
NR @qr.com.au
queenslandrail.com.au
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twitter.com/queenslandrail

From: NR [mailto: NR @stockland.com.au]
Sent: Wednesday, 28 August 2013 09:15
To: NR
Subject: FW: QR Plans for Concept Approval

Morning NR please find final updated plans attached for your approval.

Please note the interim drawing is now Rev C. In addition, the exact extent of the hatching is yet to be confirmed, however it identifies at the crossing that the full width will be constructed in the interim solution, however the lanes won't be used by traffic until the upgrade is required.

Kind re ards

NR
Approvals Manager - Stockland QLD
Stockland, Level 4, 99 Melbourne Street, South Brisbane QLD 4101
M NR
F +61 7 3305 8703 **E** NR stockland.com.au
www.stockland.com.a

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Please consider the environment before you print this email.
www.stockland.com.au

From: NR
Sent: Monday, 26 August 2013 5:15 PM
To: NR
Subject: RE: QR Plans for Concept Approval

NR you are correct and this it is a drafting error from Browns. We will update the drawing error and provide tomorrow under separate cover.

Kind regards

Not Relevant
Planning & Approvals Manager
Gold Coast & Northern NSW Region
Development Division
Stockland
Level 4, 99 Melbourne Street, South Brisbane, QLD 4101
PO Box 10160 Adelaide Street, Brisbane QLD 4000
T: (07) 5573 7210
F: (07) 5573 7251
M NR
E: NR @stockland.com.au
W: www.stockland.com.au

From: NR mailto NR @qr.com.au]
Sent: Monday, 26 August 2013 1:08 PM
To: NR
Subject: RE: QR Plans for Concept Approval

Hi NR

Happy to do that for you -

Just a quick one, I think the 'Interim' level crossing plan should be similar to the 'Ultimate' crossing with regards to shading of traffic islands etc. See red circle areas on both plans.

Can you please confirm if we can have the Interim one updated? Or are you happy for me to make a note in red?

Thanks,

QueenslandRail
NR
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twitter.com/queenslandrail

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From NR [mailto NR @stockland.com.au]
Sent: Monday, 26 August 2013 12:28
To: NR
Cc:
Subject: RE: QR Plans for Concept Approval

NR thanks for your attention to this matter. Is it your intention to issue a brief cover letter in approving the plans?

If so can I suggest some wording that references item 12 of the Department of Transport & Main Roads Concurrence Agency Information Request, dated 7th May 2013 such as:

*Queensland Rail provide their consent to the rail crossing at the proposed Olive Street Intersection, and the temporary construction use (and removal) of the existing William Palfrey Street intersection as conceptually detailed in Brown Consulting's plans (Interim Scenario: **N12081-SK11 Rev B** & Ultimate Scenario: **N12081-SK10 Rev C**).*

The plan you sent through only referrers to the ultimate crossing – at which time William Palfrey would have been closed. Just to keep it 'tidy' – could you please reference the notes as attached on the interim plan remain (very close to the wording she just sent), and the updated plan is for the ultimate concept in your consent (interim: **N12081-SK11 Rev B** & Ultimate: **N12081-SK10 Rev C**).

We understand the consent remains subject to the previously advised conditions noted in Queensland Rail's letter dated 12th April 2013 and the detailed design of both crossings. We are happy to adopt NR wording if the wording has sufficient flexibility to amend the agreed position as we develop a greater level of detail (ie. The Construction Management Plan). Are you able to confirm?

Please do not hesitate to give me a call should you wish to discuss.

NR
Planning & Approvals Manager
Gold Coast & Northern NSW Region
Development Division
Stockland
Level 4, 99 Melbourne Street, South Brisbane, QLD 4101
PO Box 10160 Adelaide Street, Brisbane QLD 4000
T: (07) 5573 7210
F: (07) 5573 7251
M: NR
E: NR @stockland.com.au
W: www.stockland.com.au

From: NR [mailto: NR @qr.com.au]
Sent: Monday, 26 August 2013 10:30 AM
To: NR
Subject: RE: QR Plans for Concept Approval

Hi NR

Please find attached amended crossing drawing with Queensland Rail's notes on them. Is this all you need from us?

Thanks,

QueenslandRail

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NR
Senior Property Planner
Cent Conc-Lower, 290 Ann Street
GPO Box 1429 • Brisbane, QLD 4000
T: +61 7 3072 1229 M: Not Relevant F:
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twitter.com/queenslandrail

From: NR [mailto: NR @stockland.com.au]
Sent: Friday, 23 August 2013 09:38
To: Not Relevant
Cc:
Subject: RE: QR Plans for Concept Approval

Morning NR please refer attached as discussed for your consideration.

Thanks for your attention to this matter.

Regards

NR
Senior Approvals Manager - Stockland QLD
Stockland, Level 4, 99 Melbourne Street, South Brisbane QLD 4101
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F +61 7 3305 8703 **E** Not Relevant stockland.com.au
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From Not Relevant
Sent: Wednesday, 21 August 2013 1:07 PM
To: Not Relevant @qr.com.au
Cc: NR @stockland.com.au)
Subject: FW: QR Plans for Concept Approval

NR email with attached advise from our engineers.

I will send the relevant Drawing for your approval under separate cover.

As discussed, we are happy to work through the detailed safety requirements and construction management prior to commencing works.

Cheers

NR

From NR
Sent: Thursday, 15 August 2013 10:24 AM
To: NR
Cc NR @qr.com.au
Subject: RE: QR Plans for Concept Approval

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NR as per our discussion Friday I attach correspondence from our Engineers confirming the lack of traffic proposed to utilise the existing rail crossing at William Palfrey Drive. In summary:

- A traffic/construction management plan will be required by Council and approved prior to works commencing;
- The earthworks on site balance and as such no material will be entering or leaving the site during construction;
- Delivery of construction material will be managed and relatively minor to reflect the small (30lots) first stage; and
- The staffing numbers will also small and limited to machinery operators.

Please let me know should you require any additional information.

Kind regards

NR
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W: www.stockland.com.au

From: NR [mailto: NR @qr.com.au]
Sent: Friday, 9 August 2013 1:28 PM
To: NR
Subject: FW: QR Plans for Concept Approval

Hi NR

The previous ALCAM assessment for William Palfrey Road crossing was based on boom gates and traffic volume for 300 lots.

With respect to the information forwarded regarding the use of the crossing for construction purposes only, could you advise the likely daily traffic volumes and vehicle type, to confirm or not the suitability of flashing lights.

Thank you.

Regards,

NR
Road Rail Interface Manager
Queensland Rail
RC2-5, 309 Edward Street
Brisbane, Queensland 4000
T: +61 7 3072 0317 M: NR F: +61 7 3235 3962
NR @qr.com.au

PLEASE NOTE NEW TELEPHONE AND FAX NUMBERS

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From: NR
Sent: Friday, 9 August 2013 11:43
To: Not Relevant
Cc:
Subject: FW: QR Plans for Concept Approval

Hi All,

Please note that Stockland are not proposing to have residents use William Palfrey for any stage of the development. This crossing is only to be used for construction vehicles for Stage 1. The Olive Street crossing will be open prior to residents of Stage 1 moving in. This will be a condition of approval that William Palfrey Crossing is closed down and Olive Street opened prior to the plan sealing of Stage 1 survey plan (i.e. creation of the proposed Stage 1 lots).

Can you please advise if this alleviates our concerns and if the proposed construction management plan for construction vehicles crossing William Palfrey with no booms is appropriate NR do you think you will need to undertake another ALCAM based on your previous construction vehicle numbers minus the 300 allotments?

I'm away Monday & Tuesday next week, but if you need additional information regarding potential vehicle numbers etc., please feel free to contact Gareth/

Kind Regards,

QueenslandRail
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Senior Property Planner
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queenslandrail.com.au
facebook.com/queenslandrail
twitter.com/queenslandrail

From NR mailto: NR @stockland.com.au]
Sent: Friday, 9 August 2013 11:24
To Not Relevant
Cc
Subject: RE: QR Plans for Concept Approval

Not Relevant as discussed we maintain that no new residents will use the existing William Palfrey Crossing and it will only be used by construction traffic under the supervision of an approved construction management plan.

I note our information response is ready to lodge pending your response. We look forward to your response early next week.

Kind regards

Not Relevant
Senior Approvals Manager - Stockland QLD
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From: [mailto: Not Relevant @qr.com.au]
Sent: Friday, 9 August 2013 10:31 AM
To: Not Relevant
Subject: RE: QR Plans for Concept Approval

Hi NR

Just a quick one, it is still the plan that both operational works construction vehicles and the residents of 300 lots are to continue using William Palfrey Crossing or is it now proposed that Olive Street will be constructed prior to the commencement of Stage 1?

Thanks,

QueenslandRail
NR
Senior Property Planner
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From NR [mailto NR @stockland.com.au]
Sent: Wednesday, 7 August 2013 09:56
To: Not Relevant
Cc:
Subject: QR Plans for Concept Approval
Importance: High

Mornin Not Relevant

The Purchase Order for the QR design finally came through – **PO 716906**. Please refer attached.

Also attached is our revised concept plan for your endorsement prior to submitting our Information Response. The notes on the drawing in relation to the decommissioning of William Palfrey road reflect our conversation last week. We understand that the safety of this coring is critical during the temporary use by construction traffic. Please do not hesitate to give me a call should you wish to discuss our proposed approach.

We are targeting this Friday to lodge our Information Response and would appreciate your earliest consideration.

Kind regards

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Development Manager - Stockland QLD
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****
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****

[attachment "QR Approval letter.pdf" deleted by Victoria L Stavar/cp1/qdot/au] [attachment "Ministerial Recommendation.pdf" deleted by Victoria L Stavar/cp1/qdot/au]

RTI-3295 file1 Release.pdf - Page Number: 24 of 672

IDAS technical advice – Rail

TMR Reference No.	TMR13-005882	**Due date**	PD&O requested: 03/09/2013 Stat: 11/09/2013
Street Address	Yaamba Road, Parkhurst QLD 4702	**Officer coordinating TMR response**	Byron Jones
Lot on Plan	Lot 1RP602376, 22SP134380, 23SP134380, 2RP608099, 37RP600698, 38RP600698, 41SP226571, 49SP129857, 5SP238731, 6SP238731	**Technical Specialist**	Victoria Stavar – 3066 1580
Recommendation (check box) *Note: To check a box, double click the box, under 'default value' select 'checked' and then press 'ok'*		☐	Information request
		☒	Concurrence agency response

PLEASE NOTE:

This technical advice has been approved by the Manager Development Support, and relates to agreements reached with stakeholders. If you intend to change any of the conditions provided, please contact the Development Support team.

If the applicant changes the development (e.g. by way of a change to application or change to approval) after these draft conditions have been provided, please send a new request to this technical advice group to review the changed development.

SECTION B. Conditions

No.	Conditions of Development	Condition Timing	Jurisdiction and Reasons
Preliminary Approval - **Material Change of Use** (s242 to vary the effect of the planning scheme for a Master Planned Community – Ellida Local Plan)			
1	The development must be carried out generally in accordance with the following plan, except as modified by these concurrence agency	Prior to the commencement of use	Land use and transport coordination under the Transport Planning and Coordination Act 1994

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No.	Conditions of Development	Condition Timing	Jurisdiction and Reasons	
	conditions: • Ellida Local Plan, prepared by RPS and dated March 2013.		and to be maintained at all times	and the purpose mentioned in the Transport Infrastructure Act 1994, section 258(2). The Department of Transport and Main Roads' assessment of the development application was undertaken on the basis of the cited plan which depicts how the proposed development will be carried out.
2	(a) The proposed replacement rail level crossing located on Olive Street must be designed and constructed at the applicant's expense in accordance with the following: • Correspondence entitled "Olive Street, Parkhurst Crossing Proposal In-Principle Approval Parkhurst Masterplanned Community", from Queensland Rail to Stockland Development Division dated 28/08/2013; • Yaamba Road Intersection Interim Design Geometry, Drawing Number N12081-SK11, Issue C, prepared by Brown Smart Consulting and dated 27/08/2013; and • Yaamba Road Intersection Ultimate Design Geometry, Drawing Number N12081-SK10, Issue C, prepared by Brown Smart Consulting and dated 22/08/2013. (b) The replacement rail level crossing must be designed and constructed in accordance with AS1742.7–2007 *Manual of*		(a) and (b) Upon decommissioning the existing rail level crossing located on William Palfrey Drive and prior to the commencement of use for stage 1 (c) Prior to obtaining a final inspection certificate or certificate of classification, whichever is applicable, or prior to the commencement of use, whichever occurs first, for	Land use and transport coordination under the Transport Planning and Coordination Act 1994 and the purpose mentioned in the Transport Infrastructure Act 1994, section 258(2). The way the object of s.8A of the TPCA is to be achieved includes ensuring, as far as practicable, development does not have a significant adverse impact on public passenger transport and future public passenger transport infrastructure. The development is required to ensure the safety and operational integrity of railways and future railways. Comments or additional information:

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No.	Conditions of Development	Condition Timing	Jurisdiction and Reasons	
	uniform traffic control devices, Part 7: Railway crossings and must include the following at a minimum: • active control devices and treatments (RX-5 railway crossing flashing signal assemblies and boom gates) on each side of the crossing for each vehicle lane and overhead flashing signal assemblies, including signage, to cover multiple traffic lanes. The active controls must be coordinated with the proposed traffic light system at the intersection of Olive Street and the Bruce Highway; • advanced warning signage; • railway crossing signage and pavement markings; and • pedestrian crossings with active protection controls and mazes on each side of the crossing. (c) The applicant must provide to the Department of Transport and Main Roads written evidence from the railway manager that the development has been designed and constructed in accordance with parts (a) and (b) of this condition.		stage 1	Pursuant to section 255 of the *Transport Infrastructure Act 1994*, the railway manager's written approval is required to carry out works in or on a railway corridor or otherwise interfere with the railway or its operations. The applicant is responsible for obtaining any necessary approvals and/or other agreements from the railway manager (Queensland Rail) for the detailed design and construction of the rail level crossing.
3	(a) The existing rail level crossing of the North Coast Line at William Palfrey Drive (ID: 5412) must be decommissioned and closed. (b) The applicant must provide to the Department of Transport and Main Roads written evidence from the railway manager that the rail level crossing has been decommissioned and closed.		(a) Prior to the commencement of use for stage 1 and prior to the opening of the replacement rail level crossing located on Olive	Land use and transport coordination under the Transport Planning and Coordination Act 1994 and the purpose mentioned in the Transport Infrastructure Act 1994, section 258(2). The way the object of s.8A of the TPCA is to be achieved includes ensuring, as far as

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No.	Conditions of Development	Condition Timing	Jurisdiction and Reasons	
			Street (b) Prior to obtaining a final inspection certificate or certificate of classification, whichever is applicable, or prior to the commencement of use, whichever occurs first, for stage 1	practicable, development does not have a significant adverse impact on public passenger transport and future public passenger transport infrastructure. The development is required to ensure the safety and operational integrity of railways and future railways. In particular, the development must ensure no further crossings are added to the rail network in accordance with the *Queensland Level Crossing Safety Strategy 2012-2021.* Comments or additional information: The existing rail level crossing must be decommissioned and closed in accordance with the requirements of the railway manager (Queensland Rail). The applicant is responsible for obtaining any necessary approvals and/or other agreements from Queensland Rail for the decommissioning and closing of the rail level crossing. Queensland Rail will need to verify that the rail level crossing has been appropriately decommissioned and closed in accordance with their standards and requirements.

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No.	Conditions of Development	Condition Timing	Jurisdiction and Reasons	
4	(a) The development must provide noise attenuation measures as detailed in the following, except where modified by these concurrence agency conditions: • Correspondence entitled "Response to Queensland Department of Transport and Main Roads Information Request – Noise Impact Assessment for Proposed Master Planned Community – 'Ellida' – Parkhurst North", from MWA Environmental to Stockland Development Pty Ltd, Reference Number L15713/BH/11-007 and dated 7/08/2013; and • Masterplan Environmental Amenity Assessment – Proposed Master Planned Community – 'Ellida' – Parkhurst North, Job Number 11-007, prepared by MWA Environmental and dated 27 February 2013. (b) The applicant must provide RPEQ certification to the Department of Transport and Main Roads that the development has been designed and constructed in accordance with parts (a) and (b) of this condition.	(a) Prior to the commencement of use and to be maintained at all times for the relevant stage (b) Prior to obtaining a final inspection certificate or certificate of classification, whichever is applicable, or prior to the commencement of use, whichever occurs first for the relevant stage	Land use and transport coordination under the Transport Planning and Coordination Act 1994 and the purpose mentioned in the Transport Infrastructure Act 1994, section 258(2). The development will be impacted on by environmental emissions generated by public passenger transport, public passenger transport infrastructure and/or railways and is required to address these impacts. Comments or additional information: Further information regarding development in a railway environment can be obtained from the Guide for Development in a Railway Environment which is available at: http://www.tmr.qld.gov.au/Business-industry/Technical-standards-publications.aspx.
5	(a) Accommodation activities (residential development) within the area identified as 'Railway Acoustic Treatment Zone' on Figure 3 – 'Dwelling Acoustic Treatment Area', Drawing No. 11-077-3-IR, Job No. 11-007, prepared by MWA Environmental and dated 06/08/13 must be designed and constructed to meet the	(a) Prior to the commencement of use and to be maintained at all times for the relevant	Land use and transport coordination under the Transport Planning and Coordination Act 1994 and the purpose mentioned in the Transport Infrastructure Act 1994, section 258(2).	

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No.	Conditions of Development	Condition Timing	Jurisdiction and Reasons	
	following internal noise criteria for railways: • ≤45 dB(A) single event maximum sound pressure level for sleeping areas at all times; and • ≤50 dB(A) single event maximum sound pressure level for habitable rooms at all times. (b) The applicant must provide RPEQ certification to the Department of Transport and Main Roads that the development has been designed and constructed in accordance with part (a) of this condition.		stage (b) Prior to obtaining a final inspection certificate or certificate of classification, whichever is applicable, or prior to the commencement of use, whichever occurs first for the relevant stage	The development will be impacted on by environmental emissions generated by public passenger transport, public passenger transport infrastructure and/or railways and is required to address these impacts. Comments or additional information: Should Transport Noise Corridors be gazetted for railways at a future date, the applicant can apply to change any existing approval in accordance with the *Sustainable Planning Act 2009*. Further information regarding development in a railway environment can be obtained from the Guide for Development in a Railway Environment which is available at: http://www.tmr.qld.gov.au/Business-industry/Technical-standards-publications.aspx.
6	(a) The development must provide earth mounds adjacent to the railway, to the north and south of Olive Street, in accordance with: • Figure 1 - 'Acoustic Mound Concept', Drawing No. 11-077-1-IR, Job No. 11-007, prepared by MWA Environmental and dated 06/08/13; • Figure 2 – 'Proposed Acoustic Mound Alignment', Drawing		(a) - (d) Prior to the commencement of use and to be maintained at all times for the relevant stage	Land use and transport coordination under the Transport Planning and Coordination Act 1994 and the purpose mentioned in the Transport Infrastructure Act 1994, section 258(2). The development will be impacted on by environmental emissions generated by public

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No.	Conditions of Development	Condition Timing	Jurisdiction and Reasons	
	No. 11-077-2-IR, Job No. 11-007, prepared by MWA Environmental and dated 06/08/13; and • Figure 5 – 'Railway Noise Acoustic Barrier', Drawing No. 11-077-5, Job No. 11-007, prepared by MWA Environmental and dated 27/02/13. (b) Earth mounds must be designed and constructed to have a batter slope no steeper than 1:2 on either side and be in accordance with the Department of Transport and Main Roads' Technical Standard - MRTS04, where relevant. (c) Earth mounds must be landscaped in accordance with the following Department of Transport and Main Roads' Technical Standards and Specifications, where relevant: • MRTS16 – General Requirements Landscape and Revegetation Works; • MRTS16B – Vegetation Ground Works; • MRTS16C – Vegetation Works; and • MRTS16E – Establishment and Monitoring Works. (d) Earth mounds must not be located on rail corridor land. (e) The applicant must provide RPEQ certification to the Department of Transport and Main Roads that the development has been designed and constructed in accordance with parts (a) – (d) of this condition.	(e) Prior to obtaining a final inspection certificate or certificate of classification, whichever is applicable, or prior to the commencement of use, whichever occurs first, for the relevant stage	passenger transport, public passenger transport infrastructure and/or railways and is required to address these impacts. Comments or additional information: Further information regarding development in a railway environment can be obtained from the Guide for Development in a Railway Environment which is available at: http://www.tmr.qld.gov.au/Business-industry/Technical-standards-publications.aspx.

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No.	Conditions of Development	Condition Timing	Jurisdiction and Reasons	
7	(a) Stormwater management for the development must be in accordance with the following: • Flood Management Report, Report Number: B11007.W.-01C, Issue C, prepared by Brown Consulting (QLD) Pty Ltd and dated 24/01/2013; and • Ellida Local Plan, Parkhurst - Stormwater Quality Management Plan Masterplan, prepared by Design Flow and dated 04/03/2013. In particular, the management of stormwater (quantity and quality) post development must achieve a no worsening impact (on the pre-development condition) for all flood and stormwater events that exist prior to development and up to a 1% Annual Exeedance Probability (AEP) (equivalent to 1/100 year Average Recurrence Interval (ARI)). Stormwater management for the development must ensure no worsening or actionable nuisance to the rail corridor land and rail transport infrastructure caused by peak discharges, flood levels, frequency/duration of flooding, flow velocities, water quality, sedimentation and scour effects. (b) Any excavation, filling, paving, landscaping, construction or any other works to the land, including noise barriers (earth mounds), must not: • create any new discharge points for stormwater runoff onto the rail corridor land; and • interfere with the existing stormwater drainage on the rail corridor land.	(a) and (b) Prior to the commencement of use and to be maintained at all times for the relevant stage (c) Prior to obtaining a final inspection certificate or certificate of classification, whichever is applicable, or prior to the commencement of use, whichever occurs first, for the relevant stage	Land use and transport coordination under the Transport Planning and Coordination Act 1994 and the purpose mentioned in the Transport Infrastructure Act 1994, section 258(2). Stormwater runoff from development can have a significant adverse impact on public passenger transport and/or public passenger transport infrastructure and on the safety and operational integrity of railways and future railways. Comments or additional information: Further information regarding development in a railway environment can be obtained from the Guide for Development in a Railway Environment which is available at: http://www.tmr.qld.gov.au/Business-industry/Technical-standards-publications.aspx. Further guidance regarding stormwater management is also provided in the Queensland Urban Drainage Manual available at http://www.ehp.qld.gov.au/water/policy/urban_stormwater_planning_guidelines.html and in the Environmental Protection Act 1994 and	

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No.	Conditions of Development	Condition Timing	Jurisdiction and Reasons
	(c) The applicant must provide RPEQ certification to the Department of Transport and Main Roads that the development has been designed and constructed in accordance with parts (a) and (b) of this condition.		Environmental Protection (Water) Policy 2009 which are available at www.legislation.qld.gov.au.
8	(a) The design of any excavation works, filling and backfilling works, earth mound structures, retaining works and other works involving ground disturbance abutting rail corridor land must not de-stabilise rail transport infrastructure or the land supporting this infrastructure. (b) Temporary structures and batters must not encroach into rail corridor land. (c) Any retaining structures necessary to stabilise any excavations to the development must be located outside rail corridor land. (d) The development must not store any fill, spoil or any other material on rail corridor land at any stage of construction. (e) The applicant must provide RPEQ certification to the Department of Transport and Main Roads that the development has been designed and constructed in accordance with parts (a) – (d) of this condition.	(a) – (c) Prior to the commencement of use and to be maintained at all times for the relevant stage (d) To be maintained at all times during construction for the relevant stage (e) Prior to obtaining a final inspection certificate or certificate of classification, whichever is applicable, or prior to the commencement of use, whichever occurs first, for the relevant stage	Land use and transport coordination under the Transport Planning and Coordination Act 1994 and the purpose mentioned in the Transport Infrastructure Act 1994, section 258(2). The way the object of s.8A of the TPCA is to be achieved includes ensuring, as far as practicable, development does not have a significant adverse impact on public passenger transport and future public passenger transport infrastructure. The development is required to ensure the safety and operational integrity of railways and future railways. Comments or additional information: Further information regarding development in a railway environment can be obtained from the Guide for Development in a Railway Environment which is available at:

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No.	Conditions of Development	Condition Timing	Jurisdiction and Reasons	
				http://www.tmr.qld.gov.au/Business-industry/Technical-standards-publications.aspx.
9	(a) Fencing must be provided on the site along the boundary with the rail corridor land in accordance with the Guide for Development in a Railway Environment and Queensland Rail Standard Drawing 2573 – Chain-Link Fabric Fence. (b) The applicant must provide RPEQ certification to the Department of Transport and Main Roads that the development has been designed and constructed in accordance with part (a) of this condition.		(a) Prior to the commencement of use and to be maintained at all times for the relevant stage (b) Prior to obtaining a final inspection certificate or certificate of classification, whichever is applicable, or prior to the commencement of use, whichever occurs first for the relevant stage	Land use and transport coordination under the Transport Planning and Coordination Act 1994 and the purpose mentioned in the Transport Infrastructure Act 1994, section 258(2). The way the object of s.8A of the TPCA is to be achieved includes ensuring, as far as practicable, development does not have a significant adverse impact on public passenger transport and future public passenger transport infrastructure. The development is required to ensure the safety and operational integrity of railways and future railways. Comments or additional information: Further information regarding development in a railway environment can be obtained from the Guide for Development in a Railway Environment which is available at: http://www.tmr.qld.gov.au/Business-industry/Technical-standards-publications.aspx.
Development Permit - **Reconfiguring a Lot** (Stages 1-3: 5 into 199 lots)				

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No.	Conditions of Development	Condition Timing	Jurisdiction and Reasons	
1	The development must be carried out generally in accordance with the following plans, except as modified by these concurrence agency conditions: • Proposal Plan (Plan Reference 109116-82, Revision G) and Balance Lot Plan (Plan Reference 109116-86, Revision B), both prepared by RPS and dated 19/02/2013.	Prior to submitting the Plan of Survey to the local government for approval for the relevant stage	Land use and transport coordination under the Transport Planning and Coordination Act 1994 and the purpose mentioned in the Transport Infrastructure Act 1994, section 258(2). The Department of Transport and Main Roads' assessment of the development application was undertaken on the basis of the cited plans which depict how the proposed development will be carried out.	
2	(a) The proposed replacement rail level crossing located on Olive Street must be designed and constructed at the applicant's expense in accordance with the following: • Correspondence entitled "Olive Street, Parkhurst Crossing Proposal In-Principle Approval Parkhurst Masterplanned Community", from Queensland Rail to Stockland Development Division dated 28/08/2013; • Yaamba Road Intersection Interim Design Geometry, Drawing Number N12081-SK11, Issue C, prepared by Brown Smart Consulting and dated 27/08/2013; and • Yaamba Road Intersection Ultimate Design Geometry, Drawing Number N12081-SK10, Issue C, prepared by Brown Smart Consulting and dated 22/08/2013. (b) The rail level crossing must be designed and constructed in	(a) and (b) Upon decommissioning of the existing rail level crossing located on William Palfrey Drive and prior to submitting the Plan of Survey to the local government for approval for stage 1 (c) Prior to submitting the Plan of Survey to the local government for approval for Stage 1	Land use and transport coordination under the Transport Planning and Coordination Act 1994 and the purpose mentioned in the Transport Infrastructure Act 1994, section 258(2). The way the object of s.8A of the TPCA is to be achieved includes ensuring, as far as practicable, development does not have a significant adverse impact on public passenger transport and future public passenger transport infrastructure. The development is required to ensure the safety and operational integrity of railways and future railways.	

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No.	Conditions of Development	Condition Timing	Jurisdiction and Reasons	
	accordance with AS1742.7–2007 *Manual of uniform traffic control devices, Part 7: Railway crossings* and must include the following at a minimum: • active control devices and treatments (RX-5 railway crossing flashing signal assemblies and boom gates) on each side of the crossing for each vehicle lane and overhead flashing signal assemblies, including signage, to cover multiple traffic lanes. The active controls must be coordinated with the proposed traffic light system at the intersection of Olive Street and the Bruce Highway; • advanced warning signage; • railway crossing signage and pavement markings; and • pedestrian crossings with active protection controls and mazes on each side of the crossing. (c) The applicant must provide to the Department of Transport and Main Roads written evidence from the railway manager that the development has been designed and constructed in accordance with parts (a) and (b) of this condition.			Comments or additional information: Pursuant to section 255 of the *Transport Infrastructure Act 1994*, the railway manager's written approval is required to carry out works in or on a railway corridor or otherwise interfere with the railway or its operations. The applicant is responsible for obtaining any necessary approvals and/or other agreements from Queensland Rail for the detailed design and construction of the rail level crossing.
3	(a) The existing rail level crossing of the North Coast Line at William Palfrey Drive (ID: 5412) must be decommissioned and closed. (b) The applicant must provide to the Department of Transport and Main Roads written evidence from the railway manager that the rail level crossing has been decommissioned and closed.		(a) Prior to submitting the Plan of Survey to the local government for approval for stage 1 and prior to the opening of the	Land use and transport coordination under the Transport Planning and Coordination Act 1994 and the purpose mentioned in the Transport Infrastructure Act 1994, section 258(2). The way the object of s.8A of the TPCA is to be

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No.	Conditions of Development	Condition Timing	Jurisdiction and Reasons	
			replacement rail level crossing located on Olive Street (b) Prior to submitting the Plan of Survey to the local government for approval for stage 1	achieved includes ensuring, as far as practicable, development does not have a significant adverse impact on public passenger transport and future public passenger transport infrastructure. The development is required to ensure the safety and operational integrity of railways and future railways. In particular, the development must ensure no further crossings are added to the rail network in accordance with the *Queensland Level Crossing Safety Strategy 2012-2021.* Comments or additional information: The existing rail level crossing must be decommissioned and closed in accordance with the requirements of the railway manager (Queensland Rail). The applicant is responsible for obtaining any necessary approvals, contract arrangements, and/or other agreements from Queensland Rail for the decommissioning and closing of the rail level crossing. Queensland Rail will need to verify that the rail level crossing has been appropriately decommissioned and closed in accordance with

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No.	Conditions of Development	Condition Timing	Jurisdiction and Reasons	
				their standards and requirements.
4	(a) The development must provide noise attenuation measures as detailed in the following, except where modified by these concurrence agency conditions: • Correspondence entitled "Response to Queensland Department of Transport and Main Roads Information Request – Noise Impact Assessment for Proposed Master Planned Community – 'Ellida' – Parkhurst North", from MWA Environmental to Stockland Development Pty Ltd, Reference Number L15713/BH/11-007 and dated 17/08/2013; and • Noise Amenity Assessment – Stages 1 to 3 – 'Ellida' - Parkhurst North, Job Number 11-007, prepared by MWA Environmental and dated 27 February 2013. (b) The applicant must provide RPEQ certification to the Department of Transport and Main Roads that the development has been designed and constructed in accordance with parts (a) and (b) of this condition.		(a) and (b) Prior to submitting the Plan of Survey to the local government for approval for the relevant stage	Land use and transport coordination under the Transport Planning and Coordination Act 1994 and the purpose mentioned in the Transport Infrastructure Act 1994, section 258(2). The development will be impacted on by environmental emissions generated by public passenger transport, public passenger transport infrastructure and/or railways and is required to address these impacts. Comments or additional information: Further information regarding development in a railway environment can be obtained from the Guide for Development in a Railway Environment which is available at: http://www.tmr.qld.gov.au/Business-industry/Technical-standards-publications.aspx.
5	(a) An earth mound of 5.5m in height must be provided in accordance with: • Figure 1 - 'Acoustic Mound Concept', Drawing No. 11-077-1-IR, Job No. 11-007, prepared by MWA Environmental and dated 06/08/13; and		(a) - (e) Prior to submitting the Plan of Survey to the local government for approval for the relevant stage	Land use and transport coordination under the Transport Planning and Coordination Act 1994 and the purpose mentioned in the Transport Infrastructure Act 1994, section 258(2).

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No.	Conditions of Development	Condition Timing	Jurisdiction and Reasons	
	• Figure 2 – 'Proposed Acoustic Mound Alignment', Drawing No. 11-077-2-IR, Job No. 11-007, prepared by MWA Environmental and dated 06/08/13. (b) The earth mound must be designed and constructed to have a batter slope no steeper than 1:2 on either side and be in accordance with the Department of Transport and Main Roads' Technical Standard - MRTS04, where relevant. (c) The earth mound must be landscaped in accordance with the following Department of Transport and Main Roads' Technical Standards and Specifications, where relevant: • MRTS16 – General Requirements Landscape and Revegetation Works; • MRTS16B – Vegetation Ground Works; • MRTS16C – Vegetation Works; and • MRTS16E – Establishment and Monitoring Works. (d) The earth mound must not be located on rail corridor land. (e) The applicant must provide RPEQ certification to the Department of Transport and Main Roads that the development has been designed and constructed in accordance with parts (a) – (d) of this condition.			The development will be impacted on by environmental emissions generated by public passenger transport, public passenger transport infrastructure and/or railways and is required to address these impacts. Comments or additional information: Further information regarding development in a railway environment can be obtained from the Guide for Development in a Railway Environment which is available at: http://www.tmr.qld.gov.au/Business-industry/Technical-standards-publications.aspx.
6	(a) Stormwater management for the development must be in accordance with the following:		(a) – (c) Prior to submitting the	Land use and transport coordination under the Transport Planning and Coordination Act 1994

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No.	Conditions of Development	Condition Timing	Jurisdiction and Reasons	
	• Flood Management Report, Report Number: B11007.W.-01C, Issue C, prepared by Brown Consulting Pty Ltd and dated 24/01/2013; and • Parkhurst North Stormwater Quality Management Plan Stages 1-3, prepared by Design Flow and dated 28/02/2013. In particular, the management of stormwater (quantity and quality) post development must achieve a no worsening impact (on the pre-development condition) for all flood and stormwater events that exist prior to development and up to a 1% Annual Exeedance Probability (AEP) (equivalent to 1/100 year Average Recurrence Interval (ARI)). Stormwater management for the development must ensure no worsening or actionable nuisance to the rail corridor land and rail transport infrastructure caused by peak discharges, flood levels, frequency/duration of flooding, flow velocities, water quality, sedimentation and scour effects. (b) Any excavation, filling, paving, landscaping, construction or any other works to the land, including the noise barrier (earth mound), must not: • create any new discharge points for stormwater runoff onto the rail corridor land; and • interfere with the existing stormwater drainage on the rail corridor land. (c) The applicant must provide RPEQ certification to the		Plan of Survey to the local government for approval for the relevant stage	and the purpose mentioned in the Transport Infrastructure Act 1994, section 258(2). Stormwater runoff from development can have a significant adverse impact on public passenger transport and/or public passenger transport infrastructure and on the safety and operational integrity of railways and future railways. Comments or additional information: Further information regarding development in a railway environment can be obtained from the Guide for Development in a Railway Environment which is available at: http://www.tmr.qld.gov.au/Business-industry/Technical-standards-publications.aspx. Further guidance regarding stormwater management is also provided in the Queensland Urban Drainage Manual available at http://www.ehp.qld.gov.au/water/policy/urban_stormwater_planning_guidelines.html and in the Environmental Protection Act 1994 and Environmental Protection (Water) Policy 2009 which are available at

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No.	Conditions of Development	Condition Timing	Jurisdiction and Reasons	
	Department of Transport and Main Roads that the development has been designed and constructed in accordance with parts (a) and (b) of this condition.			www.legislation.qld.gov.au.
7	(a) The design of any excavation works, filling and backfilling works, earth mound structures, retaining works and other works involving ground disturbance abutting rail corridor land must not de-stabilise rail transport infrastructure or the land supporting this infrastructure. (b) Temporary structures and batters must not encroach into rail corridor land. (c) Any retaining structures necessary to stabilise any excavations to the development must be located outside rail corridor land. (d) The development must not store any fill, spoil or any other material on rail corridor land at any stage of construction. (e) The applicant must provide RPEQ certification to the Department of Transport and Main Roads that the development has been designed and constructed in accordance with parts (a) – (d) of this condition.		(a) – (e) Prior to submitting the Plan of Survey to the local government for approval for the relevant stage	Land use and transport coordination under the Transport Planning and Coordination Act 1994 and the purpose mentioned in the Transport infrastructure Act 1994, section 258(2). The way the object of s.8A of the TPCA is to be achieved includes ensuring, as far as practicable, development does not have a significant adverse impact on public passenger transport and future public passenger transport infrastructure. The development is required to ensure the safety and operational integrity of railways and future railways. Comments or additional information: Further information regarding development in a railway environment can be obtained from the Guide for Development in a Railway Environment which is available at: http://www.tmr.qld.gov.au/Business-industry/Technical-standards-publications.aspx.

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No.	Conditions of Development	Condition Timing	Jurisdiction and Reasons	
8	(a) Fencing must be provided on the site along the boundary with the rail corridor land in accordance with the Guide for Development in a Railway Environment and Queensland Rail Standard Drawing 2573 – Chain-Link Fabric Fence. (b) The applicant must provide RPEQ certification to the Department of Transport and Main Roads that the development has been designed and constructed in accordance with part (a) of this condition.	(a) – (b) Prior to submitting the Plan of Survey to the local government for approval for the relevant stage	Land use and transport coordination under the Transport Planning and Coordination Act 1994 and the purpose mentioned in the Transport Infrastructure Act 1994, section 258(2). The way the object of s.8A of the TPCA is to be achieved includes ensuring, as far as practicable, development does not have a significant adverse impact on public passenger transport and future public passenger transport infrastructure. The development is required to ensure the safety and operational integrity of railways and future railways. Comments or additional information: Further information regarding development in a railway environment can be obtained from the Guide for Development in a Railway Environment which is available at: http://www.tmr.qld.gov.au/Business-industry/Technical-standards-publications.aspx.	

SECTION D. Advice

Pursuant to section 255 of the *Transport Infrastructure Act 1994*, the railway manager's written approval is required to carry out works in or on a railway corridor or otherwise interfere with the railway or its operations.

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Under section 253 of the *Transport Infrastructure Act 1994,* Rockhampton Regional Council must seek permission from the Chief Executive of the Department of Transport and Main Roads in relation to relevant infrastructure associated with constructing, maintaining and operating a road on rail corridor land or non-rail corridor land by way of a level crossing. The permission can be subject to conditions and the railway manager will be consulted as part of this process. After the permission is granted, the permission will be recorded on the property title for the railway and under the *Transport (Rail Safety) Act 2010*, the Rockhampton Regional Council will be required to enter into an interface agreement with the railway manager (Queensland Rail).

Upon the decommissioning of the existing public level crossing of the North Coast Line at William Palfrey Drive, it is recommended that temporary vehicle access from William Palfrey Drive to the proposed public level crossing of the North Coast Line at Olive Street be considered to manage external traffic flows and community expectations until such time that formal road access can be provided through the proposed development.

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INTERNAL TECHNICAL ASSESSMENT (for TMR only)

Jurisdiction

This development application was properly made to the local government 11 March 2013. It is therefore triggered to the Department of Transport and Main Roads for a reconfiguration of a lot for residential purposes of 100 or more allotments (1 into 199 lots and balance lot over 3 stages) under schedule 7, table 2, item 34 and schedule 10 of the *Sustainable Planning Regulation 2009* (superseded). It is also triggered for preliminary approval for a material change of use under schedule 7, table 13, item 15 and schedule 13 of the *Sustainable Planning Regulation 2009* (superseded) for land that is completely or partly within a corridor, having a total site area of greater than 5ha and land that abuts rail corridor land.

Assessment

This application is for a preliminary approval for a MCU for a master planned residential estate of ultimately 2350 allotments and a ROL for stages 1 – 3 of 199 lots. The development was facilitated as a 'major project' under the previous Department of State Development Infrastructure Planning (DSDIP) Industry Support Unit. There were a number of workshops and pre-lodgement meetings with the developer, Department of Transport and Main Roads, Queensland Rail and the Minister's office from November 2012 regarding the proposal for a new rail crossing for the development.

Information Request Response

An information request was provided which asked the following;

- Provide concept drawings of the proposed at-grade crossing at Olive Street in 2 stages (2 lanes, then 4 lanes).
- Provide an amended Noise Amenity Assessment report for stages 1 to 3 in accordance with the *Department of Transport and Main Roads Policy Position Statement: Development on Land Affected by Environmental Emissions from Transport and Transport Infrastructure*; Version 1.0 dated 31 March 2011. Reflect these findings in the Ellida Local Plan for the MCU preliminary approval.

The following assesses the applicant's information request response.

Rail Level Crossing

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The applicant is proposing to provide the at-grade crossing at Olive Street in 2 stages. Olive Street will form the main entry road to the development and there is an associated need to upgrade the Olive Street/Bruce Highway intersection. Initially 2 lanes will traverse the rail corridor, and then the crossing will be duplicated to 4 lanes once traffic volumes increase to a certain threshold. The existing William Palfrey Drive at-grade crossing will be utilised for construction purposes, then decommissioned and closed upon the opening of Olive Street.

Queensland Rail provided approval in principle to both proposed crossings on condition that that they are consulted again at detailed design stages. They also provided a minimum requirements list for the crossing to the department for conditioning purposes. The plans provided by the applicant indicate Queensland Rail's requirements; therefore the plans and QR approval letters will be conditioned accordingly.

Rail Noise

The applicant proposes to increase sensitive uses in proximity to the rail corridor. The applicant submitted a Noise Amenity Assessment report prepared by MWA Environmental and dated 27 February 2013 is for stages 1 to 3 of the proposed development. The submitted noise report was required to be amended to more adequately address the internal railway noise criteria and to provide more certainty for conditioning should the applicant wish to proceed with the optional noise barrier. The noise report also assumed transport noise corridors for railways had been gazetted and placed a heavy reliance on noise being addressed through the QDC MP4.4 at the building works stage.

An information request response was provided by the applicant that proposed a 5.5 metre acoustic earth mound between the development and the rail corridor south of Olive St (this will apply to stages 1-3) and a 4-5m earth mound to the north of Olive St (specific details of this mound to be provided as part of a future ROL stage and can be conditioned by TMR then) to attenuate external rail noise. It also proposed that in order to meet the internal acoustic criteria, acoustic treatment of buildings out to 250 metres from the rail corridor will be required.

E&T advice on the amended noise report is as follows;

The report addendum shows an acceptable approach. We should be able to condition the barrier as proposed. We would also want to condition acoustic treatments to meet our internal criteria.

Therefore it is appropriate that this amended noise report be conditioned accordingly.

The Ellida Local Plan includes the following provision in relation to rail noise for the site;

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Table 6.2.1 - Ellida Amenity Overlay Code

Performance Outcome		Acceptable Outcome	
Where associated with a Reconfiguring a lot application			
QDC MP4.4 Acoustic Treatment Zone			
PO1	The impact of noise from the North Coast Railway is identified and mitigated where necessary in a manner which provides for the retention of both visual and acoustic amenity.	AO1	a) The subdivision of land adjacent to the North Coast Railway is supported by a stage specific Noise Impact Assessment, prepared by an appropriately qualified person, which: (i) models the impact of the North Coast Railway; (ii) determines mitigation measures required to comply with the 87 dB(A) Lmax planning level; and (iii) specifies the relevant QDC noise criteria for affected urban areas. b) Where acoustic barriers are proposed, they are to be: (i) constructed within the boundaries of the Ellida area; (ii) constructed as an earth mound / barrier or any solid and gap-free materials achieving a minimum density of 12.5 kg/m^2. (iii) screened in accordance with the provisions of the Ellida Landscaping Code.

It is appropriate that this performance outcome remains within the Local Plan because it is anticipated Transport Noise Corridors for railways will be gazetted at a future date. In the interim, rail noise must be ameliorated and will therefore require conditioning as part of the preliminary approval for sensitive uses within 250 metres of the North Coast Line.

As the development application was referred to TMR in April 2013, the applicable noise criteria are those in the Environmental Emissions Policy, version 1.0, dated 31 March 2011 (as per the concurrence agency assessment requirements of s.282 of the SPA).

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Fencing

The boundary of the site with the rail corridor land should be fenced to prevent unauthorised access. The submitted earthmound drawing submitted for stages 1-3 indicates that the applicant intends to construct a chain wire fence.

Stormwater and Drainage

The site is not floodprone and stormwater will generally be discharged away from the rail corridor. The applicant has submitted stormwater management plans for stages 1 – 3 as well as for the whole preliminary approval master planned area. The stormwater report for stages 1 – 3 states that flows from the railway will be captured within the development's stormwater system and there will be no upstream impacts on the railway. There is a hydraulic analysis by way of a flood management report for the whole master plan site. It provides a catchment plan that indicates only a small portion of external catchment (~0.97ha) flows to the site which will be captured by drainage systems of stages 1 – 3 and drained to the creek. All other sub-catchments, external to the site, flow directly to Ramsey Creek. Furthermore, E&T Hydraulics has confirmed that the hydraulic modelling in the flood study ensures no a worsening impact on state infrastructure (the rail and the highway), see below. Therefore, the stormwater management plan can be conditioned accordingly.

Victoria,

Thanks for referring the DA for a residential development at Parkhurst North for Hydraulics Technical Advice.
We refer Brown Consulting (Qld) Pty Ltd's Version C Jan 2013 Flood Management Report.
The proposed development is on Ramsey Creek, downstream of the North Coast Railway (Glen Geddes to Parkhurst) and the state-controlled 10F Bruce Highway.
A small portion of the site in the north receives tributary discharge from the railway reserve. The site layout shows that this portion will not be developed and hence will not impede runoff from state controlled infrastructure.
All other parts of the site runoff away from the state-controlled network and have no external catchment crossing that network. Flood modelling of Ramsey Creek for a range of ARIs from 5 to 100 years, results in flood levels at the upstream cross-section (some 75m downstream of the railway crossing) in the developed case being equal to that for the existing case. Hence there is no worsening of flood level at the state-controlled network.
Hence TMR should have no objection to this development on stormwater drainage grounds.

Kind regards,

Tina O'Connell
Principal Engineer (Hydraulics) | Structures
Engineering & Technology | Department of Transport and Main Roads

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Olive Street Level Crossing
Stockland Development, Parkhurst
Project Update

07/03/2014



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Introduction

As part of the Stockland housing development at Parkhurst, a new active level crossing is proposed at Olive Street and the existing William Palfrey Road level crossing will be closed / decommissioned simultaneously. Queensland Rail has approved in principle the "at grade" crossing pending execution of Development / Interface Agreements and a Licence to Enter and Construct, as well as compliance with the level crossing concept designs which were approved during the development application stage. The approval in principle will be subject to Stockland Development providing funding and will also be subject to items identified following further investigation / findings.

Queensland Rail's preferred tenure outcome for the level crossing is a permission area under s253 of the Transport Infrastructure Act. Stockland Development is to liaise with the Rockhampton Regional Council to apply for this permission area.

This project update outlines the signalling scope of works / modifications required to be made to Queensland Rail signalling infrastructure in order to accommodate these changes.

Scope of Works

The signalling scope refers to the following Signalling Documents:

- Signalling Locality Plan CL1458 Sht 6 V1A.002
- Olive Street Concept Parkhurst Signalling Arrangement V2.0 AS1458

A new Open Level Crossing (OLC) will be installed at Olive Street which includes half booms and two active pedestrian mazes. William Palfrey Road level crossing will be closed upon commissioning of the new Olive Street crossing. It is a requirement that the William Palfrey Road level crossing be available for use up until the commissioning of Olive Street level crossing.

The new OLC will be actively protected by flashing lights and half boom gates. A new level crossing hut will also be installed. An active pedestrian maze system will be installed on both sides of the road for pedestrian traffic at the OLC. The new OLC active protection will be integrated into the traffic light control system at the Bruce Highway and Olive Street intersection. Traffic lights will be provided on the eastern side of the proposed Olive Street level crossing.

Additional signals 13, 13P, 21, 29 & 14 are required to meet operational requirements. Along with the installation of 21 signal, 3 aspect signals are required at signals 23 and 25. The signals will be of the LED type.

In order to accommodate the required interlocking changes, a Processor Based Interlocking (PBI) system is required to replace the existing relay interlocking at Parkhurst. The interlocking technology to be used is Westrace MkII in a distributed architecture. Object controllers will be located in the vicinity of 7 points, 12 points and at the Olive Street level crossing. Additional object controller sites may be specified if required. The object controllers shall be housed in a pre-fabricated hut which complies with Queensland Rail standards. The central processor will be located off-site at a location to be determined by Queensland Rail.

New power circuitry will be required and shall be housed in a new Power Equipment Room (PER). A new alternator will also be provided in a separate building.

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All other equipment not affected by the Olive Street level crossing signalling and associated works will not be modified.

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In general, Stockland Development (or their sub-contractors) will undertake the necessary roadworks associated with the Olive Street level crossing and will undertake the removal of the existing roadway across the rail corridor at the William Palfrey Road level crossing.

The following parties will be engaged for the delivery of the described signalling activities associated with this project.

The Signalling Design and Construction Contractor shall complete (but not limited to) the following:

1. CAD design and independent check of all interlocking data, circuits, cable drawings and maintenance screen.
2. Set to work of simulator.
3. Principles Testing including Universal Traffic Control (UTC) Integration and Database testing.
4. As built circuits post-commissioning.
5. Supply, delivery and installation of all signalling hardware and buildings including cabling.
6. Factory acceptance testing of Westrace MkII system.
7. All construction works.
8. All testing and commissioning duties including bell testing and function testing.
9. Decommissioning and removal of William Palfrey Road level crossing signalling infrastructure, existing alternator and Signalling Equipment Room and all other redundant equipment following commissioning of the Olive Street OLC.
10. Specify and undertake the signaling decommissioning design works for William Palfrey Road OLC.
11. Set-to-work of the local MoviaW system and fully test.
12. Testing and commissioning package and associated documentation.
13. Provide Tester in Charge and coordinate all testing and construction works.
14. Project management and reporting to Queensland Rail (includes meetings, progress reports, etc.)
15. All Automatic Train Protection (ATP) design, supply, testing and commissioning.
16. Cooperate with construction audits as necessary.

Queensland Rail's Rail Infrastructure Program Unit will coordinate and manage the delivery of the signalling works. Queensland Rail's Regional Signalling Systems Unit will complete verification and certification design activities as follows:

1. Provide Approved AS (Signalling Arrangement) Plans, Control Tables, Locality / Scheme Plans.
2. Pass and approve the interlocking data, location circuits and cable drawings.
3. Witness the Principles Testing (and related activities) of the interlocking data.
4. Arrange for rail closures, safe working and Protection Officers for on-track work.
5. Approval of testing and commissioning package.
6. Auditing of construction works.
7. UTC changes including bitlist.

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Stockland Development (or their consultants / sub-contractors) to complete (but not limited to) the design and construction works of the road intersection, Olive Street OLC road infrastructure and decommissioning works at the William Palfrey Road OLC as follows:

1. Design and specify all road infrastructure works, overhead lighting system including road / bikeway / pedestrian line markings and road / level crossing warning signage in the road corridor. The road design across the rail corridor is to be submitted to Queensland Rail to ensure compliance with Queensland Rail's requirements.
2. Liaise with the Signalling Design Contractor to incorporate the rail level crossing design requirements into the overall design of the roadway and intersection.
3. Undertake the construction of the road infrastructure and drainage works in the rail corridor at the crossing (including road line marking works) as well as construction of the bikeways and pedestrian pathways to the mazes (and across the rail corridor). The works shall include the installation of advance warning signage and level crossing / pedestrian crossing protection control signage (in accordance with AS 1742.7). The construction works shall include the installation of the foundations and masts (e.g. RX-5 and RX-12 assemblies, cantilever assemblies, pedestrian maze concrete slabs, conduits, pits, fencing etc.) at the level crossing and pedestrian crossing. The construction works are to be carried out in consultation with the Signalling Design and Construction Contractor and in conjunction with the Signalling Design and Construction Contractor's works at and in the vicinity of the level crossing.
4. Relocation or alteration to any underground or overhead services.
5. Installation of the roadway, bikeway and pedestrian overhead lighting system at and in the vicinity of the level crossing.
6. Undertake the removal of the road infrastructure at the William Palfrey OLC (across the rail corridor) and all other works such as alteration of road line markings, removal of level crossing warning signage, installation of infrastructure required by the road authority to enable the closing of the level crossing, earthworks, drainage works, kerbing across the existing access etc.
7. Install rail corridor fencing at the William Palfrey OLC to Queensland Rail and Council's requirements.

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4.1 Signalling Power Supply

All DC power supplies shall be duplicated for redundancy and alarm contacts provided to the interlocking.

4.2 Equipment Boxes

The level crossing and PBI equipment shall be housed in a hut complying with the current Queensland Rail standard design.

It is preferable that air-conditioning is not provided and that temperature control of the room be managed by passive means (e.g. Tropical Roof)

4.3 Processor Based Interlocking

The level crossing control shall be provided by a Westrace MkII interlocking. SOM24 cards

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shall be used for interface to external equipment.

4.4 Train Detection

Train detection north of 14BT and including Olive Street level crossing shall be provided by axle counters. The existing track circuit layout is to be retained south of (and including 14BT).

The Signalling Design Contractor shall liaise with Queensland Rail's Signalling Engineering on proposed axle counter reset methodologies.

4.5 Level Crossing Equipment

The following level crossing equipment shall be used:

- 24V Safetran S60 Boom Mechanism.
- 200mm Flashing Light LED units.
- Overhead lighting for the pedestrian crossings shall be provided by Stockland Development (or their sub-contractors).
- Push buttons on either side of the roadway (in the rail corridor) shall be provided for level crossing activation by on- track vehicles etc.
- Queensland Rail Flashing Light driver, tone generator equipment to be replaced with SOM24 modules for Westrace MkII.

The Signalling Design Contractor should be aware that the RX-5 flashing light assemblies may be used to mount the road traffic lights as a shared pole arrangement. Consideration should be given in the design to the earthing requirements pertaining to the different power supplies used for the road traffic light system and the level crossing flashing light system.

4.6 Local & Remote Diagnostics

A local maintenance computer shall be provided with MoviolaW software for Westrace MkII diagnostics and access to axle counter diagnostic information. Provision shall be made for remote access via Queensland Rail diagnostics LAN.

4.7 Type Approval

All equipment which is not presently covered by a Queensland Rail Type Approval (24V converters for S60 boom mechanisms, solid state crossing bells etc.) shall be identified by the Signalling Design Contractor. Documentation to support the type of approval of these items shall be submitted to Queensland Rail Signalling Engineering in a timely fashion to facilitate approval before crossing commissioning.

4.8 Spares

The Signalling Design Contractor shall specify appropriate spares for all equipment used in this arrangement which are not currently held by the local signalling maintenance section.

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5.1 Timeframes

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Commissioning of Olive Street level crossing (and Parkhurst station interlocking)	Tentatively May 2015. Note: This date is based on a February 2014 approval to proceed date.
Decommissioning of William Palfrey Road level crossing (crossing must be open and available for use up until this date)	Tentatively May / June 2015. Note: This date is based on a February 2014 approval to proceed date.

The project draft schedule is attached for reference under Annexure 1.

5.2 Design Standards

All designs shall conform to the latest Queensland Rail's Regional Signalling Principles and Standards.

5.3 Standards, Codes and Guidelines

The Signalling Design Contractor shall comply with Queensland Rail's standards to the extent that they remain valid for the Westrace Mark II system architecture. All divergences from these standards shall be highlighted to the Queensland Rail's Principle Engineer, Signalling Engineering and updates recommended.

- Signal Engineering - Signalling Principles – Regional RCS v1.0 S.07.4211.27
- Signal Engineering – Westrace Data Structures Document – Regional RCS
- Signal Engineering - General Signalling Specification
- Signal Engineering - Safety in Design - P.01.4210.01
- Control of EPROM's /Data Storage Devices for Signalling Equipment - P.07.4211.04
- Principles for the Signalling of Trains Standard - SAF/STD/0006/SIG
- Signalling Layout Drawings Standard - SAF/STD/0025/SIG
- Train Operations Spatial Directions Standard - SAF/STD/0072/SIG
- Safeworking Principles - SAF/STD/0076/SIG
- Change Management of Signalling and Operational Systems Infrastructure - SAF/STD/0113/SIG
- General Operational Safety Manual - SAF/STD/0036/SWK
- Observance of Signals Manual - SAF/STD/0037/SWK
- Remote Control Signalling Manual - SAF/STD/0040/SWK

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6.1 Design, Construct and Commission

Siemens Rail Automation Pty Ltd (Siemens) were approached to provide a cost estimate to design, construct and commission the necessary signalling works associated with this project. A site visit was undertaken to refine the scope of works and cost estimate. Siemens have provided a "not to exceed" estimate of $5M ex GST. It has been determined that Queensland Rail engage Siemens under a contract to deliver these works and Stockland Development shall pay to Queensland Rail the costs associated with these works / contract.

On 3 March 2014 it was agreed by Queensland Rail management that the 12.5% Corporate Administration Service fee would be waived on this portion of work.

6.2 Queensland Rail's involvement in the Design, Construct and Commission phases of the project.

Stockland Development shall pay to Queensland Rail its costs for undertaking the Queensland Rail Works on a cost plus arrangement. Queensland Rail's cost estimate for undertaking this portion of the works is $1.21M ex GST. The parties agree the estimate may be exceeded in which case Stockland Development agrees to pay reasonable rates and charges which exceed the estimate.

Should this matter proceed further, Queensland Rail will require from Stockland Development a signed Interface Agreement document and License to Enter and Construct on Queensland Rail Land which will cover all relevant issues such as Queensland Rail costs, Queensland Rail requirements, Queensland Rail statutory requirements, access requirements and compensation requirements.

On a monthly basis or at such other times as may be agreed between Queensland Rail and Stockland Development, Queensland Rail will invoice Stockland Development on the following basis:

a) Direct project charges as booked to the project in the Queensland Rail financial system;
b) Corporate administration services as 12.5% of Queensland Rail direct project charges;
c) 12% interest compounded daily on invoiced amounts overdue.

Should the operations of Queensland Rail's trains or those of a third party be delayed by the Works or the acts or omissions of Stockland Development, its servants or agents, Queensland Rail shall be entitled to recover also as Queensland Rail's Rates and Charges referred to in the Interface Agreement document, Schedule of Contract Information.
All Rates and Charges referred to in the Interface Agreement, Schedule of Contract information, are subject to change from time to time with 30 days' written notice by Queensland Rail.

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The following project draft signalling documents are attached for reference under Annexure 2:

1. Signalling Locality Plan CL1458 Sht 6 V1A.002
2. Olive Street Concept Parkhurst Signalling Arrangement V2.0 AS1458

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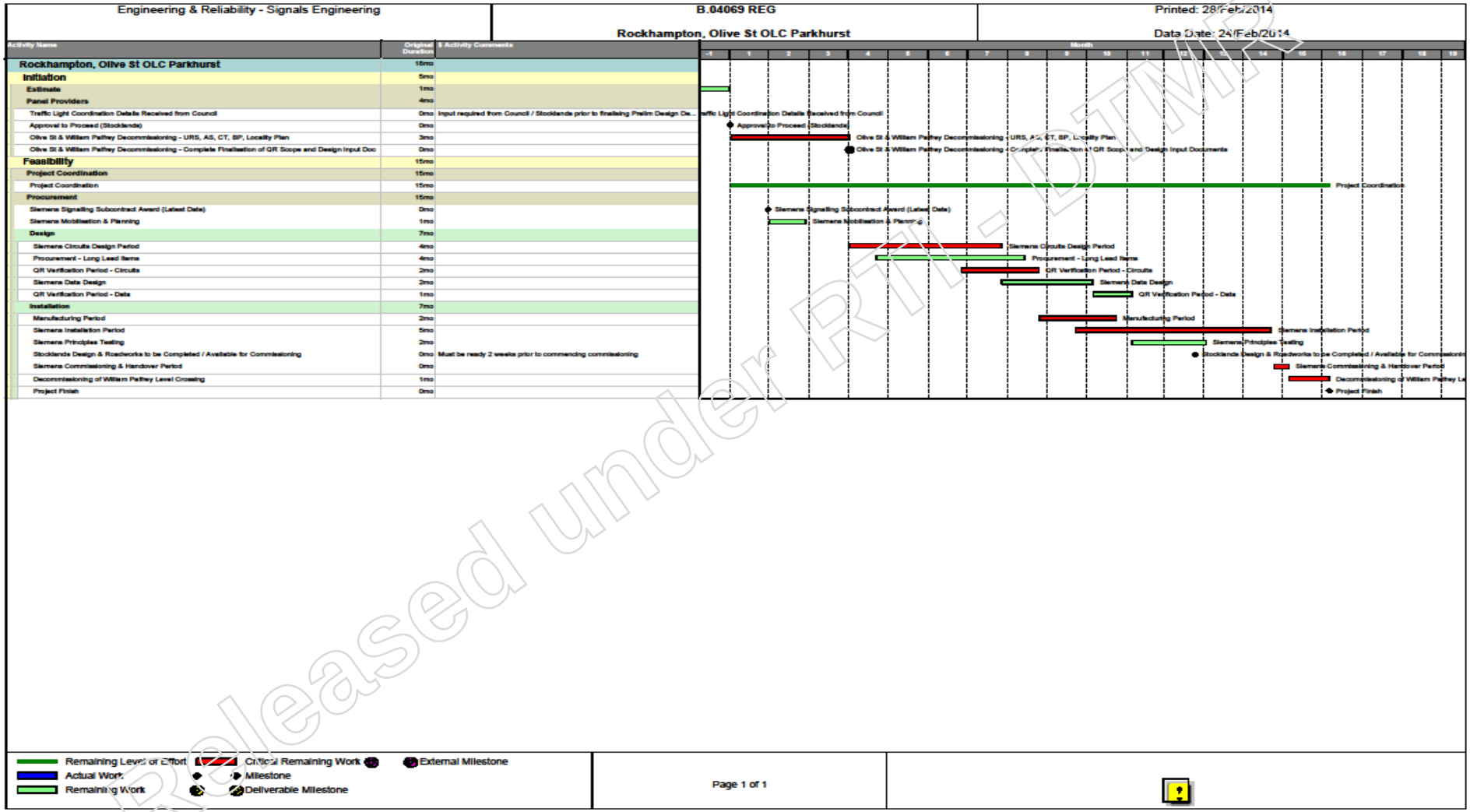

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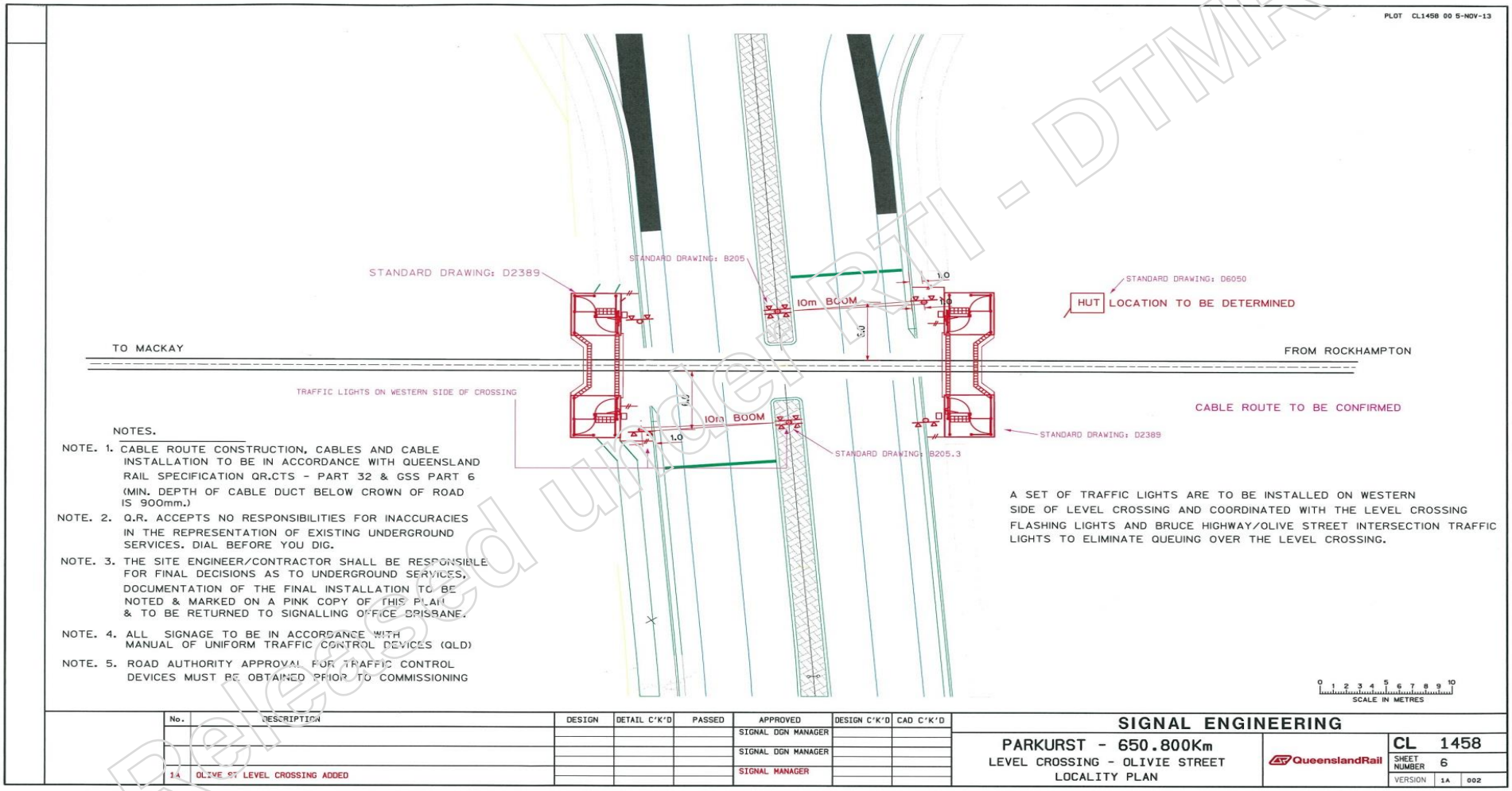

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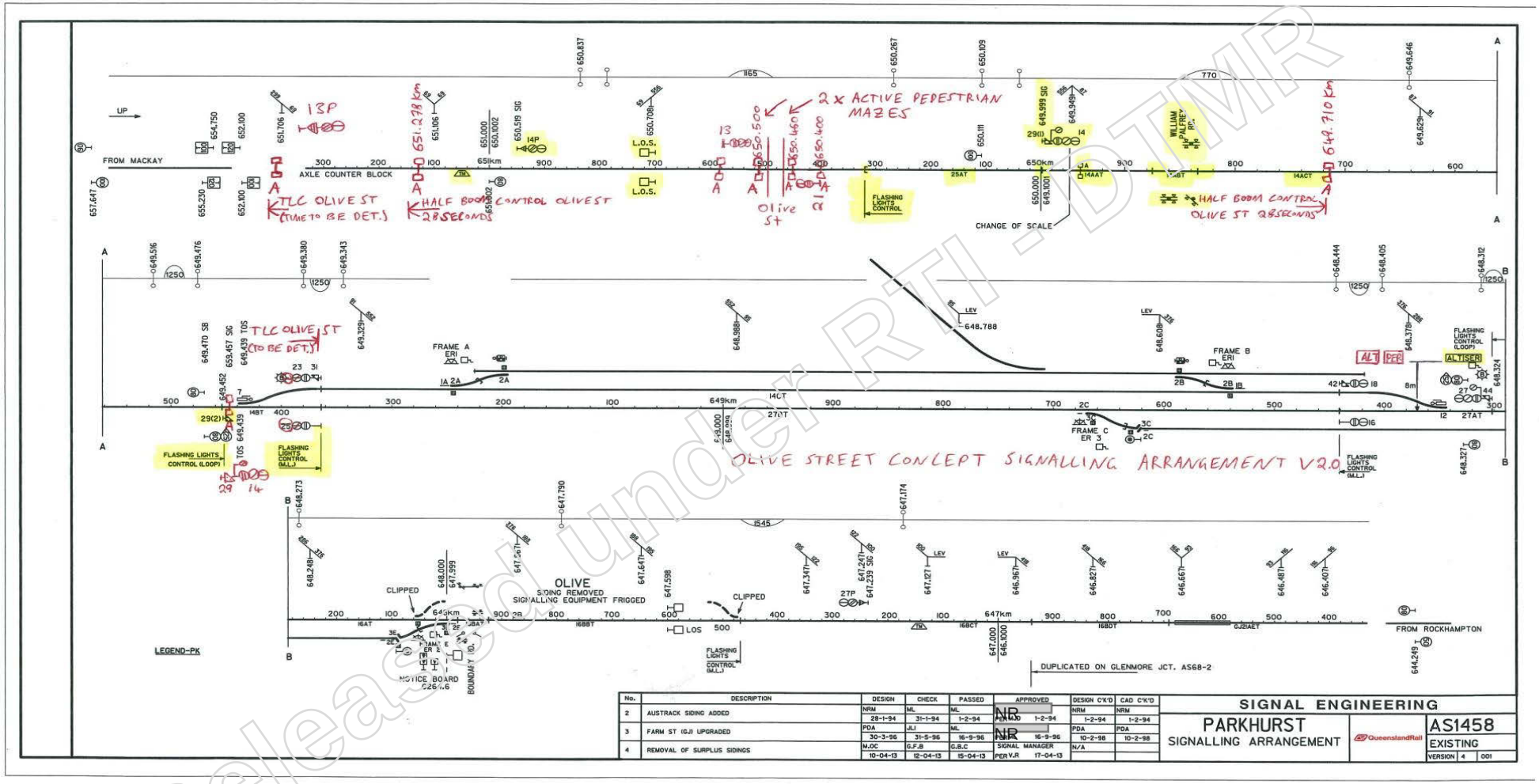

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Proposed Stockland Development, Olive Street Parkhurst

Preliminary ALCAM Assessment for proposed Olive Street extension level crossing and existing level crossing at William Palfrey Road, Parkhurst.

1. William Palfrey Road.

An ALCAM assessment has been carried out for the William Palfrey Road level crossing based on crossing characteristic and control data collected and photographs taken during crossing assessments and inspections carried out in 2002 and 2007 and data provided by the developer.

Data provided by the developer includes:

- Vehicle volumes following construction of the first stage of the development (300 lots) of up to 3000 vehicles per day. It is assumed this volume excludes background traffic (to be confirmed).
- The road is not an approved B-Double vehicle route. No vehicles over 19m in length will be used during construction works.
- No data concerning construction traffic volumes / flow has been provided.
- No upgrade works will be carried out on William Palfrey Road.
- No upgrade works will be carried out at the intersection of William Palfrey Road and the Bruce Highway, except minor works such as line marking. It will remain a "Give Way' control.
- Current vehicles volumes over the crossing have not been provided. A figure of 100 vehicles per day has been used.

Although it may not be the case, for the purpose of the assessment of the existing crossing it has been assumed that:

- all advance warning signage is in good condition and meets the required standard,
- crossing control will be as existing, i.e. flashing lights;
- all crossing controls meet the required standards and are in good condition;
- the road will not be widened and road surfaces will not be upgraded;
- road markings where applicable, are in good condition.

An additional ALCAM assessment was completed with the following upgrade works:

- the road way widened to allow two 19m vehicles to pass
- the roadway restored to good condition
- the crossing control upgraded to flashing lights and half boom gates.

The results of the three ALCAM assessments follow:

Crossing	Control	ALCAM Score	Risk Band	ALCAM Risk Score
Existing	Flashing Lights	165	Medium	231,000
Proposed, no works	Flashing Lights	218	Medium	9,156,000
Proposed, upgrade	Boom Gates	157	Low	6,594,000

2. Olive Street

The Stockland Development proposes a new at grade level crossing over the North Coast Line opposite Olive Street.

Key crossing characteristics and controls of the proposal used in the ALCAM assessment, as provided by the developer and derived from information supplied by the developer, include:

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- The crossing will have active flashing lights and boom gates provided for each vehicle lane of traffic.
- The crossing controls and the Olive street / Bruce Highway intersection traffic lights will be co-ordinated
- Traffic volume of the completed development will not exceed18,000 vehicles per day, including background traffic.
- Heavy vehicles, 19m in length or less, will comprise less than 5% of vehicle total
- Olive Street will not be an approved B-Double route. Although it has not been considered in the assessment, it is possible that B-Doubles may use the route if the road authority consents to use by special permit in the future.
- Although not confirmed, it is likely that Olive Street will be a passenger bus route.
- Three lanes of traffic will traverse the rail in each direction – two vehicle lanes and 1 bicycle lane.
- A medium strip will divide the east and west bound lanes on each approach to the crossing.
- A possibility of eastbound traffic queuing from the highway will exist.
- Advance sight lines to the crossing controls will be compromised due to multi lane traffic on approach to the crossing.
- Future increase in train volume and longer trains (1500m) has not been included.

The result of the ALCAM assessment follows:

Proposed Crossing	Control	ALCAM Score	Risk Band	ALCAM Risk Score
Bus Route	Boom Gates	128	Medium	129,024,000
Non-Bus Route	Boom Gates	128	Medium	32,256,000

The assessments 'Bus Route' and 'Non-Bus Route' are for comparison and understanding of the risk exposure presented by certain crossing characteristics.

There are minor additional treatments such as installing "Keep Clear" signage and yellow cross hatching at the crossing, however these treatments are insufficient in reducing the ALCAM Score to the Low Risk Band.

3. Olive Street Pedestrian Crossing

Pedestrian traffic over the rail line has not been addressed for the development and has not been assessed.

In accordance with planning strategies for pedestrian crossings in larger urban areas, the minimum requirement for pedestrian control is a passive maze with visual and audible alarms, regardless of pedestrian volumes. However ALCAM modelling is required to confirm if this is an adequate level of control at this site.

4. Background

ALCAM Assessments

The ALCAM is primarily a tool for rating level crossing safety in a comparative manner rather than as a definitive stand alone 'safety score' for a specific crossing. The characteristic based nature of the model also makes it useful for identifying the key characteristics that contribute the most to the level of risk at a crossing.

Note that the ALCAM Likelihood Score for a crossing may not, in itself, provide a complete picture of the crossing's level of safety. There may be additional localised issues or safety factors that should also be considered in the overall safety assessment of a crossing. ALCAM should also be used in conjunction with other stakeholder crossing assessments, standards, other risk mitigation strategies, and sound engineering, operational and human factor judgement when determining the treatment measures for a crossing.

Risk Bands:

The Risk Bands are defined on a scale dependent on the exposure rating (rail volume and road traffic volume). As the exposure increases, the acceptable likelihood level will decrease.

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Low indicates a level below which the likelihood of collision is considered low and remedial work to address the identified risks is not likely to be required unless there are specifically flagged risk factors.

Medium indicates a level above which there is likely to be safety hazards that require priority attention to mitigate the level of risk to road and rail users. This may require short-term and long-term actions to reduce the identified risks.

High indicates a level crossing that requires immediate attention and should be addressed as a priority with appropriate mitigation works to bring the risk to an acceptable level.

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Cambray Consulting Pty Ltd
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7 August 2013

Department of Transport and Main Roads
Program Delivery and Operations
Fitzroy Region (Rockhampton Office)
PO Box 5096
Red Hill QLD 4701

For the attention of Mr Byron Jones
cmo.rockhampton@tmr.qld.gov.au

Dear Sir

Proposed Development:	**Preliminary Approval to vary the effect of the planning scheme for a material change of use for a master planned community and a development permit for reconfiguring a lot (five lots into 199 lots, public use land and balance lots)**
Real Property Description:	**Lot 1RP602376, 22SP134380, 23SP134380, 2RP608099, 37RP600698, 38RP600698, 41SP226571, 49SP129857, 5SP238731, 6SP238731**
Street Address:	**Yaamba Road, Parkhurst QLD 4702**
Assessment Manager Ref:	**D/36-2013**
Local Government Area:	**Rockhampton Regional Council**

1.0 Introduction

This letter has been prepared in response to the Request for Additional Information issued by the Department of Transport and Main Roads (TMR) dated 7 May 2013, in relation to the above application. It addresses the traffic-related issues contained therein.

2.0 Response to Issues Raised in TMR's Information Request

The traffic-related issues raised in TMR's Request for Additional Information have been considered and addressed, as described following.

Road Traffic

1. ***Please provide a copy of the Traffic Impact Assessment (TIA) report signed by an RPEQ;***

   Please refer to the revised TIA reports for the development (see **Attachment A** & **Attachment B**) which have been certified by a RPEQ engineer as requested.

2. ***Section 4.2 of the TIA (Stages 1 - 3) refers to Figure 4.2(d) however this figure does not appear in the report, please clarify;***

   Please refer to the attached revised TIA report for the Stage 1-3 ROL application (see **Attachment B**) in which Figure 4.2d has been correctly labelled.

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3. ***Section 4.3 of the TIA (Stages 1 - 3) assumes that the full development of stage 1 – 3 (198 Lots) will be completed by 2015 and as such adopts a design horizon of 2025 for the 10 year post-development assessment. TMR has concerns that this development timeframe is overly optimistic which may result in less than a 10 year design horizon for these stages of development. Please provide further justification or evidence supporting the assumption that stages 1 – 3 will be completed by 2015;***

Even if it is assumed that the construction of Stage 1 does not commence until 2014, this still allows two years (2014 & 2015) for the proposed 198 lots to be developed, which equates to a development rate of approximately 100 lots per year.

As identified in **Table 3a** below, Rockhampton Regional Council's *Planning Assumptions Report (2011)*, which underpins their adopted infrastructure charges resolution, identifies an overall development rate of approximately 141 lots per year for the Parkhurst area.

Table 3a: RRC Forecast Development Growth for Parkhurst

PIA locality	PIP projection category	Existing and Projected Dwellings						
		2010 (Existing)	2011	2016	2021	2026	2031 (outside PIA)	Ultimate development
Parkhurst	Single dwelling	409	428	860	1,643	2,310	2,552	3,694
	Semi-attached	6	6	47	136	211	364	364
	Multiple dwelling	0	0	37	215	223	223	223
	Other dwelling	259	259	309	309	181	181	181
	Total Dwellings	674	693	1,253	2,306	2,925	3,320	4,462

Furthermore it is understood that the forecast development within the Parkhurst area only represents about 47% of the total Rockhampton district land supply (excluding the Livingstone Shire Council area), with a total of 298 lots per annum identified within the *RPS Economics Report* submitted as part of the development application. As such the proposed development rate of 100 lots per annum for the North Parkhurst site would only reflect a total market share of approximately 30%, which is considered reasonable.

Therefore based on the information provided above, it can be seen that the proposed development timing (completion by 2015) for Stages 1-3 can be considered acceptable.

4. ***Please provide clarification/justification for the 1% per annum compound growth adopted in the analysis as indicated in Section 4.3 of the TIA (Stage 1 – 3);***

Please refer to Section 5.2 of the revised TIA traffic report for the Preliminary Approval application (see **Attachment A**) and Section 4.3 of the revised TIA report for the Stage 1-3 ROL application (see **Attachment B**) which identify that the adoption of the proposed 1% per annum compound background traffic growth rate in addition to the inclusion of all approved developments that are yet to be constructed equates to combined growth rate of approximately 1.8%-3.5% per annum up to the proposed 10 year design horizon for the development of 2035. This section of the revised report also identifies that the recorded historical 10 year background growth rate for this section of the highway is approximately 1.5% per annum (compound).

From this information it can clearly be seen that the adoption of the 1% per annum background growth plus the approved development traffic as proposed in the revised TIA reports, is in excess of the historical background growth rates for this section of the highway, and its use can therefore can be considered both conservative and acceptable for use in forecasting the future pre development traffic volumes as part of the analysis of the impacts of the proposed development.

5. ***Section 4.5.1.2 of the TIA (Stage 1 – 3) states that the intersection of the Bruce Highway / Olive St includes the provision of a four lane cross section for the Bruce Highway, which was identified to be required irrespective of the development due to the forecast mid-block volumes exceeding 15,000 vehicles per day. TMR has no committed concept, design or funds for this work and as such, the applicant should not assume that these works will necessarily be in place. Further consideration, analysis and recommendations should be carried out for this intersection on the assumption that TMR are not in a position to upgrade the Bruce Highway within the design horizons currently investigated;***

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The traffic analysis undertaken within the revised TIA reports (see **Attachment A** & **Attachment B**) reiterates that the existing two lane cross section for the Bruce Highway (Yeppoon Road to Olive Street) and the associated Bruce Highway / Olive Street intersection exceeds TMR's desirable level of service (15,000vpd) based on the existing pre development traffic volumes. To resolve these existing deficiencies would require the duplication of the Highway and the upgrade of the Bruce Highway / Olive Street intersection. These works are recommended irrespective of the inclusion of traffic generated by the proposed North Parkhurst development.

Through discussions with TMR officers it is understood that the State acknowledges these existing deficiencies, a fact that is highlighted by the Departments completion of a future road network planning study for Parkhurst and the application for and subsequent attainment of federal government funding to construct the required upgrade works for a portion (Yeppoon Road – Boundary Road East) of the Bruce Highway corridor through Parkhurst.

It should be noted that the 15,000 vpd trigger identified represents the desired level of service for the road, not its ultimate capacity. The capacity of a road network is generally 25% higher than the desired level of service. As demonstrated by the current volumes identified for the existing sections of the Bruce Highway south of Boundary Road East, it is anticipated that volumes in the order of 18,000 – 20,000 vpd can be accommodated by a two lane cross section of road.

Therefore, it would not be unreasonable for TMR to defer the upgrade of this remaining section of the corridor (i.e. Boundary Road East – Olive Street), and based on forecast background growth and the proposed development rates, we do not anticipate the capacity being reached within 5-10 years. This then provides TMR with an additional 5-10 years in which to obtain further federal funding to upgrade the highway to a four lane cross section up to the Olive Street intersection.

However notwithstanding the comments above, and regardless of whether TMR has committed concept, design or funds to undertake the required upgrade works to the Bruce Highway corridor through Parkhurst, it would still be considered unreasonable for the Department to request the applicant to construct these works, which are identified to be existing deficiencies in the state controlled road network.

6. ***Section 4.5.1.2 of the TIA (Stage 1 – 3) states that storage lengths were calculated assuming a two and a half minute delay to vehicles at the level crossing. Please provide further evidence to justify this assumption and explain how this figure was arrived at. In addition, what consideration (if any) has been given to the effect on the signalised intersection if the train lengths increase in the future or if the assumed speed of the trains through the level crossing is lowered;***

A 2min 30sec delay is highly conservative.

It is our understanding that the current train speed on that section of the North Coast line is approximately 80km/h and that the maximum length of trains is 695m. Based on discussions with QR, we understand that this maximum length of train was unlikely to increase due to current weight and length restrictions for trains using the line (in particular in regards to movements over the rail bridge in Rockhampton).Using this information calculations were then undertaken to estimate the likely delay times.

If the train speed were 60km/h, it would take approximately 42 seconds for the train to pass the crossing. Additional time (20 sec) is then assumed both before and after the train to cater for the boom gates lowering and rising clear of the train movements.

As a consequence we expect an 85 second delay (1min 25sec) to vehicles during the train phase.

Therefore in summary, from the information provided above it can be seen that the assumption of a delay time of approximately two and a half minutes to vehicles at the level crossing is conservative and therefore should be more than adequate to establish the effect on road traffic movements at the adjacent intersection due to a train movement.

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7. ***The proposed intersection layout indicated in Figure 4.5.1.2a does not adequately cater for what is anticipated to be a significant pedestrian demand from the estate to the existing Parkhurst School on Mason Avenue on the eastern side of the Bruce Highway. It is suggested the provision of an additional pedestrian crossing at the signals on the Olive St (East) leg or the relocation of the pedestrian crossing from the Bruce Highway (North) leg to the Bruce Highway (South) leg may resolve this issue. Your further consideration and advice as to how this matter will be addressed is sought;***

   Please refer to Section 5.4.1.2 of the revised TIA report (Preliminary Approval) (**Attachment A**) and Section 4.5.1.2 of the revised TIA report for the Stage 1-3 ROL application (**Attachment B**) which detail the revised analysis undertaken for the proposed Bruce Highway / Olive Street signalised intersection, incorporating both the relocation of the pedestrian crossing from the northern to the southern leg of the Bruce Highway and the provision of a pedestrian crossing at the signals on the eastern (Olive Street) approach.

   As identified by this analysis, the proposed interim and ultimate intersection configurations (including the relocation of the pedestrian crossing across the highway and the additional pedestrian crossing on the eastern approach to the signals) are expected to operate within acceptable limits for all analysed post development traffic scenarios, and as such are considered acceptable to cater for the expected post development traffic flows at the Bruce Highway / Olive Street intersection as a result of the proposed North Parkhurst development.

8. ***Section 4.5.1.3 of the TIA (Stage 1 – 3) includes analysis of an upgraded intersection at Bruce Highway / Boundary Road (East) rather than the existing intersection form. Similarly to item 5 above, TMR has no committed concept, design or funds for this work and as such, the applicant should not assume that these works will necessarily be in place. Further consideration, analysis and recommendations should be carried out for this intersection on the assumption that TMR are not in a position to upgrade the Bruce Highway / Boundary Road (East) within the design horizons currently investigated;***

   The traffic analysis undertaken within the revised TIA reports (see **Attachment A** & **Attachment B**) reiterates that the provision of a four lane cross section for the Bruce Highway (Yeppoon Road to Olive Street) and associated works at the Bruce Highway / Boundary Road (East) intersection are a requirement of the pre development traffic volumes on the Bruce Highway corridor. As these works are therefore necessary irrespective of the inclusion of traffic generated by the proposed North Parkhurst development, they can be considered an existing deficiency of the state-controlled network.

   Through discussions with TMR officers it is understood that this view regarding the networks existing deficiencies is agreed, a fact that is highlighted by the Departments completion of a future road network planning study for Parkhurst and the application for and subsequent attainment of federal government funding to construct the required upgrade works for a portion (Yeppoon Road – Boundary Road East) of the Bruce Highway corridor through Parkhurst.

   As the Bruce Highway / Boundary Road (East) intersection falls within the abovementioned section of the highway which has obtained federal funding, it has been assumed that TMR would now be in a position to undertake all upgrade works recommended to rectify the identified existing network deficiencies at this intersection within the design horizons currently investigated.

   Furthermore, irrespective of the above, and regardless of whether TMR has committed concept, design or funds for the required upgrade works to its network, it would be unreasonable for the Department to request the applicant to construct these works which are required to existing deficiencies.

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9. ***Section 4.5.1.4 of the TIA (Stage 1 – 3) indicates that the analysis added another lane to the Boundary Road approach to simulate left turning vehicles propping next to right turning vehicles. With respect, this is not considered appropriate at unsignalised intersections for sight visibility reasons. Further explanation is provided in the department's "Road Planning and Design Manual" (RPDM) section 13.3.1.3 and Figure 13.6;***

   It is noted that this additional lane was included in the analysis of the intersection in the previous version of the report to simulate the effect of left turning vehicles propping next to right turning vehicles at the intersection, which although not deemed appropriate by TMR is currently occurring at the intersection as a result of the large exit lane width available on the Boundary Road (West) approach.

   Regardless of this matter it is noted that the provision of this "additional lane" does not significantly impact on the overall operation of the intersection and as such has been removed from the analysis within the revised report. As such please refer to the appropriate sections of both revised TIA reports, which now more accurately reflect TMR's view on the existing lane configurations on the western leg/approach to the Bruce Highway / Boundary Road (West) intersection.

10. ***Section 4.5.1.4 of the TIA (Stage 1 – 3) includes analysis of an upgraded intersection at Bruce Highway / Boundary Road (West) rather than the existing intersection form. Similarly to items 5 and 8 above, TMR has no committed concept, design or funds for this work and as such, the applicant should not assume that these works will necessarily be in place. Further consideration, analysis and recommendations should be carried out for this intersection on the assumption that TMR are not in a position to upgrade the Bruce Highway / Boundary Road (West) within the design horizons currently investigated;***

    The traffic analysis undertaken within the revised TIA reports (see **Attachment A** & **Attachment B**) reiterates that the provision of a four lane cross section for the Bruce Highway (Yeppoon Road to Olive Street) and associated works at the Bruce Highway / Boundary Road (West) intersection are a requirement of the pre development traffic volumes on the Bruce Highway corridor. As these works are therefore necessary irrespective of the inclusion of traffic generated by the proposed North Parkhurst development, they can be considered an existing deficiency of the state-controlled network.

    Through discussions with TMR officers it is understood that this view regarding the networks existing deficiencies is agreed, a fact that is highlighted by the Departments completion of a future road network planning study for Parkhurst and the application for and subsequent attainment of federal government funding to construct the required upgrade works for a portion (Yeppoon Road – Boundary Road East) of the Bruce Highway corridor through Parkhurst.

    As the Bruce Highway / Boundary Road (West) intersection falls within the abovementioned section of the highway which has obtained federal funding, it has been assumed that TMR would now be in a position to undertake all upgrade works recommended to rectify the identified existing network deficiencies at this intersection within the design horizons currently investigated.

    Furthermore, irrespective of the above, and regardless of whether TMR has committed concept, design or funds for the required upgrade works to its network, it would be unreasonable for the Department to request the applicant to construct these works which are required to existing deficiencies.

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11. ***TMR has no committed concept, design or funding for the upgrade of this section of the Bruce Highway. The applicant is requested to provide a mitigation strategy to address the developments impacts on the state-controlled network.***

The traffic analysis undertaken within the revised TIA reports (see **Attachment A** & **Attachment B**) reiterates that the existing two lane cross section for the Bruce Highway (Yeppoon Road to Olive Street) exceeds TMR's desirable level of service (15,000vpd) based on the existing pre development traffic volumes. To resolve these existing deficiencies would require the duplication of the Highway. These works are recommended irrespective of the inclusion of traffic generated by the proposed North Parkhurst development.

Through discussions with TMR officers it is understood that the State acknowledges these existing deficiencies, a fact that is highlighted by the Departments completion of a future road network planning study for Parkhurst and the application for and subsequent attainment of federal government funding to construct the required upgrade works for a portion (Yeppoon Road – Boundary Road East) of the Bruce Highway corridor through Parkhurst.

It should be noted that the 15,000 vpd trigger identified represents the desired level of service for the road, not its ultimate capacity. The capacity of a road network is generally 25% higher than the desired level of service. As demonstrated by the current volumes identified for the existing sections of the Bruce Highway south of Boundary Road East, it is anticipated that volumes in the order of 18,000 – 20,000 vpd can be accommodated by a two lane cross section of road.

Therefore, it would not be unreasonable for TMR to defer the upgrade of this remaining section of the corridor (i.e. Boundary Road East – Olive Street), and based on forecast background growth and the proposed development rates, we do not anticipate the capacity being reached within 5-10 years. This then provides TMR with an additional 5-10 years in which to obtain further federal funding to upgrade the highway to a four lane cross section up to the Olive Street intersection.

However notwithstanding the comments above, and regardless of whether TMR has committed concept, design or funds to undertake the required upgrade works to the Bruce Highway corridor through Parkhurst, it would still be considered unreasonable for the Department to request the applicant to construct these works, which are identified to be existing deficiencies in the state controlled road network.

We trust the above information is of assistance, and adequately addresses the traffic-related raised by TMR in the Request for Additional Information dated 9 March 2011, regarding this application.

If you have any queries regarding the comments above please do not hesitate to contact me on NR NR

Yours faithfully

NR

NR

BEng (Civil) | NR | CPEng | MIEAust |NPER
Senior Transport Engineer
Cambray Consulting Pty Ltd

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ATTACHMENT A

Revised Traffic Impact Assessment Report

Preliminary Approval Application

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CAMBRAY consulting
Traffic Engineering and Transport Planning



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Proposed Master Planned Community
Stockland North Parkhurst

Traffic Impact Assessment (Application for Preliminary Approval)

Report Revision B (responding to information requests)

Prepared for Stockland
8 August 2013

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APPENDIX A

Parkhurst Area Land Use Figure
Parkhurst and Yeppoon Road Corridor Structure Plan (2007)

APPENDIX B

Proposed Road Parkhurst Hierarchy Figure
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APPENDIX C

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SIDRA Results
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APPENDIX R

Count Data
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(Prepared by Austraffic)

APPENDIX S

SIDRA Results
Alexandra Street / Belmont Road / Birkbeck Drive

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1.0 Introduction

Cambray Consulting was engaged to assist Stockland with developing a master plan for the planned residential site located in North Parkhurst, QLD. As part of this assessment a Traffic Impact Assessment report (dated 5 March 2013) was completed and lodged with Council as part of the development application for the proposed development.

Requests for additional information were then received from both Rockhampton Regional Council and the Department of Transport and Main Roads (TMR) in relation to the proposed development, which have led to minor amendments to the internal site layout and the methodology of the traffic impact assessment for the site and the inclusion of additional analysis regarding the impact of the development on key local government controlled intersections.

This updated report has therefore been prepared in response to requests for additional information, addressing the traffic-related issues identified and assessing the revised site layout. This assessment involved:

- Establishment of access strategy for the proposed development;
- Operation of the proposed at grade rail crossing;
- Internal road hierarchy and cross sections;
- Staging of the road network including trigger volumes; and
- Investigation into traffic impacts of the development including attributable external roadworks / contributions;

1.1 Limits of Report

This report takes into account the particular instructions and requirements of our client. Cambray Consulting has taken care in the preparation of this report, however it neither accepts liability nor responsibility whatsoever in respect of:

- Any use of this report by any third party;
- Any third party whose interests may be affected by any decision made regarding the contents of this report; and/or
- Any conclusion drawn resulting from omission or lack of full disclosure by our client, our client's consultants, or any other parties.

1.2 Safety In Design

Within the scope of our design activities, we have identified safety in design issues and potential hazards, whenever reasonably practicable within our field of expertise. Due to our limited and upfront role on this project, it is not considered reasonably practicable to identify all potential hazards which may occur throughout the life of a project, including during detailed design and construction activities. It is strongly recommended that safety in design issues be reviewed during all ensuing design and construction stages of the project.

1.3 RPEQ Certification

I, NR, confirm that I have prepared and/or reviewed the contents of this document.

NR

NR

BEng (Civil) | NR | CPEng | MIEAust | NPER
Senior Transport Engineer
Cambray Consulting Pty Ltd

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2.0 Site Location

The proposed development site is located as shown in **Figure 2a** below, and is bounded by the Bruce Highway and the North Coast Rail line the East, William Palfrey Drive to the South, land identified for future rural residential uses to the West and Ramsay Creek to the North.

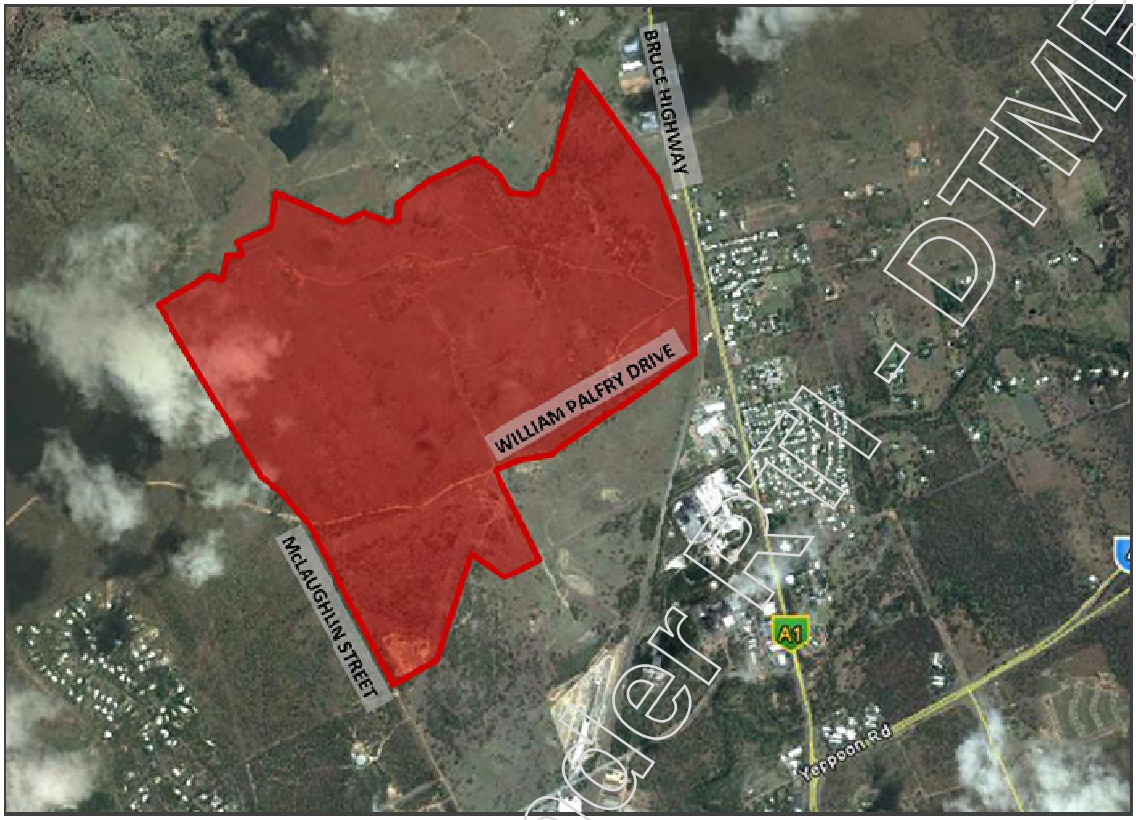

Figure 2a: Site Location

The subject site comprises five (5) lots, all of which are under the ownership of Stockland having a combined area of 276.72ha:

- Lot 1 on RP602376;
- Lot 5 on SP238731;
- Lot 37 on RP600698;
- Lot 37 on RP600698; and
- Lot 2 on RP608099.

The following lots have been included in the application to secure site access provisions from the Bruce Highway (Yaamba Road) and to facilitate continued access over railway corridor:

- Lot 22 on SP134380 (*held by the State of Qld*);
- Lot 23 on SP134380 (*held by the State of Qld*);
- Lot 49 on SP129857 (*held by the State of Qld*); and
- Lot 41 on SP226571 (private ownership)

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3.0 Planning Context

The proposed development site has been identified for several years as an area for future residential development growth, by both Council and Main Roads. This can be seen by its inclusion in such planning documents as

- Council's Parkhurst and Yeppoon Road Corridor Structure Plan (GHD 2007);
- Rockhampton Traffic Study (Arup 2008);
- RRC Priority Infrastructure Plan Planning Assumptions Report (GHD 2011), and
- TMR's draft Parkhurst Forward Planning Traffic Analysis Study (2010).

All of these planning documents envisaged a large residential development (i.e. > 2,000 lots) with the primary access from the Bruce Highway and secondary access via McLaughlin Street and the Alexandra Street corridor. Common to each study was a Urban Arterial Road providing connectivity between the Bruce Highway and the planned residential catchments to the west of the Highway. Several of these planning documents identify this proposed Urban Arterial Road joining the Bruce Highway at Olive Street, creating a fourth (western) leg to the existing intersection. This intersection requires signalisation and would incorporate an at-grade crossing of the adjacent rail corridor..

These planning documents are discussed in further detail below. The intent of Stockland is to develop the land in a manner that is consistent with these planning studies

3.1 Parkhurst & Yeppoon Road Corridor Structure Plan (2007)

This was a land use planning study commissioned by the former Rockhampton City Council. The study identifies the extent of land required to service the possible future growth (both residential and commercial) within the local Parkhurst area.

Figure 3.1a below is an extract from this study which shows the land uses identified on the subject site. A full size copy of the plan is included as **Appendix A**.

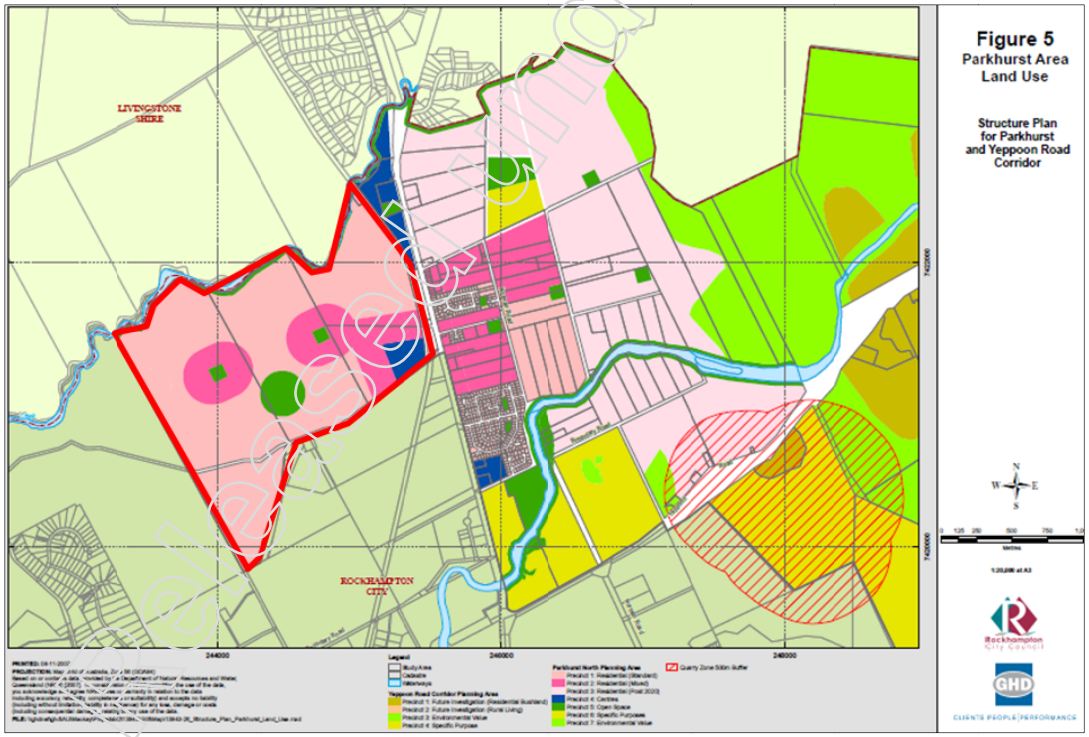

Figure 3.1a – Extract from Parkhurst & Yeppoon Road Corridor Structure Plan (2007)

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As can be seen in the figure above the majority of the Stockland site was identified for future residential uses and was assumed to yield approximately 2,650 dwellings. It is also noted that a Neighbourhood Centre was identified within the site, being located on the south-eastern corner of site.

Figure 3.1b below is an extract of the road hierarchy plan that was included in this Council study. Again a full size copy of this figure is included as **Appendix B**.

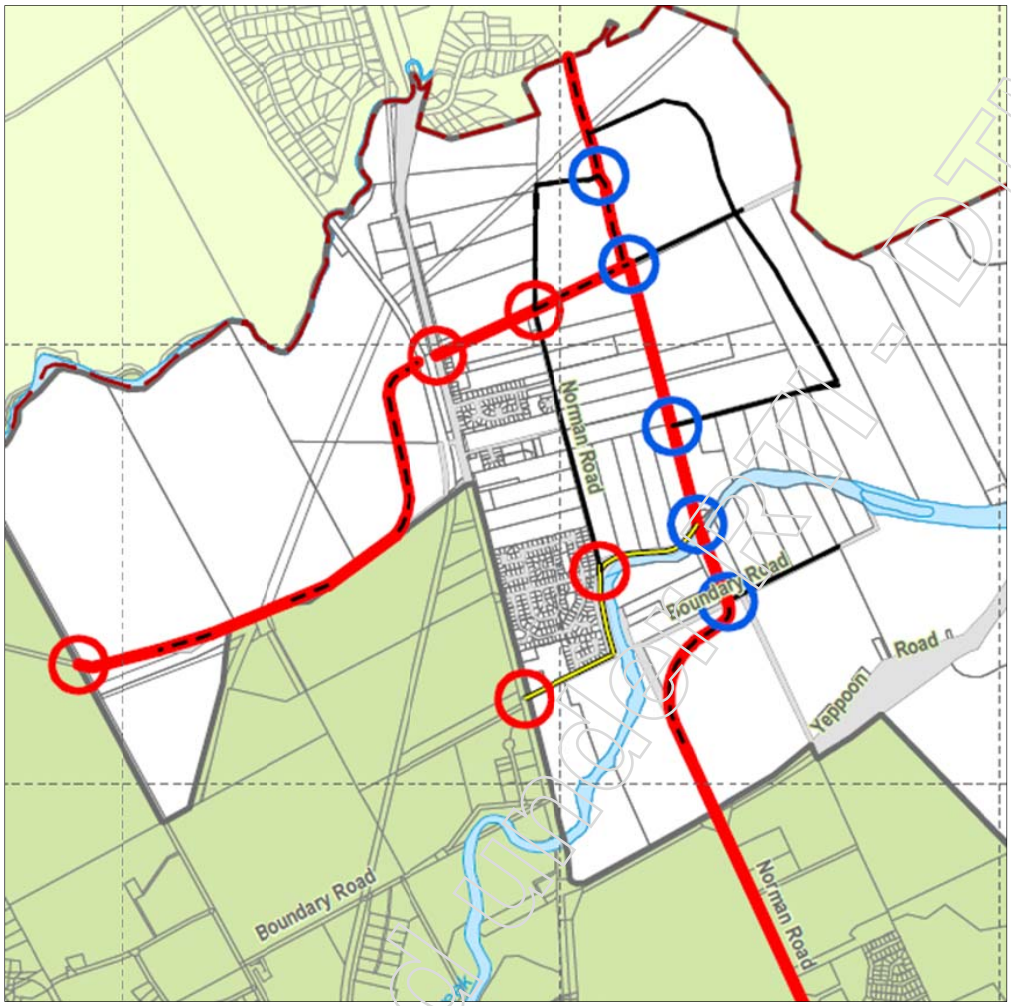

Figure 3.1b – Proposed Road Hierarchy -Parkhurst & Yeppoon Road Corridor Structure Plan (2007)

The figure above indicating the proposed road hierarchy identifies the proposed Urban Arterial Road utilising a section of the current alignment of William Palfrey Road before deviating to intersect the Bruce Highway at the current Olive Street intersection location.

The technical document that accompanied the planning study identified that an *"Urban Arterial Road needs to be established to service this area providing connection to Yaamba Road (Bruce Highway)"* and that "alternate access to/from this development is via McLaughlin St and Alexandra St". This suggests an expected provision of two (2) points of access to the development site at the ultimate build-out scenario. The report also identified a distribution split for traffic from west of the highway (i.e. the subject site) of 80% to/from the Bruce Highway and 20% to/from the Alexandra St corridor.

Rockhampton City Council subsequently resolved to adopt this structure plan for the Parkhurst and Yeppoon Road corridor at its meeting held on 3rd December 2008.

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3.2 Rockhampton Traffic Study 2008

The Rockhampton Traffic Study (RTS) (2008) was commissioned by Council to identify and evaluate a future Road Network Strategy for the Rockhampton area. Underpinning the study was the development of a strategic transport model which divided Rockhampton into several development zones, with forecast population and employment figures assigned to each zone for 2011, 2016 and 2021.

Initially a 2011 "do minimum" scenario was developed based on the existing road network and all the road projects that Council and Main Roads had identified to be complete prior to 2011.

Future year scenarios (2016 and 2021) were then carried out based on two scenarios of population growth; 1) the City Plan Scenario, which was based on PIFU High Series forecasts and has development in line with the land zoning of the previous Rockhampton City Plan , and 2) the Parkhurst Accelerated Growth (PAG) Scenario, which was based on growth in the Parkhurst area significantly greater than that identified in the City Plan.

The inclusion of the PAG scenario was requested during the study after Council became aware of the potential development of two large land parcels in Parkhurst. The scale of these developments was significant and an alternative land use scenario was prepared to establish the impacts of such accelerated development in the Parkhurst area on the surrounding road network. The two parcels identified were:

- A major parcel of land near the intersection of Belmont Road and William Palfrey Road – known as Edenbrook; and
- A major landholding in Parkhurst between Edenbrook and the North Coast Rail Line extending up to the previous City Boundary (Ramsay Creek) and straddling William Palfrey Road – which is the subject site for the proposed Stockland Master Planned Community.

Various road projects were then modelled to mitigate the impacts of this future development with the output from the study being a list of recommended road network projects required to accommodate the proposed development scenarios, including the expected timeframes for the works and approximate cost estimates.

Whilst we do not have access to the traffic model which underpins the study, the report included information on future population and lot yields for each development area, as well as providing forecast traffic volumes on the various links within the local road network.

Working backwards from these forecast volumes and lot yield assumptions the traffic distribution for the Stockland North Parkhurst site adopted in the RTS was estimated to be 70% to/from the Bruce Highway and 30% to/from the Alexandra Street corridor.

It is noted that this distribution differs from that previously identified in Council's *Parkhurst and Yeppoon Road Corridor Structure Plan 2007* (80% to/from Bruce Highway and 20% to/from Alexandra Street corridor). The RTS involved the development of a detailed traffic model in EMME/2 adopting a traditional 4-step methodology. This model assigns traffic to the road network based on sophisticated algorithms. As a consequence, the distributions identified in the RTS are expected to provide a more accurate representation of the future traffic conditions and will be adopted for the purpose of this report

The report also made several assumptions regarding the additional road network required to accommodate the PAG scenario. The additional network was identified based on previous planning applications and discussions with Council and included the provision of two (2) points of access for the proposed Stockland site, including:

- The realignment of William Palfrey Road and connection to the Bruce Highway at Olive Street; and
- A new road link connecting Alexandra Street to William Palfrey Road (realignment of McLaughlin Street).

The model also assumes that there is a major urban arterial road through the site providing connectivity between McLaughlin Street and the Bruce Highway. The traffic report identifies a number of road projects to ensure that the road network continues to operate within the desirable level of service under the PAG scenario. **Figure 3.2a** shows the key road projects within close proximity to the subject site.

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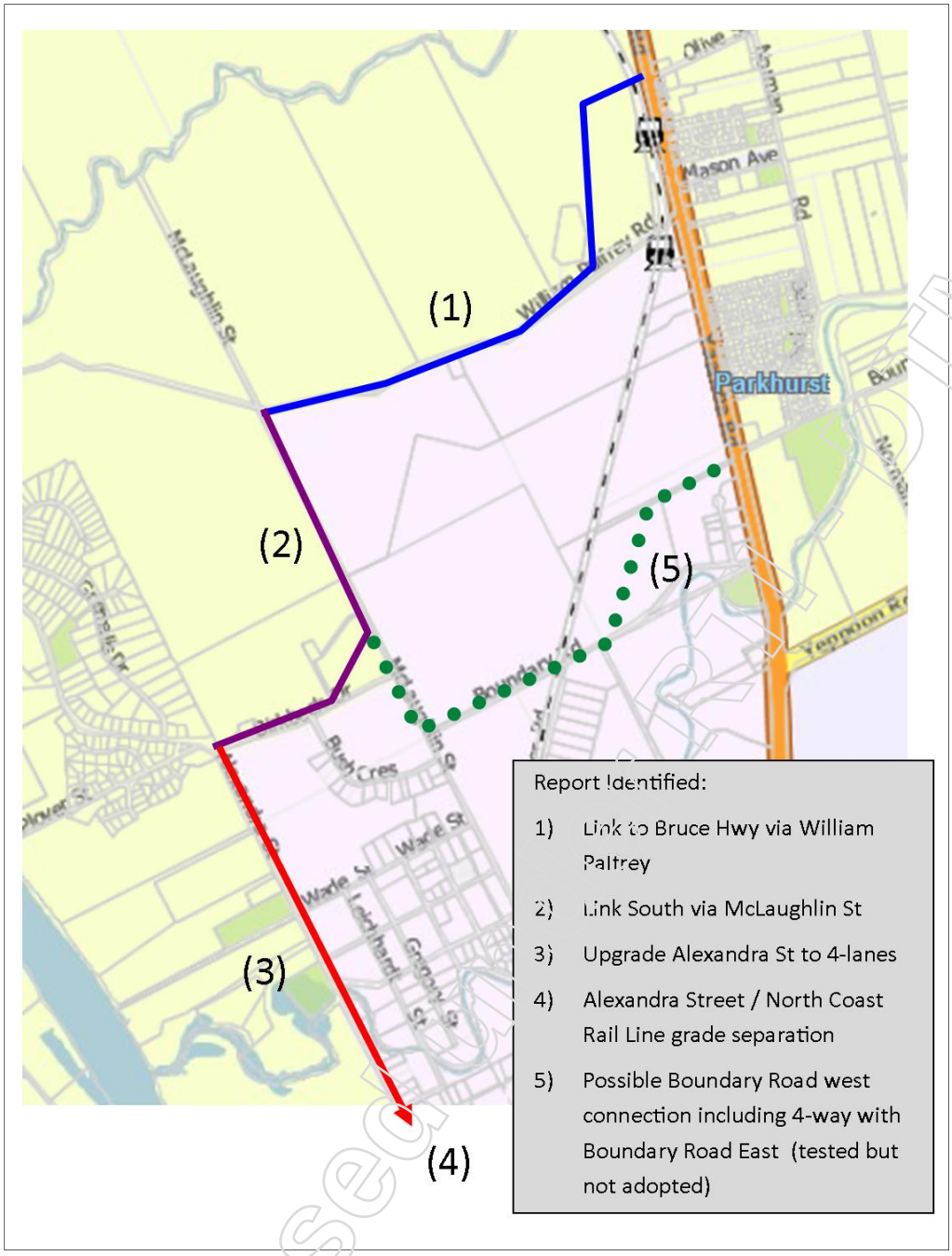

Figure 3.2a – Road Projects included in Transport Model

3.3 Planning Assumptions Report 2011

The Planning Assumptions Report (PAR) contains the planning assumptions and growth projections underpinning Council's Priority Infrastructure Plan (PIP) prepared by Rockhampton Regional Council and approved by the Minister for the Department of Local Government and Planning.

The PAR documented the methodology and the assumptions used to prepare the Planning Assumptions Model (PAM) including dwelling, population, floor space (GFA) and employment planning assumptions, as well as the timing of development and development sequence. This information was then used to establish the Priority Infrastructure Area (PIA) for each of the identified development areas within the Rockhampton Regional Council Local Government Area. This information was then used as the basis for the preparation of Council's *Adopted Infrastructure Charges Resolution 2011*.

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As part of this process the future development in the Parkhurst area was identified, with an extract from the PAR shown in **Figure 3.3a** below, with a full size copy included as **Appendix C**.

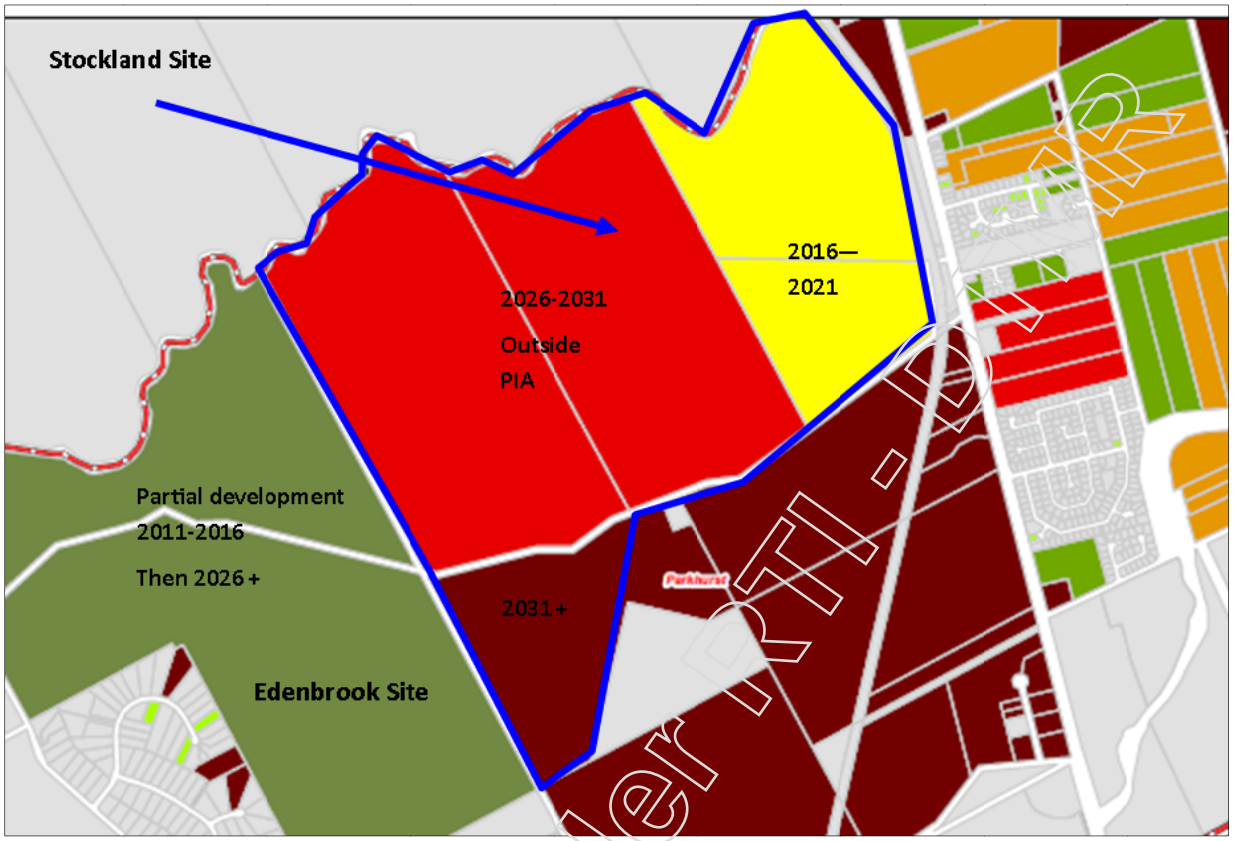

Figure 3.3a – Extract from Council's Planning Assumptions Report

As seen above, the eastern portion of the proposed development site has been identified for residential uses and is included in the PIP (<2026). Whilst the balance of the subject site is also identified for residential uses, it is not included in the current PIP due to the anticipated timing of development (>2026).

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3.4 Adopted Infrastructure Charges Resolution No. 2 (2012)

The purpose of Council's Infrastructure Charges Resolution is to identify truck infrastructure required to mitigate the impacts of planned development. The planned development includes all land uses which have been identified in the PIP and fall within the Priority Infrastructure Area (PIA).

In the Parkhurst growth area, all of Edenbrook and the eastern portion of the subject site are included in the PIA. It is also understood that Council's intent for this eastern portion of the site was for development to occur with sole access via an intersection off the Bruce Highway.

Figure 3.4a shows the trunk infrastructure identified by Council to support this development, with a full size copy included as **Appendix D**.

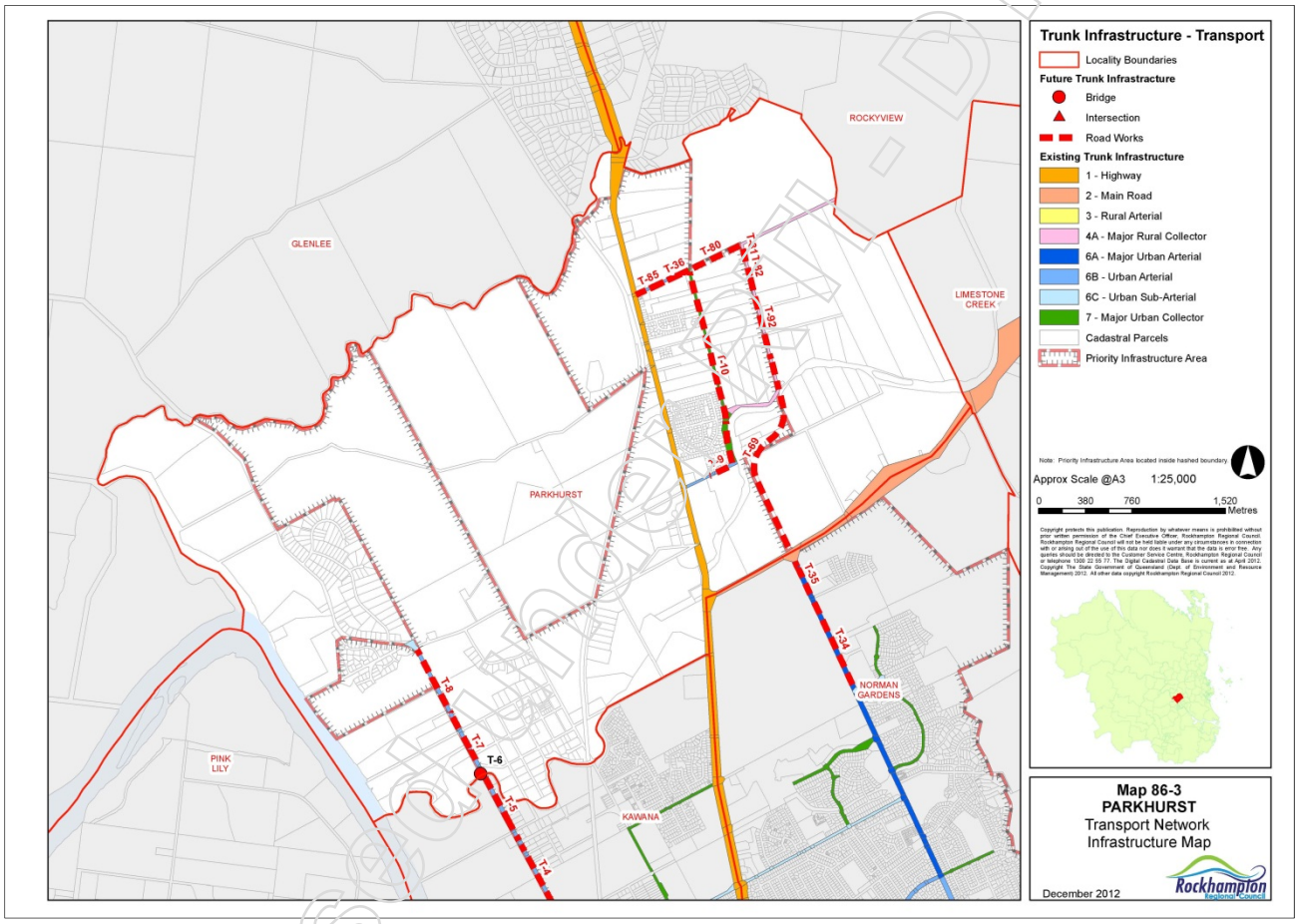

Figure 3.4a – Trunk Infrastructure

Council have committed to funding the above-mentioned works by collecting contributions from only those developments that are included within the PIP.

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3.5 Transport Main Roads Planning Intent "Bruce Highway"

It is our understanding that DTMR's ultimate planning intent for this road corridor is to upgrade the highway from a two-lane undivided road to a four-lane divided road as well as implement an access management strategy to minimise the number of intersections on the Highway and provide defined access and egress points for traffic associated with development on both sides of the Highway. From discussions with TMR they have identified 15,000 vehicles as representing their deficiency capacity and hence the notional trigger volume for four lanes.

This planning is in response to both the current and anticipated development in the Parkhurst area which includes not only the proposed North Parkhurst site, but land to the north and on the eastern side of the Bruce Hwy.

From a review of TMR's preliminary future road network planning layouts and spread sheet model, it is our understanding that the current planning intent for the Bruce Highway through Parkhurst includes:

Olive Street / North Parkhurst Access / Bruce Highway Intersection (Traffic Signals)

Main Roads has identified in its planning that the current intersection of Olive Street with the Bruce Highway as the access location for the North Parkhurst land parcel. This access has been shown as an upgrade of the current intersection to traffic signals with a fourth western leg constructed to provide access to the North Parkhurst site.

Boundary Road East (Traffic Signals)

It is our understanding that as part of a recently approved development application the existing intersection of Boundary Road East with the Bruce Highway was conditioned to be upgraded to traffic signals.

Closure of William Palfrey Road

With the addition of a connection to the land on the west of the highway via the proposed fourth leg at the Olive Street intersection it has been identified that the existing connection to the west (i.e. William Palfrey Road) will be closed under TMR's ultimate planning intent for the Bruce Highway corridor through Parkhurst.

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4.0 Proposed Masterplan

As detailed in Section 3 of this report, the proposed development site has been identified for several years as an area for future residential development growth, by both Council and Main Roads. Stockland plans to develop the subject site as a master planned residential community, generally consistent with the future planning intents of both Council and TMR.

The application seeks preliminary approval to ultimately create a 2,000+ lot residential and mixed use development aimed at providing a benchmark for master planned communities within Rockhampton. For the purpose of the traffic assessment we have assumed a maximum development yield equivalent to 2,350 detached residential dwellings. The plan of development for the proposed master planned community prepared by RPS can be seen in **Appendix E**.

4.1 Access Strategy

The development will be serviced by two (2) major access points:

- the principal access will be via the Bruce Highway at the existing Olive Street intersection; and
- the secondary access will be via the Alexandra Street / McLaughlin Street corridor.

Consistent with the transport planning intent of both Council and TMR, the masterplan makes allowance for a future Urban Arterial Road which would provide connectivity between the Bruce Highway and the existing/planned residential catchments to the west (e.g. Edenbrook). This Urban Arterial Road is proposed to connect to the Bruce Highway at Olive Street, creating a fourth western leg of a new signalised intersection which would also incorporate an at-grade crossing of the adjacent North Coast rail line.

The rail crossing would essentially be a relocation of the existing rail crossing on William Palfrey Road, which would ultimately be closed as part of the planned residential development. This would also include re-diverting the traffic that currently utilises the existing at grade crossing to the new crossing and providing an alternative connection for this traffic to William Palfrey Road.

This access strategy is consistent with both TMR's planning intent for the Bruce Highway corridor and the local government road network identified in Council planning studies. In addition it is understood that as part of the construction of the initial stage of the development access for the construction vehicles will be sought via William Palfrey Road, utilising both the current rail crossing and intersection with the Bruce Highway.

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4.2 Rail Crossing

The proposed development site is bounded by the North Coast Rail Line along its eastern edge. Queensland Rail identifies the North Coast Line as *"the principle freight and passenger line within the Queensland Rail network, running the length of coastal Queensland between Brisbane in the south and Cairns in the north".*

The relevant section of the North Coast Line runs parallel to the Bruce Highway throughout the Parkhurst corridor and is primarily used by containerised freight services, high speed tilt trains, single commodity trains and cattle trains. The line also travels throughout the city of Rockhampton and has several at grade crossings with various levels of treatment (lights, boom gates etc.) at the interface with both Council and state controlled roads, as shown in **Figure 4.2a** below.

NORTH COAST LINE

403	639.342	Stanley Street	Public Level	Signs	X S	Open	LGA
403	639.574	Derby Street	Public Level	Signs	X S	Open	LGA
403	639.805	William Street	Public Level	Signs	X S	Open	LGA
403	640.040	Denham Street	Public Level	Signs	X S	Open	LGA
403	640.270	Fitzroy Street	Public Level	Half Boomgates		Open	MRD
403	640.499	Archer Street	Public Level	Signs	X S	Open	LGA
403	640.730	Cambridge Street	Public Level	Signs	X S	Open	LGA
403	640.963	Albert Street (Bruce Highway)	Public Level	Half Boomgates		Open	MRD
403	641.205	North Street	Public Level	Signs	X S	Open	LGA
403	641.441	Bolsover Street	Public Level	Half Boomgates		Open	LGA
831	641.998	Glenmore Road	Public Level	Half Boomgates		Open	LGA
831	643.246	Main Street	Public Level	Half Boomgates		Open	LGA
831	643.588	Taylor Street Pedestrian Access	Pedestrian			Open	LGA
831	644.161	Richardson Road	Public Level	Half Boomgates		Open	LGA
831	645.060	Farm Street	Public Level	Half Boomgates		Open	LGA
831	647.960	Boundary Road	Public Level	Flashing Lights		Open	LGA
832	649.855	William Palfrey Road	Public Level	Flashing Lights		Open	LGA

Figure 4.2a: Existing Rail Crossings of North Coast Line in Rockhampton and Current Treatments

Discussions with officers from Queensland Rail has identified that the section of line in the vicinity of the proposed development carries in the order of two (2) trains (one in either direction) in both the AM and PM peak periods, that train speeds are approximately 60-80km/h and that the largest freight services are approximately 650m in length.

Due to the location of the proposed development in relation to the current alignment of the North Coast rail line, the site generated traffic is required to cross the rail line at some point when travelling south regardless of the proposed access location for the development, whether this be at:

- the existing at-grade crossing at William Palfrey Road; or
- the existing at-grade crossing at Boundary Road West;
- the existing at-grade crossing at Farm Street; or
- the proposed at-grade crossing on the new western leg of Olive Street.

Consideration was given to the provision of a grade separated crossing of the rail line as part of the proposed development, however due to a number of issues including the cost of this infrastructure, the requirement for an additional intersection on the Highway, construction and land ownership hurdles and the departure from both Council's and TMR's ultimate planning intent for the local road network this option was not deemed to be viable.

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As such the following access strategy is proposed:

i. A four-way signalised intersection on the Bruce Highway at Olive Street; and
ii. An at-grade crossing of the rail corridor on the proposed western fourth leg of this intersection.

The operation of the proposed four-way signalised intersection on the Bruce Highway is discussed in detail in section 5 of this report. The detail that follows addresses the proposed configuration and operation of the at-grade crossing. Specifically the co-ordination of the traffic signals with the rail signals.

It is also important to note that no additional rail crossings are proposed as part of the proposed access strategy. To clarify, the existing rail crossing on William Palfrey Road is proposed to be relocated to align with the proposed access to the planned residential development. This includes diverting the traffic that currently utilises the existing at grade crossing to the new crossing which then provides an alternative connection for this traffic to William Palfrey Road.

The provision of this alternate access via Olive Street (West) will also alleviate any future requirement for the adjacent intersection of William Palfrey Road with the Bruce Highway to be upgraded to accommodate the use of traffic travelling to/from the west. This is deemed to be desirable as constraints anticipated to be imposed by the adjacent properties (in particular the access/egress locations for the existing shop/service station opposite William Palfrey) are expected to impact on the ability for traffic signals to effectively be provided at this location. Furthermore it is noted that the provision of a signalised access at William Palfrey Road would not be in line with TMR's current planning intent for the Bruce Highway corridor.

The relocation of the existing at-grade crossing from William Palfrey Road is expected to improve the safety for traffic in the area to the benefit of the community, as the current crossing has minimal safety treatments, with only flashing signals provided (as seen in **Figure 4.2b** and **Figure 4.2c** below), whilst the relocated crossing is proposed to provide full active protection (e.g. flashing signals, boom gate barriers, advance warning signs, gated pedestrian enclosures etc.) as well as providing an opportunity for the use of new technology or approaches to the treatment of level crossings.



Figure 4.2b: Existing At-Grade Crossing at William Palfrey Road



Figure 4.2c: Existing At-Grade Crossing at William Palfrey Road

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In addition to the active protection at the relocated crossing, measures are proposed to manage the impact of vehicle queuing from the proposed traffic signals at Bruce Highway / Olive Street. They include:

- Implementation of a "Keep Clear" zone on the development road approach to the proposed Olive Street signalised intersection to minimise the occurrence of vehicles queuing on the crossing;
- The co-ordination of the rail crossing with the proposed traffic signals on the Bruce Highway, including:
  - A special "clearance phase", as shown in **Figure 4.2d** below, which is to be called at the proposed Olive Street signals when a train is on the approach to the crossing. This clearance phase will provide "green time" to the development road approach to the intersection to allow the vehicles queued between the rail corridor and the Highway to clear. This is expected to limit the potential for queuing across the rail corridor; and
  - As the train passes through the crossing, a second phase, as shown in **Figure 4.2e** below, is run which continues to hold traffic back from entering the development road and therefore the crossing (i.e. no left-turn or right turn movements from the Highway into the site will be allowed) and gives priority to the through movements on the Bruce Highway.

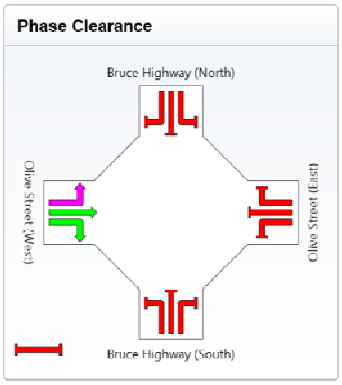

Figure 4.2d: Proposed Clearance Phase at Access Intersection

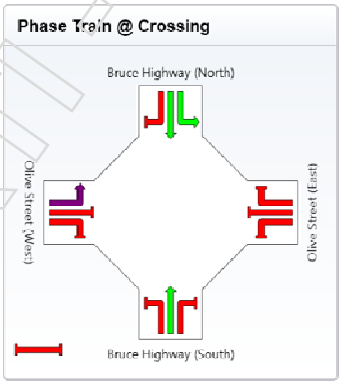

Figure 4.2e: Proposed Train Phase at Access Intersection

This proposed co-ordination of the crossing control measures and the traffic signals at Olive Street with train movements is expected to ensure that appropriate stop measures, including boom gates and red lights for certain traffic movements, are triggered to stop conflicts between trains and vehicular traffic.

In addition, the design of the signalised intersection at Olive Street is proposed to include adequate storage length in the proposed auxiliary turn lanes on the Bruce Highway approaches to accommodate the queuing that will occur if a train arrives coincident with the AM or PM road peak. This is expected to ensure that vehicle queues formed in these auxiliary lanes during a train crossing of the development access road will not impede the through vehicle movements and therefor the operational efficiency of the Bruce Highway. Refer to section 5 of this report for further detail on the geometry of the Bruce Highway / Olive Street traffic signals.

The analysis in Section 5 of this report shows that the proposed signalised intersection at Olive Street operates below capacity. As a consequence during each cycle, the traffic signals will accommodate all vehicles that are expected to arrive during the cycle. Because the signals operate with spare capacity, the traffic signals have the capacity to accommodate additional vehicle demand.

When a train crosses Olive Street, a train phase is called (refer Figure 4.2e above).

This phase prevents traffic crossing the rail corridor (i.e. entering or leaving the proposed development). The result being that queue of vehicles will develop. After the train has passed the traffic signals will revert back to the standard phasing. The spare capacity within the traffic signals is then used to dissipate the queue that has been generated as a result of the train.

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For example, during the 2025 AM peak hour with full build out we expect in the order of 1000 vehicles will depart the site via the Bruce Hwy. The traffic signals are proposed to run on a 140 second cycle time. Therefore each cycle we would expect in the order of 39-40 vehicles would depart the site to the Bruce Hwy. The traffic signals have capacity to accommodate 46 vehicles per cycle, and as a consequence the traffic signals have the capacity to accommodate an additional 7 vehicles per cycle.

We expect motorists leaving the site will be delayed for approximately 85 seconds due to the train. This assumes a 700m long train travelling at 60km/hr with 20 seconds grace period before and after. During this time 23 vehicles will be stopped.

Once the traffic signals revert back to the standard phasing, this additional demand (23 vehicles) will require just over 3 cycles (spare capacity = 7 veh / cycle) to dissipate. This is just under 8 minutes.

Therefore, should a train arrive during the AM peak hour, we expect the queue to dissipate (i.e. normal traffic conditions) within 10 minutes.

The detailed working for a train arriving during the AM peak hour period are shown in **Figures 4.2f-l** over page.

In summary, the combination of the proposed active protection measures at the relocated crossing, and the co-ordination of the rail crossing signals with the adjacent signalised access intersection on the Bruce Highway to both restrict vehicular traffic from conflicting with train movements and manage vehicle queues is expected to provide a functional rail crossing which allows access to the proposed development consistent with the planning intent of both Council and TMR.

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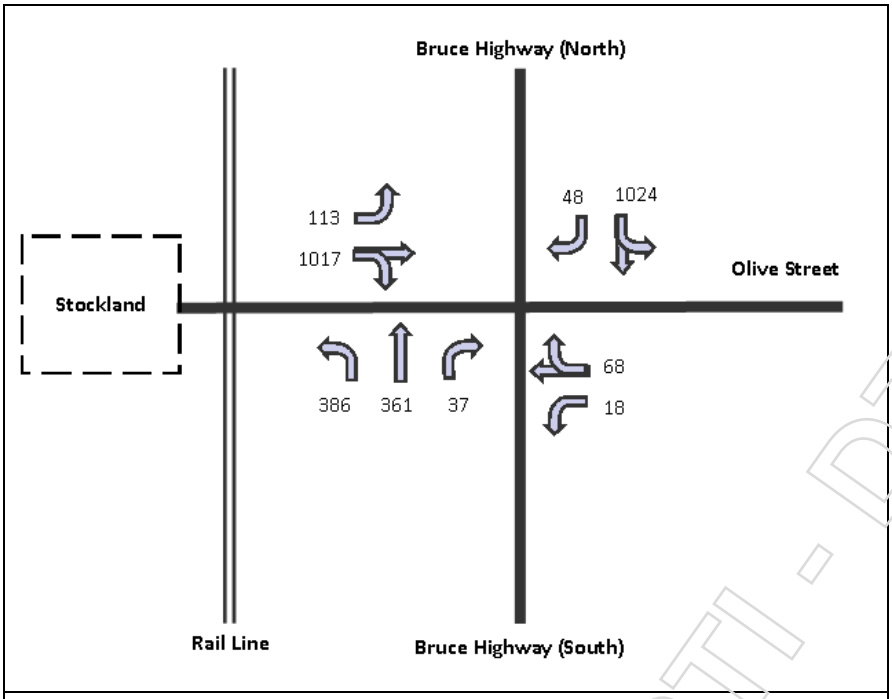

Figure 4.2f 2025 AM Peak Hour (Vehicles per Hour)

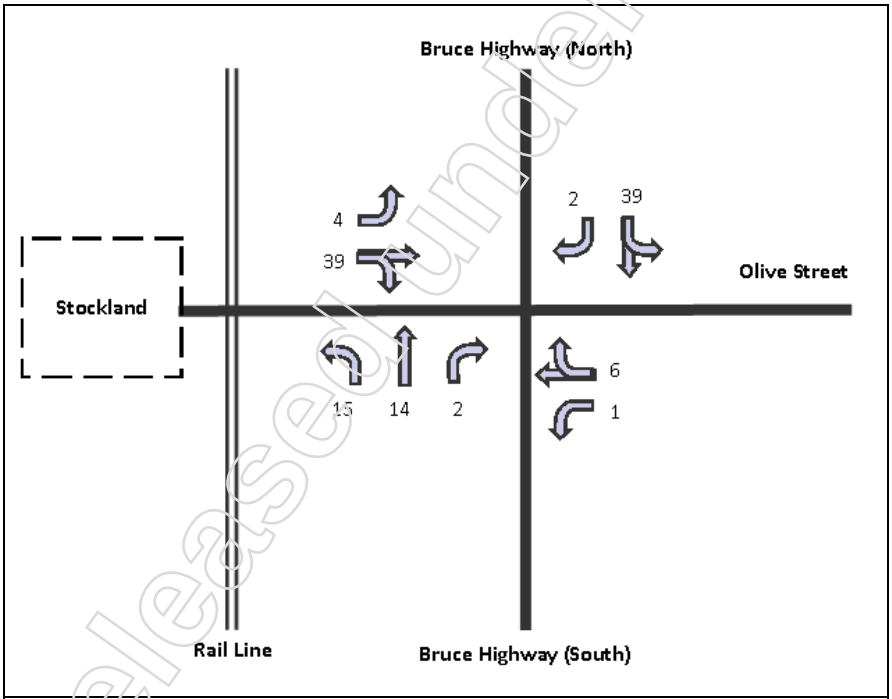

Figure 4.2g Figure 2025 AM Peak Hour (Vehicles per Cycle – 140sec cycle)

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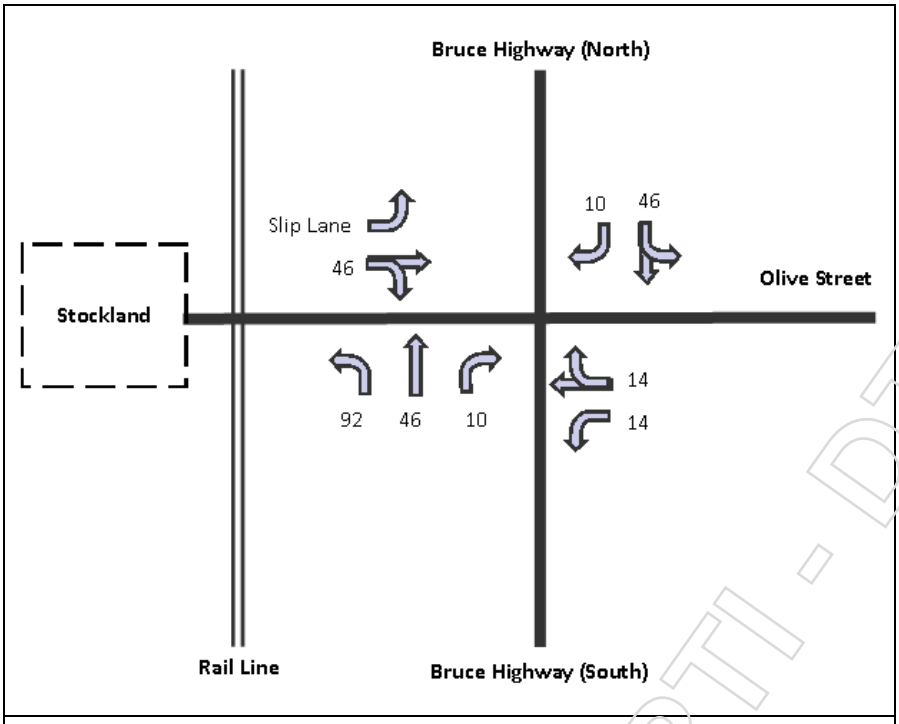

Figure 4.2h Green Time Per Cycle (seconds)

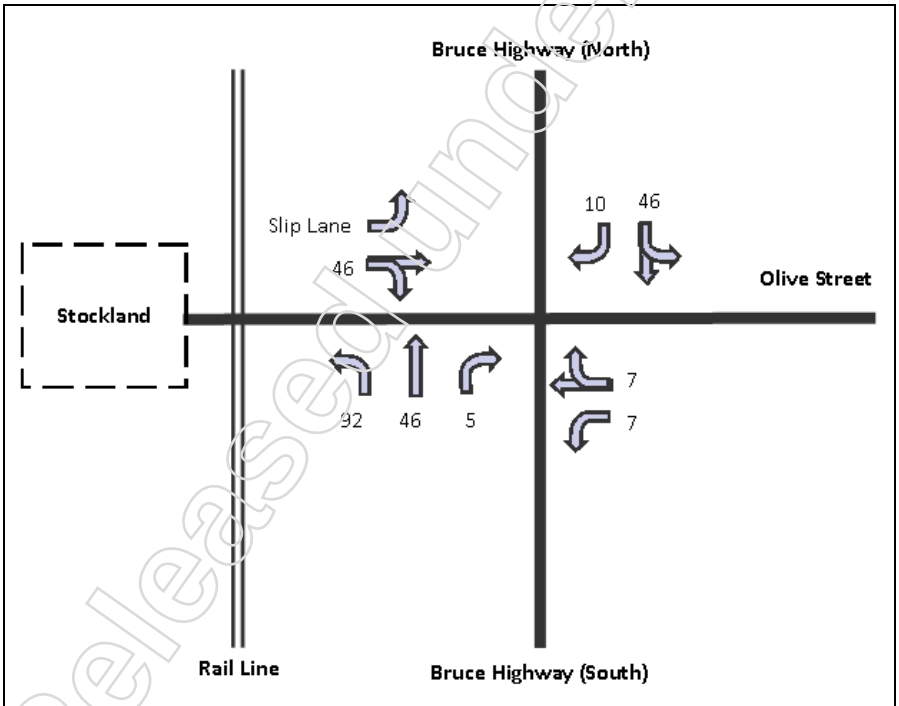

Figure 4.2i Capacity Per Cycle (Vehicle)

Note: assumes 2 seconds per vehicle/lane

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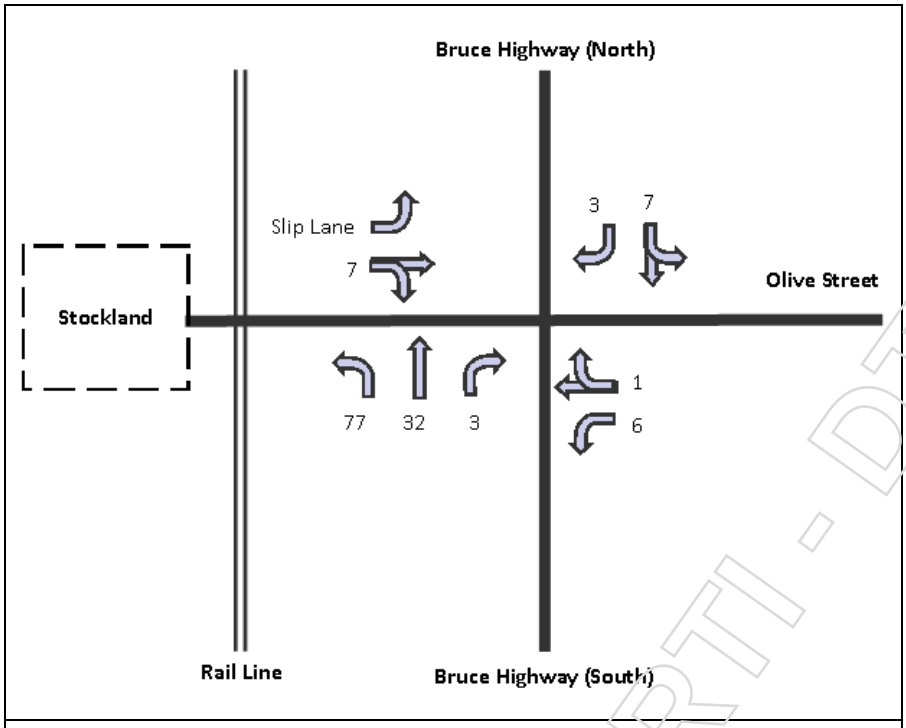

Figure 4.2j Spare Capacity Per Cycle (Vehicles)

(Figure 4.2i—Figure 4.2g)

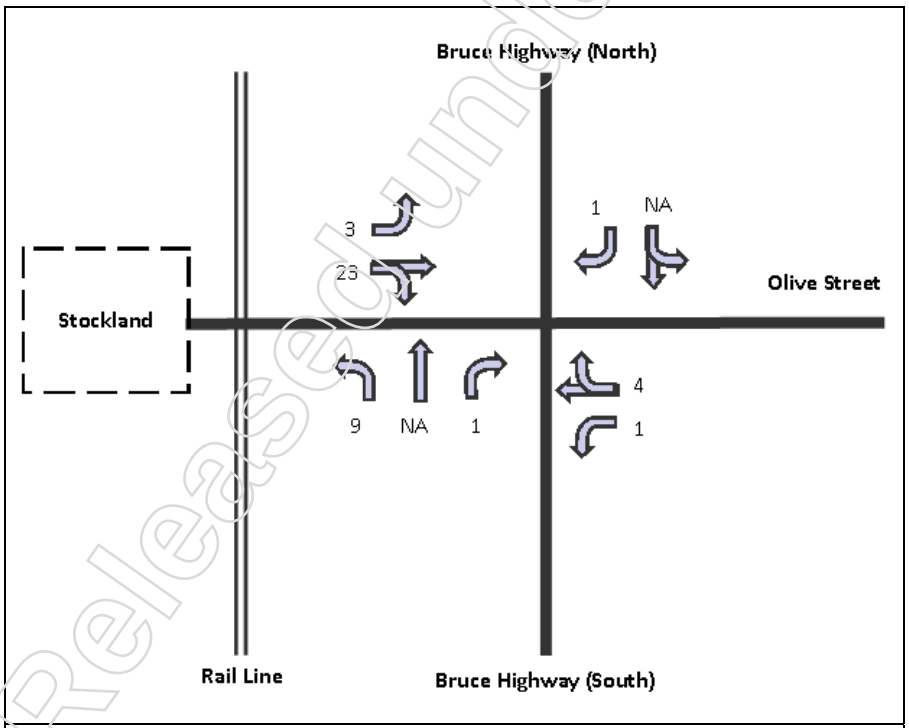

Figure 4.2k Additional Demand During Train Phase

(This assumes the train will delay motorists by 85 seconds)

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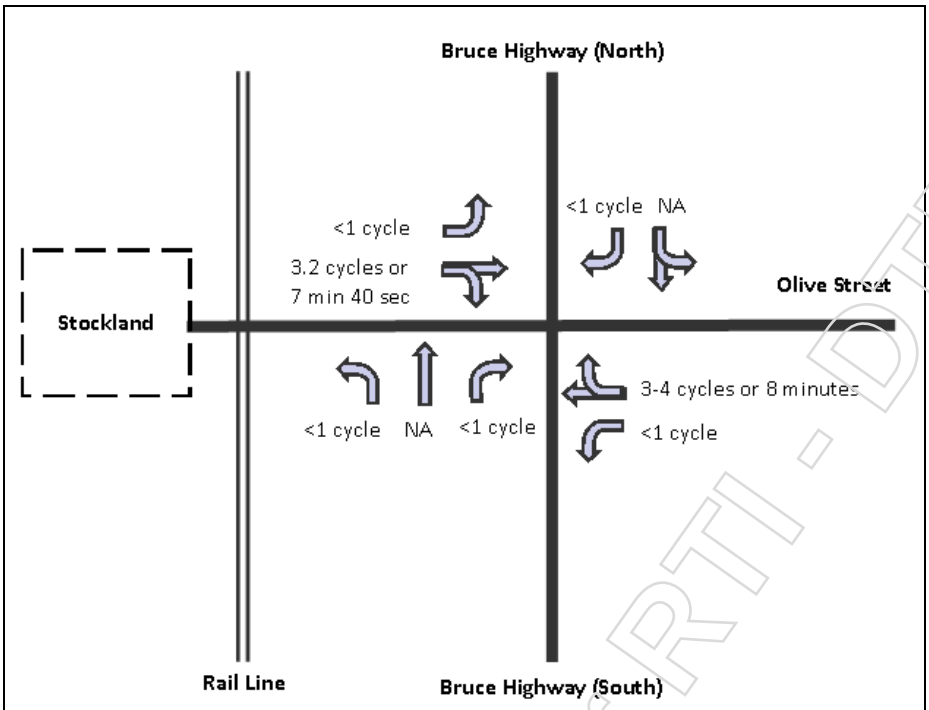

Figure 4.2l Time to dissipate the additional queue following train (i.e. normal traffic conditions)

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4.3 Internal Road Hierarchy

The internal road network has been developed generally in accordance with Rockhampton City Council's Planning Policy No. 13 *Road Hierarchy* and seeks to achieve a safe, efficient and convenient road system. A copy of the proposed road hierarchy plan has been included as **Appendix F**.

A copy of the proposed cross sections is included in **Appendix G.** These cross sections are generally consistent with the dimensional requirements specified in the Capricorn Municipal Development Guidelines (CMDG), however we note that some minor amendments are proposed to address site specific aspects (e.g. roads adjacent to the esplanade and roads split by drainage corridors).

The sections that follow provide detail on the proposed road hierarchy and cross-sections and further justification for any proposed departure from Council's guidelines or policies.

4.3.1 Urban Arterial

Consistent with the transport planning intent of both Council and TMR, the overall masterplan for the site makes allowance for a future Arterial Road through the site to provide connectivity between the Bruce Highway and the existing/planned residential catchments to the west (e.g. Edenbrook).

As shown in the proposed Road Hierarchy plan for the development (refer to **Appendix F**) the eastern section of this connection, between the internal signalised intersection and the access intersection with the Highway at Olive Street, has been identified as an Urban Arterial Road.

It is noted that there isn't a standard cross section for an Urban Arterial within the CMDG, and that Council requires the applicant to provide a cross-section. The proposed cross section for the Urban Arterial in **Appendix G** recommends a four-lane configuration within a 32.5m road reserve, including the provision of 2m on-road bicycle lanes, a 5m centre median and footpaths in both verges. The provision of such a cross section for the Urban Arterial Road is considered to be appropriate to cater for the expected traffic volumes for this section of the internal road network.

Furthermore this section of Urban Arterial Road forms part of the identified connection between the Alexandra Street and Bruce Highway corridors and is intended to service a catchment which extends well beyond the subject site, and as such is trunk infrastructure.

4.3.2 Urban Sub Arterial

The proposed Road Hierarchy plan also identifies the section of road from the southern connection of the internal traffic signals to the intersection with McLaughlin Street, including a portion of the current alignment of William Palfrey Road, as an Urban Sub Arterial.

The proposed cross section for Urban Sub Arterial roads (as shown in **Appendix G**) recommends a two-lane configuration within a 25.5m road reserve, including the provision 5.5m carriageways, 2m shoulders/on-road bicycle lanes, a 5m centre median and 4.75m verges including footpaths. It is noted that whilst the proposed 25.5m road reserve is narrower than the width specified in the CMDG (30m), the remainder of the individual elements of the cross section (carriageway, verge and median widths) meet or exceed the minimum requirements of the CMDG. As a consequence it is considered that the provision of such a cross section for the Urban Sub Arterial Roads appropriate to cater for the expected traffic volumes for this section of the internal road network.

In addition, this section of Urban Sub Arterial Road also forms part of the identified connection between the Alexandra Street and Bruce Highway corridors and is intended to service a catchment which extends well beyond the subject site, and as such is trunk infrastructure.

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4.3.3 Major Urban Collector

As shown on the Road Hierarchy Plan (refer to **Appendix F**) it is proposed that two different types of Major Urban Collector Roads are included within the internal road network for the proposed master planned community.

The first (Major Urban Collector Type 1) is a no-access roadway and is proposed to be located at the start and end of the main, northern east-west roadway within the site. The proposed cross section (as shown in **Appendix G**) identifies a two-lane configuration within a 20.5m road reserve, with provision of a 10m carriageway, including 3.5m traffic lanes and 1.5m shoulders/on-road bicycle lane and 5.25m verges with pathways on both sides of the reserve.

It is noted that all of the individual elements of the proposed cross section meet or exceed the minimum requirements specified for a Major Urban Collector in the CMDG. As such it is therefore considered that the proposed cross section for the non-access Major Urban Collector (Type 1) is acceptable from a traffic perspective.

The second Major Urban Collector identified in the Road Hierarchy Plan incorporates a carriageway split by the main drainage channel which runs through the northern section the site. This portion of the road network is expected to operate as two separate one-way roadways separated by a large centre median (the drainage channel). Several connections be between the two directions of travel are also proposed, mainly adjacent to the intersections with the main north-south minor collector roads.

The proposed cross section for the Major Urban Collector Type 2 (as shown in **Appendix G**) identifies a two-lane configuration within a varying road reserve, with provision of a 5m pavement, incorporating 3.5m traffic lanes and 1.5m shoulders/on-road bicycle lane with an additional 5.25m verge with pathways on both sides of the central drainage corridor. The cross section also identifies the possibility for an optional parking bay to be included on the inside of the roadway, adjacent to the drainage channel. It is again noted that all of the individual elements of the proposed cross section meet or exceed the minimum requirements specified for a Major Urban Collector in the CMDG.

Furthermore, by splitting the carriageway into two separate directions of travel it is anticipated that the traffic volumes for each carriageway will be below the 3,000 vehicles per day threshold for restricted lot access. To this end we believe it is appropriate for the section of road within this master planned community identified as Major Urban Collector (Type 2) to have direct property access.

4.3.4 Minor Urban Collector

Similarly to Major Urban Collectors, the proposed Road Hierarchy plan also identifies two types of Minor Urban Collector Roads within the internal road network of the proposed master planned community.

The first (Minor Urban Collector Type 1) is the main minor collector street utilised in the road network, with the proposed cross section (as shown in **Appendix G**) identifying a two-lane configuration within a 18m road reserve, with provision of a 7.5m carriageway and 5.25m verges with a pathways on one side of the reserve.

It is noted that all of the individual elements of the proposed cross section meet or exceed the minimum requirements specified for a Minor Urban Collector in the CMDG, and as such it is therefore considered acceptable from a traffic perspective.

The proposed Road Hierarchy plan identifies that the Minor Urban Collector (Type 2) is proposed to be utilised for the section of road between the Mixed Use parcel and parkland to the south of the Urban Arterial access road to the development. The proposed cross section for the Type 2 Minor Urban Collector includes the provision of a 7.5m pavement in line with a standard Minor Collector (and CMDG specifications) but also proposes 2.5m parking lanes along both sides of the carriageway. It is also proposed that the standard 18m road reserve width is retained, and that smaller verge widths be provided outside the parking lanes, as additional verge width can be accommodated within the adjacent parkland and within the assumed building setback of the mixed use parcel. This is considered acceptable and therefore the proposed cross section for the Minor Urban Collector (Type 2) is deemed appropriate from a traffic perspective.

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4.3.5 Access Street

The proposed cross section for the Access Streets within the network (as shown in **Appendix G**) includes a two-lane configuration within a 15m road reserve, with provision of a 7m carriageway and 4m verges. It is noted that whilst the proposed 15m road reserve and 7.0m carriageway are slightly less than the minimum widths specified in the CMDG (16m and 7.5m respectively) they are generally in accordance with the design standards of several other local governments.

Furthermore, the provision of a 7.0m carriageway is in excess of the 5.5m width identified in RRC's City Plan and considered more sufficient to cater for the movement of vehicles in both directions past a parked car. It is therefore considered that the proposed cross section for the Access Streets is acceptable from a traffic perspective.

4.3.6 Access Place

The proposed cross section for the Access Place within the network (as shown in **Appendix G**) includes a two-lane configuration within a 14m road reserve, with provision of a 5.5m carriageway and 4.25m verges. It is noted that whilst the proposed 14m road reserve is slightly less than the minimum width specified in the CMDG (16m) all of the individual elements of the cross section (carriageway and verge widths) meet or exceed the minimum requirements of the CMDG. As such it is therefore considered that the proposed cross section for the Access Streets is acceptable from a traffic perspective.

4.3.7 Esplanade Road

The proposed Road Hierarchy Plan (refer to **Appendix F**) identifies an Esplanade Road along the northern edge of the site, adjacent to the Ramsay Creek corridor. The proposed cross section for the Esplanade Road is identified in **Appendix G** and includes a two-lane configuration, with road element widths generally consistent with an Access Street, which would be the applicable cross section for the expected traffic volumes on these sections of the internal network.

The only variation from the proposed cross section of an Access Street is the provision of a smaller verge on the side of the road reserve abutting the proposed parkland adjacent to Ramsay Creek. This reduced verge width is considered acceptable as the width provided (2m) is considered sufficient to cater for the provision of services and the remainder of the verge width could easily be accommodated within the adjacent parkland. Therefore it is considered that the proposed cross section for the Esplanade Road is acceptable from a traffic perspective.

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4.3.8 Proposed Bus Route and Bus Stop Facilities

The proposed road hierarchy also incorporates bus routes within the site to provide access for residents to public passenger transport. As shown in **Figure 4.3.2a** below it is proposed that the bus route through the site will includes the use of the identified Urban Arterial, Urban Sub Arterial and both Major and Minor Urban Collector roads.

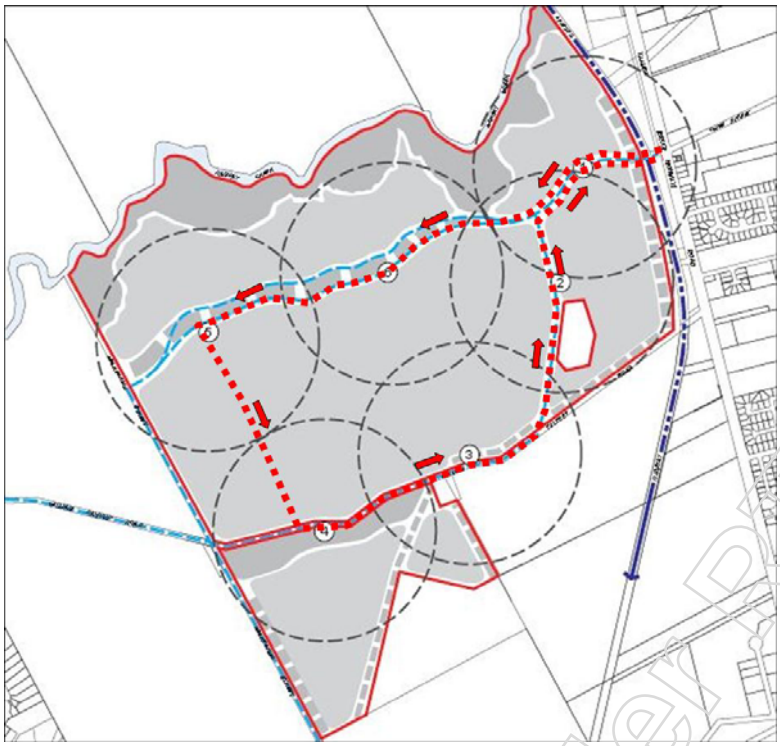

Figure 4.3.2a – Proposed Internal Bus Route

The second plan includedin **Appendix F** shows the above mentioned bus route superimposed over the road hierarchy plan.

Figure 4.3.2a above also identifies indicative bus stop locations throughout the site, whilst the exact locations of the bus stops are to be confirmed, and will be established during the detailed design phase of the project, it can readily be seen that the proposed development will meet the requirement to provide 90% of residents with easy access to public transport facilities (i.e. < 400m walk). Furthermore, it is proposed that bus stops facilities in line with Translink's Regular Stop standards (as shown in **Figure 4.3.2b** below), will be provided at the appropriate locations within the development.

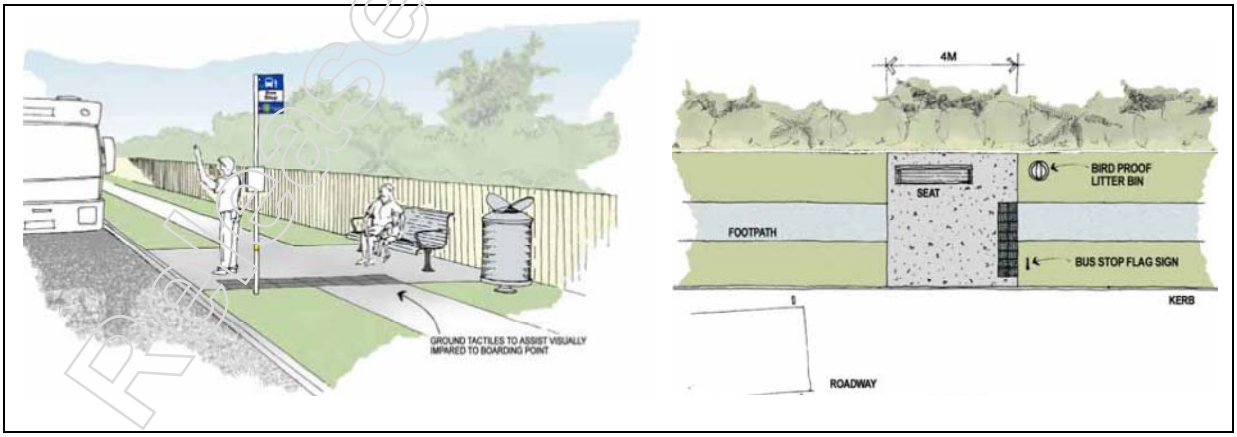

Figure 4.3.2b – Translink Regular Stop

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4.3.9 Compliance with Reconfiguring a Lot Code

The proposed road hierarchy and cross sections will comply with following acceptable solutions of Council's *Reconfiguring A Lot Code*:

- ✓ The driving distance from any allotment to a major street is no more than 700 metres (**A31.1**)
- ✓ No more than three (3) turning movements at intersections or junctions are required in order to travel from any home to the most convenient major street. (**A31.2**)
- ✓ All clusters of more than 100 allotments are provided with at least two (2) alternative accesses to a major road. (**A31.3**)
- ✓ At least 90% of all allotments are located within 400m radial distance from an existing, approved or proposed (as a part of the subdivision) major urban collector road. (**A 32**)

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4.4 Development Staging & Trigger Volumes

As previously mentioned the applicant intends staging the development from east to west, with the internal road network of the development being delivered as required in line with this approach. Access to the development under the early stages will be via the Bruce Highway only and it will not be until the later stages of the development that the western part of the site will be developed and connection provided to McLaughlin Street. As such the transport infrastructure within the site is proposed to be delivered based on trigger volumes of internal traffic.

As part of the first stage of the development traffic signals are required at the Bruce Highway / Olive Street intersection. The geometry of this intersection is shown diagrammatically in **Figure 4.4a**.

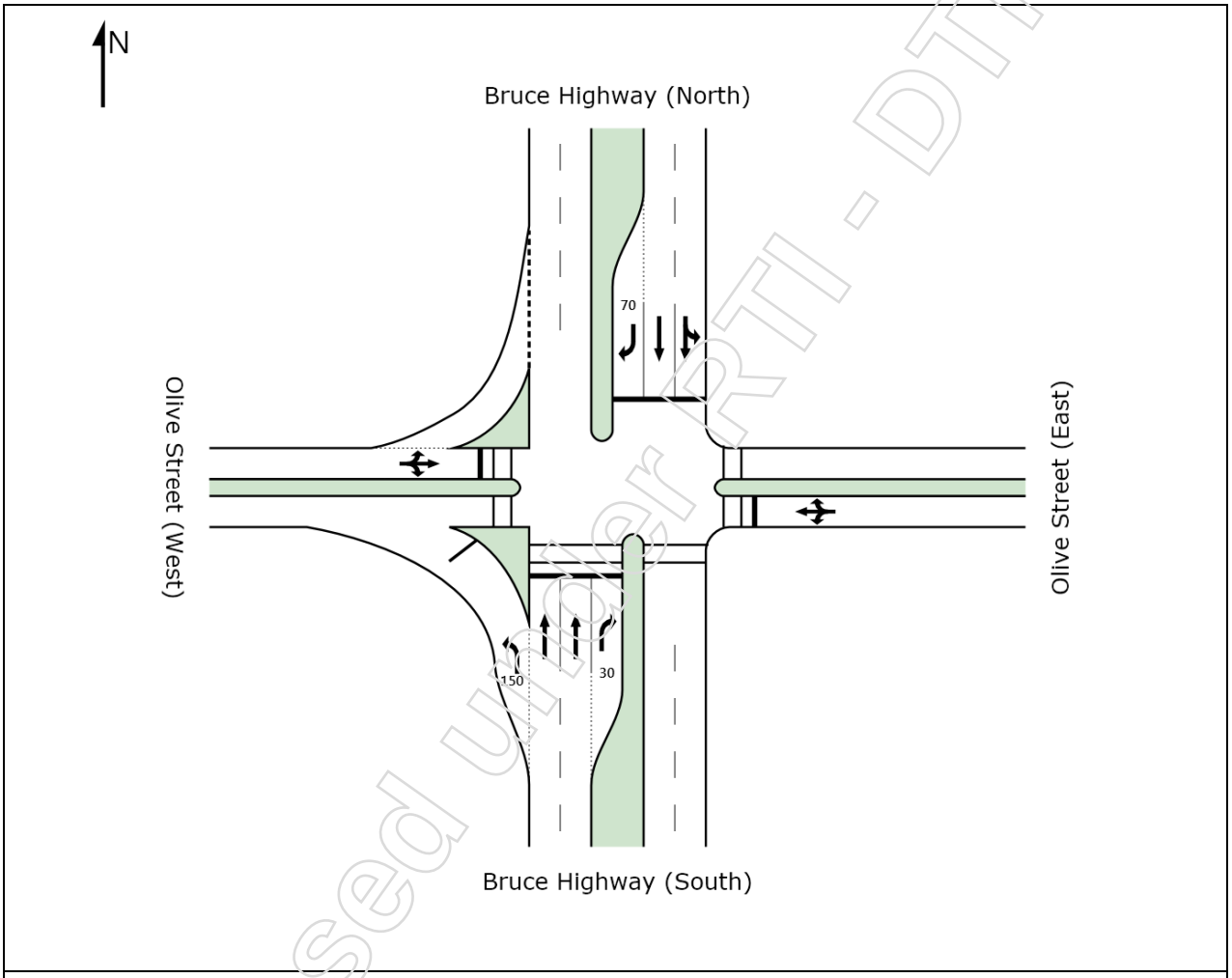

Figure 4.4a: Proposed Interim Four-Way Signalised Intersection Configuration - Bruce Highway / Olive Street Intersection
****NOTE : Values shown on auxiliary lanes indicate storage length only.**

The intersection geometry is expected to operate within the acceptable limit of operation (i.e. 90% degree of saturation) until such time as site generated traffic exceeds 11,475 vehicles per day, or approximately 1,275 detached residential dwellings. It is at this point that the intersection may need to be upgraded to the ultimate configuration **(Trigger 1).**

Initially the urban arterial road will be constructed as a two lane road providing connectivity to the Bruce Highway only. The extent of construction will be limited to that necessary to provide access to the applicable stage of the development.

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Under the ultimate planning intent the north-eastern section of the Urban Arterial Road will have a four lane cross section. However, this will not be required until such time as traffic volumes exceeds 13,000 vehicles per day which approximates 1,450 detached dwellings **(Trigger 2).**

The ultimate geometry for the Bruce Hwy / Olive Street traffic signals has been designed to operate within the acceptable limit of operation (i.e. 90% DOS) for site generate traffic up to approximately 17,100 vehicles per day. This is equivalent to 1,900 lots. Once this trigger has been reached a second point of access to the site is required to accommodate the balance of the development. The second access will be achieved by extending the urban arterial road through to McLaughlin Street **(Trigger 3).**

4.4.1 Trigger 1 – 1,275 dwellings

Traffic signals are proposed at the intersection of the Bruce Highway and Olive Street. The interim geometry shown in **Figure 4.4a** above is expected to reach the acceptable limit of operation (i.e. 90% DOS) when site generated traffic reaches 11,475 vehicles per day, which equates to approximately 1,275 dwellings.

This will be trigger for the construction of the ultimate intersection which is shown diagrammatically in **Figure 4.4.1a** below. For further information regarding the traffic analysis completed to determine this trigger volume please refer to **Section 5.4.1.2** of this report.

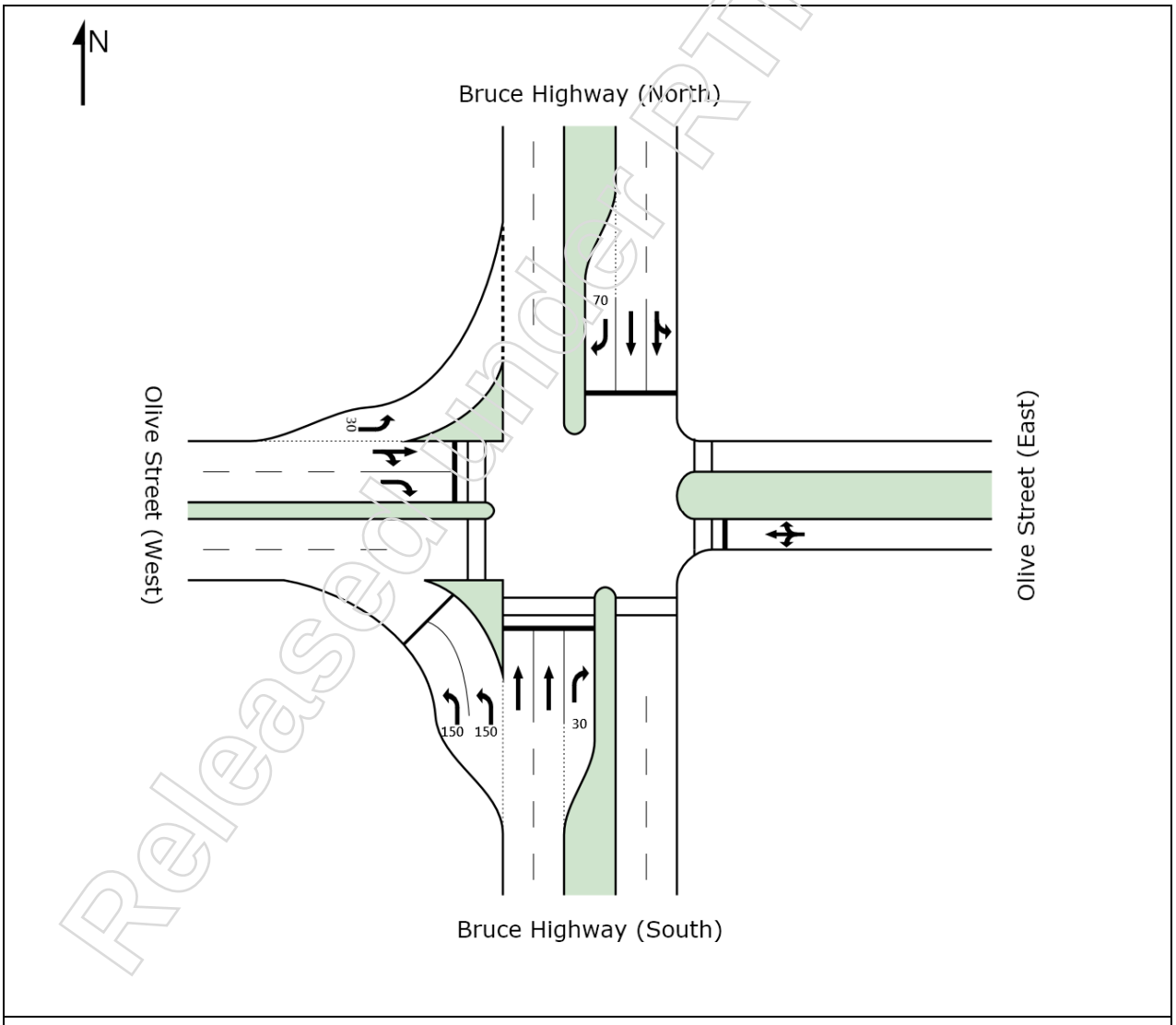

Figure 4.4.1a: Proposed Ultimate Four-Way Signalised Intersection Configuration - Bruce Highway / Olive Street Intersection
****NOTE : Values shown on auxiliary lanes indicate storage length only.**

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4.4.2 Trigger 2 – 1,450 dwellings

Under the ultimate planning intent the north-eastern section of the Urban Arterial Road will have a four lane cross section. However, this will not be required until such time as traffic volumes exceed 13,000 vehicles per day or approximately 1,450 detached dwellings.

The trigger volume of 13,000 vehicles per day was identified as the desirable level of service for a two lane urban arterial roads in the *Rockhampton Traffic Study 2008* report.

4.4.3 Trigger 3 – 1,900 dwellings

The ultimate geometry for the Bruce Hwy / Olive Street traffic signals is expected to operate within the acceptable limit of operation (i.e. 90% DOS) for site generate traffic of approximately 17,100 vehicles per day. This analysis is included in Section 5 of this report. This approximates 1,900 detached dwellings, at which time the urban arterial road through to McLaughlin Street will be constructed.

4.4.4 Delivery of other Parts of the Transport Infrastructure

With the exception of the urban arterial road, there are no trigger volumes which will mandate the delivery of the internal road network. The internal roads will be delivered as necessary to provide access to the relevant stage of the development.

Whilst the current infrastructure charges policy does not recognise the urban arterial or McLaughlin Street as trunk infrastructure they are intended to service a catchment which extends well beyond the subject site. As a consequence, we believe it should be classified as trunk infrastructure and any physical works carried out by the Applicant on these parts of the road network should be creditable against the infrastructure charges paid.

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5.0 Traffic Impact Assessment

5.1 Development Traffic Generation and Distribution

To ensure that the proposed development is in accordance with the overall development yield identified in the PAG development scenario in the *Rockhampton Traffic Study (2008)*, this application seeks preliminary approval for up to 2,350 lots.

The development is also proposed to include approximately 4,500m^2 GFA of non-residential uses including up to 3,500m^2 GFA of retail tenancies. However for the purposes of assessment it has been assumed that the catchments for the non-residential uses will be wholly contained internally within the development, which is considered acceptable for a residential development of this size. As such the traffic generated by the proposed non-residential uses have not been considered when investigating the impact of the proposed development on the external road network.

Using the standard traffic generation rates for residential lots identified in the RTA's *Guide to Traffic Generating Developments* and the proposed development yield, an estimate of the traffic volumes forecast to be generated by the development was established, as summarised in **Table 5.1a** below.

Table 5.1a: Proposed Master Planned Community Ultimate Development Traffic Generation

Use	Yield	Daily Traffic Generation Rate	Daily Traffic Generation	Peak Hour Traffic Generation Rate	Peak Hour Traffic Generation
Standard Residential Lots	2,350 lots	9 trips / lot	21,150 trips	0.85 trips / lot	1,998 trips
		TOTAL	**21,150 trips**	**TOTAL**	**1,998 trips**

The proposed plan of development identifies a connection between McLaughlin Street and the Bruce Highway, via the internal Urban Arterial Road. As such the development is proposed to have two connection points to the external road network, and subsequently it has been assumed that 70% of traffic generated by the development will access the Bruce Highway, whilst the remaining 30% will travel via McLaughlin Street.

These traffic distribution assumptions are believed to be generally consistent with those adopted in the traffic model which underpinned the 2008 *Rockhampton Traffic Study.* A full summary of the traffic distribution assumptions adopted for the analysis of the proposed development can be seen in **Table 5.1b** over page.

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Table 5.1b: Estimated Development Traffic Distribution

Assumed Traffic Distributions	
AM Peak	**PM Peak**
Stockland North Parkhurst Development	
Arrival / Departure Split ▪ 30% Incoming to Development; ▪ 70% Outgoing from Development. ***External Network Distribution*** ▪ 70% to/from the Bruce Highway; of which • 10% to/from Bruce Highway (North); and • 90% to/from Bruce Highway (South). ▪ 30% to/from the McLaughlin Street.	***Arrival / Departure Split*** ▪ 60% Incoming to Development; ▪ 40% Outgoing from Development. ***External Network Distribution*** ▪ 70% to/from the Bruce Highway; of which • 10% to/from Bruce Highway (North); and • 90% to/from Bruce Highway (South). ▪ 30% to/from the McLaughlin Street.
255 Lots from Adjacent Edenbrook Development (Approved)	
Arrival / Departure Split ▪ 30% Incoming to Development; ▪ 70% Outgoing from Development. ***External Network Distribution*** ▪ 100% to/from the Bruce Highway; of which • 10% to/from Bruce Highway (North); and • 90% to/from Bruce Highway (South).	***Arrival / Departure Split*** ▪ 60% Incoming to Development; ▪ 40% Outgoing from Development. ***External Network Distribution*** ▪ 100% to/from the Bruce Highway; of which • 10% to/from Bruce Highway (North); and • 90% to/from Bruce Highway (South).

It is also important to note that the proposed east-west arterial road will also provide connectivity to other residential land uses along the Alexandra Street corridor (e.g. Edenbrook). Therefore as part of the analysis of the proposed access intersection with the Bruce Highway we have conservatively assumed that 30% or 255 of the approved lots within the adjacent Edenbrook development will access the Bruce Highway at this location.

Figure 5.1a and **Figure 5.1b** below show the assumed development volumes at the proposed access intersection with the Bruce Highway for the both the AM and PM peak hours based on the assumptions above. It is noted that at the request of Council a volume of 50 vph has been assigned to the through movements between Olive Street East and West during the AM peak hour to represent the expected traffic movements between the proposed development and the Parkhurst State School on the eastern side of the Highway.

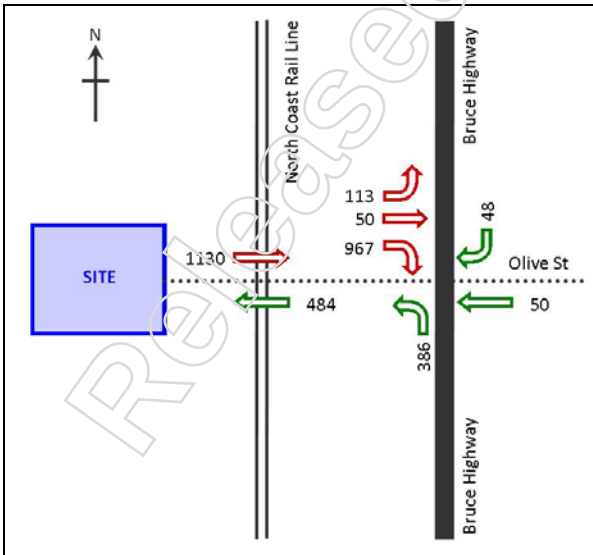

Figure 5.1a: Development Traffic Volumes (AM Peak)

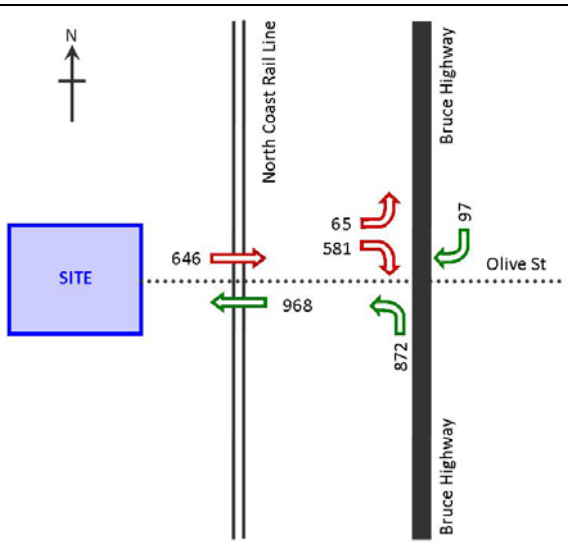

Figure 5.1a: Development Traffic Volumes (PM Peak)

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The peak hour development traffic volumes identified for the proposed access intersection above were then distributed along Bruce Highway corridor through Parkhurst, with the volumes at the each of the relevant intersections including Olive Street, Boundary Road (East), Boundary Road (West) and Yeppoon Road summarised in **Figure 5.1c** below.

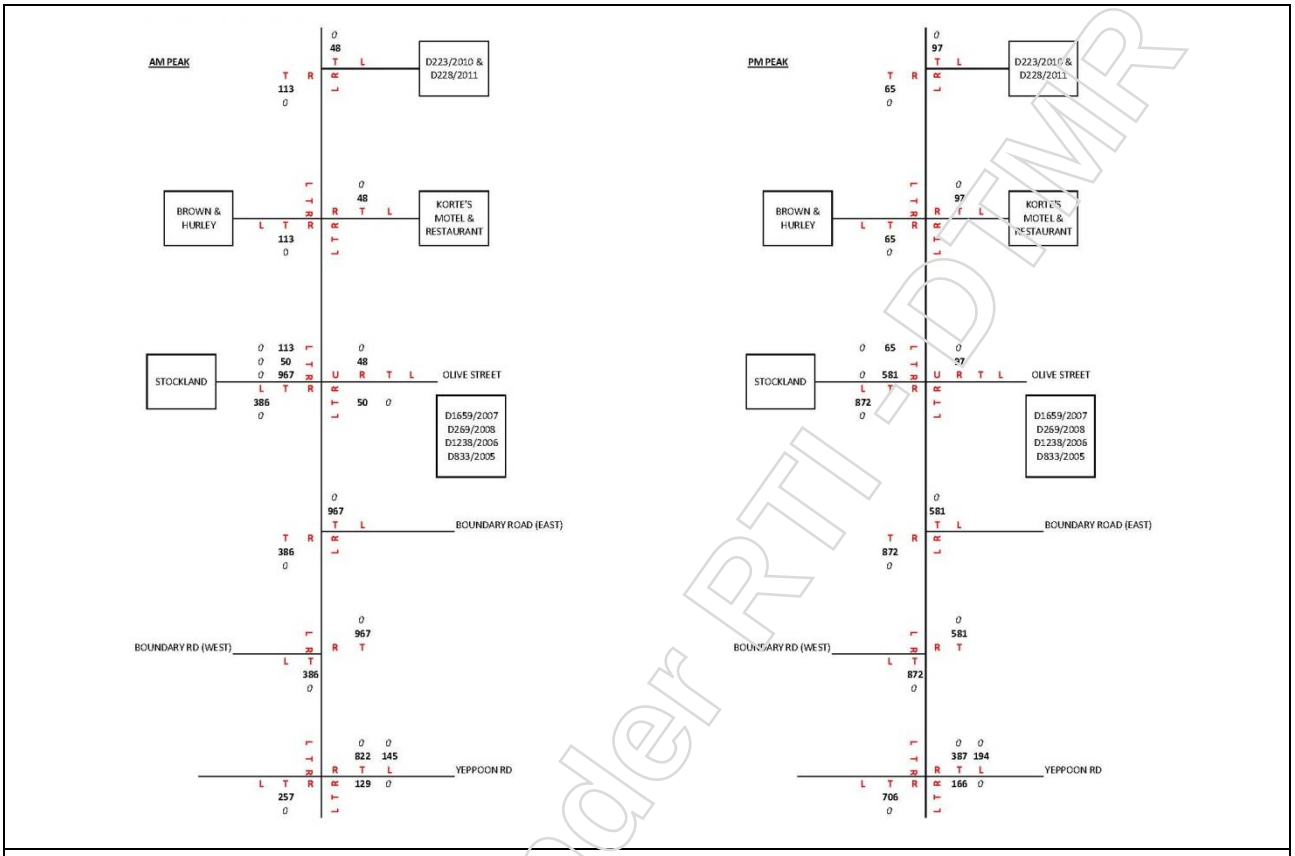

Figure 5.1c: Stockland North Parkhurst - Development Traffic Volumes (Bruce Highway Corridor)

5.2 Pre Development Traffic

To establish the background traffic volumes on the surrounding road network, the latest intersection count data for the relevant intersections along the Bruce Highway corridor were obtained from the Department of Transport and Main Roads (TMR). These included the intersections of the Bruce Highway with Olive Street, Boundary Road (East), Boundary Road (West) and Yeppoon Road. This data was collected via manual turning counts at the intersections which were undertaken throughout 2012, with the raw data for each intersection included as **Appendix H**.

For the purpose of the analysis it has been assumed that full build-out of the proposed master planned community would occur by 2025, resulting in a 10 year design horizon for the development of 2035. It is noted that whilst this assumption regarding the timing of the development has been made, the timing of the key milestone dates identified above will ultimately be determined by the physical sales rate and construction of the proposed lots, and as such may be beyond those assumed for the purpose of this analysis.

Notwithstanding the above, due to the variable nature of traffic networks and the possibility of changes to the forecast traffic characteristics as a result of a number of external factors, it is considered impractical to try and forecast traffic conditions past 2035 as the longer period the current data is extrapolated (especially for periods over 20 years) the less likely that the resultant traffic volumes will be an accurate representation of the future network volumes.

To establish the expected future background traffic volumes at the proposed access intersection location a growth rate of 1% p.a. (compound) was conservatively applied to the through movements on the Bruce Highway. The resultant background traffic volumes along the Parkhurst Bruce Highway corridor can be seen in **Appendix I**.

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In addition to the background traffic volumes on the Bruce Highway, the traffic volumes expected to be generated by developments already approved in the Parkhurst corridor were also considered at the request of both Rockhampton Regional Council and TMR. These developments included Korte's Motel and Restaurant development, the proposed 1 into 5 ROL application over the Brown and Hurley site, several residential developments on the eastern side of the Bruce Highway (D223/2010, D228/2011, D1659/2007, D269/2008, D1238/2006 and D833/2005) and the retail development (shopping centre) on the corner of Boundary Road East and the Highway.

The traffic generation and distribution from these additional developments were based on the *Traffic Impact Assessment* reports submitted for each application. Where such reports were unavailable the traffic distributions adopted were in accordance with those identified in TMR's future planning network spreadsheet models. The traffic calculations for each of the existing approved developments for both the assumed 2025 and 2035[1] road networks can be seen in **Appendix J** with the forecast development volumes at the relevant intersections along the Parkhurst Bruce Highway corridor also included.

It is noted that the inclusion of additional traffic from the approved developments identified above **in addition** to the application of the proposed 1% p.a. compound growth rate for the through movements on the highway is expected to exceed the historical growth rate (1.5% p.a. compound) identified for this section of the highway by TMR, as shown in **Table 5.2a** below.

Table 5.2a: Adopted Background Traffic Growth Rate

Scenario	Traffic Volumes (vph)		Growth Rate	
	AM Peak	PM Peak	AM Peak	PM Peak
2012 Bruce Highway / Olive Street Count Volumes	942 (120)	920 (94)		
Forecast 2025 Pre Development Volumes	1,364 (139)	1,476 (106)	2.71%	3.48%
Forecast 2025 Pre Development Volumes	1,414 (153)	1,584 (117)	1.78%	2.39%

Note: Volumes calculated for midblock section south of Olive Street based on recorded and forecast Bruce Highway / Olive Street intersection volumes. All growth rates identified are compound growth rates per annum.

The pre development volumes were then calculated by combining the forecast background traffic volumes with the volumes generated by the approved developments previously identified. The resultant 2025 and 2035 AM and PM peak pre development traffic volumes for the road network are summarised in **Figure 5.2a** and **Figure 5.2b** below.

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[1] The 2035 road network assumes the connection of the two sections of Norman Road has been completed (in 2031 as per Council's Infrastructure Charges Resolution Ver2), thus leading to a redistribution of the development traffic for the approved developments east of the Bruce Highway.

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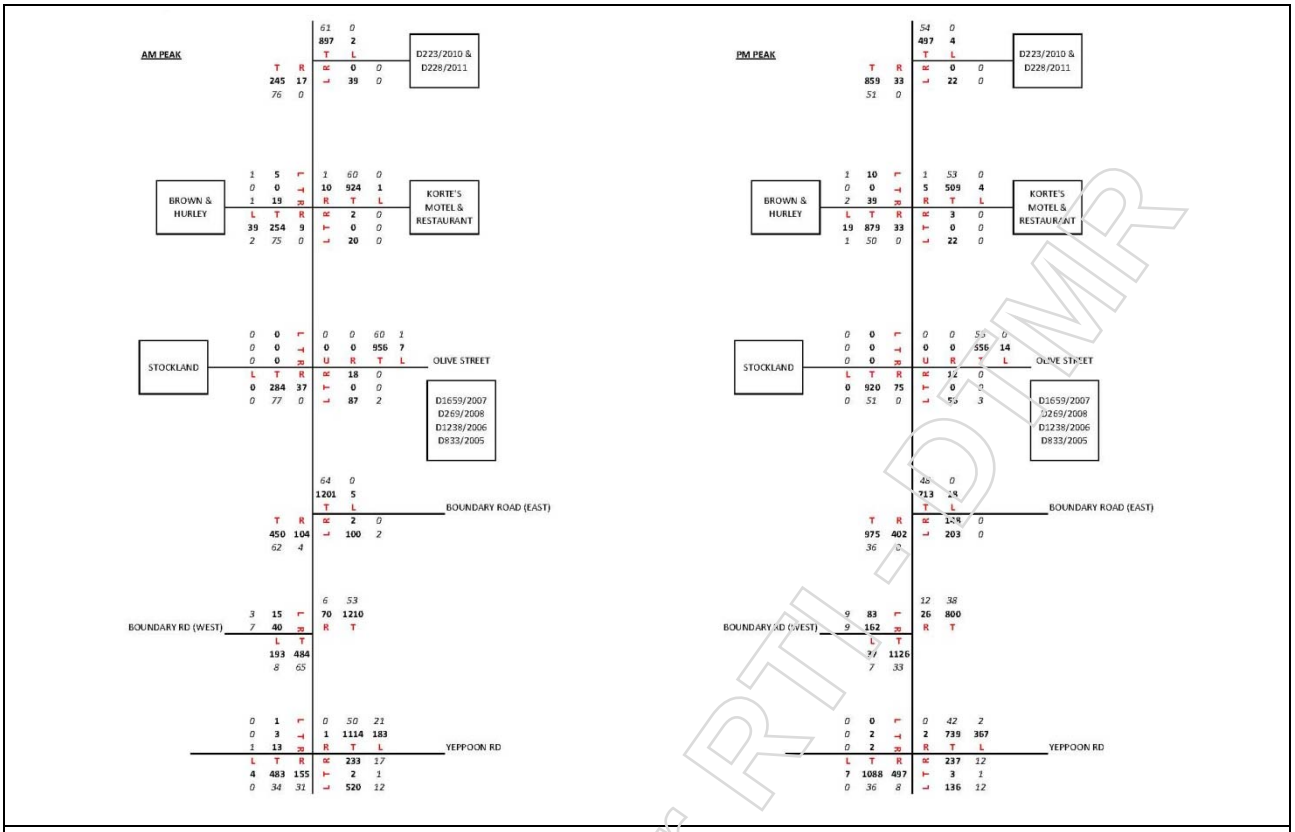

Figure 5.2a: 2025 Pre Development Traffic Volumes (Bruce Highway Corridor)

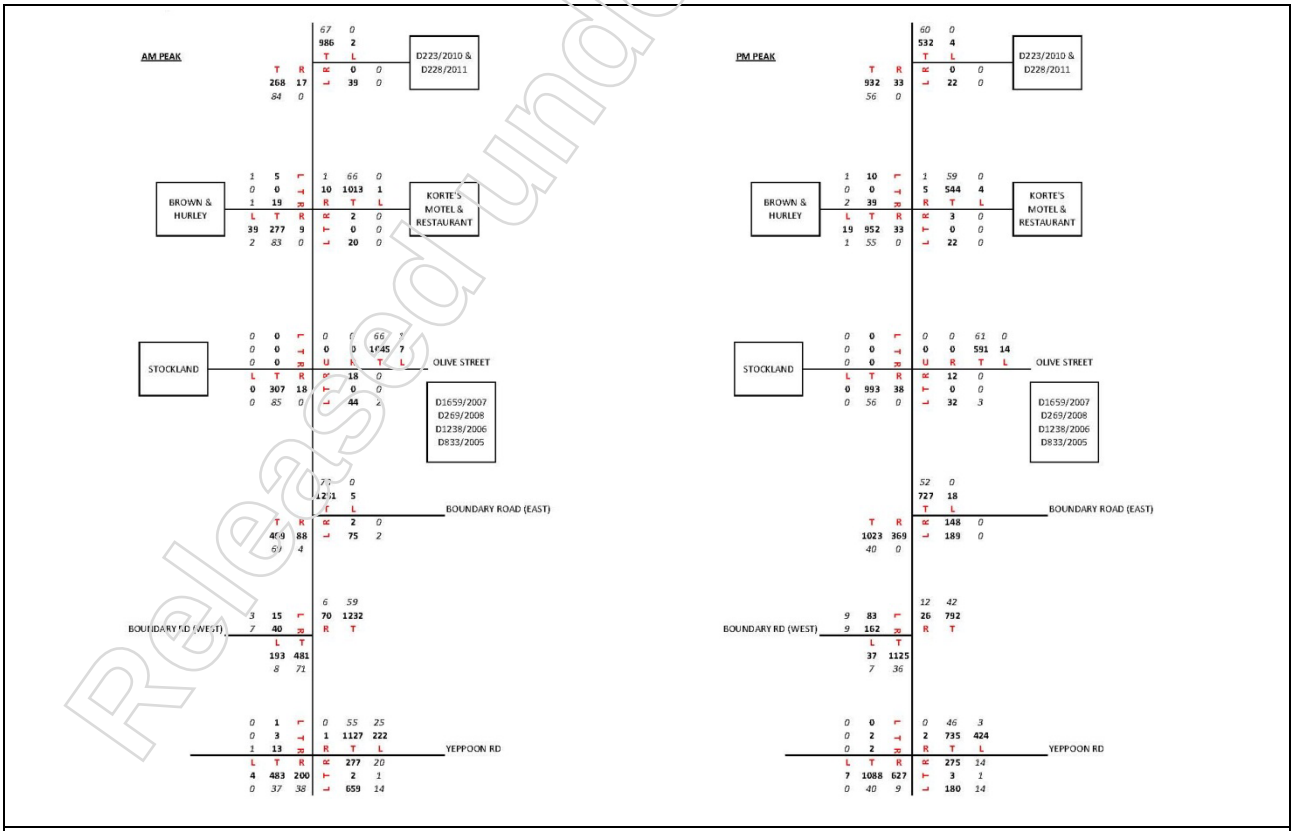

Figure 5.2b: 2035 Pre Development Traffic Volumes (Bruce Highway Corridor)

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5.3 Post Development Traffic

Using the volumes predicted to be generated by the proposed development, those by the already approved developments in the surrounding area and the forecast background traffic volumes, the post development traffic conditions at the relevant intersections along the Bruce Highway corridor through Parkhurst were analysed.

This analysis was completed for both the identified AM and PM peak periods, at the year of completion (2025) and the ten year design horizon (2035). The resultant 2025 and 2035 peak hour post development traffic volumes for the road network are summarised in **Figure 5.3a** and **Figure 5.3b** below.

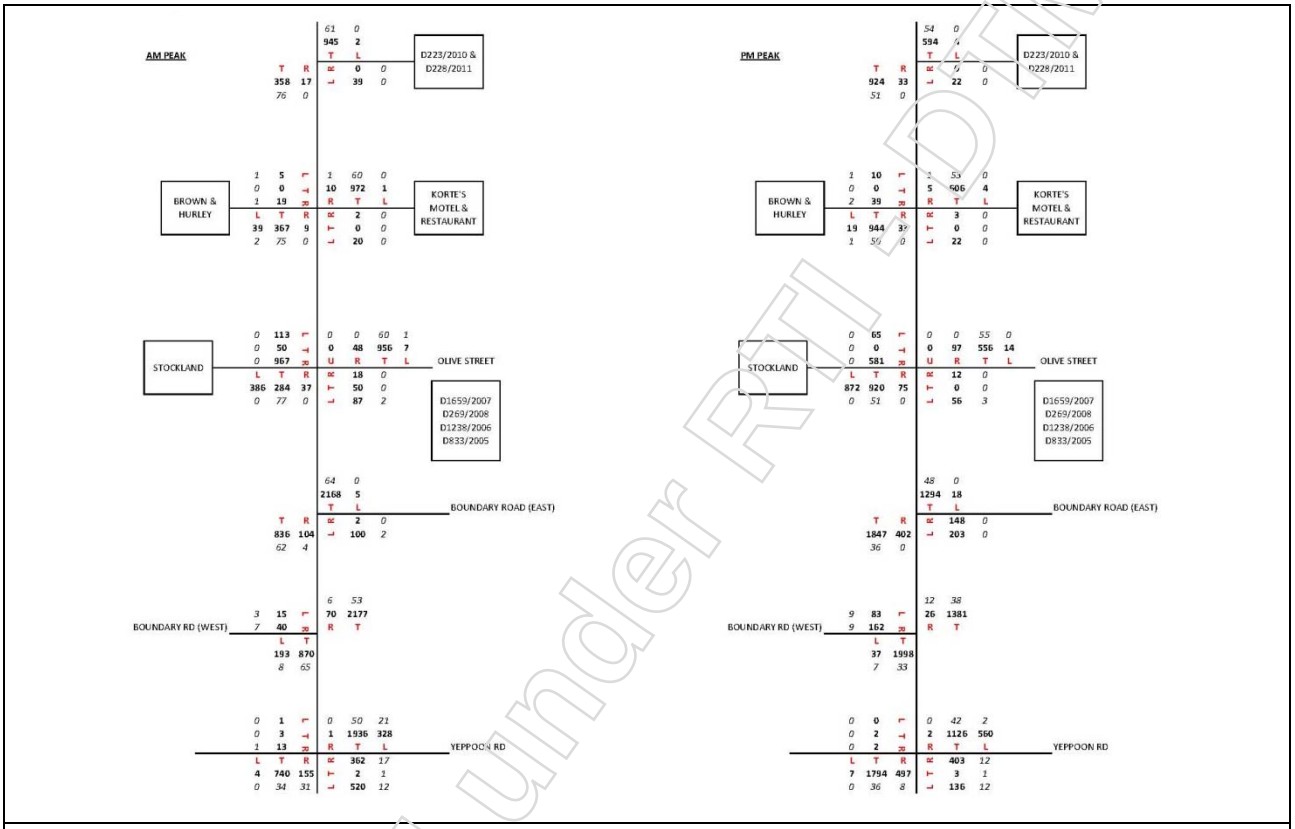

Figure 5.3a: 2025 Post Development Traffic Volumes (Bruce Highway Corridor)

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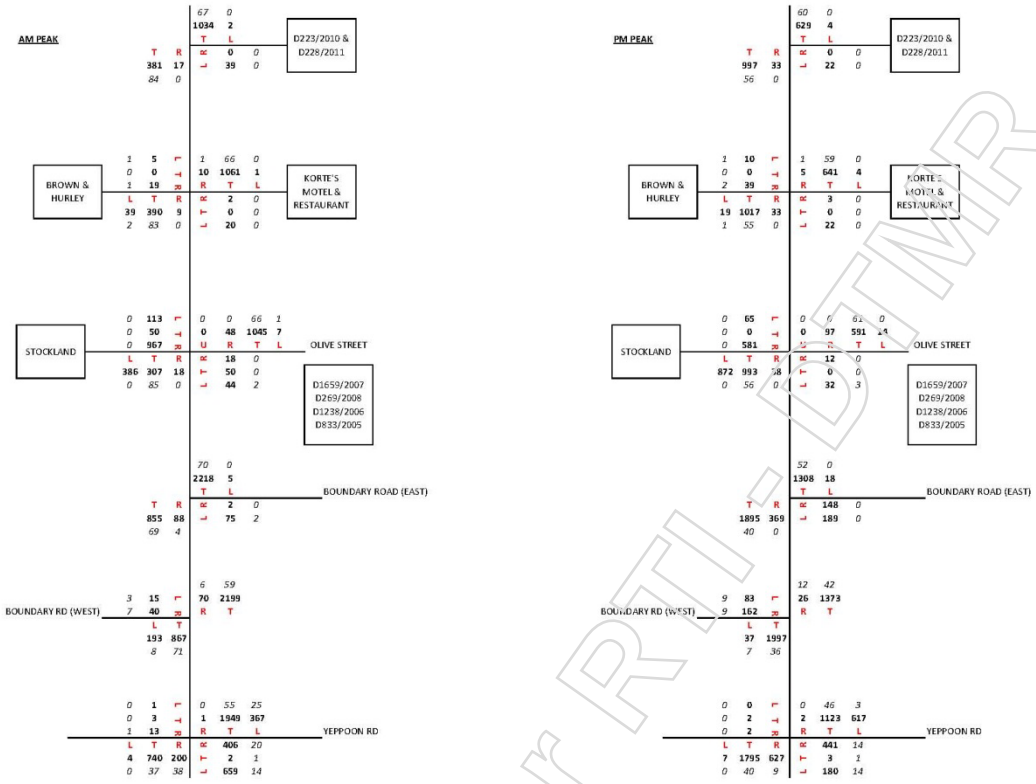

Figure 5.3b: 2035 Post Development Traffic Volumes (Bruce Highway Corridor)

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5.4 Traffic Impact Assessment

As previously mentioned analysis has been completed to determine the impact of the proposed master planned community on both the state and local government controlled external road networks. The investigation into the operation of the state controlled road network will focus on the relevant section of the Parkhurst Bruce Highway corridor, including the major intersections, whilst the assessment of the impact on the local government controlled network will focus on the Alexandra Street corridor.

5.4.1 State Controlled Road Network Analysis

An investigation into the impacts of the proposed development on the state controlled road network has been completed, with analysis being undertaken on the relevant section of the Bruce Highway (Yeppoon Road to Olive Street) including mid-block volumes and the operation of the major intersections of:

- Olive Street (Interim and Ultimate configurations);
- Boundary Road (East);
- Boundary Road (West); and
- Yeppoon Road.

These analyses are discussed in further detail in the following sections.

5.4.1.1 Midblock Volumes – Capacity of Current Cross Section

TMR has previously advised that the desired maximum daily flow and hence trigger volume for an upgrade from two lanes to four is 15,000 vehicles per day. Whilst Annual Average Daily Traffic (AADT) segment volumes for the relevant sections of the highway are currently available, these do not include the additional traffic generated by the approved developments in the area and as such do not provide an accurate representation of the expected pre-development traffic volumes.

The mid-block volumes have been derived from the pre-development intersection volumes. This was achieved by extracting the approach and departure volumes. **Figure 5.4.1.1a** below identifies the intersection volumes and corresponding mid-block volumes for the forecast 2013 pre development traffic scenario.

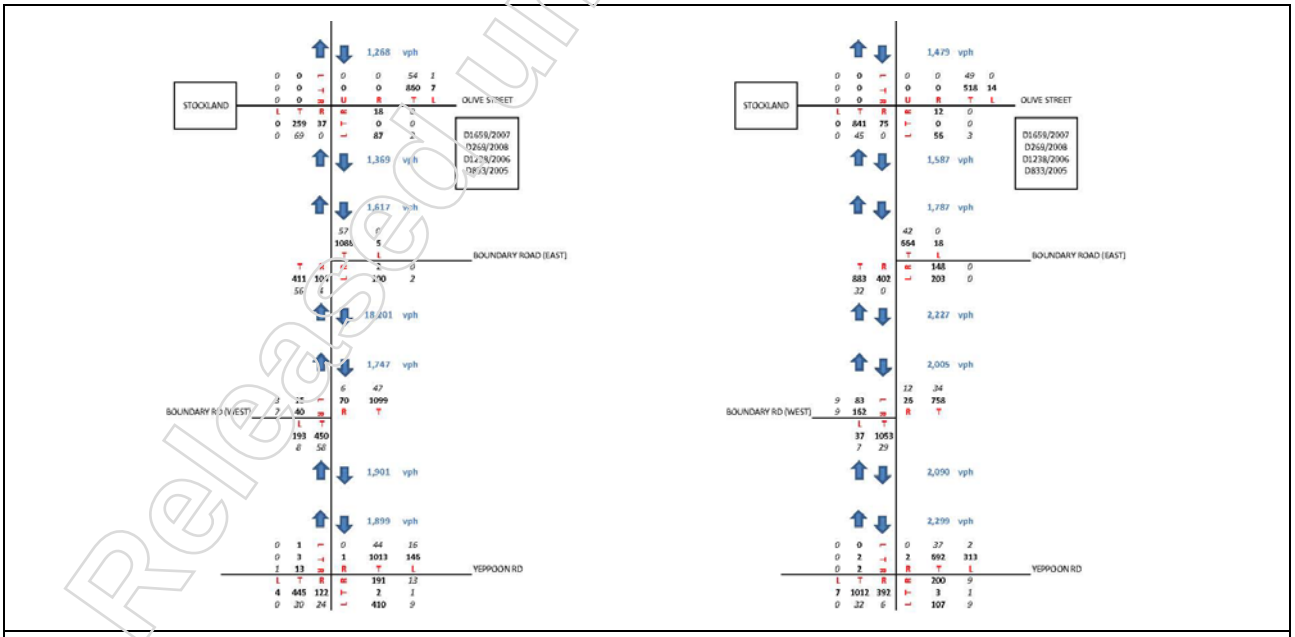

Figure 5.4.1.1a: 2013 Forecast Peak Hour Mid-Block Traffic Volumes (Bruce Highway Corridor)

Section 5.2 of TMR's *Road Planning and Design Manual* describes the generally accepted method of applying a factor of ten (10) for urban arterial roads to calculated peak hour volumes from daily traffic volumes, and vice versa. By

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applying this factor of ten to the peak hour mid-block values shown above the expected daily volumes were estimated, as shown in **Figure 5.4.1.1b** below.

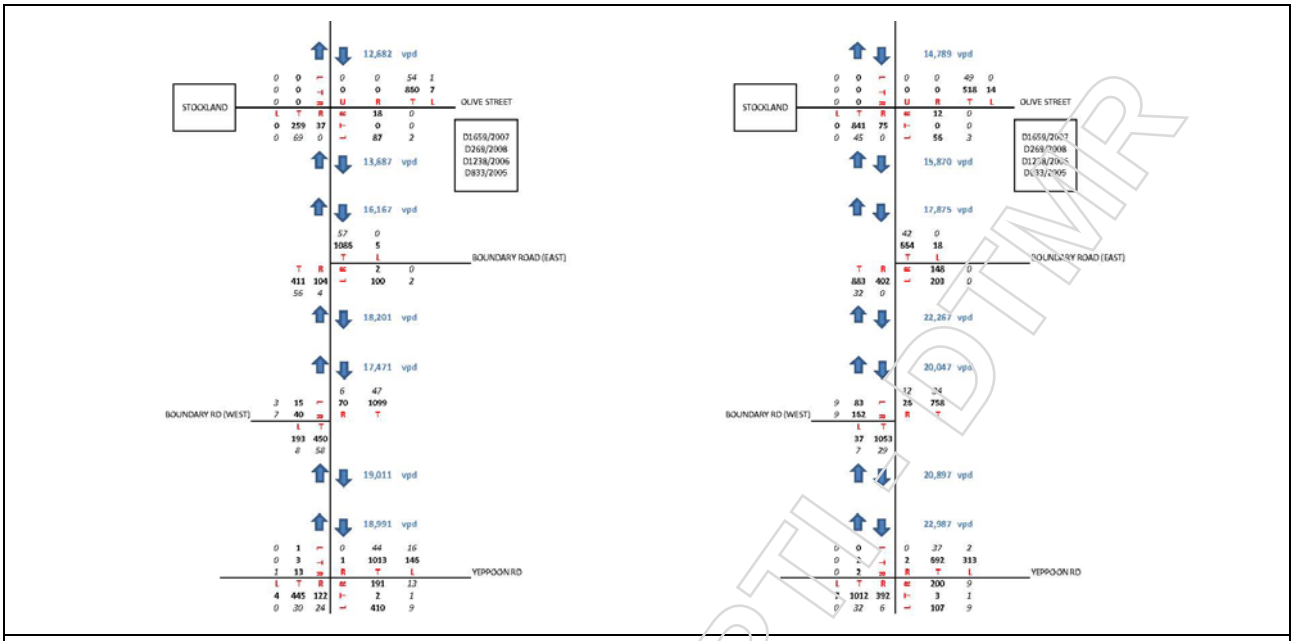

Figure 5.4.1.1b: 2013 Forecast Daily Mid-Block Traffic Volumes (Bruce Highway Corridor)

From the values identified in the figure above it can be seen that the expected pre development daily mid-block volumes on each relevant section of the Bruce Highway between Yeppoon Road and Olive Street exceed the TMR trigger volume of 15,000 vehicles per day. These values also therefore validate both DTMR's future intent for this road corridor and current planning studies, as well as the recommendation from the 2008 *Rockhampton Traffic Study* (prepared by Arup) that the initial section of the Highway (Yeppoon Road to Boundary Road (East) required duplication by 2011.

As such it is expected that an upgrade of the Highway from two to four lanes, including the provision of additional through lanes at existing intersections, will be required regardless of the construction of the proposed North Parkhurst development.

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5.4.1.2 Bruce Highway / Olive Street

The analysis of the intersections was then completed using SIDRA 5.1 software, adopting a proposed four-way signalised intersection for the Bruce Highway / Olive Street intersection in accordance with the future planning intent of both TMR and Council.

As previously mentioned, an interim intersection configuration has been proposed to accommodate the traffic generated by the initial stages of the development, and an upgrade trigger of 1,275 lots identified as the limit of operation for the proposed interim configuration. As such traffic analysis has been completed to confirm this proposed upgrade trigger, with the assumptions and results of the analysis described below.

For the purpose of analysis the majority of the traffic assumptions listed in **Table 5.1a** and **Table 5.1b** were adopted, however as is anticipated that a connection to the west (i.e. McLaughlin Street) would not be provided as part of the works for the initial 1,000 lots, it has been assumed that 100% of the traffic from these lots would access the external road network via the proposed signals at the Bruce Highway / Olive Street intersection.

In addition, the identified design horizon for the overall development (2035) has been conservatively been adopted for the analysis of the interim configuration for the initial 1,275 lots to verify the proposed intersection upgrade trigger. The interim intersection configuration adopted for the analysis of the proposed Bruce Highway / Olive Street intersection upgrade trigger (1,275 lots) can be seen in **Figure 5.4.1.2a** below.

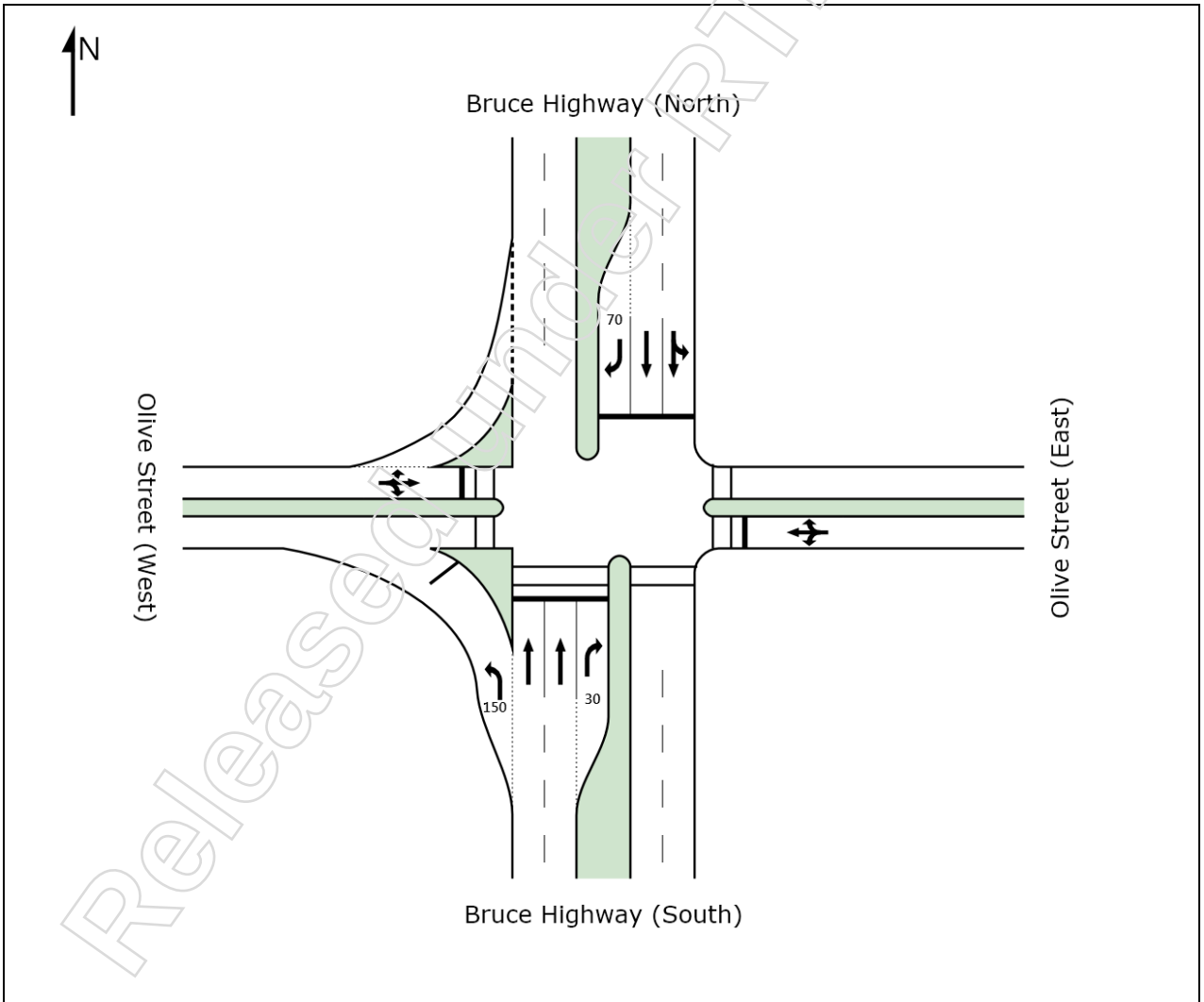

Figure 5.4.1.2a: Proposed Interim Four-Way Signalised Intersection Configuration - Bruce Highway/Olive Street Intersection
****NOTE : Values shown on auxiliary lanes indicate storage length only.**

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The interim intersection configuration identified above includes the provision of a four lane cross section for the Highway which in Section 5.4.1.1 was identified to be required regardless of the development due to the forecast pre development mid-block volumes exceeding 15,000 vehicles per day which triggers the need for TMR to four-lane the Bruce Highway between Yeppoon Road and Olive Street, which would include the southern approach to this intersection.

It is also noted that the required storage lengths of the auxiliary lanes for the left turn into the site from the south and the right turn from the north have been sized to accommodate the expected queue lengths developed during a train passing over the proposed level crossing on the new access road into the site. These storage lengths have been calculated assuming a two and a half minute delay to vehicles at the level crossing.

A four (4) phase signal configuration with pedestrian crossings on the southern (staged), eastern and western approaches was adopted for the purpose of the intersection analysis. The modelled phasing is shown in **Figure 5.4.1.2b** below.

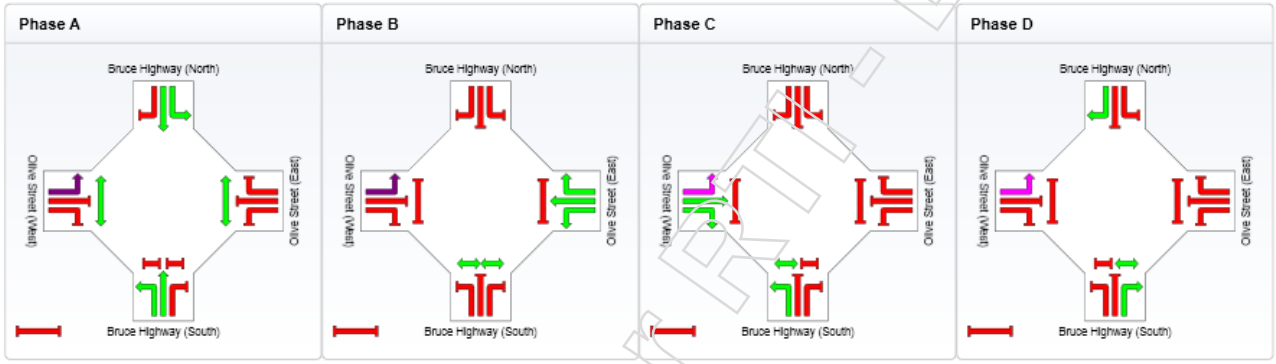

Figure 5.4.1.2b: Adopted Signal Phasing – Bruce Highway / Olive Street Intersection

The results of the analyses detailing the predicted operation of the proposed interim configuration of the Bruce Highway / Olive Street intersection for the adopted design horizons have been included within **Appendix K**, with a summary of the results provided in **Table 5.4.1.2a** below.

Table 5.4.1.2a: Summary of SIDRA Analysis Results – Bruce Highway / Olive Street Intersection – Interim Configuration Post Development Scenarios – Proposed Signalised Intersection Configuration

Intersection	Intersection Control	Year	Peak Hour	DOS %
Interim (1,275 Lots) Bruce Highway / Olive Street	Four-way Signalised	2035	AM	**89.3**
			PM	**67.4**

From the results above it can be seen that the proposed interim four-way signalised intersection configuration of the Bruce Highway / Olive Street intersection is expected to operate satisfactorily up to the proposed intersection trigger (1,275 lots) with all calculated values for intersection Degree of Saturation (DOS) for the assumed post development scenarios within the acceptable limits of operation (90%) for signalised intersections.

Once the identified development trigger (1,275 lots) has been reached[2], it is proposed that the intersection will be upgraded to the identified ultimate intersection configuration. This ultimate intersection configuration includes an additional entry and exit lane on the western approach leg to the intersection, as well as an additional signalised left turn lane into the site from the southern Bruce Highway approach.

[2] Note – Development trigger may be extended beyond 1,275 lots if subsequent traffic analysis identifies the interim intersection configuration will operate within acceptable limits of operation for a signalised intersection.

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The ultimate configuration for the Bruce Highway / Olive Street intersection adopted during the analysis of the post development traffic conditions for the development can be seen in **Figure 5.4.1.2c** below.

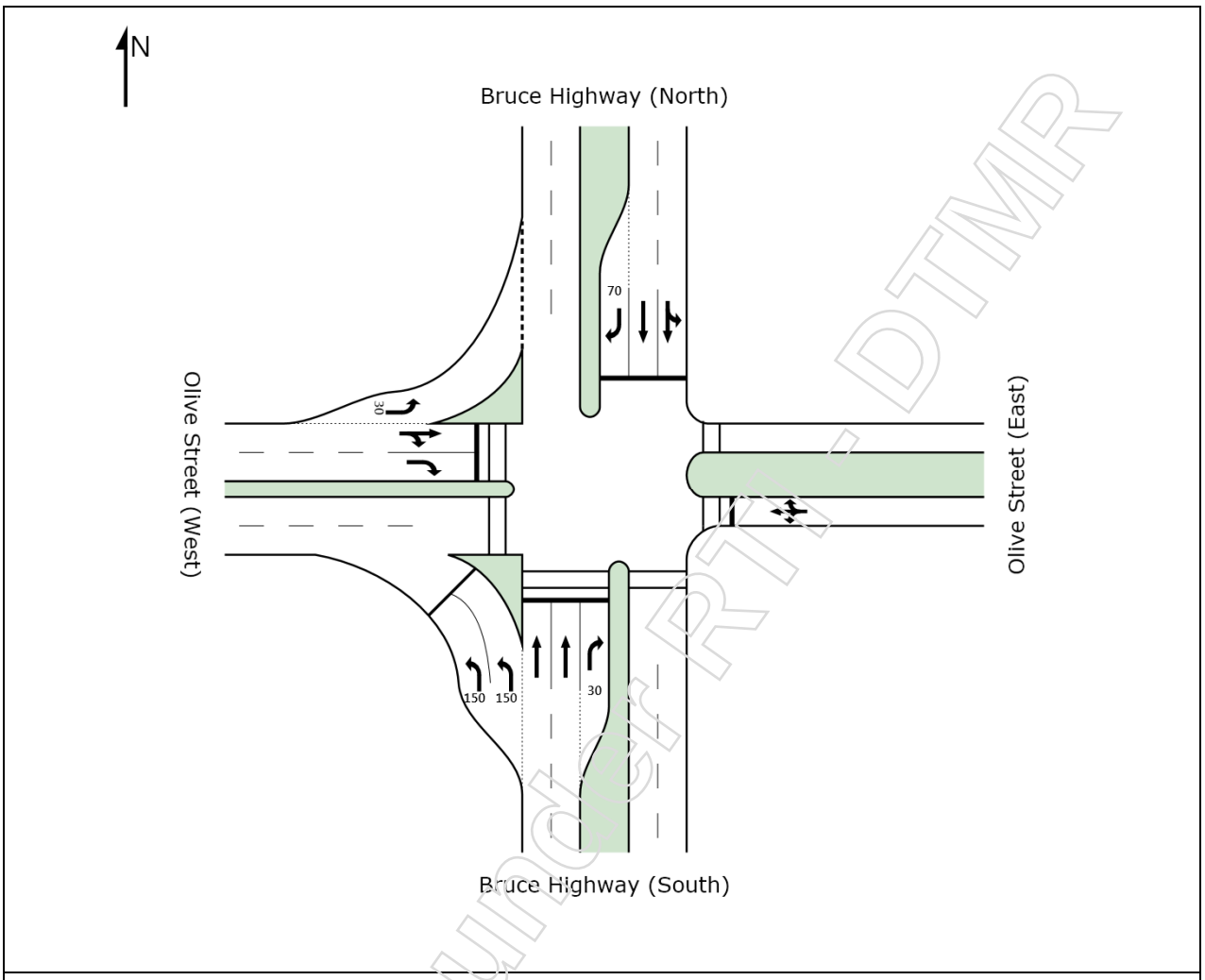

Figure 5.4.1.2c: Proposed Four-Way Signalised Intersection Configuration - Bruce Highway / Olive Street Intersection
****NOTE : Values shown on auxiliary lanes indicate storage length only.**

Again a four (4) phase signal configuration with pedestrian crossings on the southern (staged), eastern and western approaches was adopted in the analysis with a summary of the phasing used shown in **Figure 5.4.1.2d** below.

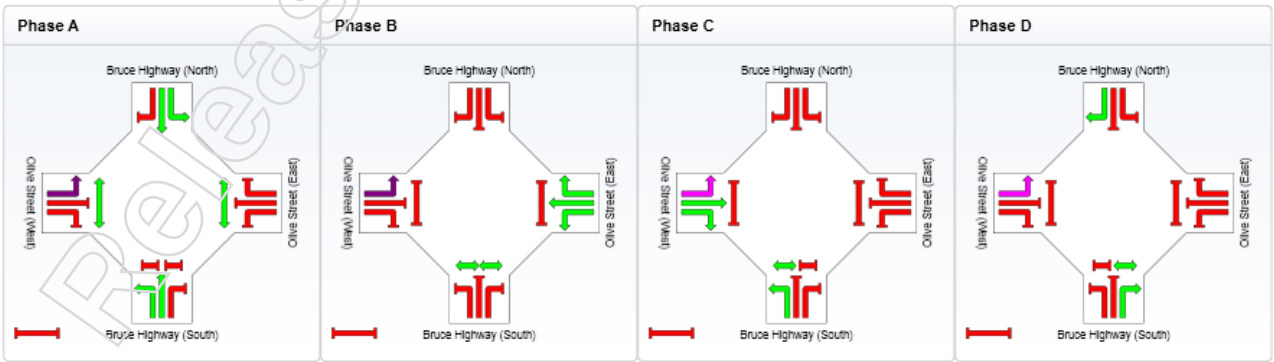

Figure 5.4.1.2d: Adopted Signal Phasing – Bruce Highway / Olive Street Intersection

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The results of the analyses detailing the predicted operation of the proposed Bruce Highway / Olive Street intersection for the forecast post development traffic conditions are attached as **Appendix K.** A summary of these results is provided in **Table 5.4.1.2b** over page.

Table 5.4.1.2b: Summary of SIDRA Analysis Results – Bruce Highway / Olive Street Intersection – Ultimate Configuration Post Development Scenarios – Proposed Signalised Intersection Configuration

Intersection	Intersection Control	Year	Peak Hour	DOS %
Bruce Highway / Olive Street	Four-Way Signalised	2025	AM	**83.2**
			PM	**74.9**
		2035	AM	**84.8**
			PM	**78.7**

From the results above it can be seen that the proposed ultimate configuration of the four-way signalised intersection of the Bruce Highway / Olive Street intersection is expected to operate satisfactorily for all post development scenarios, with all calculated values for intersection Degree of Saturation (DOS) below the acceptable limit of operation (90%) for signalised intersections.

5.4.1.3 Bruce Highway / Boundary Road (East)

Following consultation with TMR the signalised configuration of the Boundary Road (East) / Bruce Highway intersection conditioned as part of a recently approved shopping centre development (on Boundary Road East) was identified, as shown in **Figure 5.4.1.3a** below.

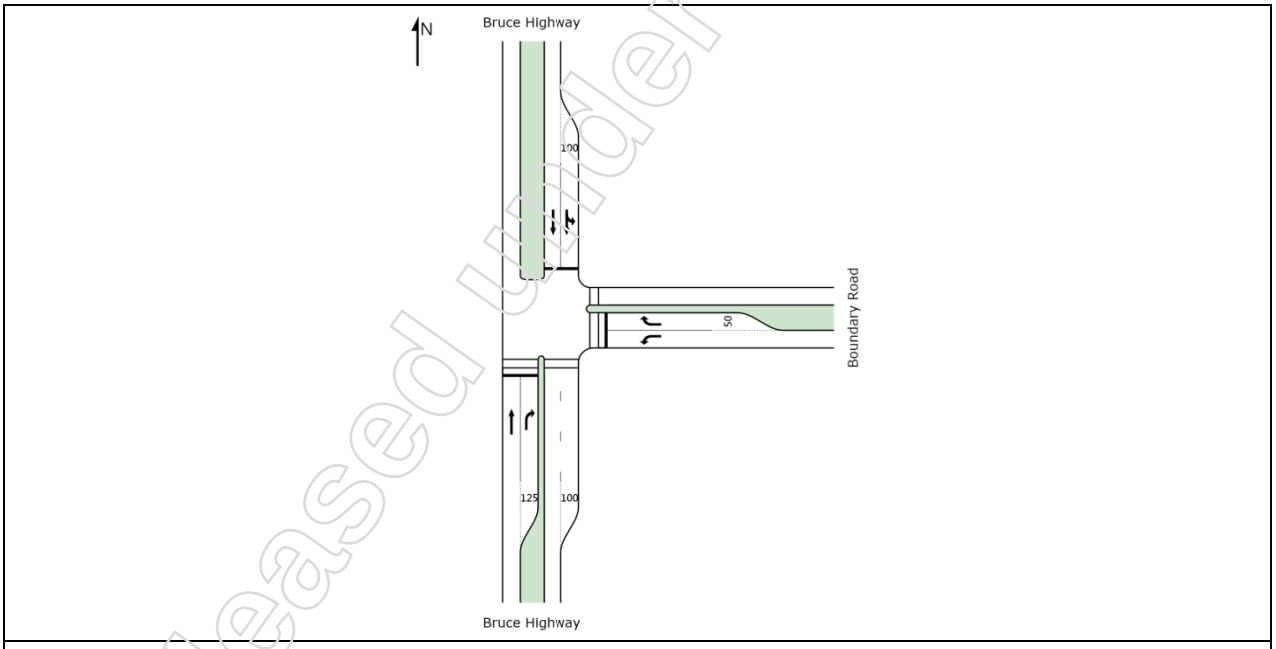

Figure 5.4.1.3a: Approved Signalised Intersection Configuration - Bruce Highway / Boundary Road (East) Intersection

It is noted that the geometry indicated in this approved intersection configuration only provides one through lane for northbound traffic and a short secondary through lane for southbound traffic. Therefore to align with the previously identified requirement for a four lane cross section of the Highway on both approaches to the intersection, an alternative, upgraded intersection configuration to address this existing deficiency has been proposed as shown in **Figure 5.4.1.3c** below.

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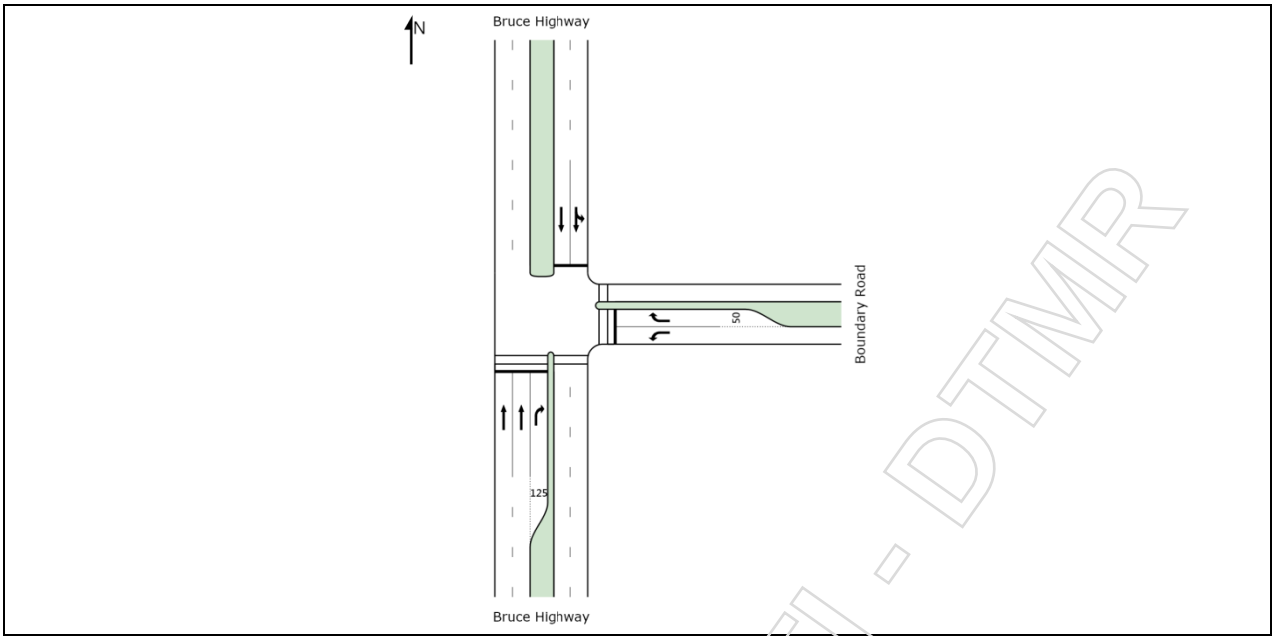

Figure 5.4.1.3c: Upgraded Intersection Configuration - Bruce Highway / Boundary Road (East) Intersection

A three (3) phase signal configuration with pedestrian crossings on the southern and eastern approaches was adopted for the purpose of the intersection analysis. A generalised summary of the adopted signal phasing is shown in **Figure 5.4.1.3b** below.

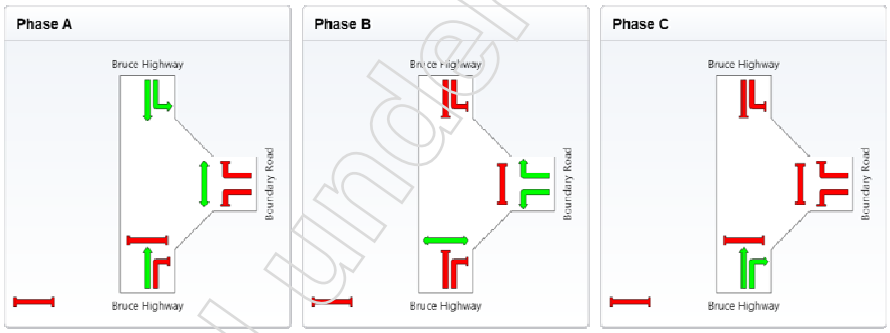

Figure 5.4.1.3b: Adopted Signal Phasing – Bruce Highway / Boundary Road (East) Intersection

The results of the analyses detailing the predicted operation of the proposed upgraded configuration of the Bruce Highway / Boundary Road (East) intersection for the forecast post development traffic conditions are attached as **Appendix L.** A summary of these results is provided in **Table 5.4.1.3b** below.

Table 5.4.1.3b: Summary of SIDRA Analysis Results – Bruce Highway / Boundary Road (East) Intersection Post Development Scenarios – Proposed Upgraded Signalised Intersection Configuration

Intersection	Intersection Control	Year	Peak Hour	DOS %
Bruce Highway / Boundary Road (East)	Three-Way Signalised	2025	AM	**85.0**
			PM	**84.8**
		2035	AM	**84.8**
			PM	**83.1**

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From the results above it can be seen that the proposed upgrade to the signalised intersection configuration of the Bruce Highway / Boundary Road (East) intersection is expected to operate satisfactorily for all post development scenarios, with all calculated values for intersection Degree of Saturation (DOS) below the acceptable limit of operation (90%) for signalised intersections.

5.4.1.4 Bruce Highway / Boundary Road (West)

The existing priority controlled geometry of the Bruce Highway / Boundary Road West intersection is shown in **Figure 5.4.1.4a** below.

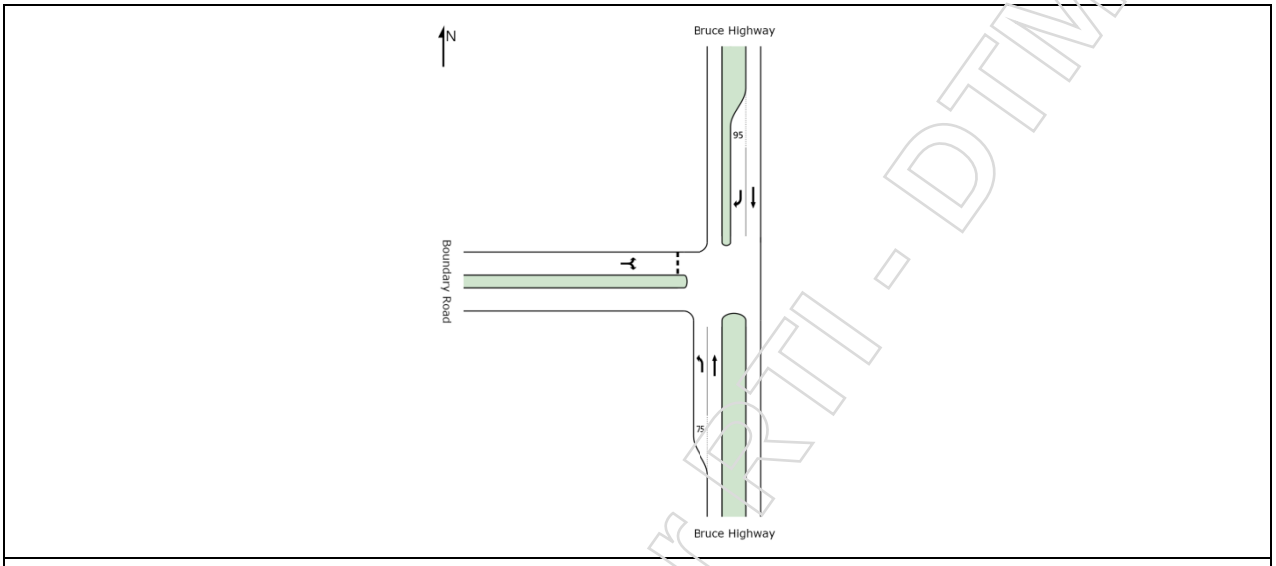

Figure 5.4.1.4a: Existing Intersection Configuration - Bruce Highway / Boundary Road (West) Intersection

It is noted that the current geometry of the intersection, as identified above, is based on the existing two-lane alignment of the Bruce Highway. However as established in Section 5.4.1.1 the Bruce Highway requires duplication to provide a four lane cross section and as such the requirement to provide these additional through lanes on both Bruce Highway approaches to the intersection can be considered an existing deficiency of the road network.

The geometry that will be required to address the identified existing deficiencies is shown in **Figure 5.4.1.4b** below. This alternative configuration includes additional through lanes in both directions, as well as including pedestrian crossings on both the northern and western approaches which whilst included are not expected to cater for large volume of pedestrian traffic.

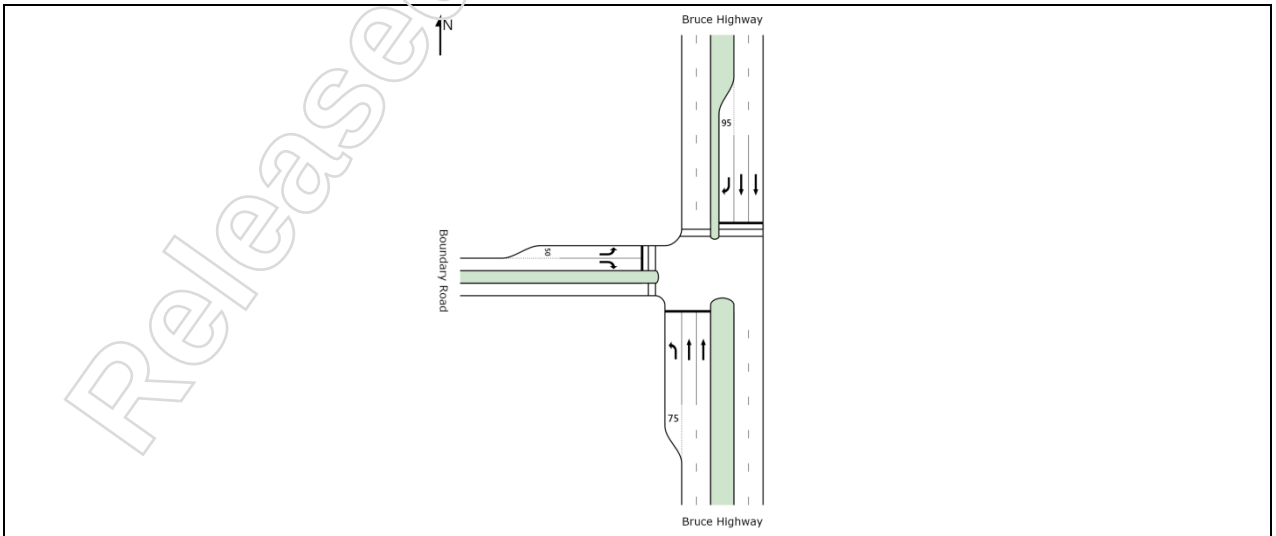

Figure 5.4.1.4b: Upgraded Intersection Configuration - Bruce Highway / Boundary Road (West) Intersection

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A three (3) phase signal configuration with pedestrian crossings on the northern and western approaches was adopted for the purpose of the intersection analysis. A generalised summary of the adopted signal phasing is shown in **Figure 5.4.1.4c** below.

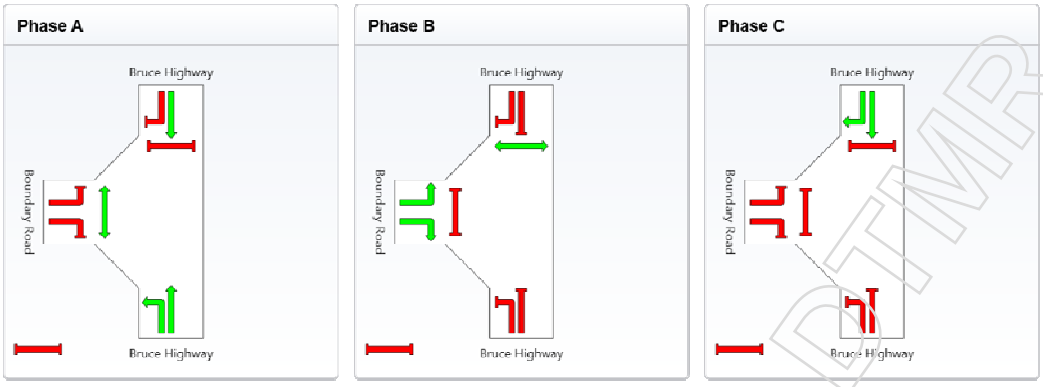

Figure 5.4.1.4c: Adopted Signal Phasing – Bruce Highway / Boundary Road (West) Proposed Signalised Intersection

The results of the analyses detailing the predicted operation of the proposed upgraded configuration of the Bruce Highway / Boundary Road (West) intersection for the forecast post development traffic conditions are attached as **Appendix M,** with a summary provided in **Table 5.4.1.4b** below.

Table 5.4.1.4b: Summary of SIDRA Analysis Results – Bruce Highway / Boundary Road (West) Intersection Post Development Scenarios – Proposed Upgraded Intersection Configuration

Intersection	Intersection Control	Year	Peak Hour	DOS %
Bruce Highway / Boundary Road (West)	Three-Way Signalised	2025	AM	**76.1**
			PM	**74.4**
		2035	AM	**74.7**
			PM	**74.6**

From the results above it can be seen that once the existing deficiencies of the intersection have been rectified the proposed upgraded Bruce Highway / Boundary Road (West) intersection (three way signalised) is expected to operate satisfactorily during the analysed post development scenarios, with all calculated values for intersection Degree of Saturation (DOS) within the acceptable limits of operation (90%) for signalised intersections.

5.4.1.5 Bruce Highway / Yeppoon Road

Initial analysis was completed to assess the future operation of the existing signalised intersection configuration of the Bruce Highway / Yeppoon Road intersection. A diagram of the configuration adopted for this analysis is in **Figure 5.4.1.5a** below.

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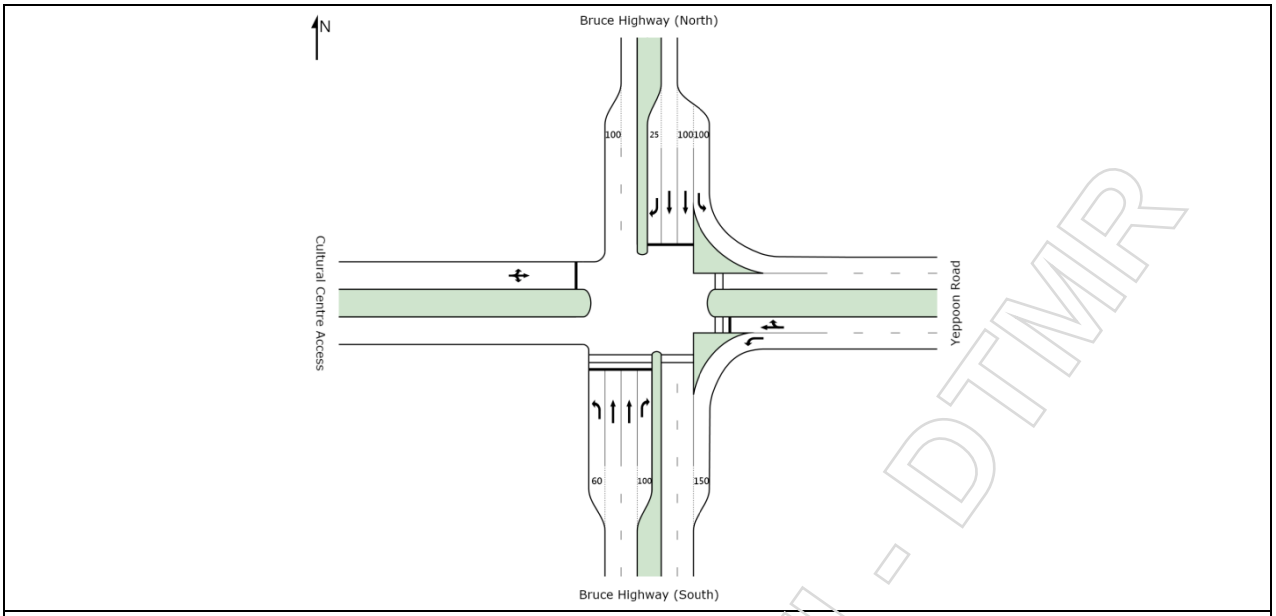

Figure 5.4.1.5a: Existing Intersection Configuration - Bruce Highway / Yeppoon Road (West) Intersection

A four (4) phase signal configuration with pedestrian crossings on the southern and eastern approaches was adopted for the purpose of the intersection analysis. A generalised summary of the adopted signal phasing is shown in **Figure 5.4.1.5b** below.

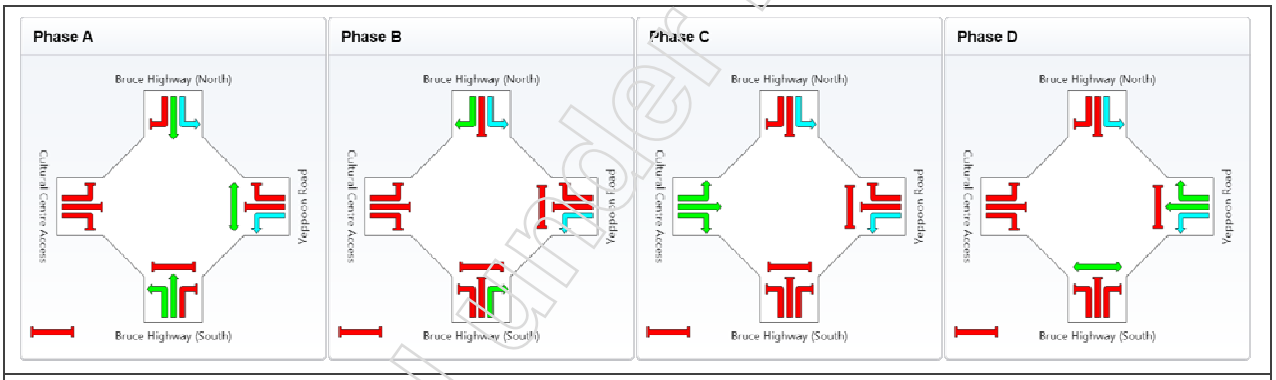

Figure 5.4.1.5b: Adopted Signal Phasing – Bruce Highway / Yeppoon Road Intersection (Existing Configuration)

The results of the analysis detailing the predicted operation of the existing Bruce Highway / Yeppoon Road intersection for the forecast pre development traffic conditions are attached as **Appendix N**, with a summary of these results provided in **Table 5.4.1.5a** over page.

Table 5.4.1.5a: Summary of SIDRA Analysis Results – Bruce Highway / Yeppoon Road Intersection
Pre Development Scenarios – Existing Signalised Intersection Configuration

Intersection	Intersection Control	Year	Peak Hour	DOS %
Bruce Highway / Yeppoon Road	Four-Way Signalised	2013	AM	75.3
			PM	101.3

The results above indicate that the current intersection configuration of the Bruce Highway / Yeppoon Road intersection is not expected to operate satisfactorily during the 2013 PM pre development scenario (including assumed traffic volumes from approved developments), with the calculated value for intersection Degree of Saturation (DOS) outside the acceptable limits of operation (90%) for signalised intersections.

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A detailed investigation of the calculated results for the 2013 PM peak analysis indicates that the failure mechanism for the current intersection configuration is the right turn lane and adjacent through lanes on the southern approach to the intersection. Furthermore the results indicate an underutilisation of the outside or westernmost through lane on the southern approach, which can be attributed to the provision of a short (100m) auxiliary through lane downstream of this movement. The results further reinforce the need for the provision of a four lane cross section of the highway north of Yeppoon Road as identified earlier, and also demonstrate that the current configuration of the Bruce Highway / Yeppoon Road intersection will need to be upgraded regardless of the addition of traffic from the proposed Stockland North Parkhurst development.

An upgraded intersection configuration, including the provision of the full four through lane cross section on the northern approach, as shown in **Figure 5.4.1.5c** below, was then analysed. This alternative configuration also incorporated an increase in the current length of the right turn pocket on the southern approach from 100m to 250m, and adopted that same signal phasing as the existing configuration analysis shown above.

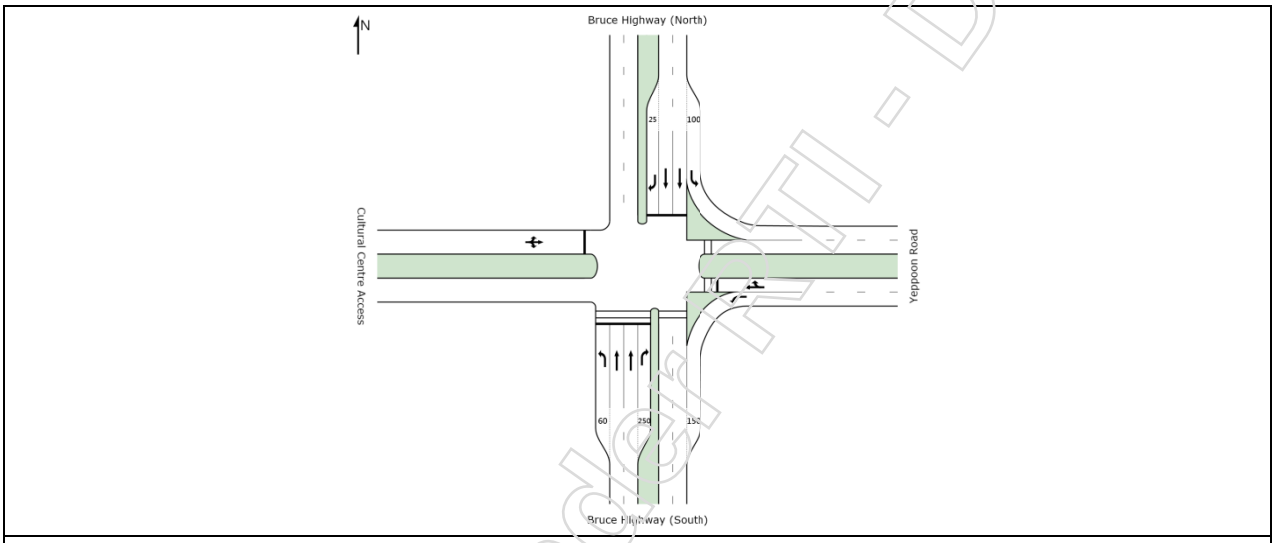

Figure 5.4.1.5c: Upgraded Intersection Configuration - Bruce Highway / Yeppoon Road Intersection

The results of the analyses detailing the predicted operation of the proposed upgraded Bruce Highway / Yeppoon Road intersection for the forecast pre development traffic conditions are attached as **Appendix N.** A summary of these results is provided in **Table 5.4.1.5b** below.

Table 5.4.1.5b: Summary of SIDRA Analysis Results – Bruce Highway / Yeppoon Road Intersection
Pre Development Scenarios – Proposed Upgraded Signalised Intersection Configuration

Intersection	Intersection Control	Year	Peak Hour	DOS %
Bruce Highway / Yeppoon Road	Four-Way Signalised	2013	AM	**72.5**
			PM	**81.0**
		2025	AM	**72.4**
			PM	**92.1**
		2035	AM	**81.1**
			PM	**102.2**

From the results above it can be seen that the proposed upgraded Bruce Highway / Yeppoon Road intersection including the provision of the required four through lane cross section is not expected to operate satisfactorily during the analysed pre development scenarios, with the calculated values of intersection Degree of Saturation (DOS) for both the 2025 and 2035 PM peak period outside the acceptable limits of operation (90%) for signalised intersections.

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A second iteration of an upgraded intersection layout was then developed to improve the operational performance of the intersection under the forecast pre development traffic conditions. This second iteration of the layout included the provision of two right turn pockets on the southern approach, which in turn led to the formation of a combined through and left lane on this approach and the modification of the left turn lane on the northern approach from a continuous lane with designated downstream lane to a standard priority controlled slip lane. A diagram of the analysed intersection configuration is shown in **Figure 5.4.1.5d** below

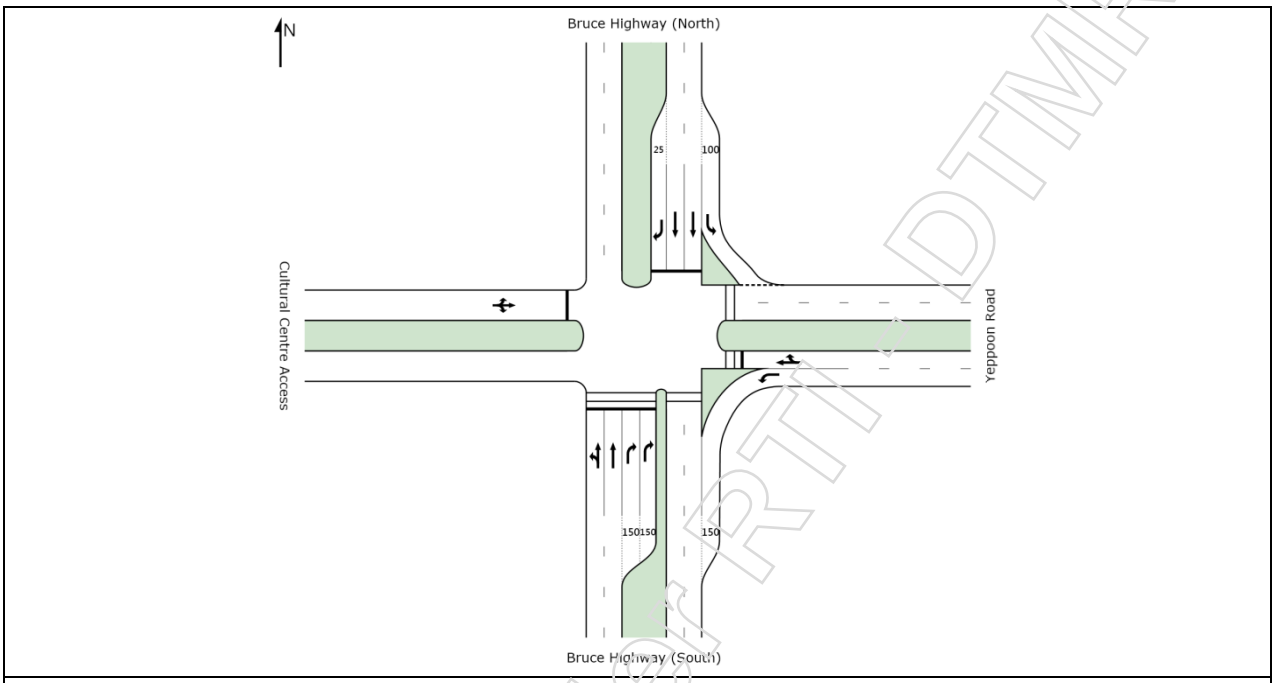

Figure 5.4.1.5d: Upgraded (Second Iteration) Intersection Configuration - Bruce Highway / Yeppoon Road Intersection

These alterations to the intersection configuration also led to minor modifications to the movement restrictions during each phase of the signal cycle, primarily concerning the left turn from the northern approach, as shown in the signal phasing summary shown in **Figure 5.4.1.5e** below.

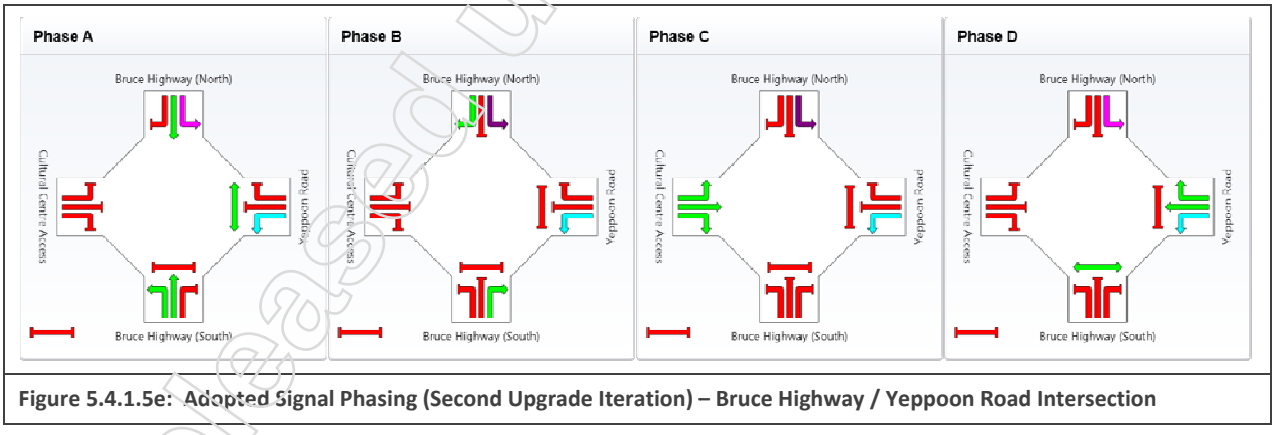

Figure 5.4.1.5e: Adopted Signal Phasing (Second Upgrade Iteration) – Bruce Highway / Yeppoon Road Intersection

The results of the analysis detailing the predicted operation of the second iteration of proposed upgrades to the Bruce Highway / Yeppoon Road intersection for the forecast pre development traffic conditions are attached as **Appendix N.** A summary of these results is provided in **Table 5.4.1.5c** below.

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Table 5.4.1.5c: Summary of SIDRA Analysis Results – Bruce Highway / Yeppoon Road Intersection
Pre Development Scenarios – Proposed Upgraded (Second Iteration) Signalised Intersection Configuration

Intersection	Intersection Control	Year	Peak Hour	DOS %
Bruce Highway / Yeppoon Road	Four-Way Signalised	2025	AM	66.6
			PM	77.5
		2035	AM	75.6
			PM	81.2

From the results above it can be seen that the proposed upgraded Bruce Highway / Yeppoon Road intersection is expected to operate satisfactorily during the analysed pre development scenarios, with all calculated values for intersection Degree of Saturation (DOS) within the acceptable limits of operation (90%) for signalised intersections.

The results also demonstrate that the proposed upgraded layout (second iteration) identified above could be considered to represent the minimum infrastructure provision requirements at the intersection to cater for the pre development traffic from 2025 onwards, and that the provision of these upgrades will be required regardless development of the Stockland North Parkhurst site.

The operation of the proposed upgraded configuration of the Bruce Highway / Yeppoon Road intersection was then analysed for the forecast post development scenarios. The results of this analysis are attached as **Appendix N** and summary of these results is provided in **Table 5.4.1.5d** below.

Table 5.4.1.5d: Summary of SIDRA Analysis Results – Bruce Highway / Yeppoon Road Intersection
Post Development Scenarios – Proposed Upgraded (Second Iteration) Signalised Intersection Configuration

Intersection	Intersection Control	Year	Peak Hour	DOS %
Bruce Highway / Yeppoon Road	Four-Way Signalised	2025	AM	98.6
			PM	105.7
		2035	AM	104.3
			PM	114.7

From the results above it can be seen that the geometry shown in **Figure 5.4.1.5d** is not expected to operate satisfactorily during the analysed post development scenarios, with the calculated values for intersection Degree of Saturation (DOS) outside the acceptable limits of operation (90%) for signalised intersections.

Therefore a final upgrade to the intersection has been proposed to improve the intersection operation under the forecast post development traffic conditions. As shown in **Figure 5.4.1.5f** below, this proposed upgrade provides an additional auxiliary through lane on the northern approach to the intersection and the corresponding downstream auxiliary through lane. In addition a second short right turn lane has been provided on the eastern approach to the intersection and the left turn provision on this approach has been modified from a single continuous lane to a double signalised left turn (including one short turn pocket).

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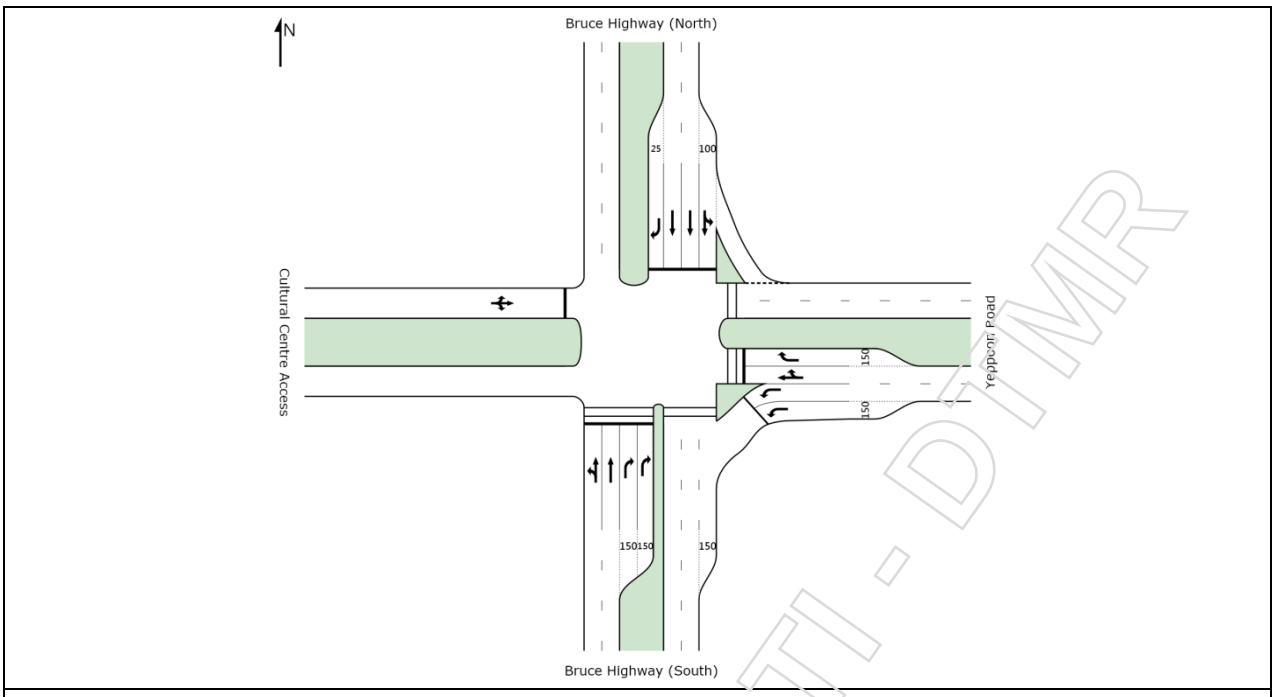

Figure 5.4.1.5f: Upgraded (Final) Intersection Configuration - Bruce Highway / Yeppoon Road Intersection

The upgrades identified above have also led to a modification to the proposed signal phasing for the intersection. As part of the analysis different signal phasings were adopted for the AM and PM peak periods as shown in **Figure 5.4.1.5g** and **Figure 5.4.1.5h** below. It is also noted that the pedestrian crossing on the southern approach to the intersection has been staged across several phases to optimise the operation of the intersection.

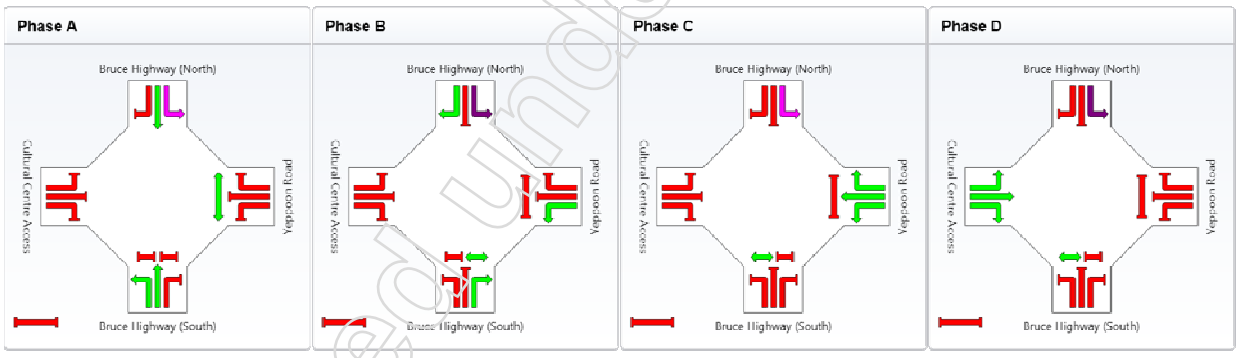

Figure 5.4.1.5g: Adopted AM Peak Signal Phasing (Final Upgrade) – Bruce Highway / Yeppoon Road Intersection

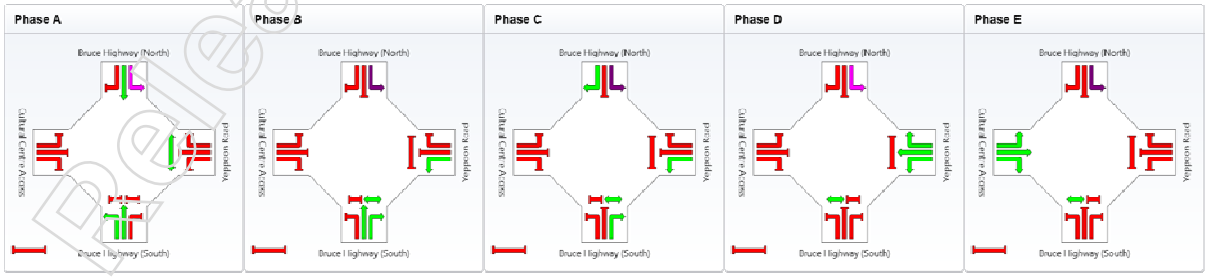

Figure 5.4.1.5h: Adopted PM Peak Signal Phasing (Final Upgrade) – Bruce Highway / Yeppoon Road Intersection

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The results of the analysis detailing the predicted operation of the proposed upgraded Bruce Highway / Yeppoon Road intersection for the forecast post development traffic conditions are attached as **Appendix N.** A summary of these results is provided in **Table 5.4.1.5e** below.

Table 5.4.1.5e: Summary of SIDRA Analysis Results – Bruce Highway / Yeppoon Road Intersection Post Development Scenarios – Proposed Upgraded (Final) Signalised Intersection Configuration

Intersection	Intersection Control	Year	Peak Hour	DOS %
Bruce Highway / Yeppoon Road	Four-Way Signalised	2025	AM	**78.9**
			PM	**83.9**
		2035	AM	**82.5**
			PM	**86.9**

From the results above it can be seen that the proposed upgraded Bruce Highway / Yeppoon Road intersection is expected to operate satisfactorily during the analysed post development scenarios, with all calculated values for intersection Degree of Saturation (DOS) within the acceptable limits of operation (90%) for signalised intersections.

5.4.2 Local Government Controlled Road Network Analysis

An investigation into the impacts of the proposed development on the local government controlled road network has also been completed, with analysis being undertaken on several key intersections on both the existing external and proposed internal road networks, in accordance with the request from Rockhampton Regional Council. These key intersections include:

- William Palfrey Road / McLaughlin Street;
- Alexandra Road / Belmont Road / Birkbeck Drive; and
- Proposed internal signalised intersection at junction of Access Arterial (Olive Street), the East-West Sub Arterial and Southern Sub Arterial (William Palfrey Realignment).

To assist with the assessment of the intersections identified above and to inform the internal road hierarchy of the development, a full internal road network model has been constructed assuming the full build-out scenario of both Edenbrook and the proposed North Parkhurst site. Further information regarding the completed analysis for each intersection can be seen in the following sections and a diagram summarising the calculated daily traffic volumes on the identified higher order road links within the site has been included for reference as **Appendix O**.

5.4.2.1 William Palfrey Road / McLaughlin Street

Using the road link volumes forecast using the internal road network model, the expected daily traffic volumes at the proposed William Palfrey Road / McLaughlin Street intersection were identified as shown in **Figure 5.4.2.1a** below. It is noted that this intersection is also assumed to be the access point for the Edenbrook development to the external road network via McLaughlin Street, and as such the assumed traffic volumes generated by this development have also been included within the analysis.

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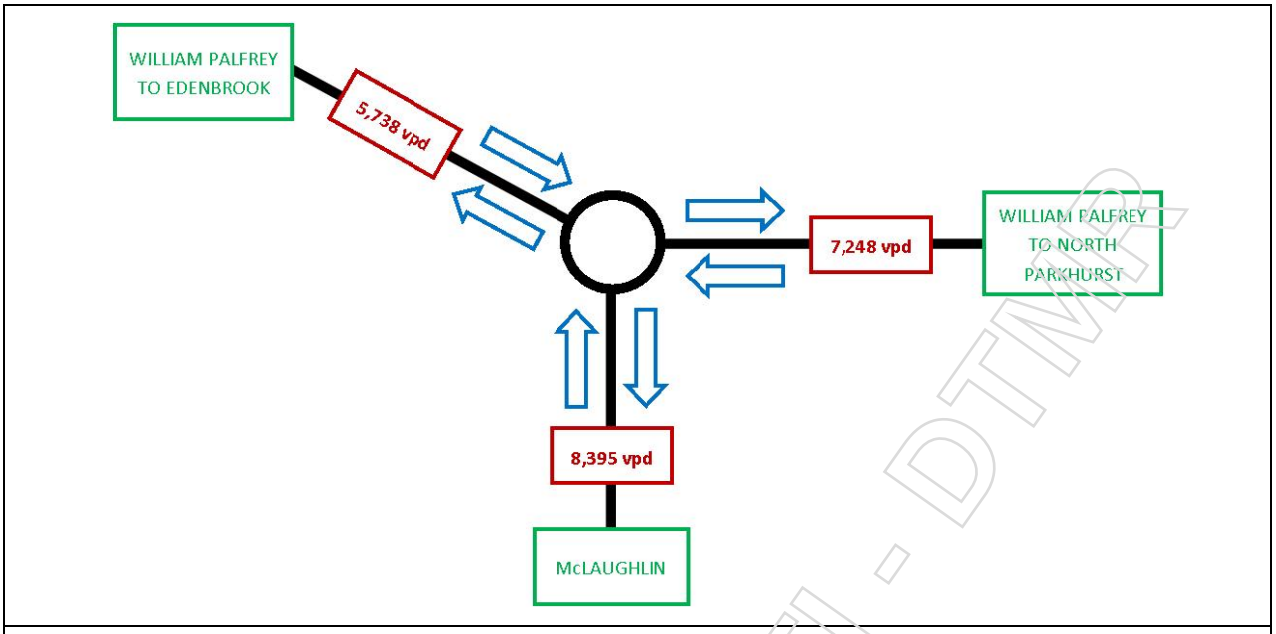

Figure 5.4.2.1a: Forecast Daily Traffic Volumes – William Palfrey Road / McLaughlin Street Intersection

Adopting the development traffic distribution assumptions as previously identified in **Table 5.1b**, the forecast daily traffic volumes were used to establish an estimate of the likely hourly volumes at the intersection, with the resultant AM and PM peak volumes summarised in **Figure 5.4.2.1b** and **Figure 5.4.2.1c** below. It is also noted that a heavy vehicle percentage of 2% has been adopted for the purpose of the analysis.

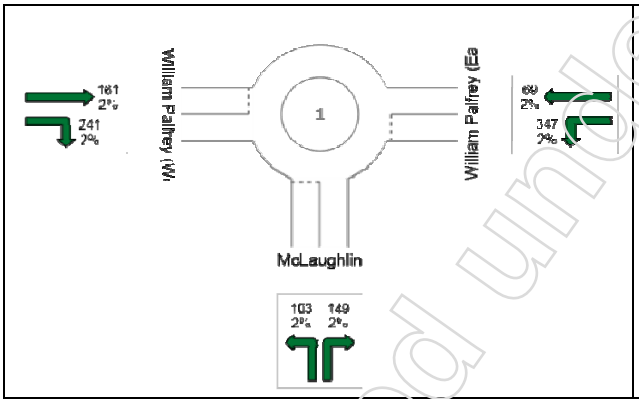

Figure 5.4.2.1b: Forecast AM Peak Traffic Volumes – William Palfrey Road / McLaughlin Street Intersection

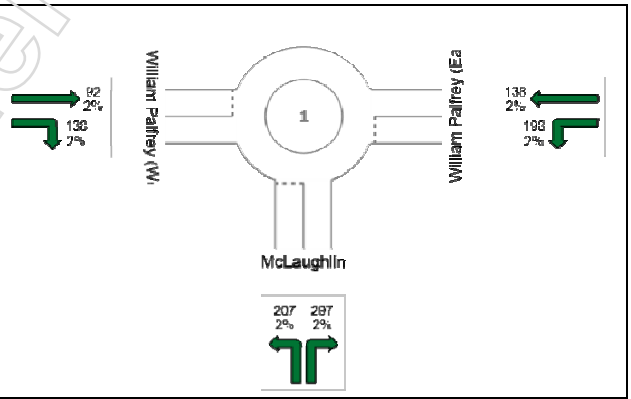

Figure 5.4.2.1c: Forecast PM Peak Traffic Volumes – William Palfrey Road / McLaughlin Street Intersection

These forecast peak hour volumes shown above were then used to complete the analysis for the intersection. Due to the higher order road approaches to the intersection and the fact that the intersection will serve as an access point to two residential developments, a roundabout has been proposed for the configuration of the roundabout, with the geometry adopted for the analysis consistent with that required to accommodate 19m Articulated vehicle movements (if required).

It is also noted that due to the assumed timings of both the proposed development and the adjacent Edenbrook development, it is not expected that traffic from North Parkhurst would utilise this intersection until the later stages of the project, and therefore it has been assumed this intersection (at least the relevant parts) would have been constructed as part of the external works required for the Edenbrook development. A diagram indicating the proposed configuration of the intersection adopted for the analysis is in **Figure 5.4.2.1d** below.

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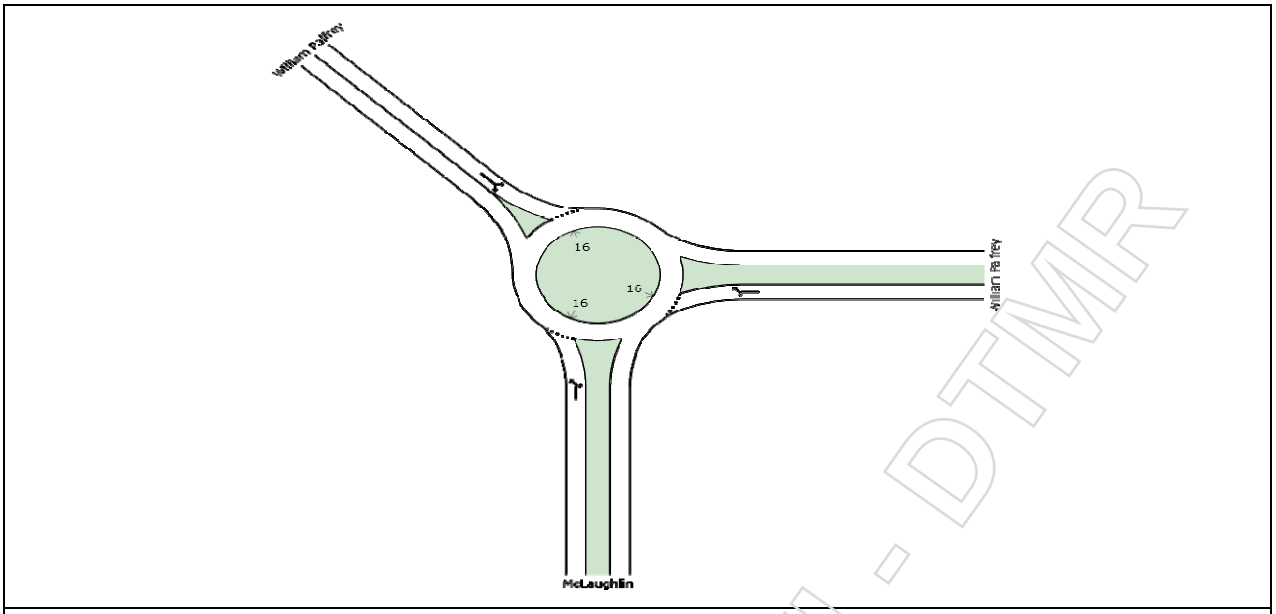

Figure 5.4.2.1d: Proposed Intersection Configuration – William Palfrey Road / McLaughlin Street

The results of the analysis detailing the predicted operation of the proposed William Palfrey Road / McLaughlin Street intersection for the forecast full build-out traffic conditions are attached as **Appendix P.** A summary of these results is provided in **Table 5.4.2.1a** below.

Table 5.4.2.1a: Summary of SIDRA Analysis Results – William Palfrey Road / McLaughlin Street Intersection
Post Development Scenarios – Full Build-out Proposed Roundabout Intersection Configuration

Intersection	Intersection Control	Scenario	Peak Hour	DOS %
William Palfrey Road / McLaughlin Street	Three-Way Roundabout	Full Build-out	AM	**36.6**
			PM	**39.0**

From the results above it can be seen that the proposed roundabout configuration of the William Palfrey Road / McLaughlin Street intersection is expected to operate satisfactorily for both the AM and PM peaks assuming the full build-out development scenario, with all calculated values for intersection Degree of Saturation (DOS) well within the acceptable limits of operation (85%) for roundabouts.

As such it can be considered that the proposed roundabout configuration of the William Palfrey Road / McLaughlin Street intersection is adequate to cater for the expected traffic volumes associated with the full build-out of the proposed North Parkhurst development.

5.4.2.2 Proposed Internal Signals

As part of the internal road network it has been identified that the intersection of the arterial access road (Olive Street West), the main east-west collector and the realignment of William Palfrey Road is to be controlled by a signalised intersection, with the proposed location of the signals shown in **Figure 5.2.4.2a** below.

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Figure 5.4.2.2a: Proposed Location of Internal Signalised Intersection

Using the road link volumes forecast within the internal road network model, the expected daily traffic volumes at the proposed internal signals were identified as shown in **Figure 5.4.2.2b** below.

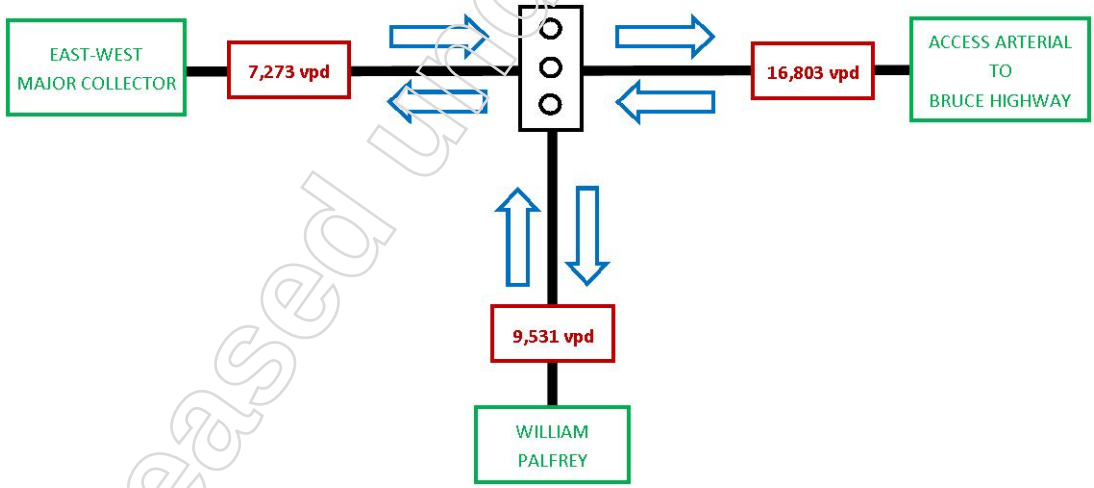

Figure 5.4.2.2b: Forecast Daily Traffic Volumes – Internal Signals

Adopting the development traffic distribution assumptions as previously identified in **Table 5.1b**, the forecast daily traffic volumes were used to establish an estimate of the likely hourly volumes at the intersection, with the resultant AM and PM peak volumes summarised in **Figure 5.4.2.2c** and **Figure 5.4.2.2d** below. It is also noted that a heavy vehicle percentage of 2% was again adopted for the purpose of the analysis.

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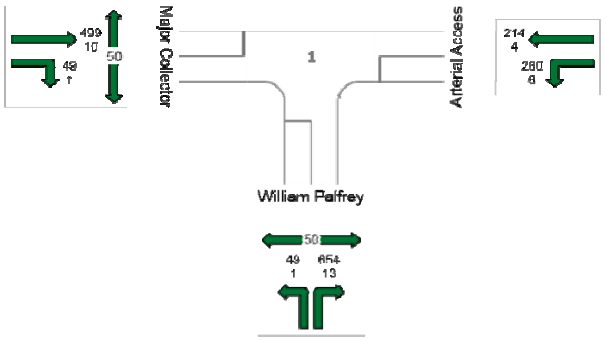

Figure 5.4.2.2c: Forecast AM Peak Traffic Volumes – Internal Signals

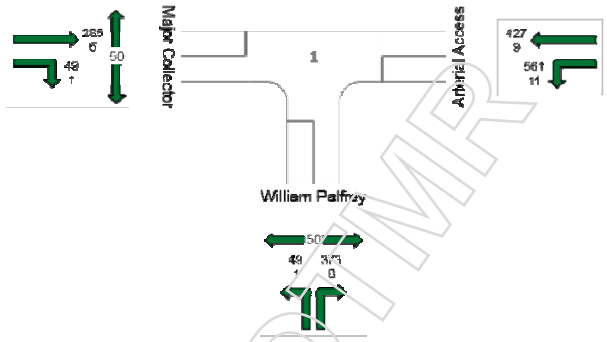

Figure 5.4.2.2d: Forecast PM Peak Traffic Volumes – Internal Signals

These forecast peak hour volumes as shown above were then used to complete the analysis for the intersection, with a diagram of the proposed configuration of the intersection shown in **Figure 5.4.2.2e** below.

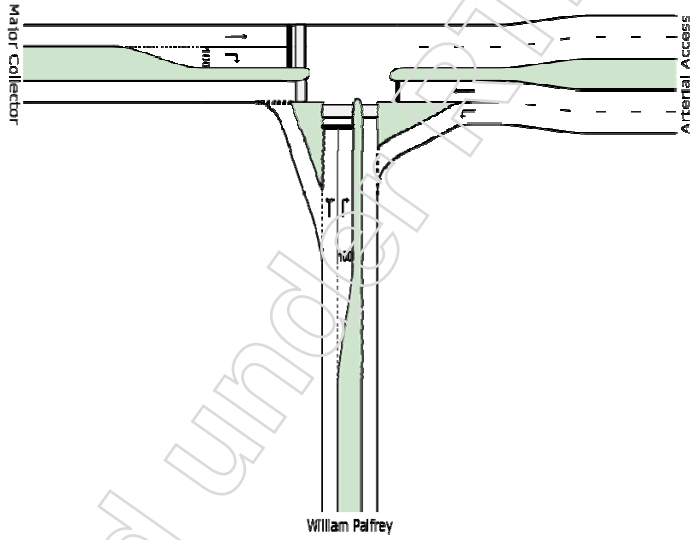

Figure 5.4.2.2e: Proposed Intersection Configuration – Internal Signals

A standard three (3) phase signal configuration with pedestrian crossings on the southern and western approaches was adopted for the purpose of the intersection analysis. A generalised summary of the adopted signal phasing is shown in **Figure 5.4.2.2f** below.

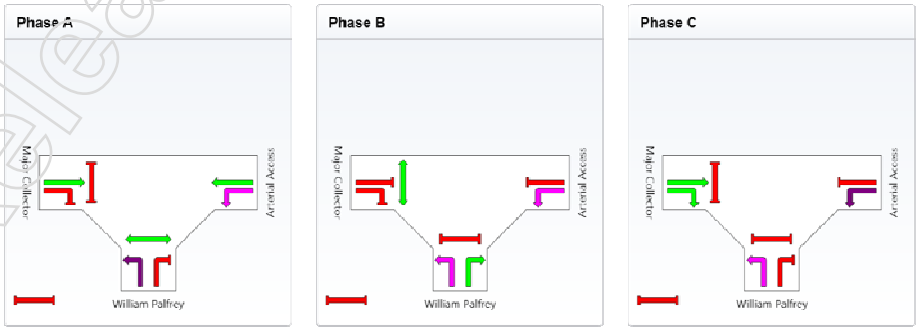

Figure 5.4.2.2f: Adopted Signal Phasing – Proposed Internal Signals

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The results of the analysis detailing the predicted operation of the proposed internal signals for the forecast full build-out traffic conditions are attached as **Appendix R.** A summary of these results is provided in **Table 5.4.2.2a** below.

Table 5.4.2.2a: Summary of SIDRA Analysis Results – Proposed Internal Signals
Post Development Scenarios – Full Build-out Proposed Internal Signals

Intersection	Intersection Control	Scenario	Peak Hour	DOS %
Internal Signals	Signalised Three Way	Full Build-out	AM	66.5
			PM	67.2

From the results above it can be seen that the proposed configuration of the internal signalised intersection is expected to operate satisfactorily for both the AM and PM peaks assuming the full build-out development scenario, with all calculated values for intersection Degree of Saturation (DOS) within the acceptable limits of operation (90%) for signalised intersections.

As such it can be considered that the proposed configuration of the internal signals is adequate to cater for the expected traffic volumes associated with the full build-out of the proposed North Parkhurst development.

5.4.2.3 Alexandra Road / Belmont Road / Birkbeck Drive

The final intersection that Council has been requested to be analysed is the existing intersection of Alexandra Road, Belmont Road and Birkbeck Drive. As this is an existing intersection that currently forms part of the Council controlled road network, the investigation will include analysis of both the forecast pre development and post development traffic conditions to determine the impacts of the proposed North Parkhurst on the operation of the intersection, as described in the following sections.

5.4.2.3.1 *Pre Development Traffic Conditions*

To determine the background traffic at the Alexandra Road / Belmont Road / Birkbeck Drive intersection a manual traffic count was undertaken on 28 May 2013, with the raw count data included as **Appendix S**. From the count data the AM peak was established as 7:30-8:30am and a PM peak from 4:30-5:30pm. The recorded turning movement volumes at the intersection for these peak periods are summarised in **Figure 5.4.2.3a** and **Figure 5.4.2.3b** below.

It is also noted that due to the fact that the Belmont Road – Alexandra Road corridor does not provide a direct through connection to the north, and is essentially a closed catchment, it is not expected that any background traffic growth will occur, and that the only increases in traffic volumes will be as a direct result of future developments. As such the current volumes at the intersection are considered appropriate to forecast the future background traffic volumes under the full build-out scenario for the North Parkhurst development.

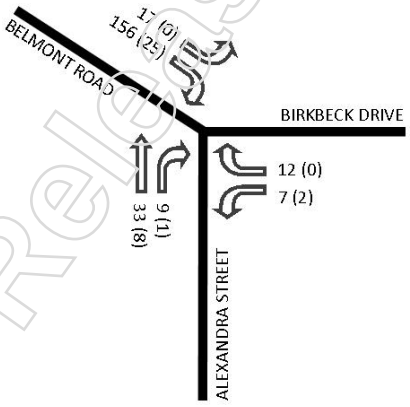

Figure 5.4.2.3a: AM Peak Background Volume (2013)

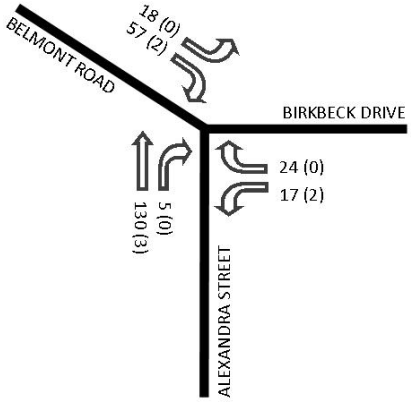

Figure 5.4.2.3B: PM Peak Background Volume (2013)

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Then to establish the pre development traffic volumes at the intersection, the expected traffic volumes from the approved development in the area was added to the current volumes recorded at the intersection. From discussions with Council the approved development in the area was identified to be Edenbrook and Stages 5-8 of Riverside Estate (noting that traffic from Stages 1-4 are assumed to be included in current volumes).

It is understood that Stages 5-8 of Riverside Estate will yield 84 standard residential lots, and using a standard generation rate, a 100% distribution to/from Alexandra Road to the south and the standard AM and PM inbound/outbound traffic splits identified in **Table 5.1b** above, the peak hour traffic volumes at the Alexandra Road / Belmont Road / Birkbeck Drive intersection generated by Stages 5-8 were forecast, as shown in **Figure 5.4.2.3c** below.

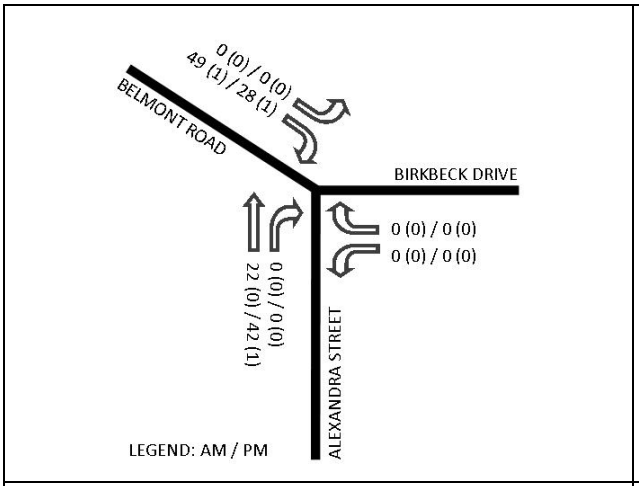

Figure 5.4.2.3c: Forecast Peak Hour Development Volumes (Stages 5-8 Riverside Estate)
Alexandra Road / Belmont Road / Birkbeck Drive

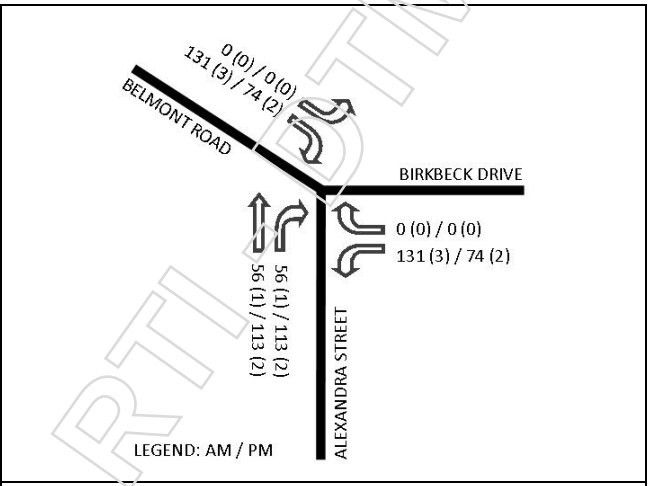

Figure 5.4.2.3d: Forecast Peak Hour Development Volumes (Edenbrook)
Alexandra Road / Belmont Road / Birkbeck Drive

Similarly the traffic volumes generated at the Alexandra Road / Belmont Road / Birkbeck Drive intersection by the approved Edenbrook development were also forecast, as shown in **Figure 5.4.2.3d** above. These volumes were calculated by applying the general development traffic distributions identified within the Arup *Traffic Impact Study* (February 2009), with approximately 25% of the traffic from the Edenbrook development assumed to utilised both the Belmont Road and Birkbeck Drive approaches to the intersection. It is also noted that a heavy vehicle percentage of 2% has been adopted for each of the development traffic volumes identified in the analysis.

As identified above, the pre development traffic volumes were established by adding the calculated approved development traffic volumes to those recorded during the background traffic count, with the resultant pre development AM and PM peak volumes summarised in **Figure 5.4.2.3e** and **Figure 5.4.2.3f** below

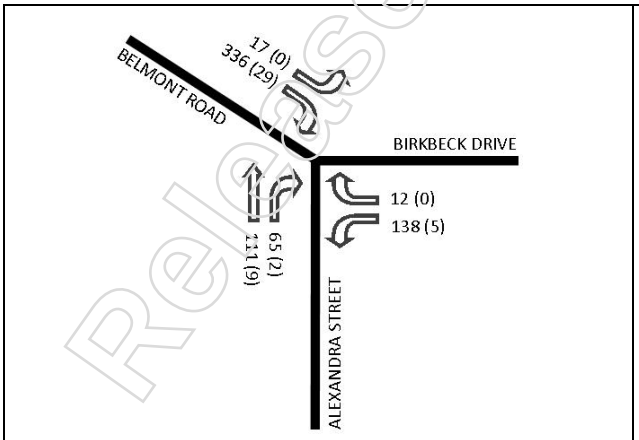

Figure 5.4.2.3e: Pre Development Volumes (AM Peak)
Alexandra Road / Belmont Road / Birkbeck Drive

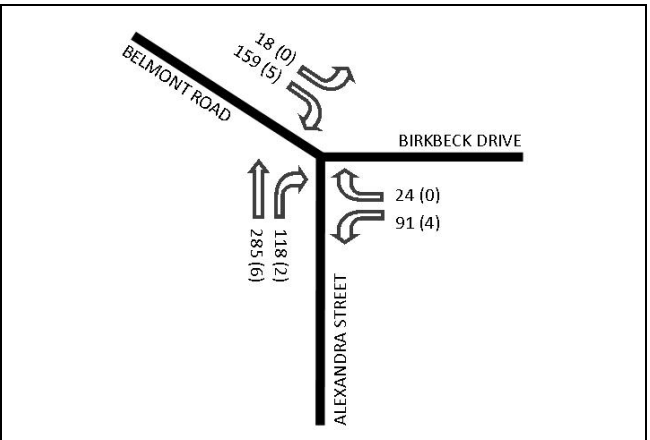

Figure 5.4.2.3f: Pre Development Volumes (PM Peak)
Alexandra Road / Belmont Road / Birkbeck Drive

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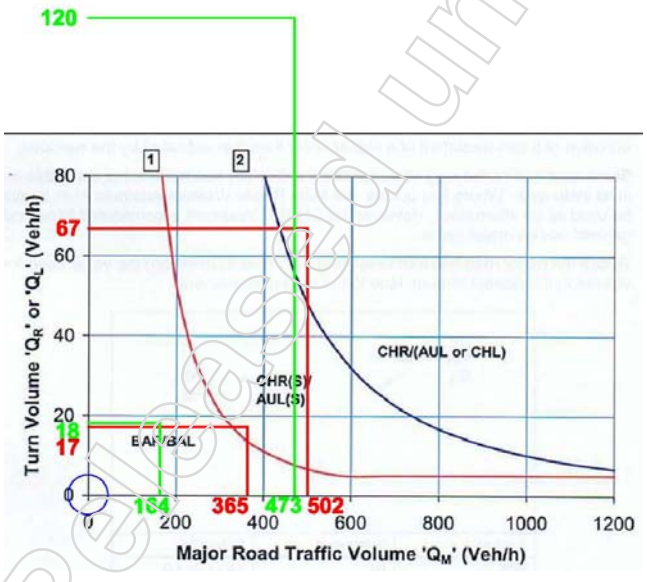
As shown in **Figure 5.4.2.3g** below, the existing configuration of the intersection operates as a three way priority controlled junction with the Alexandra Street – Belmont Road legs maintaining priority as the major legs of the intersection, with the Birkbeck Drive approach giving way. All approaches to the intersection currently operate as two way two lane roads and it is noted that neither of the priority approaches provide designated auxiliary turn lanes for movements into Birkbeck Drive.



Figure 5.4.2.3g: Existing Intersection Configuration
Alexandra Street / Belmont Road / Birkbeck Drive

As such, a turn warrants assessment has been undertaken for the forecast pre development traffic volumes at the Alexandra Street / Belmont Road / Birkbeck Drive intersection, with the resultant graph shown in **Figure 5.4.2.3h** below.



LEGEND: AM / PM

Figure 5.4.2.3h: Turn Warrants Assessment (Austroads) – Pre Development
Alexandra Street / Belmont Road / Birkbeck Drive

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Based on the figure above it can be seen that the current configuration of the Alexandra Street / Belmont Road / Birkbeck Drive intersection should be upgraded to provide a full CHR treatment for the right turn into Birkbeck Drive from Alexandra Street and an AUL(s) treatment for the left turn into Birkbeck Drive from Belmont Drive, to cater for the expected pre development traffic volumes at the intersection.

It is noted that as this upgrade/provision of auxiliary lanes has been identified to be required for the forecast pre development traffic volumes at the intersection, it can be concluded that these upgrades will be required regardless of the inclusion of the traffic from the North Parkhurst site, and as such cannot reasonably be attributed to the proposed development.

5.4.2.3.2 Development Traffic Volumes

Based on the assumption that 30% of the overall North Parkhurst development would access the Alexandra Street corridor via its intersection with Birkbeck Drive, and using the traffic distribution assumptions previously identified in **Table 5.1b**, the expected peak hour development traffic volumes at the Alexandra Street / Belmont Road / Birkbeck Drive intersection were calculated, as shown in **Figure 5.4.2.3i** and **Figure 5.4.2.3j** below.

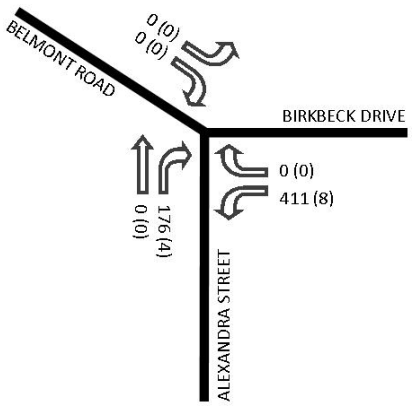

Figure 5.4.2.3i: AM Peak Hour Development Volumes (North Parkhurst)
Alexandra Road / Belmont Road / Birkbeck Drive

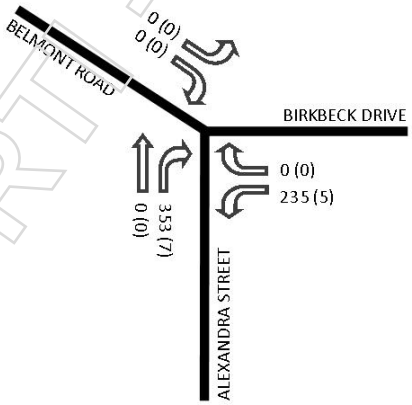

Figure 5.4.2.3j: PM Peak Hour Development Volumes (North Parkhurst)
Alexandra Road / Belmont Road / Birkbeck Drive

5.4.2.3.3 Post Development Traffic Conditions

Using the volumes predicted to be generated by the proposed North Parkhurst development and the forecast pre development traffic volumes, the post development traffic conditions at the Alexandra Street / Belmont Road / Birkbeck Drive intersection was analysed. The analysis was completed using SIDRA 5.1 software and was undertaken for both the AM and PM peak periods for the full build-out design scenario for the development. The resultant AM and PM peak post development traffic volumes at the intersection are summarised in **Figure 5.4.2.3k** and **Figure 5.4.2.3l** below.

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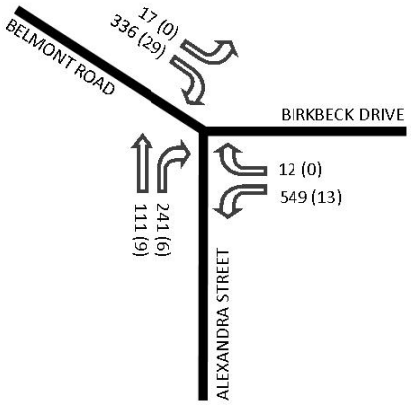

Figure 5.4.2.3k: Post Development Volumes (AM Peak) Alexandra Road / Belmont Road / Birkbeck Drive

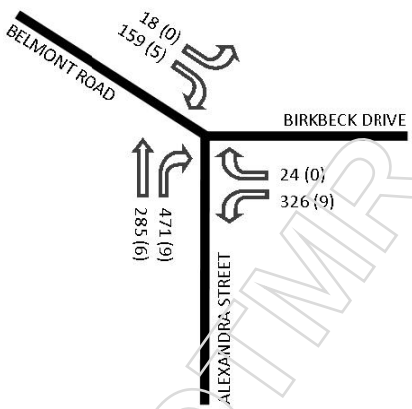

Figure 5.4.2.3l: Post Development Volumes (PM Peak) Alexandra Road / Belmont Road / Birkbeck Drive

As identified above, the upgrade of the current intersection configuration to provide designated auxiliary lanes for both the right and left turns into Birkbeck Drive are required to accommodate the pre development traffic volumes. As such it has been assumed that these upgrade works have been completed prior to the inclusion of traffic from North Parkhurst, with a diagram indicating the proposed configuration of the intersection adopted for the analysis is in **Figure 5.4.2.1m** below.

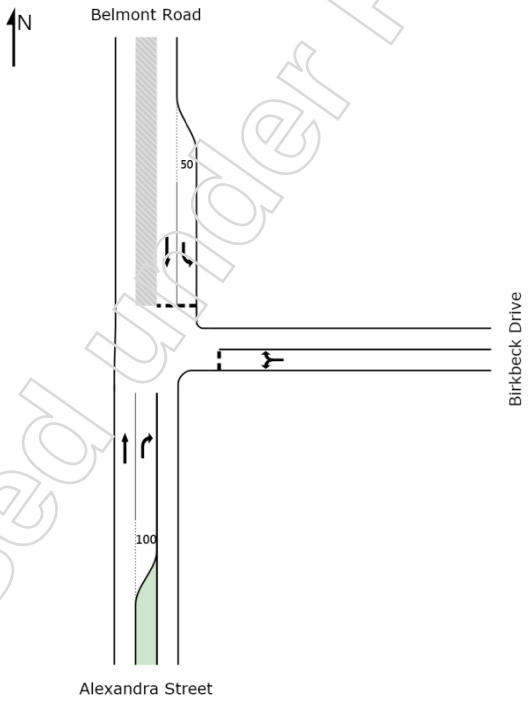

Figure 5.4.2.1m: Proposed Upgraded Intersection Configuration – Alexandra Street / Belmont Road / Birkbeck Drive

The results of the analysis detailing the predicted operation of the upgraded Alexandra Street / Belmont Road / Birkbeck Drive intersection for the forecast full build-out (post development) traffic conditions are attached as **Appendix T**. A summary of these results is provided in **Table 5.4.2.3a** below.

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Table 5.4.2.3a: Summary of SIDRA Analysis Results – Alexandra Street / Belmont Road / Birkbeck Drive Post Development Scenarios – Full Build-out

Intersection	Intersection Control	Scenario	Peak Hour	DOS %
Alexandra Street / Belmont Road / Birkbeck Drive	Three-Way Priority Controlled	Full Build-out	AM	33.3
			PM	28.7

From the results above it can be seen that the proposed upgraded configuration of the Alexandra Street / Belmont Road / Birkbeck Drive intersection is expected to operate satisfactorily for both the AM and PM peaks assuming the full build-out development scenario, with all calculated values for intersection Degree of Saturation (DOS) within the acceptable limits of operation (80%) for priority controlled intersections. As such it can be considered that the proposed upgraded configuration of the intersection (upgrade works to be completed by others) is adequate to cater for the expected traffic volumes associated with the full build-out of the proposed North Parkhurst development.

5.4.2.4 Balance of Local Government Road Network

In addition to the investigation into the impacts of the proposed development on the key intersections listed above, a high level assessment of the expected traffic impacts of the North Parkhurst site on the balance of the Council controlled road network was also completed, as described below.

Section 5.1 of this report describes how the proposed development of both the North Parkhurst and adjacent Edenbrook sites is consistent with the development scenario identified in the Parkhurst Accelerated Growth (PAG) scenario assessed in the *Rockhampton Traffic Study 2008 (RTS)*. Furthermore it demonstrated that the assumed ultimate development yield (2,350 lots) and the traffic distribution assumptions (70% to Bruce Highway / 30% to Alexandra Street) adopted as part of this analysis were generally consistent with those identified within the traffic network model which underpinned the RTS.

Therefore to simplify the analysis of the impacts of the proposed development on the local government road network and to avoid the duplication of the assessment already completed during the RTS (2008), it is proposed that the additional road network upgrade works attributed to the PAG scenario (above those identified in the City Plan scenario within the RTS) be adopted as the transport infrastructure requirements of the North Parkhurst and Edenbrook developments combined.

Furthermore, Council's *Adopted Infrastructure Charges Resolution No. 2 (2012)* subsequently detailed the transport infrastructure that has been attributed to the future development parcels identified within the designated Priority Infrastructure Area (PIA). Whilst the whole Edenbrook site was shown to be within the boundaries of the PIA only the easternmost portion of the North Parkhurst site was included, the yield of which is understood to be approximately 500 lots.

As the transport infrastructure works identified in the resolution are understood to be solely provided by the infrastructure charges applied to future development located within the PIA, it can reasonably be assumed the only contribution of the North Parkhurst site to the delivery of the transport infrastructure listed in Council's *Adopted Infrastructure Charges Resolution No. 2 (2012)* would be via the relevant transport infrastructure charges collected from the portion of the development (approximately 500 lots) within the PIA.

Using the information above, the conclusion can therefore be drawn that the transport infrastructure requirements of the portion of the North Parkhurst site outside the PIA would equate to the infrastructure upgrade works identified within the analysis of the PAG scenario in the *Rockhampton Traffic Study*, but not listed in Council's *Adopted Infrastructure Charges Resolution No. 2 (2012).*

Furthermore it is understood that the one of these items, the construction of the Alexandra Street extension to William Palfrey Road (McLaughlin Street realignment), has been conditioned on the adjacent Edenbrook development as part of a previous Infrastructre Agreement. As such its construction should not be attributable to the proposed Stockland North Parkhurst development.

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In addition, the proposed plan of development identifies William Palfrey Road as a high order Urban Arterial Road / Urban Sub Arterial Road. Once connected to the west via McLaughlin Street, this road will connect the Alexandra Street and Bruce Highway corridors, providing a direct east-west connection for development west of the highway.

As this connection will service a catchment which extends well beyond the North Parkhurst site it can reasonable be considered that the upgrade of William Palfrey Road to the identified Urban Arterial Road / Urban Sub Arterial Road standard should be classified as trunk infrastructure works. As a consequence, any physical works carried out by Stockland to deliver the arterial road should be creditable against the infrastructure charges paid by the applicant.

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6.0 Conclusion and Recommendations

The proposed development site has been identified for several years as an area for future residential development growth, by both Council and Main Roads. This can be seen by its inclusion in such planning documents as

- Council's Parkhurst and Yeppoon Road Corridor Structure Plan (GHD 2007);
- Rockhampton Traffic Study (Arup 2008);
- RRC Priority Infrastructure Plan Planning Assumptions Report (GHD 2011), and
- TMR's draft Parkhurst Forward Planning Traffic Analysis Study (2010).

All of these planning documents envisaged a large residential development (i.e. > 2,000 lots) with the primary access from the Bruce Highway and secondary access via McLaughlin Street and the Alexandra Street corridor. Common to each study was an Urban Arterial Road providing connectivity between the Bruce Highway and the planned residential catchments to the west of the Highway. Several of these planning documents identify this proposed Urban Arterial Road joining the Bruce Highway at Olive Street, creating a fourth (western) leg to the existing intersection. It was also identified that this intersection would require signalisation and would incorporate an at-grade crossing of the adjacent rail corridor on the proposed development access road approach to the intersection.

The masterplan that has been submitted as part of the application for preliminary approval is consistent with the above planning intent.

6.1 Rail Crossing, Internal Road Network and Staging

A series of meetings have been held with Queensland Rail and other stakeholders wherein an assessment of the proposed at grade rail crossing has been carried out. This report provides detail on the proposed co-ordination of the traffic signals at the proposed Olive Street intersection with the rail signals at the relocated at grade crossing to enable the proposed rail crossing to operate in a safe and efficient manner.

The internal road network has been developed generally in accordance with Rockhampton City Council's Planning Policy No. 13 *Road Hierarchy* and the Capricorn Municipal Development Guidelines (CMDG). The road layout seeks to achieve a safe, efficient and convenient road system. Some minor amendments are proposed to the standard cross sections to address site specific aspects (e.g. roads adjacent to the esplanade and roads split by drainage corridors). We are also seeking to activate the major collector streets by providing direct property access which aligns with current industry standards.

The applicant intends staging the development from east to west. Access to the development under the early stages will be via the Bruce Highway only. This will require the construction of traffic signals at the Bruce Highway / Olive Street intersection and a part of the urban arterial road (2 lanes initially). It will not be until the later stages of the development that the western part of the site will be developed and connection provided to McLaughlin Street. The transport infrastructure will be delivered based on trigger volumes. This report provides detail on the trigger volumes and staging which can be summarised as follows:

	Stage 1	Trigger 1	Trigger 2	Trigger 3
Number detached dwellings	**1**	**1,275**	**1,450**	**1,900**
Interim Traffic Signals Bruce Hwy / Olive Street. Construct at-grade rail crossing 2-lane	✓			
Upgrade Bruce Hwy / Olive Street traffic signals to ultimate geometry. Duplicate the at grade crossing of the rail corridor (i.e. 4-lanes)		✓		
Upgrade the north-eastern part of the Urban Arterial to 4-lanes			✓	
Provide a secondary point of access to the site via McLaughlin Street. This will be achieved by constructing the balance of the Urban Arterial / Urban Sub Arterial Road (William Palfrey Road).				✓

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6.2 Traffic Impact

Analysis was completed to determine the impact of the proposed master planned community on both the state and local government controlled external road networks. The investigation into the operation of the state controlled road network focused on the impact on the relevant section of the Parkhurst Bruce Highway corridor, including the major intersections, whilst the assessment of the impact on the local government controlled network focused on the impact on the Alexandra Street corridor, as well as a number of key intersections identified by Council.

An investigation into the impacts of the proposed development on the relevant section of the Bruce Highway (Yeppoon Road to Olive Street) including an assessment of the expected mid-block volumes and the operation of the major intersections of Olive Street, Boundary Road (East), Boundary Road (West) and Yeppoon Road. For the purpose of this analysis it has been assumed that full build-out of proposed master planned community development would occur by 2025, with a 10 year design horizon for the development of 2035.

From the analysis in to the mid-block volumes on the each relevant section of the Bruce Highway between Yeppoon Road and Olive Street it was identified that expected pre development daily volumes exceeded the TMR specified trigger volume of 15,000 vehicles per day in 2013. As such it is considered that the requirement to upgrade of the Highway from two to four lanes, including the provision of additional through lanes at existing intersections is an existing deficiency and would be required regardless of the development of the proposed Stockland North Parkhurst site. Therefore it would be unreasonable to attribute the upgrade of the Bruce Highway (Yeppoon Road to Olive Street) from two lanes to four to the proposed Stockland North Parkhurst development.

Analysis of the Bruce Highway / Olive Street intersection identified that the ultimate intersection configuration required the provision of a four lane cross section for the Highway which was identified to be required regardless of the development due to the forecast pre development mid-block volumes exceeding 15,000 vehicles per day. This existing deficiency triggers the need for TMR to four-lane the Bruce Highway between Yeppoon Road and Olive Street, which would include the southern approach to this intersection.

As a consequence, it is considered unreasonable to attribute the full upgrade of the Bruce Highway / Olive Street intersection (as shown in the figure above) to the Stockland North Parkhurst development.

Analysis of the Bruce Highway / Boundary Road (East) intersection identified that the ultimate intersection configuration requires the provision of a four lane cross section for the Highway which was identified to be required regardless of the development due to the forecast pre development mid-block volumes exceeding 15,000 vehicles per da. This exising deficiency triggers the need for DTMR to four-lane the Bruce Highway between Yeppoon Road and Olive Street, which would include the both the northern and southern approaches to the Bruce Highway / Boundary Road (East) intersection.

Analysis of the Bruce Highway / Boundary Road (West) intersection identified that the ultimate intersection configuration requires signalisation of the existing intersection and the provision of a four lane cross section for the Highway, which as identified in Section 5.4.1.1 is needed regardless of the development due to the forecast pre development mid-block volumes exceeding 15,000 vehicles per day. This existing deficiency triggers the requirement for TMR to four-lane the Bruce Highway between Yeppoon Road and Olive Street, which would include the both the northern and southern approaches to the Bruce Highway / Boundary Road (West) intersection.

Analysis of the Bruce Highway / Yeppoon Road intersection identified that major upgrades from the existing intersection configuration would have been required before the assumed year of completion (2025) for the proposed development regardless of the addition of traffic generated by the Stockland site. Therefore it is considered unreasonable to attribute the full upgrade of the Bruce Highway / Yeppoon Road intersection to the proposed Stockland North Parkhurst development.

Notwithstanding this, it is acknowledged that the inclusion of traffic from the proposed development site will require additional upgrades over and above those required to address deficiencies unrelated to Stockland. As such, a contribution towards the cost of the upgrade of the intersection based on the provision of attributable infrastructure is deemed appropriate.

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The investigation into the impacts of the proposed development on the relevant local government controlled road network included an assessment of several key intersections on both the existing external (Alexandra Street / Belmont Road / Birkbeck Drive) and proposed internal road networks (William Palfrey Road / McLaughlin Street and the proposed internal signals), in accordance with the request from Rockhampton Regional Council, as well a high level assessment of the expected traffic impacts of the North Parkhurst site on the balance of the Council controlled road network.

The analysis of the Alexandra Street / Belmont Road / Birkbeck Drive intersection identified that upgrade works including the provision of a CHR right turn treatment on the Alexandra Street approach, and an AUL(s) left turn treatment on the Belmont Road approach was required to accommodate the forecast pre development traffic volumes. It was then demonstrated that once upgraded, the intersection would be adequate to cater for the expected post development traffic conditions for the full build-out of the North Parkhurst site. As the need to upgrade the intersection was identified to be required regardless of the addition of traffic from the North Parkhurst site, it can be considered an existing deficiency in the road network and cannot be reasonable be attributed to the proposed development.

The analysis of the William Palfrey / McLaughlin Street intersection identified that the proposed roundabout configuration of the William Palfrey Road / McLaughlin Street intersection was expected to operate satisfactorily for both the AM and PM peaks assuming the full build-out development scenario, and as such is adequate to cater for the expected traffic volumes associated with the full build-out of the proposed North Parkhurst development. It was also noted that due to the assumed timings of both the proposed development and the adjacent Edenbrook development, that it is not expected that traffic from North Parkhurst would utilise this intersection until the later stages of the project, and therefore it has been assumed this intersection (or at least the relevant parts) would have been constructed as part of the external works required for the Edenbrook development.

Similarly the analysis of the proposed internal signalised intersection identified that the proposed configuration was expected to operate within acceptable limits for both the AM and PM peaks assuming the full build-out development scenario, and as such it can be considered that the proposed configuration of the internal signals is adequate to cater for the anticipated traffic volumes associated with the full build-out of the proposed North Parkhurst development.

In addition to the investigation into the impacts of the proposed development on the key intersections listed above, a high level assessment of the expected traffic impacts of the North Parkhurst site on the balance of the Council controlled road network was also completed.

Section 5.1 of this report describes how the proposed development of both the North Parkhurst and adjacent Edenbrook sites is consistent with the development scenario identified in the Parkhurst Accelerated Growth (PAG) scenario assessed in the *Rockhampton Traffic Study 2008 (RTS)*. Furthermore it demonstrated that the assumed ultimate development yield (2,350 lots) and the traffic distribution assumptions (70% to Bruce Highway / 30% to Alexandra Street) adopted as part of this analysis were generally consistent with those identified within the traffic network model which underpinned the RTS.

Therefore to simplify the analysis of the impacts of the proposed development on the local government road network and to avoid the duplication of the assessment already completed during the RTS (2008), it is proposed that the additional road network upgrade works attributed to the PAG scenario (above those identified in the City Plan scenario within the RTS) be adopted as the transport infrastructure requirements of the North Parkhurst and Edenbrook developments combined.

Furthermore, Council's *Adopted Infrastructure Charges Resolution No. 2 (2012)* subsequently detailed the transport infrastructure that has been attributed to the future development parcels identified within the designated Priority Infrastructure Area (PIA). Whilst the whole Edenbrook site was shown to be within the boundaries of the PIA only the easternmost portion of the North Parkhurst site was included, the yield of which is understood to be approximately 500 lots.

As the transport infrastructure works identified in the resolution are understood to be solely provided by the infrastructure charges applied to future development located within the PIA, it can reasonably be assumed the only contribution of the North Parkhurst site to the delivery of the transport infrastructure listed in Council's *Adopted*

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Infrastructure Charges Resolution No. 2 (2012) would be via the relevant transport infrastructure charges collected from the portion of the development (approximately 500 lots) within the PIA.

Using the information above, the conclusion can therefore be drawn that the transport infrastructure requirements of the portion of the North Parkhurst site outside the PIA would equate to the infrastructure upgrade works identified within the analysis of the PAG scenario in the *Rockhampton Traffic Study*, but not listed in Council's *Adopted Infrastructure Charges Resolution No. 2 (2012).*

Furthermore it is understood that the one of these items, the construction of the Alexandra Street extension to William Palfrey Road (McLaughlin Street realignment), has been conditioned on the adjacent Edenbrook development as part of a previous Infrastructre Agreement. As such its construction should not be attributable to the proposed Stockland North Parkhurst development.

In addition, the proposed plan of development identifies William Palfrey Road as a high order Urban Arterial Road / Urban Sub Arterial Road. Once connected to the west via McLaughlin Street, this road will connect the Alexandra Street and Bruce Highway corridors, providing a direct east-west connection for development west of the highway.

As this connection will service a catchment which extends well beyond the North Parkhurst site it can reasonable be considered that the upgrade of William Palfrey Road to the identified Urban Arterial Road / Urban Sub Arterial Road standard should be classified as trunk infrastructure works. As a consequence, any physical works carried out by Stockland to deliver the arterial road should be creditable against the infrastructure charges paid by the applicant.

We therefore consider that the proposal is satisfactory from a traffic operations perspective, and recommend that the development application be approved from a traffic engineering viewpoint.

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APPENDIX A

Parkhurst Area Land Use Figure

Parkhurst and Yeppoon Road Corridor Structure Plan (2007)

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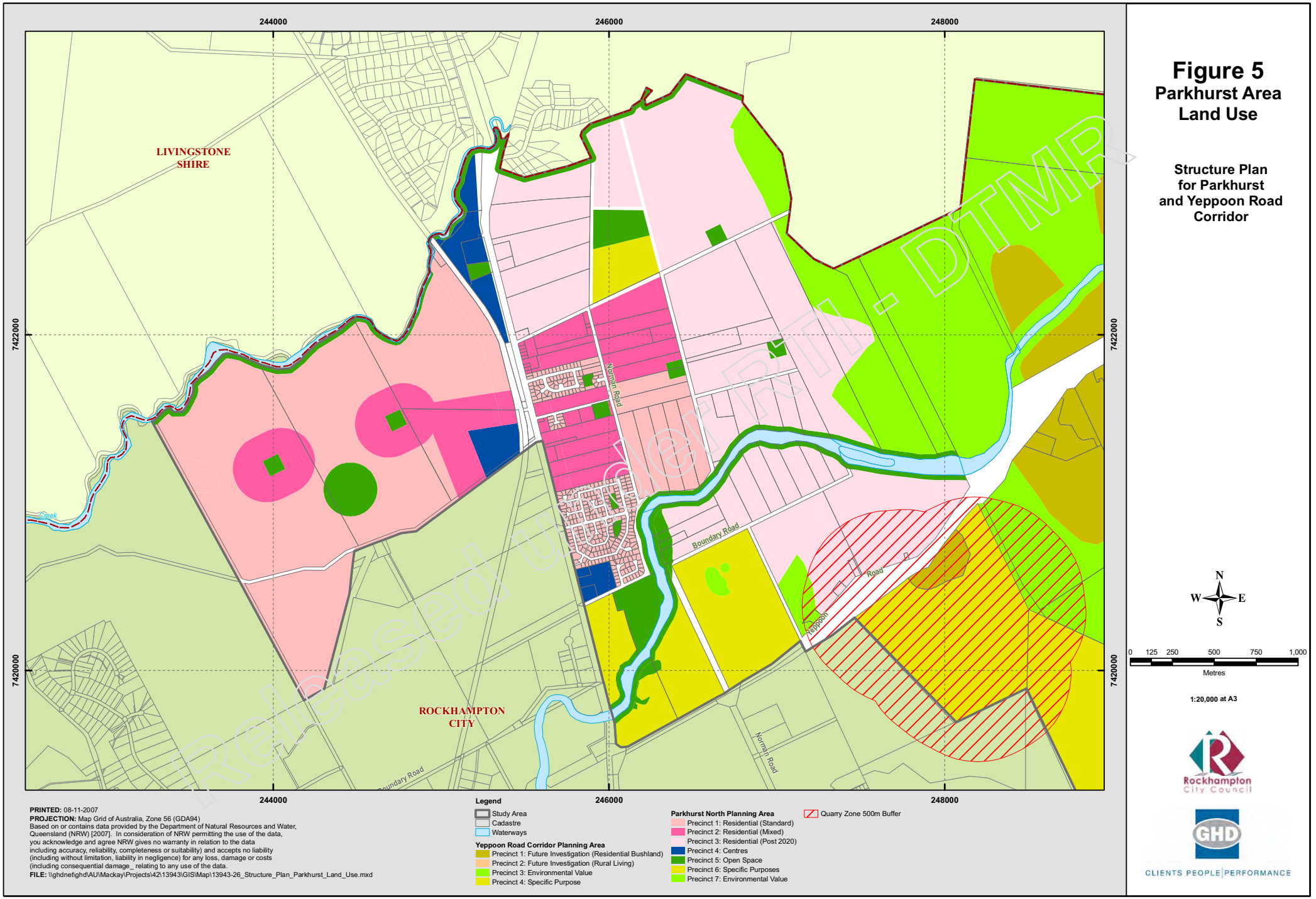

PRINTED: 08-11-2007
PROJECTION: Map Grid of Australia, Zone 56 (GDA94)
Based on or contains data provided by the Department of Natural Resources and Water, Queensland (NRW) [2007]. In consideration of NRW permitting the use of the data, you acknowledge and agree NRW gives no warranty in relation to the data including accuracy, reliability, completeness or suitability) and accepts no liability (including without limitation, liability in negligence) for any loss, damage or costs (including consequential damage_ relating to any use of the data.
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Figure 5
Parkhurst Area Land Use

Structure Plan for Parkhurst and Yeppoon Road Corridor

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Rockhampton City Council

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APPENDIX B

Proposed Road Parkhurst Hierarchy Figure

Parkhurst and Yeppoon Road Corridor Structure Plan (2007)

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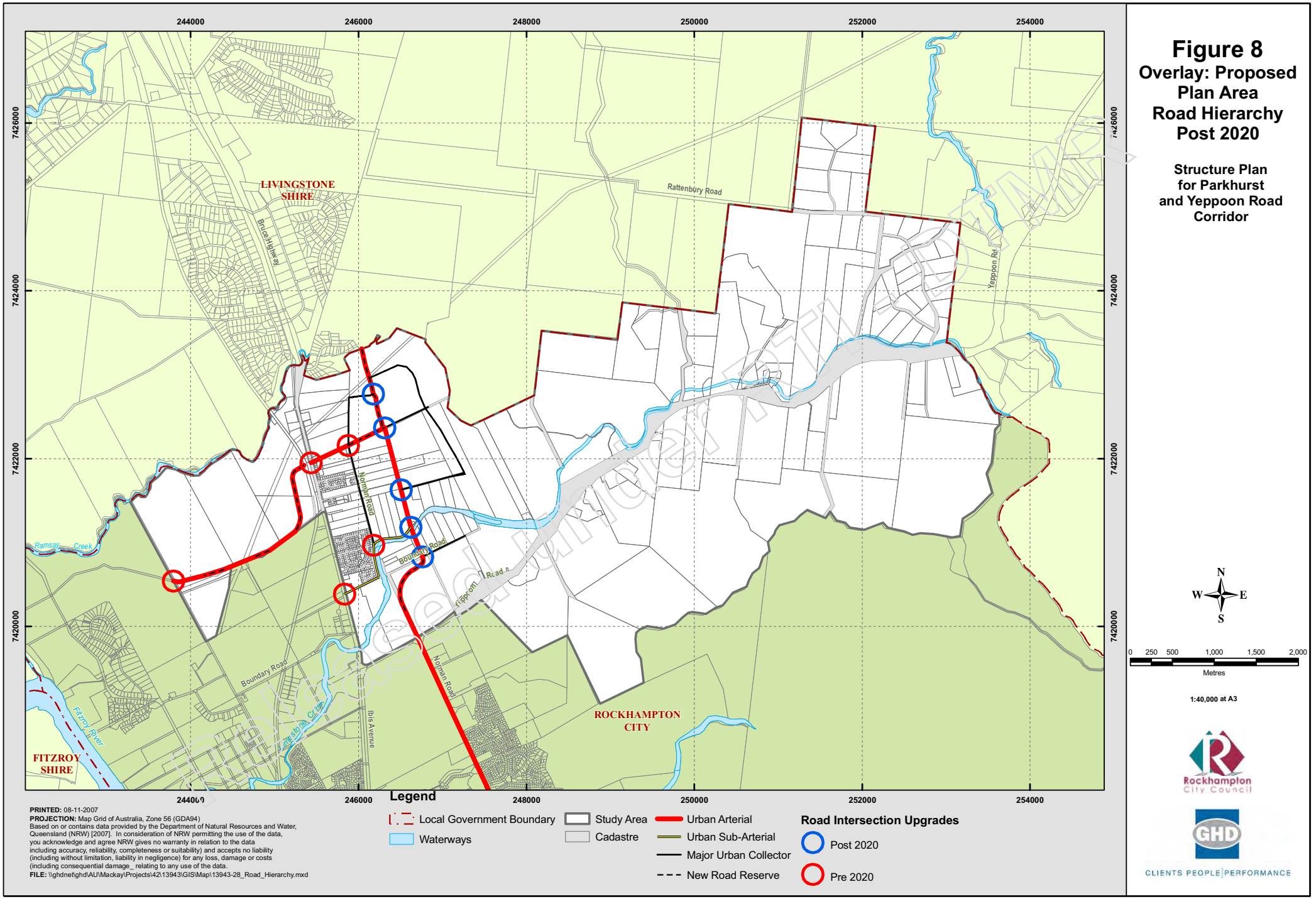

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Figure 8

Overlay: Proposed Plan Area Road Hierarchy Post 2020

Structure Plan for Parkhurst and Yeppoon Road Corridor

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Metres

1:40,000 at A3

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APPENDIX C

Parkhurst Priority Infrastructure Area Figure

Planning Assumptions Report (2011)

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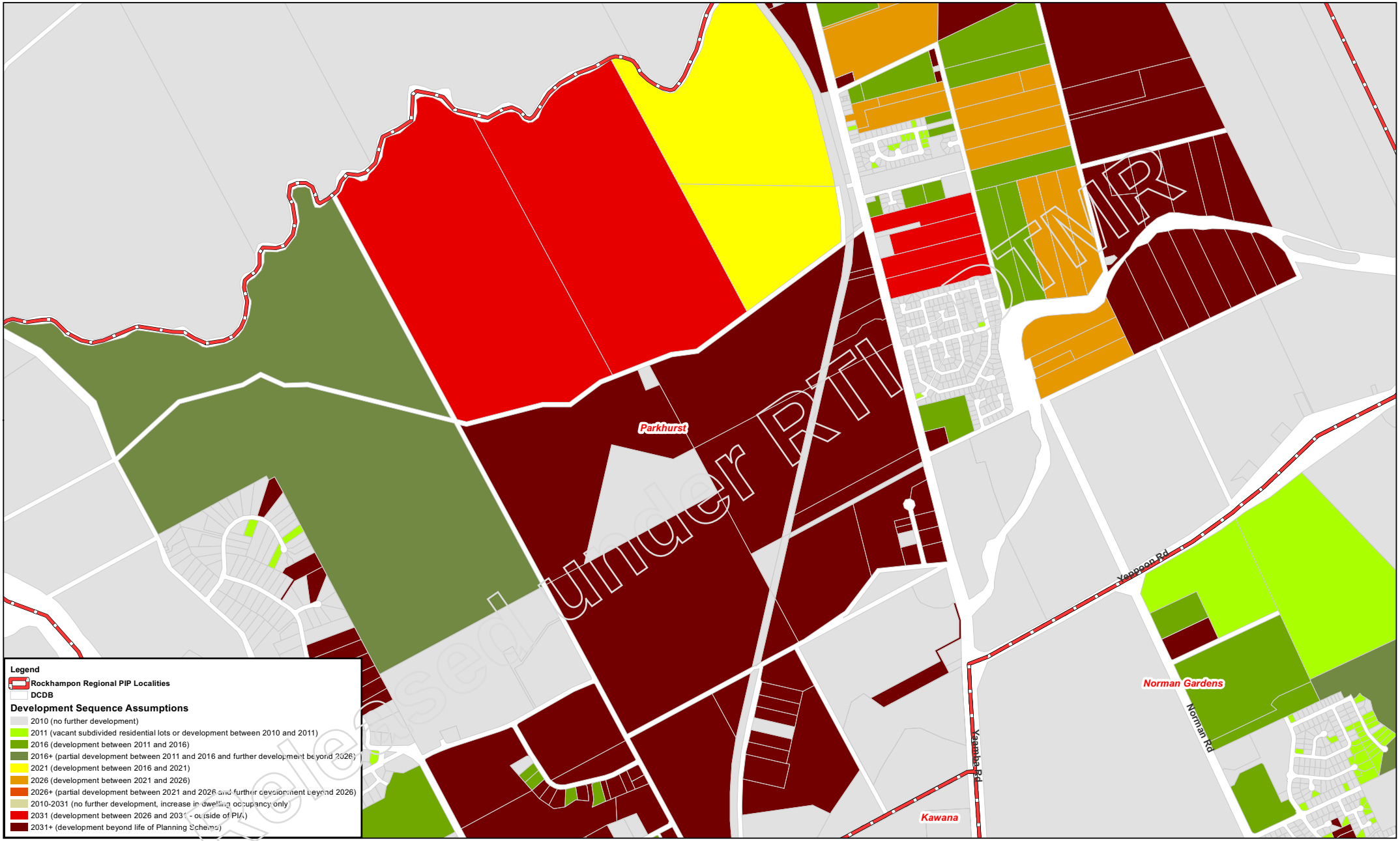

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Paper Size A3

0 50100 200 300 400 500

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

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Rockhampton Regional Council

Rockhampton Regional Council
Planning Assumptions Report

Job Number	41-23156
Revision	C
Date	22 Jul 2011

Development Sequencing Assumptions - Parkhurst

Map 30

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Data source: RRC,DERM & GHD, Data Custodian: RRC & GHD, Data Set: RRC Land Use data 2010 (based on DERM Land Valuation Land Use Codes), RRC Localities 2011 (modified by GHD). Created by:cteitzel

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APPENDIX D

Parkhurst Transport Network Infrastructure Map

Adopted Infrastructure Charges Resolution No. 2 (2012)

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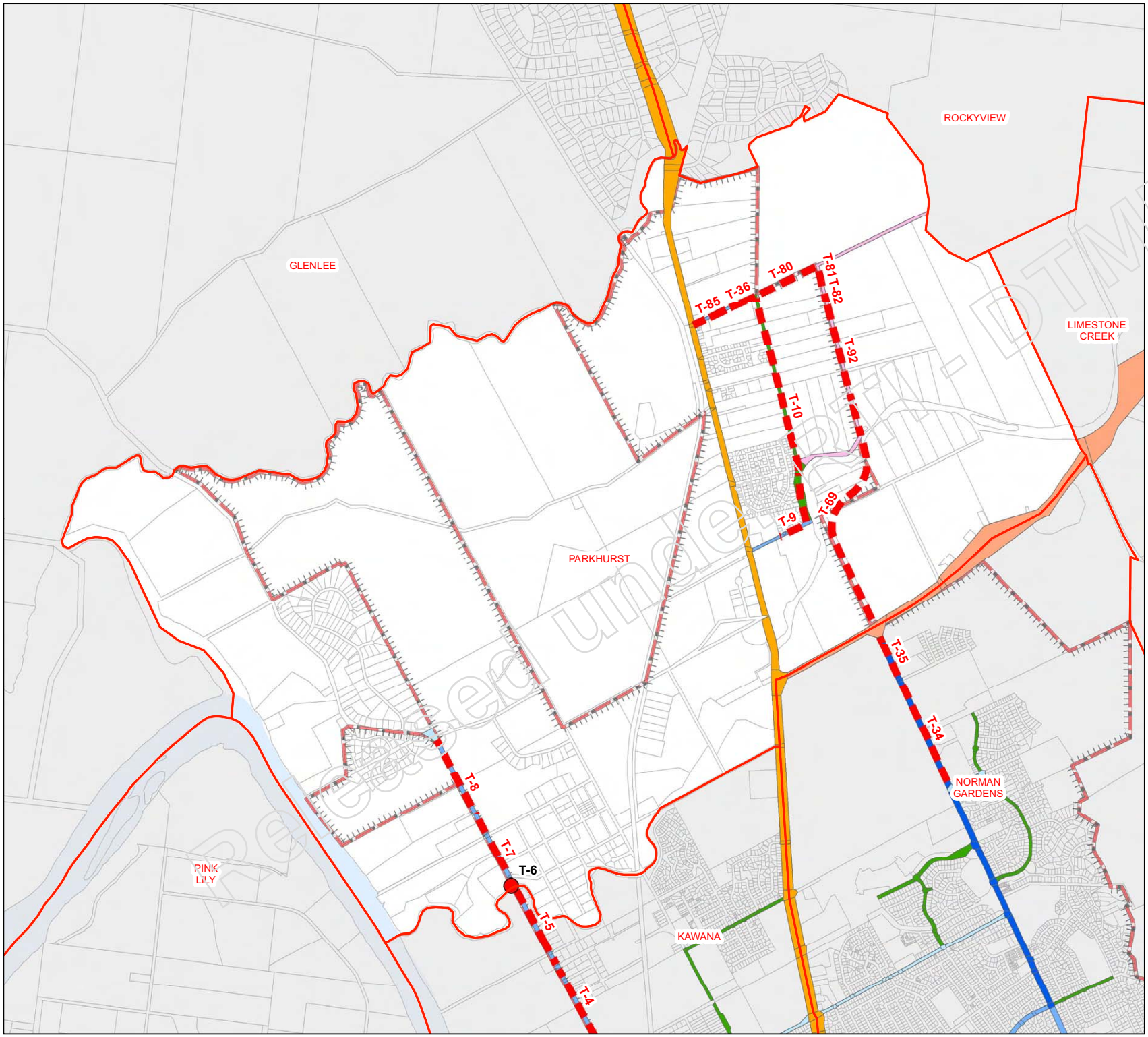

Trunk Infrastructure - Transport

- Locality Boundaries

Future Trunk Infrastructure

- Bridge
- Intersection
- Road Works

Existing Trunk Infrastructure

- 1 - Highway
- 2 - Main Road
- 3 - Rural Arterial
- 4A - Major Rural Collector
- 6A - Major Urban Arterial
- 6B - Urban Arterial
- 6C - Urban Sub-Arterial
- 7 - Major Urban Collector
- Cadastral Parcels
- Priority Infrastructure Area

Note: Priority Infrastructure Area located inside hashed boundary.

Approx Scale @A3 1:25,000

0 380 760 1,520 Metres

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Map 86-3
PARKHURST
Transport Network
Infrastructure Map

December 2012

Rockhampton Regional Council

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APPENDIX E

Proposed Plan of Development

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APPENDIX F

Proposed Road Hierarchy Plan & Bus Route

(Prepared by RPS)

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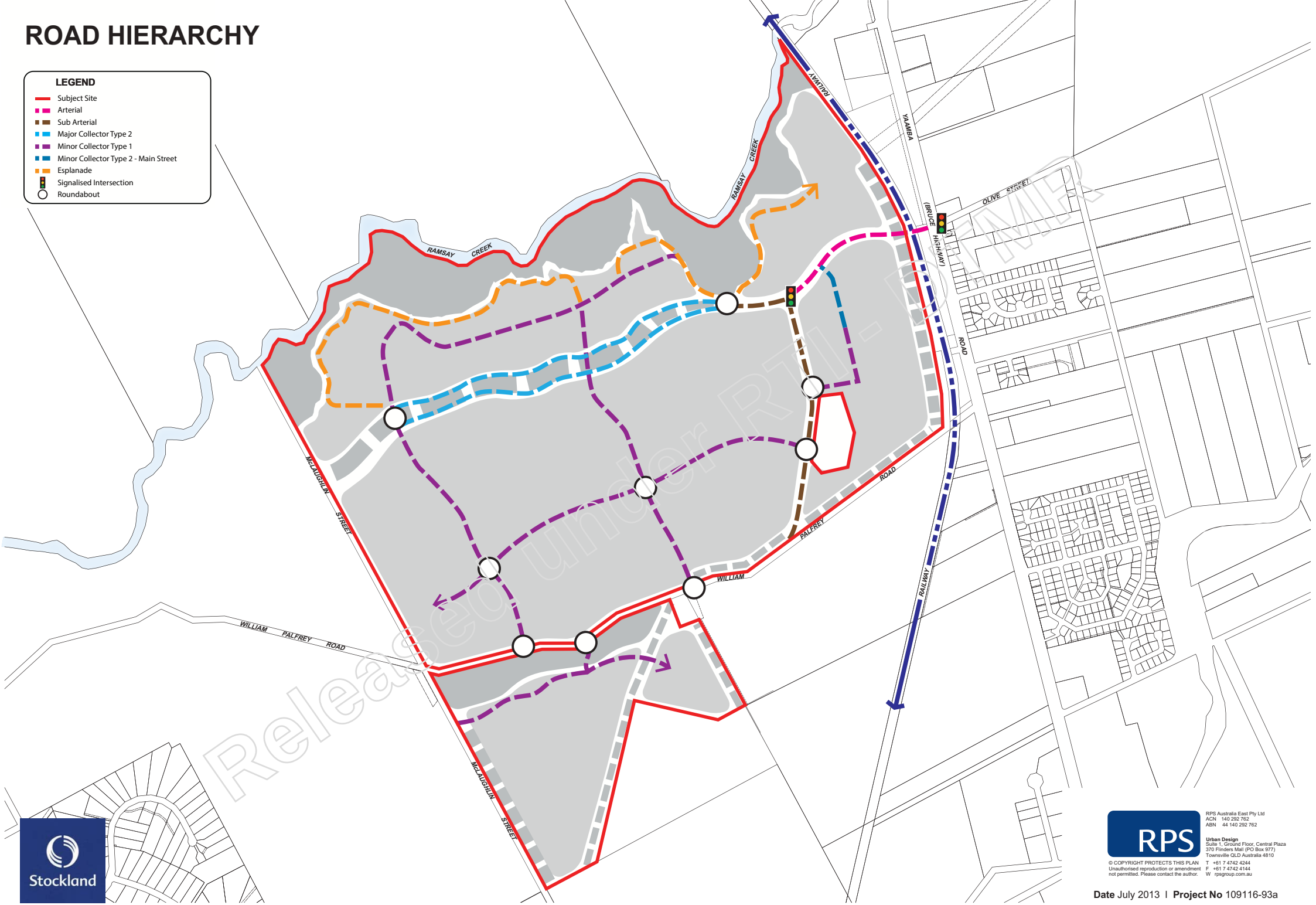
ROAD HIERARCHY



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Stockland

RPS

RPS Australia East Pty Ltd
ACN 140 292 762
ABN 44 140 292 762

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Suite 1, Ground Floor, Central Plaza
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Townsville QLD Australia 4810

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Date July 2013 I **Project No** 109116-93a

ROAD HIERARCHY

LEGEND

- Subject Site
- Arterial
- Sub Arterial
- Major Collector Type 2
- Minor Collector Type 1
- Minor Collector Type 2 - Main Street
- Esplanade
- Signalised Intersection
- Roundabout

Bus Route

RAMSAY CREEK

RAMSAY CREEK

RAILWAY

YAAMBA

OLIVE STREET

BRUCE HIGHWAY

ROAD

McLAUGHLIN STREET

WILLIAM PALFREY ROAD

WILLIAM PALFREY ROAD

RAILWAY

McLAUGHLIN STREET

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Stockland

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APPENDIX G

Proposed Road Cross Sections
(Prepared by RPS)

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APPENDIX H

2012 TMR Intersection Counts

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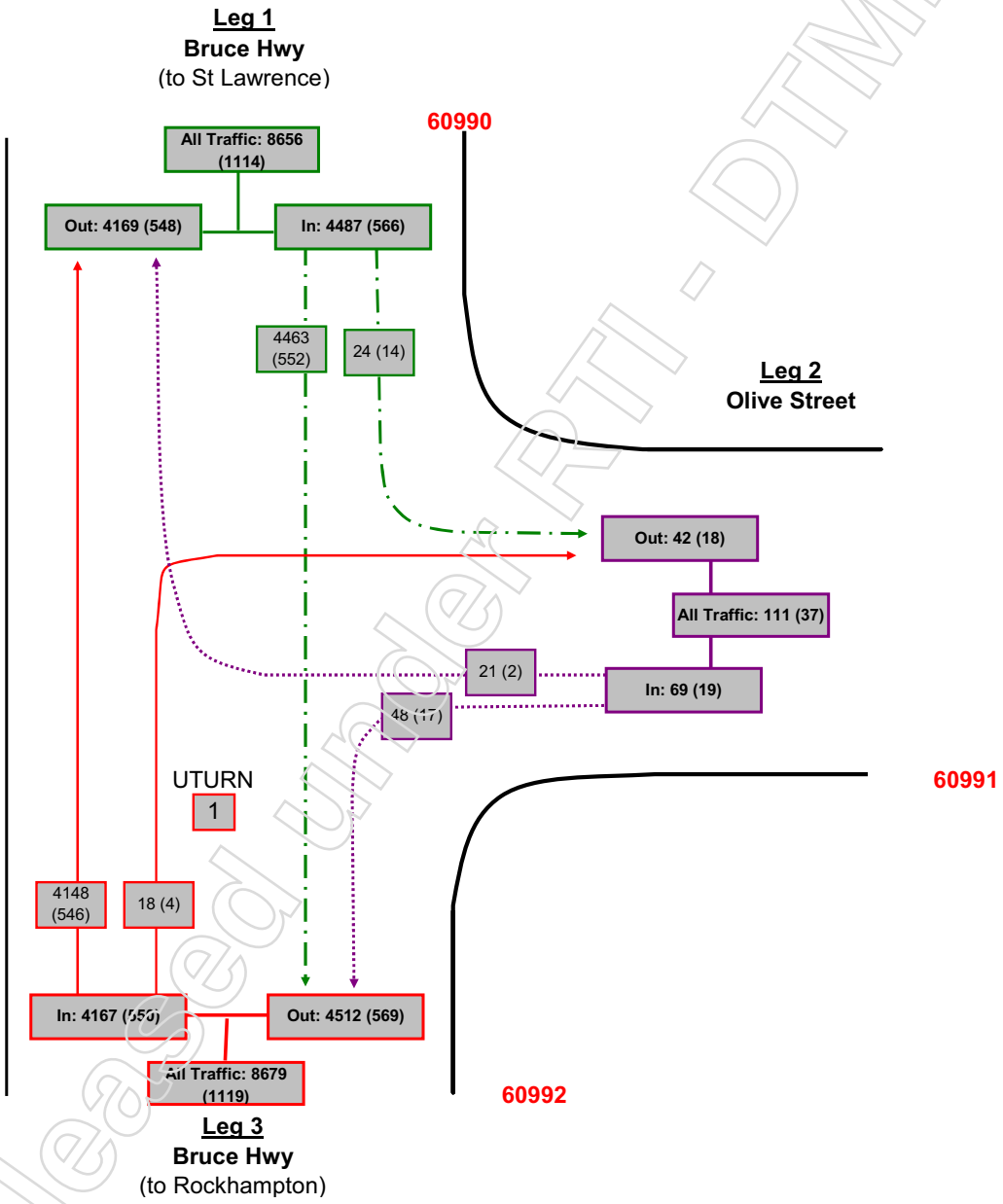
LOCATION: Bruce Hwy & Olive Street
ROAD No: 10F (Int. 588 @ Tdist 11.1Km)
DATE: Thu, 15/03/12
TIME: 06:00 - 18:00



Released under RTI - DTMR

Count Tally Sheet With Totals and Peak Flows.

Queensland Government

LOCATION: Bruce Hwy & Olive Street
ROAD No: 10F (Int. 588 @ Tdist 11.1Km)
DATE: Thu, 15/03/12
TIME: 06:00 - 18:00

	Leg 1						Leg 2						Leg 3					
	Left		Thru		U-turn	Leg	Left		Right		U-turn	Leg	Thru		Right		U-turn	Leg
Time	*Light*	*Heavy*	*Light*	*Heavy*	*All*	Total	*Light*	*Heavy*	*Light*	*Heavy*	*All*	Total	*Light*	*Heavy*	*Light*	*Heavy*	*All*	Total
6:00 - 6:15	0	0	60	4		**64**	0	0	0	0		**0**	19	18	1	0	0	**38**
6:15 - 6:30	0	0	73	9		**82**	1	0	0	0		**1**	40	6	0	0	0	**46**
6:30 - 6:45	0	0	91	3		**94**	0	0	0	0		**0**	47	9	0	0	0	**56**
6:45 - 7:00	0	1	81	9		**91**	0	0	1	0		**1**	52	13	0	0	0	**65**
7:00 - 7:15	1	2	125	2		**130**	1	0	0	0		**1**	46	15	1	1	0	**63**
7:15 - 7:30	0	0	155	12		**167**	0	0	1	0		**1**	56	12	0	0	0	**68**
7:30 - 7:45	1	0	175	16		**192**	0	0	1	0		**1**	47	18	0	0	0	**65**
7:45 - 8:00	0	0	190	16		**206**	0	2	0	0		**2**	45	11	0	0	0	**56**
8:00 - 8:15	0	1	228	8		**237**	1	0	0	0		**1**	45	25	0	0	0	**70**
8:15 - 8:30	0	0	165	6		**171**	0	1	0	0		**1**	53	11	0	0	0	**64**
8:30 - 8:45	0	1	127	14		**142**	2	0	3	0		**5**	54	13	0	0	0	**67**
8:45 - 9:00	1	0	81	15		**97**	1	0	1	0		**2**	71	11	0	0	0	**82**
9:00 - 9:15	1	0	82	7		**90**	0	0	0	0		**0**	58	10	1	0	0	**69**
9:15 - 9:30	0	0	74	11		**85**	0	0	0	0		**0**	63	11	0	0	0	**74**
9:30 - 9:45	0	0	76	11		**87**	1	1	0	0		**2**	59	16	2	0	1	**78**
9:45 - 10:00	0	0	60	11		**71**	0	0	0	0		**0**	76	4	0	0	0	**80**
10:00 - 10:15	0	0	66	12		**78**	1	0	0	0		**1**	49	9	1	0	0	**59**
10:15 - 10:30	0	0	44	13		**57**	0	0	1	0		**1**	58	11	0	1	0	**70**
10:30 - 10:45	0	0	72	6		**78**	0	0	0	0		**0**	50	5	0	0	0	**55**
10:45 - 11:00	0	1	50	9		**60**	0	1	0	0		**1**	55	12	0	0	0	**67**
11:00 - 11:15	0	0	45	16		**61**	1	0	0	0		**1**	57	9	0	0	0	**66**
11:15 - 11:30	1	0	65	13		**79**	1	0	0	0		**1**	60	9	1	0	0	**70**
11:30 - 11:45	0	0	42	12		**54**	0	0	2	0		**2**	43	24	0	0	0	**67**
11:45 - 12:00	0	0	59	9		**68**	0	0	0	0		**0**	68	8	0	0	0	**76**

Released under RTI - DTMR

Data Compiled Date: 19/03/2012
Compiled by: ALH

Count Tally Sheet With Totals and Peak Flows.

Queensland Government

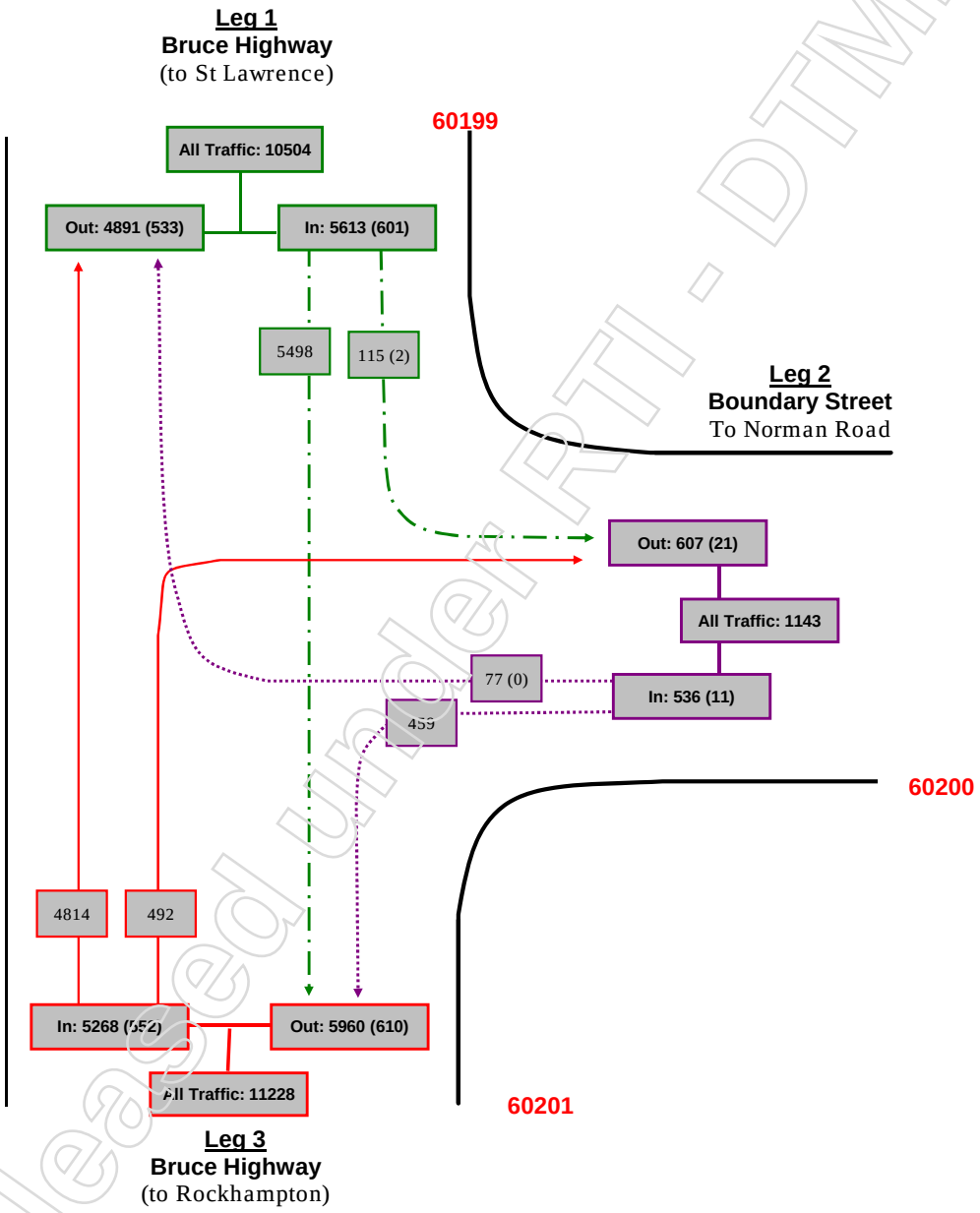
LOCATION: Bruce Hwy & Olive Street
ROAD No: 10F (Int. 588 @ Tdist 11.1Km)
DATE: Thu, 15/03/12
TIME: 06:00 - 18:00

	Leg 1						Leg 2						Leg 3					
	Left		Thru		U-turn	Leg	Left		Right		U-turn	Leg	Thru		Right		U-turn	Leg
Time	*Light*	*Heavy*	*Light*	*Heavy*	*All*	Total	*Light*	*Heavy*	*Light*	*Heavy*	*All*	Total	*Light*	*Heavy*	*Light*	*Heavy*	*All*	Total
12:00 - 12:15	0	0	54	13		**67**	1	0	1	0		**2**	56	13	0	0	0	**69**
12:15 - 12:30	0	0	52	13		**65**	0	1	0	1		**2**	64	4	0	0	0	**68**
12:30 - 12:45	0	1	55	15		**71**	0	0	1	0		**1**	61	7	0	0	0	**68**
12:45 - 13:00	0	0	56	20		**76**	1	0	0	0		**1**	66	12	1	1	0	**80**
13:00 - 13:15	0	0	59	11		**70**	0	0	0	0		**0**	63	14	1	0	0	**78**
13:15 - 13:30	0	0	62	16		**78**	1	0	0	0		**1**	58	11	0	0	0	**69**
13:30 - 13:45	2	0	56	10		**68**	0	0	0	0		**0**	57	10	1	0	0	**68**
13:45 - 14:00	0	0	49	14		**63**	1	0	1	0		**2**	62	11	0	0	0	**73**
14:00 - 14:15	0	1	57	10		**68**	0	2	0	0		**2**	68	15	0	0	0	**83**
14:15 - 14:30	0	1	56	12		**69**	0	1	0	0		**1**	69	15	0	0	0	**84**
14:30 - 14:45	0	1	92	20		**113**	1	1	0	0		**2**	75	12	0	0	0	**87**
14:45 - 15:00	0	1	84	15		**100**	0	1	0	0		**1**	55	11	0	0	0	**66**
15:00 - 15:15	0	0	78	15		**93**	5	1	1	0		**7**	95	11	0	0	0	**106**
15:15 - 15:30	0	1	77	8		**86**	0	0	0	0		**0**	132	9	0	0	0	**141**
15:30 - 15:45	0	1	55	8		**64**	1	1	0	0		**2**	126	13	1	1	0	**141**
15:45 - 16:00	0	1	84	11		**96**	0	1	1	1		**3**	105	12	1	0	0	**118**
16:00 - 16:15	0	0	90	22		**112**	0	0	1	0		**1**	100	11	0	0	0	**111**
16:15 - 16:30	0	0	87	10		**97**	0	0	0	0		**0**	126	5	0	0	0	**131**
16:30 - 16:45	0	0	80	19		**99**	3	0	0	0		**3**	131	15	0	0	0	**146**
16:45 - 17:00	0	0	83	7		**90**	1	0	0	0		**1**	135	9	1	0	0	**145**
17:00 - 17:15	1	0	80	10		**91**	3	3	3	0		**9**	162	14	0	0	0	**176**
17:15 - 17:30	1	0	54	11		**66**	0	0	0	0		**0**	187	6	0	0	0	**193**
17:30 - 17:45	0	0	62	12		**74**	0	0	0	0		**0**	136	6	1	0	0	**143**
17:45 - 18:00	1	0	63	6		**70**	3	0	0	0		**3**	142	10	0	0	0	**152**
Total:	10	14	3911	552	0	**4487**	31	17	19	2	0	**69**	3602	546	14	4	1	**4167**
Peak Count:	3	4	758	62	0	806	7	5	4	1	0	13	627	66	3	1	1	664
Peak Hour:	17:00 to 18:00	14:00 to 15:00	07:30 to 08:30	12:30 to 13:30	06:00 to 07:00	07:30 to 08:30	16:15 to 17:15	14:00 to 15:00	08:00 to 09:00	11:30 to 12:30	06:00 to 07:00	16:15 to 17:15	17:00 to 18:00	07:15 to 08:15	08:45 to 09:45	06:15 to 07:15	08:45 to 09:45	17:00 to 18:00

Released under RTI - DTMR

Data Compiled Date: 19/03/2012
Compiled by: ALH

LOCATION: Bruce Hwy & Boundary Street
ROAD No: 10F (Int. 583 @ Tdist 9.489)
DATE: Thu, 08/03/12
TIME: 06:00 - 18:00



Released under RTI - DTMR

Count Tally Sheet With Totals and Peak Flows.

Queensland Government

LOCATION: Bruce Hwy & Boundary Street
ROAD No: 10F (Int. 583 @ Tdist 9.489)
DATE: Thu, 08/03/12
TIME: 06:00 - 18:00

	Leg 1						Leg 2						Leg 3					
	Left		Thru		U-turn	Leg	Left		Right		U-turn	Leg	Thru		Right		U-turn	Leg
Time	*Light*	*Heavy*	*Light*	*Heavy*	*All*	Total	*Light*	*Heavy*	*Light*	*Heavy*	*All*	Total	*Light*	*Heavy*	*Light*	*Heavy*	*All*	Total
6:00 - 6:15	0	0	77	6		**83**	3	0	0	0		**0**	31	10	3	0	0	**3**
6:15 - 6:30	1	0	80	12		**92**	3	0	0	0		**3**	48	6	2	0	0	**56**
6:30 - 6:45	0	0	115	8		**123**	6	0	0	0		**6**	64	9	2	0	0	**75**
6:45 - 7:00	0	0	102	4		**106**	1	0	0	0		**1**	61	14	2	0	0	**77**
7:00 - 7:15	0	0	120	8		**128**	6	0	0	0		**6**	33	17	4	1	0	**55**
7:15 - 7:30	1	0	184	16		**200**	9	0	1	0		**10**	57	12	6	1	0	**76**
7:30 - 7:45	1	0	207	10		**217**	11	0	1	0		**12**	68	8	7	1	0	**84**
7:45 - 8:00	2	0	230	14		**244**	18	1	1	0		**20**	71	11	7	0	0	**89**
8:00 - 8:15	1	0	241	11		**252**	21	0	0	0		**21**	84	18	7	3	0	**112**
8:15 - 8:30	1	0	221	20		**241**	9	1	0	0		**10**	84	16	6	0	0	**106**
8:30 - 8:45	2	0	144	14		**158**	14	0	1	0		**15**	103	19	6	0	0	**128**
8:45 - 9:00	2	0	125	5		**130**	12	0	1	0		**13**	77	26	12	0	0	**115**
9:00 - 9:15	2	0	109	12		**121**	6	0	1	0		**7**	61	19	11	0	1	**92**
9:15 - 9:30	0	0	80	14		**94**	3	0	0	0		**3**	65	12	5	0	0	**82**
9:30 - 9:45	2	0	77	13		**90**	1	0	0	0		**1**	62	9	3	0	0	**74**
9:45 - 10:00	1	0	107	11		**118**	3	0	0	0		**3**	74	8	9	0	0	**91**
10:00 - 10:15	0	0	85	18		**103**	5	0	2	0		**7**	70	15	5	1	0	**91**
10:15 - 10:30	0	0	72	7		**79**	3	0	0	0		**3**	58	8	4	0	0	**70**
10:30 - 10:45	2	0	65	11		**78**	4	0	0	0		**4**	44	14	1	0	0	**59**
10:45 - 11:00	1	0	52	9		**61**	8	0	0	0		**8**	62	13	2	0	0	**77**
11:00 - 11:15	1	0	69	21		**90**	5	0	2	0		**7**	58	11	7	0	1	**77**
11:15 - 11:30	2	0	62	18		**80**	11	0	1	0		**12**	72	13	10	1	0	**96**
11:30 - 11:45	2	0	79	13		**92**	3	2	5	0		**10**	62	12	13	0	0	**87**
11:45 - 12:00	1	0	70	18		**88**	8	1	3	0		**12**	57	9	12	0	0	**78**

Released under RTI - DTMR

Data Compiled Date: 13/03/2012
Compiled by: ALH

Count Tally Sheet With Totals and Peak Flows.

Queensland Government

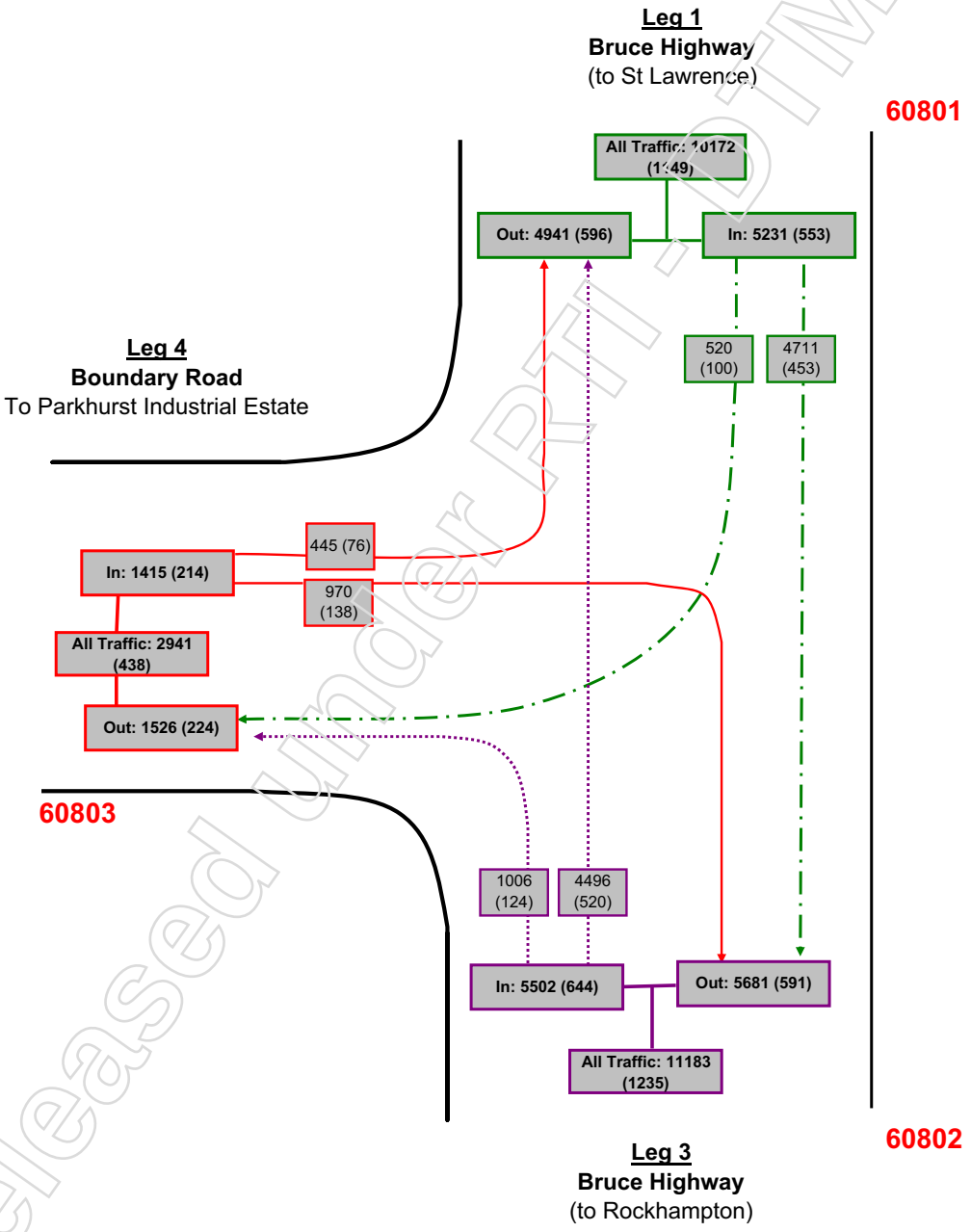
LOCATION: Bruce Hwy & Boundary Street
ROAD No: 10F (Int. 583 @ Tdist 9.489)
DATE: Thu, 08/03/12
TIME: 06:00 - 18:00

	Leg 1						Leg 2						Leg 3					
	Left		Thru		U-turn	Leg	Left		Right		U-turn	Leg	Thru		Right		U-turn	Leg
Time	*Light*	*Heavy*	*Light*	*Heavy*	*All*	Total	*Light*	*Heavy*	*Light*	*Heavy*	*All*	Total	*Light*	*Heavy*	*Light*	*Heavy*	*All*	Total
12:00 - 12:15	2	0	79	10		**89**	5	3	0	0		**8**	74	6	10	1	0	**91**
12:15 - 12:30	1	0	73	9		**82**	6	0	2	0		**8**	86	12	14	1	0	**113**
12:30 - 12:45	4	0	59	15		**74**	8	0	1	0		**9**	75	8	7	1	0	**91**
12:45 - 13:00	2	1	71	13		**84**	9	0	2	0		**11**	75	4	14	0	0	**93**
13:00 - 13:15	3	0	70	13		**83**	13	1	1	0		**15**	80	8	16	0	0	**104**
13:15 - 13:30	0	0	77	18		**95**	13	0	0	0		**13**	72	11	9	0	0	**92**
13:30 - 13:45	3	0	81	11		**92**	14	0	0	0		**14**	70	5	4	0	1	**80**
13:45 - 14:00	9	0	88	25		**113**	12	0	0	0		**12**	67	10	4	1	0	**82**
14:00 - 14:15	16	1	91	13		**104**	11	0	1	0		**12**	72	4	12	0	0	**88**
14:15 - 14:30	3	0	75	14		**89**	12	0	1	0		**13**	71	8	6	0	0	**85**
14:30 - 14:45	1	0	106	16		**122**	10	0	5	0		**15**	77	12	10	1	0	**100**
14:45 - 15:00	1	0	90	19		**109**	14	0	2	0		**16**	125	17	7	0	0	**149**
15:00 - 15:15	7	0	136	14		**150**	26	1	3	0		**30**	113	16	13	0	0	**142**
15:15 - 15:30	2	0	91	10		**101**	12	0	4	0		**16**	128	8	18	1	0	**155**
15:30 - 15:45	2	0	100	8		**108**	6	0	4	0		**10**	127	13	11	3	0	**154**
15:45 - 16:00	1	0	85	14		**99**	6	0	3	0		**9**	113	11	17	2	0	**143**
16:00 - 16:15	4	0	105	11		**116**	16	0	5	0		**21**	150	12	19	0	0	**181**
16:15 - 16:30	1	0	93	13		**106**	6	0	0	0		**6**	167	12	16	0	0	**195**
16:30 - 16:45	3	0	79	15		**94**	21	1	7	0		**29**	133	10	22	0	0	**165**
16:45 - 17:00	4	0	96	17		**113**	15	0	7	0		**22**	158	7	18	0	0	**183**
17:00 - 17:15	2	0	94	5		**99**	7	0	2	0		**9**	186	10	18	0	0	**214**
17:15 - 17:30	8	0	109	9		**118**	9	0	1	0		**10**	214	8	28	0	0	**250**
17:30 - 17:45	4	0	87	9		**96**	15	0	4	0		**19**	159	6	22	0	0	**187**
17:45 - 18:00	5	0	91	5		**96**	9	0	3	0		**12**	163	6	12	0	0	**181**
Total:	113	2	4899	599	0	**5613**	448	11	77	0	0	**536**	4281	533	473	19	3	**5268**
Peak Count:	0	0	0	70	0	954	62	6	19	0	0	78	722	80	86	6	3	834
Peak Hour:	#N/A	#N/A	#N/A	11:00 to 12:00	06:00 to 07:00	07:30 to 08:30	07:45 to 08:45	11:15 to 12:15	16:00 to 17:00	06:00 to 07:00	06:00 to 07:00	16:00 to 17:00	17:00 to 18:00	08:15 to 09:15	16:30 to 17:30	15:00 to 16:00	17:15 to 18:15	16:45 to 17:45

Released under RTI - DTMR

Data Compiled Date: 13/03/2012
Compiled by: ALH

LOCATION: 10F (Rockhampton-St Lawrence) & Boundary Rd
ROAD No: 10F (Int. 582 @ Tdist 9.016km)
DATE: Tue, 06/03/12
TIME: 06:00 - 18:00



Released under RTI - DTMR

Count Tally Sheet With Totals and Peak Flows.

Queensland Government

LOCATION: 10F (Rockhampton-St Lawrence) & Boundary Rd
ROAD No: 10F (Int. 582 @ Tdist 9.016km)
DATE: Tue, 06/03/12
TIME: 06:00 - 18:00

	Leg 1						Leg 3						Leg 4					
	Thru		Right		U-turn	Leg	Left		Thru		U-turn	Leg	Left		Right		U-turn	Leg
Time	*Light*	*Heavy*	*Light*	*Heavy*	*All*	**Total**	*Light*	*Heavy*	*Light*	*Heavy*	*All*	**Total**	*Light*	*Heavy*	*Light*	*Heavy*	*All*	**Total**
6:00 - 6:15	78	4	6	2		**90**	26	2	40	5		**73**	4	0	7	4		**15**
6:15 - 6:30	57	13	17	0		**87**	39	1	54	8		**102**	7	4	5	6		**22**
6:30 - 6:45	82	8	36	3		**129**	77	1	80	14		**172**	5	5	5	8		**23**
6:45 - 7:00	95	5	26	2		**128**	43	4	46	23		**116**	3	0	5	2		**10**
7:00 - 7:15	121	12	34	3		**170**	36	0	53	11		**100**	6	6	14	4		**30**
7:15 - 7:30	201	9	24	1		**235**	56	0	67	10		**133**	1	0	7	0		**8**
7:30 - 7:45	218	16	21	4		**259**	45	5	71	12		**133**	0	1	14	1		**16**
7:45 - 8:00	211	9	10	0		**230**	49	1	58	13		**121**	4	0	12	5		**21**
8:00 - 8:15	241	12	15	1		**269**	43	2	72	20		**137**	10	2	7	1		**20**
8:15 - 8:30	210	5	15	4		**234**	22	0	89	9		**120**	3	0	7	5		**15**
8:30 - 8:45	142	11	14	6		**173**	21	3	91	11		**126**	3	2	10	2		**17**
8:45 - 9:00	147	10	10	1		**168**	17	2	87	15		**121**	5	5	6	3		**19**
9:00 - 9:15	101	12	10	1		**124**	8	1	71	13		**93**	5	2	12	2		**21**
9:15 - 9:30	70	11	4	2		**87**	9	2	72	11		**94**	3	0	4	1		**8**
9:30 - 9:45	65	9	8	2		**84**	14	5	62	10		**91**	8	1	6	3		**18**
9:45 - 10:00	55	15	6	1		**77**	10	1	59	12		**82**	6	2	9	4		**21**
10:00 - 10:15	68	6	8	1		**83**	13	4	56	10		**83**	5	0	12	1		**18**
10:15 - 10:30	56	18	5	2		**81**	12	7	66	18		**103**	5	2	13	1		**21**
10:30 - 10:45	50	5	4	4		**63**	9	3	64	9		**85**	6	3	11	3		**23**
10:45 - 11:00	64	8	7	2		**81**	8	3	41	13		**65**	3	1	14	4		**22**
11:00 - 11:15	45	9	2	3		**59**	10	3	64	14		**91**	2	1	8	4		**15**
11:15 - 11:30	60	10	5	0		**75**	11	4	69	13		**97**	2	2	12	3		**19**
11:30 - 11:45	69	8	2	2		**81**	10	3	66	9		**88**	7	5	4	8		**24**
11:45 - 12:00	57	9	11	6		**83**	11	2	62	15		**90**	10	2	8	1		**21**

Released under RTI-DTMR

Data Compiled Date: 12/03/12
Compiled by: ALH

Count Tally Sheet With Totals and Peak Flows.

Queensland Government

LOCATION: 10F (Rockhampton-St Lawrence) & Boundary Rd
ROAD No: 10F (Int. 582 @ Tdist 9.016km)
DATE: Tue, 06/03/12
TIME: 06:00 - 18:00

	Leg 1						Leg 3						Leg 4					
	Thru		Right		U-turn	Leg	Left		Thru		U-turn	Leg	Left		Right		U-turn	Leg
Time	*Light*	*Heavy*	*Light*	*Heavy*	*All*	Total	*Light*	*Heavy*	*Light*	*Heavy*	*All*	Total	*Light*	*Heavy*	*Light*	*Heavy*	*All*	Total
12:00 - 12:15	43	16	2	3		**64**	7	5	71	15		**98**	9	0	19	1		**29**
12:15 - 12:30	56	11	6	1		**74**	20	2	65	9		**96**	4	0	11	2		**17**
12:30 - 12:45	53	13	3	0		**69**	16	4	68	9		**97**	4	0	12	3		**19**
12:45 - 13:00	42	13	2	1		**58**	7	2	47	13		**69**	0	0	14	4		**18**
13:00 - 13:15	67	11	5	1		**84**	15	2	52	12		**81**	6	1	9	4		**20**
13:15 - 13:30	52	15	5	3		**75**	7	4	61	8		**80**	3	0	6	3		**12**
13:30 - 13:45	64	7	4	3		**78**	15	4	78	13		**110**	4	2	9	3		**18**
13:45 - 14:00	59	7	2	2		**70**	17	1	62	6		**86**	3	1	13	5		**22**
14:00 - 14:15	76	8	2	0		**86**	14	4	62	10		**90**	3	0	10	6		**19**
14:15 - 14:30	85	15	4	4		**108**	9	1	79	9		**98**	7	0	11	4		**22**
14:30 - 14:45	92	12	9	3		**116**	12	4	79	8		**103**	7	1	21	6		**35**
14:45 - 15:00	66	10	5	3		**84**	9	5	81	10		**105**	11	7	18	1		**37**
15:00 - 15:15	125	8	9	0		**142**	11	5	115	14		**145**	13	2	33	2		**50**
15:15 - 15:30	80	8	7	5		**100**	19	1	144	6		**170**	7	2	33	2		**44**
15:30 - 15:45	52	5	4	2		**63**	20	2	116	13		**151**	4	0	33	2		**39**
15:45 - 16:00	67	6	7	0		**80**	12	3	123	12		**150**	25	2	62	2		**91**
16:00 - 16:15	102	4	7	3		**116**	8	3	121	4		**136**	13	1	66	2		**82**
16:15 - 16:30	87	7	7	2		**103**	9	4	130	5		**148**	18	1	28	2		**49**
16:30 - 16:45	72	11	3	3		**89**	12	1	131	9		**153**	17	2	48	3		**70**
16:45 - 17:00	69	7	7	4		**87**	7	2	143	6		**158**	18	2	33	1		**54**
17:00 - 17:15	96	7	9	3		**115**	9	0	168	8		**185**	30	4	53	3		**90**
17:15 - 17:30	51	4	3	0		**58**	9	1	147	8		**165**	22	0	15	0		**37**
17:30 - 17:45	61	8	5	1		**75**	15	3	146	7		**171**	14	0	32	1		**47**
17:45 - 18:00	78	6	3	0		**87**	4	2	127	8		**141**	14	2	31	0		**47**
Total:	4258	453	420	100	0	**5231**	882	124	3976	520	0	**5502**	369	76	832	138	0	**1415**
Peak Count:	880	53	120	12	0	993	212	17	604	58	0	679	87	15	204	21	0	292
Peak Hour:	07:30 to 08:30	12:00 to 13:00	06:30 to 07:30	08:00 to 09:00	06:00 to 07:00	07:15 to 08:15	06:30 to 07:30	09:30 to 10:30	16:45 to 17:45	06:30 to 07:30	06:00 to 07:00	16:45 to 17:45	16:30 to 17:30	06:15 to 07:15	15:45 to 16:45	13:45 to 14:45	06:00 to 07:00	15:45 to 16:45

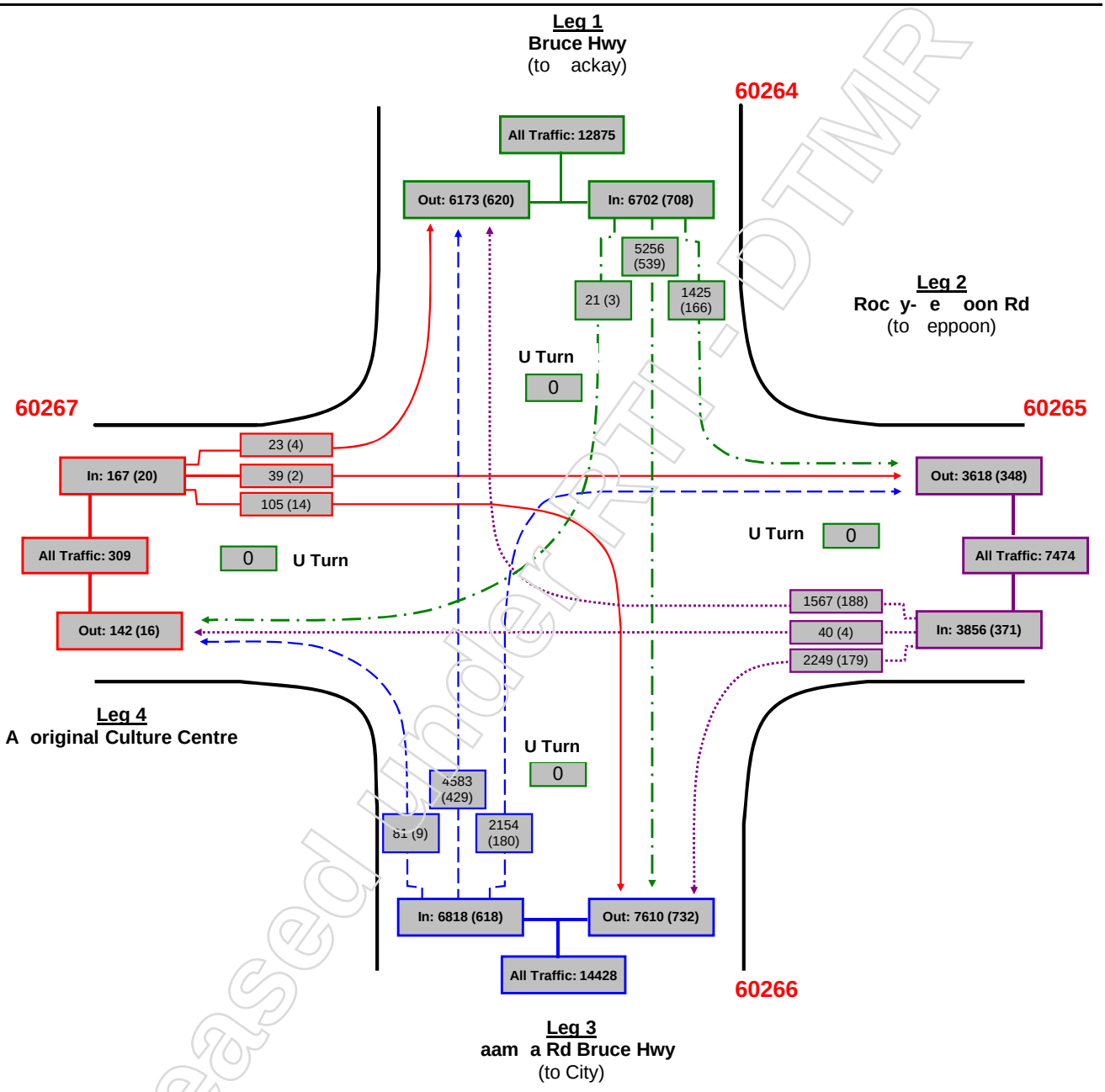
Released under RTI-DTMR

Data Compiled Date: 12/03/12
Compiled by: ALH

Count Tally Sheet

LOCATION: Intersection Bruce Hwy & Rton- eppoon Rd
ROAD No: 10F (Int **827** @ Tdist 8.550km)
DATE: Thu, 02/08/12
TIME: 06:00 - 18:00

Queensland Government



Released under RTI - DTMR

Data Collection Date:
Compiled by:

Count Tally Sheet

Intersectiomn o bruce Hwy Rton- eppoon Rd

10F lnt 827 @ 8.550km

	Leg 1								Leg 2								Leg 3								Leg 4							
	Left		T ru		Rig t		U-turn	Leg Total	Left		T ru		Rig t		U-turn	Leg Total	Left		T ru		Rig t		U-turn	Leg Total	Left		T ru		Rig t		U-turn	Leg Total
	2	2H	3	3H	4	4H			3	3H	4	4H	1	1H			4	4H	1	1H	2	2H			1	1H	2	2H	3	3H		
Time	*Light*	*Heavy*	*Light*	*Heavy*	*Light*	*Heavy*	*All*		*Light*	*Heavy*	*Light*	*Heavy*	*Light*	*Heavy*	*All*		*Light*	*Heavy*	*Light*	*Heavy*	*Light*	*Heavy*	*All*		*Light*	*Heavy*	*Light*	*Heavy*	*Light*	*Heavy*	*All*	
6:00 - 6:15	12	3	52	8	0	0		75	47	1	1	0	25	2		76	9	0	21	9	13	2		54	0	0	14	1	3	1		19
6:15 - 6:30	12	3	72	8	0	0		95	43	2	0	0	33	2		80	0	0	36	6	23	1		66	1	1	0	0	0	0		2
6:30 - 6:45	14	3	73	8	0	0		98	56	1	2	0	55	3		117	4	0	60	6	11	10		91	0	0	0	0	1	0		1
6:45 - 7:00	14	4	87	12	0	0		117	56	3	1	0	91	3		154	1	0	66	10	12	3		92	0	0	0	0	2	0		2
7:00 - 7:15	9	5	83	4	0	0		101	58	3	2	0	44	7		114	0	0	48	9	13	6		76	3	0	2	0	6	0		11
7:15 - 7:30	17	5	124	5	0	0		151	78	3	2	0	55	2		140	2	0	62	6	9	3		82	0	0	0	0	3	0		3
7:30 - 7:45	24	3	157	9	1	0		194	88	6	3	0	40	4		141	1	1	64	3	23	4		96	0	0	0	0	2	1		3
7:45 - 8:00	36	3	208	17	0	0		264	107	1	1	0	55	2		166	1	0	74	5	17	7		104	1	0	1	0	1	0		3
8:00 - 8:15	40	7	210	16	1	0		274	112	4	1	0	32	1		150	1	0	64	12	35	5		117	0	0	2	0	5	0		7
8:15 - 8:30	46	3	212	5	0	0		266	104	2	0	0	35	4		145	0	0	76	8	34	7		125	0	0	0	0	5	1		6
8:30 - 8:45	15	3	162	5	0	0		185	79	2	0	1	32	5		119	2	0	83	4	34	5		128	0	0	0	0	2	0		2
8:45 - 9:00	18	4	134	6	2	0		164	73	4	0	0	35	9		121	1	0	75	12	42	4		134	1	1	2	0	1	0		5
9:00 - 9:15	19	2	98	18	0	0		137	46	4	0	0	26	2		78	0	1	93	6	37	8		135	1	0	0	0	2	0		3
9:15 - 9:30	20	2	99	9	1	0		131	37	5	2	0	23	6		73	2	0	70	5	42	5		124	0	1	2	0	1	0		4
9:30 - 9:45	26	4	85	12	0	0		127	57	7	6	0	22	2		94	1	0	84	9	26	5		125	0	0	1	0	2	0		3
9:45 - 10:00	12	2	89	8	1	0		112	42	4	0	0	19	6		71	2	0	59	10	25	5		101	0	0	1	0	2	0		3
10:00 - 10:15	14	2	77	12	0	1		106	45	3	0	0	22	3		73	1	0	62	10	32	5		110	1	0	0	0	1	0		2
10:15 - 10:30	9	5	76	9	1	0		100	25	6	0	0	22	2		55	1	0	57	8	29	3		98	0	0	0	0	1	3		4
10:30 - 10:45	15	2	97	6	0	0		120	32	3	0	0	15	5		55	2	0	78	9	32	1		122	1	0	1	0	1	0		3
10:45 - 11:00	22	4	66	11	0	0		103	32	4	0	0	17	4		57	2	0	61	11	29	4		107	1	0	0	0	2	0		3
11:00 - 11:15	7	1	75	12	0	0		95	32	3	1	0	18	2		56	2	0	69	9	27	2		109	0	0	1	0	4	0		5
11:15 - 11:30	17	2	71	10	0	0		100	35	4	1	0	20	5		65	1	0	61	10	23	6		101	0	0	0	0	1	0		1
11:30 - 11:45	11	6	67	6	1	0		91	32	1	0	0	12	3		48	1	1	86	6	24	4		122	0	0	0	0	1	0		1
11:45 - 12:00	15	6	83	12	1	0		117	38	5	1	0	13	3		60	1	0	72	10	33	3		119	0	0	0	0	0	0		0

Released under RTI

Compilation Date:29/08/12

Compiled by: RA

Count Tally Sheet

Intersectiomn o bruce Hwy Rton- eppoon Rd

10F lnt 827 @ 8.550km

	Leg 1								Leg 2								Leg 3								Leg 4							
	Left		T ru		Rig t		U-turn	Leg Total	Left		T ru		Rig t		U-turn	Leg Total	Left		T ru		Rig t		U-turn	Leg Total	Left		T ru		Rig t		U-turn	Leg Total
	2	2H	3	3H	4	4H			3	3H	4	4H	1	1H			4	4H	1	1H	2	2H			1	1H	2	2H	3	3H		
Time	*Light*	*Heavy*	*Light*	*Heavy*	*Light*	*Heavy*	*All*		*Light*	*Heavy*	*Light*	*Heavy*	*Light*	*Heavy*	*All*		*Light*	*Heavy*	*Light*	*Heavy*	*Light*	*Heavy*	*All*		*Light*	*Heavy*	*Light*	*Heavy*	*Light*	*Heavy*	*All*	
12:00 - 12:15	19	5	72	14	0	0		110	29	3	0	0	20	4		56	1	0	72	16	40	3		132	0	0	0	0	4	0		4
12:15 - 12:30	18	3	67	9	0	0		97	31	5	2	0	21	3		62	1	0	86	8	21	4		120	1	0	0	0	0	1		2
12:30 - 12:45	24	3	89	11	0	0		127	20	6	1	0	26	3		56	1	0	71	13	25	2		112	0	0	0	0	3	0		3
12:45 - 13:00	16	6	89	17	1	2		131	29	4	0	0	20	5		58	1	1	87	7	34	1		131	0	0	0	0	5	0		5
13:00 - 13:15	14	8	86	17	0	0		125	36	7	0	0	11	5		59	1	0	101	11	34	9		156	1	0	0	0	1	1		3
13:15 - 13:30	17	6	76	11	0	0		110	28	6	0	1	16	2		53	1	0	75	14	32	2		124	0	0	1	0	1	1		3
13:30 - 13:45	17	4	69	15	0	0		105	20	2	0	0	11	4		37	1	0	91	10	38	4		144	0	0	1	0	1	0		2
13:45 - 14:00	19	5	74	7	0	0		105	22	3	0	0	15	6		46	3	1	79	11	32	1		127	0	0	0	0	4	1		5
14:00 - 14:15	21	3	80	10	1	0		115	27	4	2	0	13	3		49	0	0	82	7	37	5		131	0	0	1	0	1	0		2
14:15 - 14:30	25	3	79	18	0	0		125	28	2	0	0	28	4		62	2	1	78	4	28	6		119	0	0	0	0	1	0		1
14:30 - 14:45	36	3	82	15	0	0		136	40	4	0	0	23	5		72	2	1	91	15	49	3		161	0	0	1	1	1	1		4
14:45 - 15:00	18	5	105	12	0	0		140	33	4	0	0	36	5		78	1	0	110	7	56	2		176	2	0	0	0	2	1		5
15:00 - 15:15	45	1	124	18	0	0		188	38	6	1	0	38	14		97	1	0	114	11	45	2		173	0	0	0	0	4	0		4
15:15 - 15:30	30	5	106	20	0	0		161	37	4	1	0	30	4		76	2	0	102	11	64	5		184	2	0	0	0	1	1		4
15:30 - 15:45	53	5	107	18	2	0		185	34	12	0	0	30	10		86	4	0	125	17	59	6		211	0	0	0	0	2	1		3
15:45 - 16:00	29	6	98	15	0	0		148	39	3	0	0	27	4		73	1	1	120	8	74	1		205	0	0	1	0	3	0		4
16:00 - 16:15	71	6	103	15	2	0		197	38	5	0	0	19	6		68	1	0	125	9	72	5		212	0	0	1	0	3	0		4
16:15 - 16:30	38	3	94	5	1	0		141	35	6	0	0	32	3		76	2	1	115	9	88	0		215	2	1	1	0	0	0		4
16:30 - 16:45	62	0	101	16	0	0		179	29	2	1	0	27	0		59	1	0	130	11	66	4		212	1	0	0	0	1	0		2
16:45 - 17:00	52	1	84	15	1	0		153	26	1	0	0	37	3		67	1	0	130	14	90	3		238	0	0	0	0	1	0		1
17:00 - 17:15	59	0	96	7	1	0		163	19	3	1	0	22	1		46	0	0	152	4	104	1		261	0	0	0	0	0	0		0
17:15 - 17:30	39	0	91	8	0	0		138	35	4	1	1	44	4		69	1	0	156	7	117	0		281	0	0	1	0	0	0		1
17:30 - 17:45	49	0	95	6	0	0		150	25	1	1	0	33	1		61	5	0	154	6	73	2		240	0	0	1	0	1	0		2
17:45 - 18:00	44	1	93	12	0	0		150	18	1	1	1	39	2		62	0	0	137	6	71	1		215	0	0	1	0	2	0		3
Total:	1259	166	4717	539	18	3	0	6702	2070	179	36	4	1379	188	0	3856	72	9	4154	429	1974	180	0	6818	19	4	37	2	91	14	0	167
Peak Count:	233		835		5		0	998	424		8		260		0	602	14		623		390		0	1020	5		15		15		0	24
Peak Hour:	16:00 to 17:00		07:45 to 08:45		15:30 to 16:30		06:00 to 07:00	07:30 to 08:30	07:30 to 08:30		06:45 to 07:45		06:30 to 07:30		06:00 to 07:00	07:30 to 08:30	06:00 to 07:00		16:45 to 17:45		16:45 to 17:45		06:00 to 07:00	16:45 to 17:45	06:15 to 07:15		06:00 to 07:00		07:30 to 08:30		06:00 to 07:00	06:00 to 07:00

Released under RTI

Compilation Date:29/08/12

Compiled by: RA



APPENDIX I

Background Traffic Network Volumes

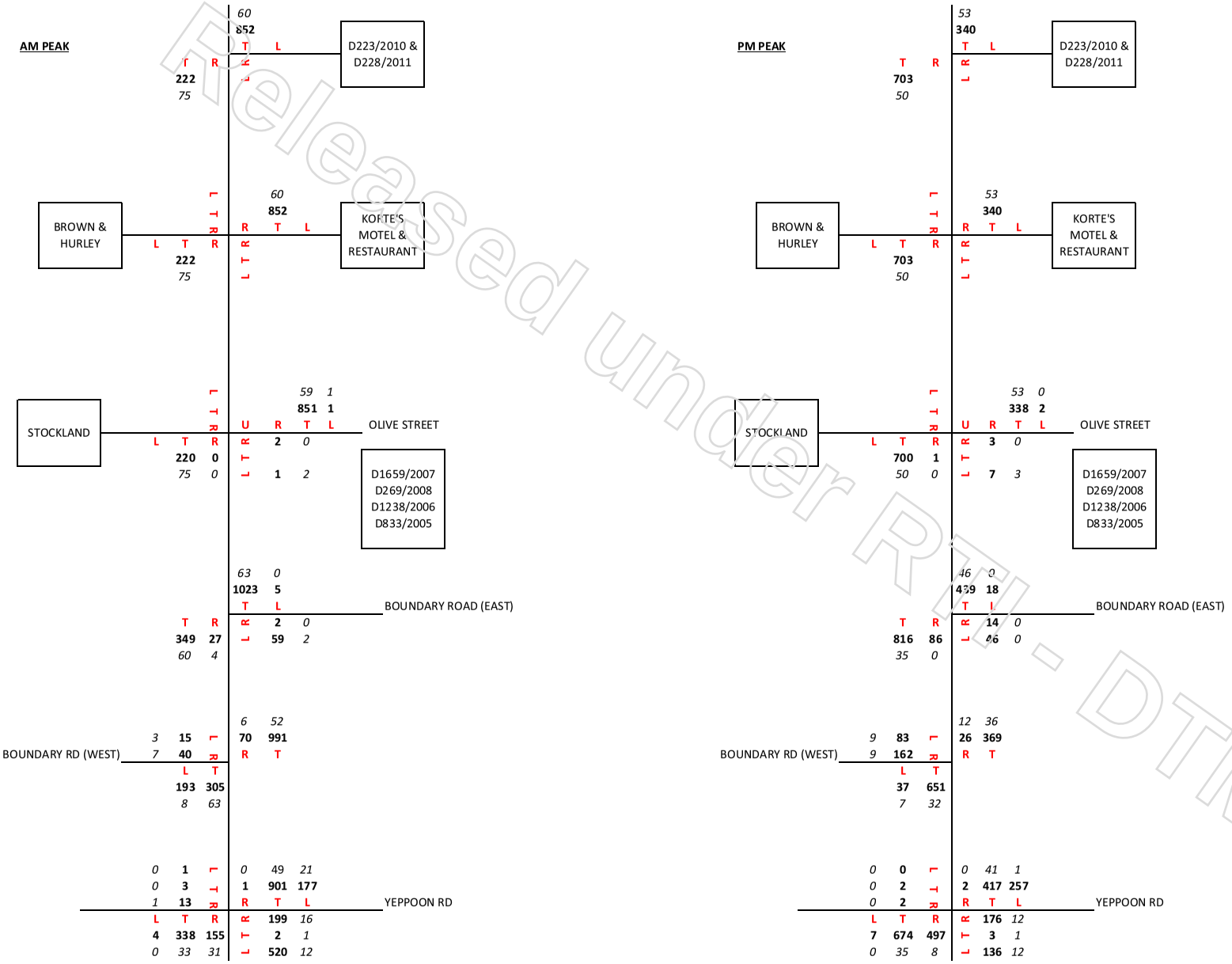
Released under RTI - DTMR

r RTI-3295 file1 Release.pdf - Page Number: 161 of 672

STO0111-01R - Stockland North Parkhurst

Background Road Network Volumes

Design Year - 2025



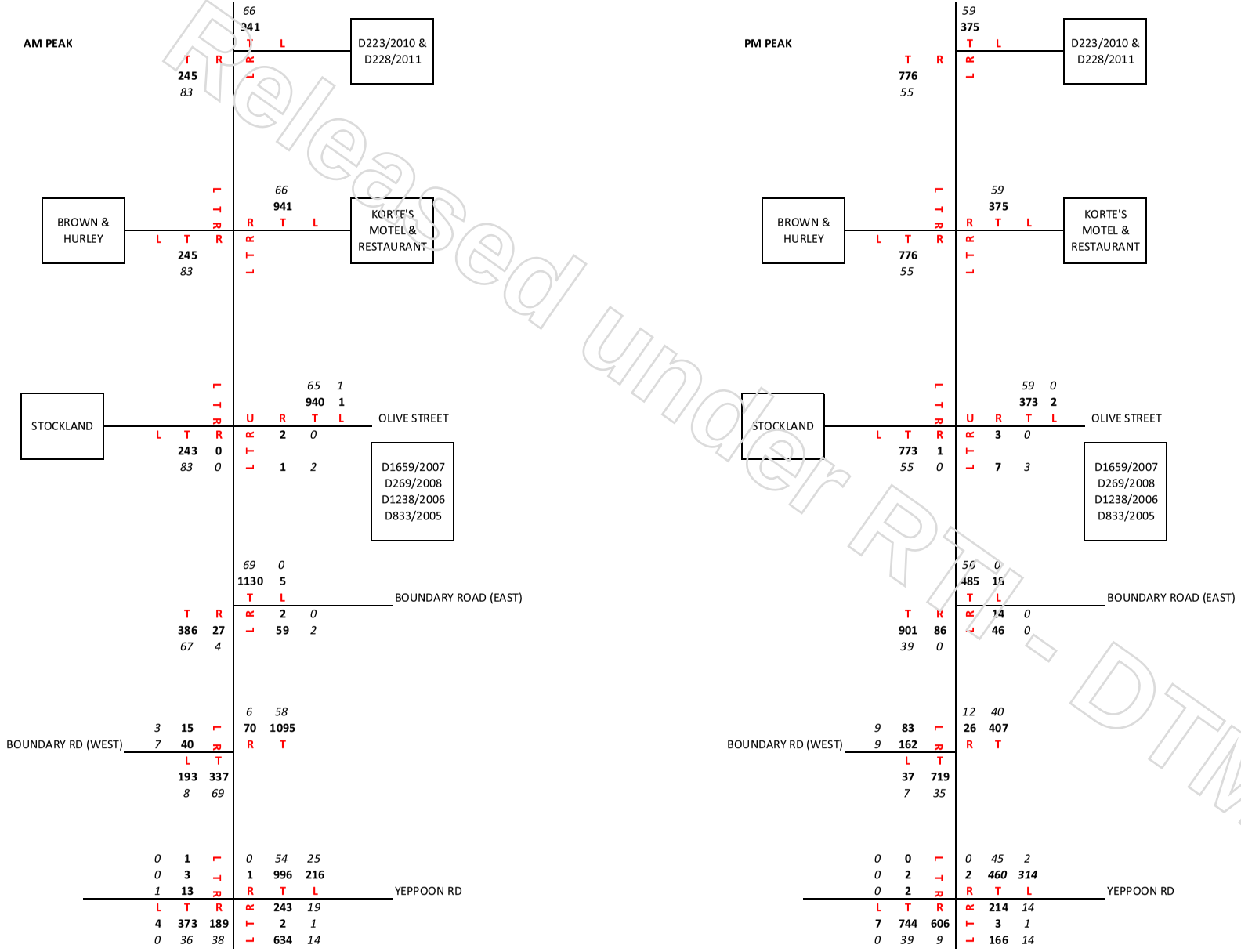
Released under RTI - DTMR

[RTI-3295 file1 Release.pdf - Page Number: 162 of 672

STO0111-01R - Stockland North Parkhurst

Background Road Network Volumes

Design Year - 2035



Released under RTI - DTMR

[RTI-3295 file1 Release.pdf - Page Number: 163 of 672



APPENDIX J

Approved Development Calculations and Associated Bruce Highway Network Volumes

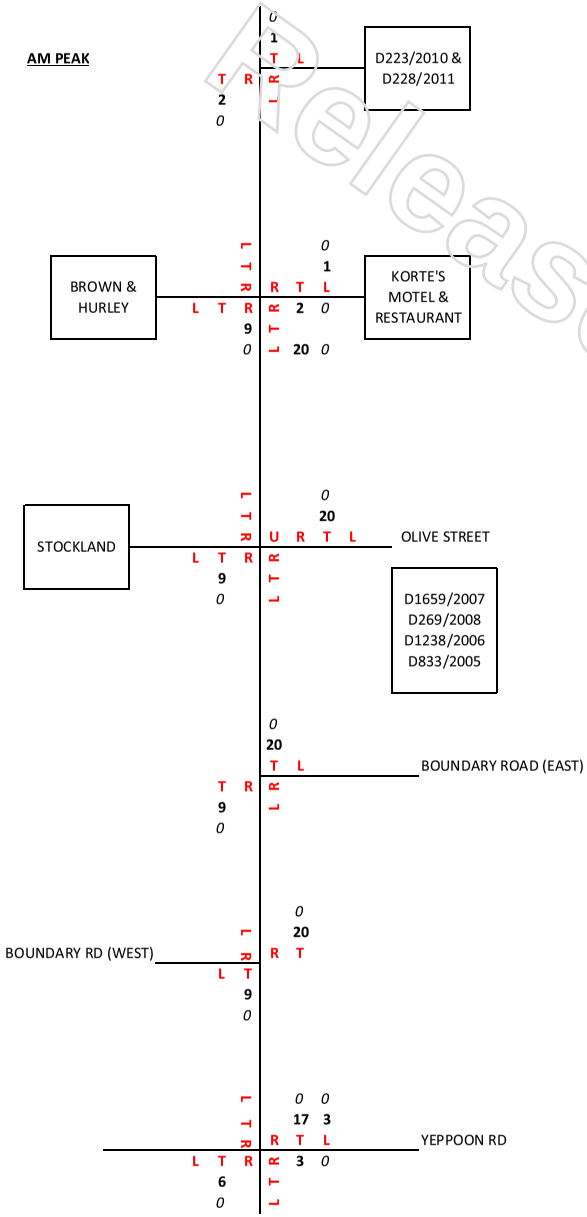
Released under RTI - DTMR

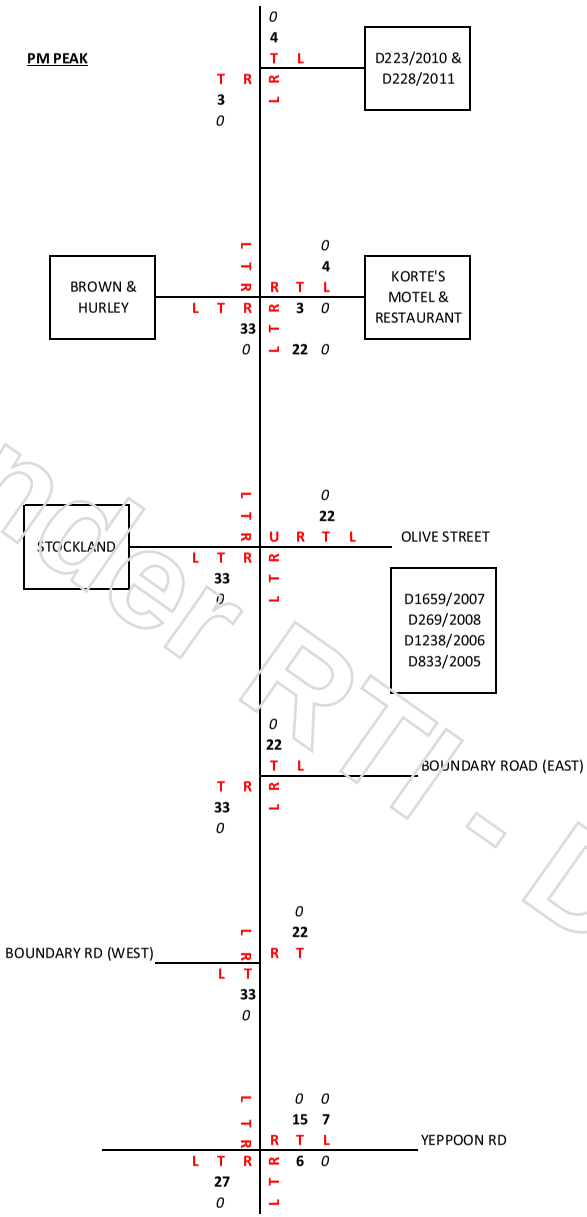
r RTI-3295 file1 Release.pdf - Page Number: 164 of 672

STO0111-01R - Stockland North Parkhurst

Road Network Volumes

Korte's Motel & Restaurant





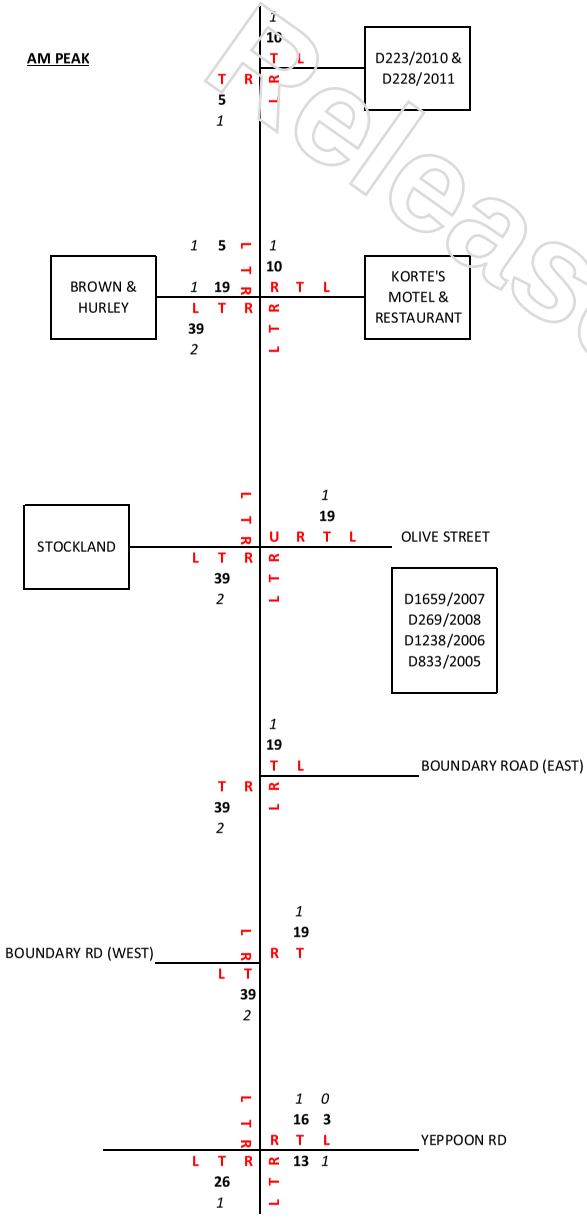
Released under RTI - DTMR

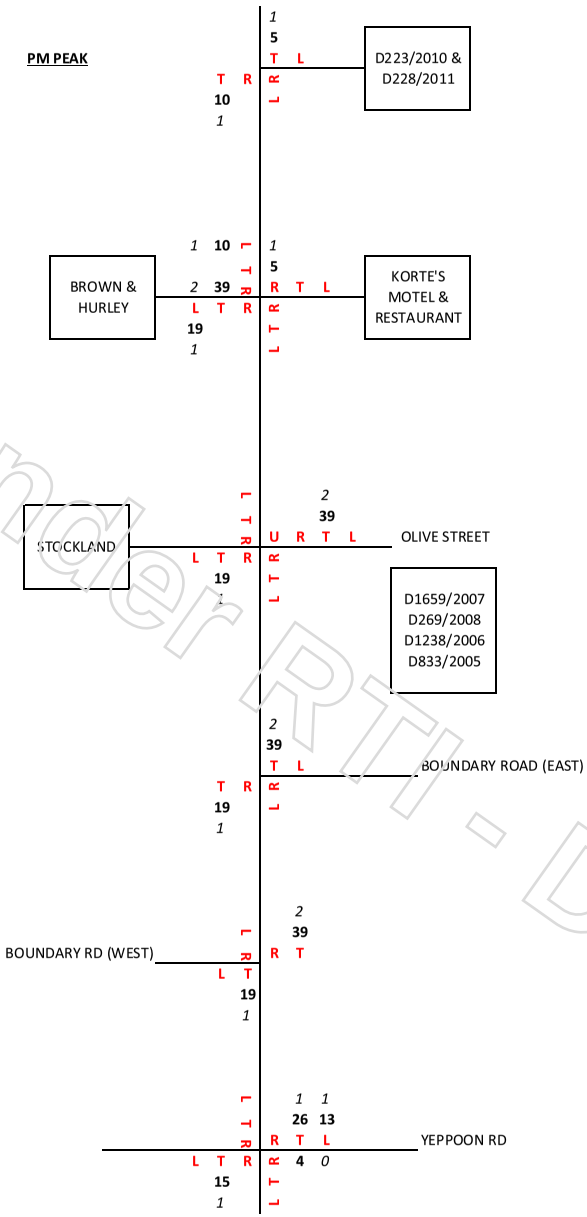
[RTI-3295 file1 Release.pdf - Page Number: 165 of 672

STO0111-01R - Stockland North Parkhurst

Road Network Volumes

Brown & Hurley Approved Development





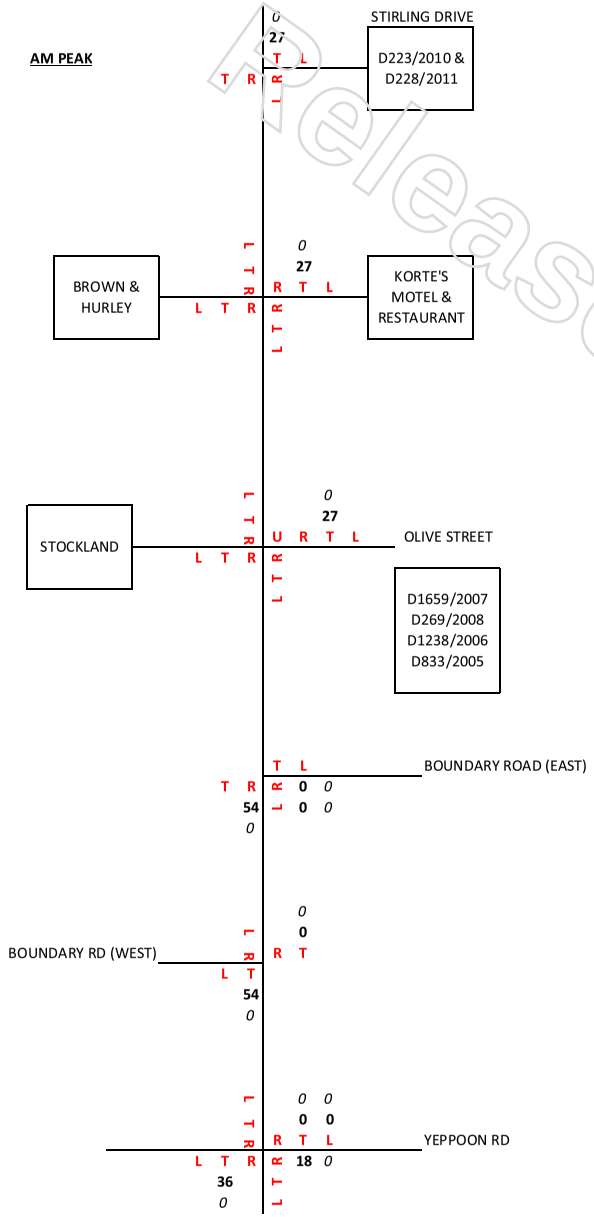
Released under RTI - DTMR

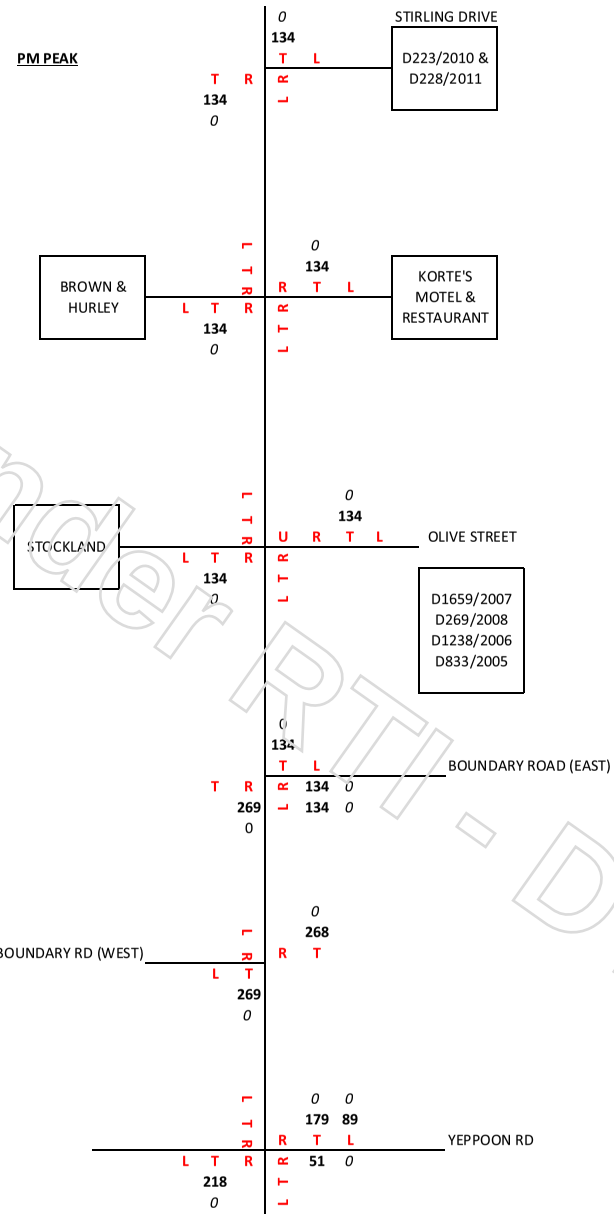
[RTI-3295 file1 Release.pdf - Page Number: 166 of 672

STO0111-01R - Stockland North Parkhurst

Road Network Volumes

Boundary Shopping Centre Development





Released under RTI - DTMR

[RTI-3295 file1 Release.pdf - Page Number: 167 of 672

STO0111-01R - Stockland North Parkhurst

Background Road Network Calculations - 2025

Approved Eastern Development Parcels

D223/2010 & D228/2011 (TMR j)

Yield	=	72 lots	
Gen Rate	=	0.85 trips/lot (peak)	
Gen Traffic Volume	=	61 trips	
AM PEAK			
% Trips IN	=	30%	
Vol Trips IN	=	18 trips	
% Trips from S	=	90%	
Vol Trips from S	=	17 trips	
% Trips from S via Stirling	=	100%	
Vol Trips from S via Stirling	=	**17** trips	A
% Trips from N	=	10%	
Vol Trips from N	=	2 trips	
% Trips from N via Stirling	=	100%	
Vol Trips from N via Stirling	=	**2** trips	B
% Trips OUT	=	70%	
Vol Trips OUT	=	43 trips	
% Trips to S	=	90%	
Vol Trips to S	=	39 trips	
% Trips to S via Stirling	=	100%	
Vol Trips to S via Stirling	=	**39** trips	C
% Trips to N	=	10%	
Vol Trips to N	=	4 trips	
% Trips to N via Stirling	=	0%	
Vol Trips to N via Stirling	=	**0** trips	D
% Trips to N via Angela Rd	=	100%	
Vol Trips to N via Angela Rd	=	**4** trips	E
PM PEAK			
% Trips IN	=	60%	
Vol Trips IN	=	37 trips	
% Trips from S	=	90%	
Vol Trips from S	=	33 trips	
% Trips from S via Stirling	=	100%	
Vol Trips from S via Stirling	=	**33** trips	F
% Trips from N	=	10%	
Vol Trips from N	=	4 trips	
% Trips from N via Stirling	=	100%	
Vol Trips from N via Stirling	=	**4** trips	G
% Trips OUT	=	40%	
Vol Trips OUT	=	24 trips	
% Trips to S	=	90%	
Vol Trips to S	=	22 trips	
% Trips to S via Stirling	=	100%	
Vol Trips to S via Stirling	=	**22** trips	H
% Trips to N	=	10%	
Vol Trips to N	=	2 trips	
% Trips to N via Stirling	=	0%	
Vol Trips to N via Stirling	=	**0** trips	I
% Trips to N via Angela Rd	=	100%	
Vol Trips to N via Angela Rd	=	**2** trips	J

D1659/2007 & D269/2008 (TMR f)

Yield	=	114 lots	
Gen Rate	=	0.85 trips/lot (peak)	
Gen Traffic Volume	=	97 trips	
AM PEAK			
% Trips IN	=	30%	
Vol Trips IN	=	29 trips	
% Trips from S	=	90%	
Vol Trips from S	=	26 trips	
% Trips from S via Olive St	=	100%	
Vol Trips from S via Olive St	=	**26** trips	K
% Trips from S via Yeppoon Rd	=	0%	
Vol Trips from S via Yeppoon Rd	=	**0** trips	L
% Trips from S via Norman	=	0%	
Vol Trips from S via Norman	=	**0** trips	M
% Trips from S via R-Y Rd	=	0%	
Vol Trips from S via R-Y Rd	=	**0** trips	N
% Trips from N	=	10%	
Vol Trips from N	=	3 trips	
% Trips from N via Olive St	=	100%	
Vol Trips from N via Olive St	=	**3** trips	O
% Trips OUT	=	70%	
Vol Trips OUT	=	68 trips	
% Trips to S	=	90%	
Vol Trips to S	=	61 trips	
% Trips to S via Olive St	=	100%	
Vol Trips to S via Olive St	=	**61** trips	P
% Trips to S via Yeppoon Rd	=	0%	
Vol Trips to S via Yeppoon Rd	=	**0** trips	Q
% Trips to S via Norman	=	0%	
Vol Trips to S via Norman	=	**0** trips	R
% Trips to S via R-Y Rd	=	0%	
Vol Trips to S via R-Y Rd	=	**0** trips	S
% Trips to N	=	10%	
Vol Trips to N	=	7 trips	
% Trips to N via Olive St	=	100%	
Vol Trips to N via Olive St	=	**7** trips	T
PM PEAK			
% Trips IN	=	60%	
Vol Trips IN	=	58 trips	
% Trips from S	=	90%	
Vol Trips from S	=	52 trips	
% Trips from S via Olive St	=	100%	
Vol Trips from S via Olive St	=	**52** trips	U
% Trips from S via Yeppoon Rd	=	0%	
Vol Trips from S via Yeppoon Rd	=	**0** trips	V
% Trips from S via Norman	=	0%	
Vol Trips from S via Norman	=	**0** trips	W
% Trips from S via R-Y Rd	=	0%	
Vol Trips from S via R-Y Rd	=	**0** trips	X
% Trips from N	=	10%	
Vol Trips from N	=	6 trips	
% Trips from N via Olive St	=	100%	
Vol Trips from N via Olive St	=	**6** trips	Y
% Trips OUT	=	40%	
Vol Trips OUT	=	39 trips	
% Trips to S	=	90%	
Vol Trips to S	=	35 trips	
% Trips to S via Olive St	=	100%	
Vol Trips to S via Olive St	=	**35** trips	Z
% Trips to S via Yeppoon Rd	=	0%	
Vol Trips to S via Yeppoon Rd	=	**0** trips	AA
% Trips to S via Norman	=	0%	
Vol Trips to S via Norman	=	**0** trips	AB
% Trips to S via R-Y Rd	=	0%	
Vol Trips to S via R-Y Rd	=	**0** trips	AC
% Trips to N	=	10%	
Vol Trips to N	=	4 trips	
% Trips to N via Olive St	=	100%	
Vol Trips to N via Olive St	=	**4** trips	AD

D1238/2006 (TMR B)

Yield	=	47 lots	
Gen Rate	=	0.85 trips/lot (peak)	
Gen Traffic Volume	=	40 trips	
AM PEAK			
% Trips IN	=	30%	
Vol Trips IN	=	12 trips	
% Trips from S	=	90%	
Vol Trips from S	=	11 trips	
% Trips from S via Olive St	=	100%	
Vol Trips from S via Olive St	=	**11** trips	AE
% Trips from S via Yeppoon Rd	=	0%	
Vol Trips from S via Yeppoon Rd	=	**0** trips	AF
% Trips from S via Norman	=	0%	
Vol Trips from S via Norman	=	**0** trips	AG
% Trips from S via R-Y Rd	=	0%	
Vol Trips from S via R-Y Rd	=	**0** trips	AH
% Trips from N	=	10%	
Vol Trips from N	=	1 trips	
% Trips from N via Olive St	=	100%	
Vol Trips from N via Olive St	=	**1** trips	AI
% Trips OUT	=	70%	
Vol Trips OUT	=	28 trips	
% Trips to S	=	90%	
Vol Trips to S	=	25 trips	
% Trips to S via Olive St	=	100%	
Vol Trips to S via Olive St	=	**25** trips	AJ
% Trips to S via Yeppoon Rd	=	0%	
Vol Trips to S via Yeppoon Rd	=	**0** trips	AK
% Trips to S via Norman	=	0%	
Vol Trips to S via Norman	=	**0** trips	AL
% Trips to S via R-Y Rd	=	0%	
Vol Trips to S via R-Y Rd	=	**0** trips	AM
% Trips to N	=	10%	
Vol Trips to N	=	3 trips	
% Trips to N via Olive St	=	100%	
Vol Trips to N via Olive St	=	**3** trips	AN
PM PEAK			
% Trips IN	=	60%	
Vol Trips IN	=	24 trips	
% Trips from S	=	90%	
Vol Trips from S	=	22 trips	
% Trips from S via Olive St	=	100%	
Vol Trips from S via Olive St	=	**22** trips	AO
% Trips from S via Yeppoon Rd	=	0%	
Vol Trips from S via Yeppoon Rd	=	**0** trips	AP
% Trips from S via Norman	=	0%	
Vol Trips from S via Norman	=	**0** trips	AQ
% Trips from S via R-Y Rd	=	0%	
Vol Trips from S via R-Y Rd	=	**0** trips	AR
% Trips from N	=	10%	
Vol Trips from N	=	2 trips	
% Trips from N via Olive St	=	100%	
Vol Trips from N via Olive St	=	**2** trips	AS
% Trips OUT	=	40%	
Vol Trips OUT	=	16 trips	
% Trips to S	=	90%	
Vol Trips to S	=	14 trips	
% Trips to S via Olive St	=	100%	
Vol Trips to S via Olive St	=	**14** trips	AT
% Trips to S via Yeppoon Rd	=	0%	
Vol Trips to S via Yeppoon Rd	=	**0** trips	AU
% Trips to S via Norman	=	0%	
Vol Trips to S via Norman	=	**0** trips	AV
% Trips to S via R-Y Rd	=	0%	
Vol Trips to S via R-Y Rd	=	**0** trips	AW
% Trips to N	=	10%	
Vol Trips to N	=	2 trips	
% Trips to N via Olive St	=	100%	
Vol Trips to N via Olive St	=	**2** trips	AX

D833/2005 (TMR d)

Yield	=	102 lots	
Gen Rate	=	0.85 trips/lot (peak)	
Gen Traffic Volume	=	87 trips	
AM PEAK			
% Trips IN	=	30%	
Vol Trips IN	=	26 trips	
% Trips from S	=	90%	
Vol Trips from S	=	23 trips	
% Trips from S via Boundary	=	100%	
Vol Trips from S via Boundary	=	**23** trips	AY
% Trips from S via Yeppoon Rd	=	0%	
Vol Trips from S via Yeppoon Rd	=	**0** trips	AZ
% Trips from S via Norman	=	0%	
Vol Trips from S via Norman	=	**0** trips	BA
% Trips from S via R-Y Rd	=	0%	
Vol Trips from S via R-Y Rd	=	**0** trips	BB
% Trips from N	=	10%	
Vol Trips from N	=	3 trips	
% Trips from N via Olive St	=	75%	
Vol Trips from N via Olive St	=	**2** trips	BC
% Trips from N via Mason	=	25%	
Vol Trips from N via Mason	=	**1** trips	BD
% Trips OUT	=	70%	
Vol Trips OUT	=	61 trips	
% Trips to S	=	90%	
Vol Trips to S	=	55 trips	
% Trips to S via Boundary	=	75%	
Vol Trips to S via Boundary	=	**41** trips	BE
% Trips to S via Rachel Dr	=	25%	
Vol Trips to S via Rachel Dr	=	**14** trips	BF
% Trips to N	=	10%	
Vol Trips to N	=	6 trips	
% Trips to N via Olive St	=	100%	
Vol Trips to N via Olive St	=	**6** trips	BI
PM PEAK			
% Trips IN	=	60%	
Vol Trips IN	=	52 trips	
% Trips from S	=	90%	
Vol Trips from S	=	47 trips	
% Trips from S via Boundary	=	100%	
Vol Trips from S via Boundary	=	**47** trips	BJ
% Trips from S via Yeppoon Rd	=	0%	
Vol Trips from S via Yeppoon Rd	=	**0** trips	BK
% Trips from S via Norman	=	0%	
Vol Trips from S via Norman	=	**0** trips	BL
% Trips from S via R-Y Rd	=	0%	
Vol Trips from S via R-Y Rd	=	**0** trips	BM
% Trips from N	=	10%	
Vol Trips from N	=	5 trips	
% Trips from N via Olive St	=	75%	
Vol Trips from N via Olive St	=	**4** trips	BN
% Trips from N via Mason	=	25%	
Vol Trips from N via Mason	=	**1** trips	BO
% Trips OUT	=	40%	
Vol Trips OUT	=	35 trips	
% Trips to S	=	90%	
Vol Trips to S	=	31 trips	
% Trips to S via Boundary	=	75%	
Vol Trips to S via Boundary	=	**23** trips	BP
% Trips to S via Rachel Dr	=	25%	
Vol Trips to S via Rachel Dr	=	**8** trips	BQ
% Trips to N	=	10%	
Vol Trips to N	=	3 trips	
% Trips to N via Olive St	=	100%	
Vol Trips to N via Olive St	=	**3** trips	BT

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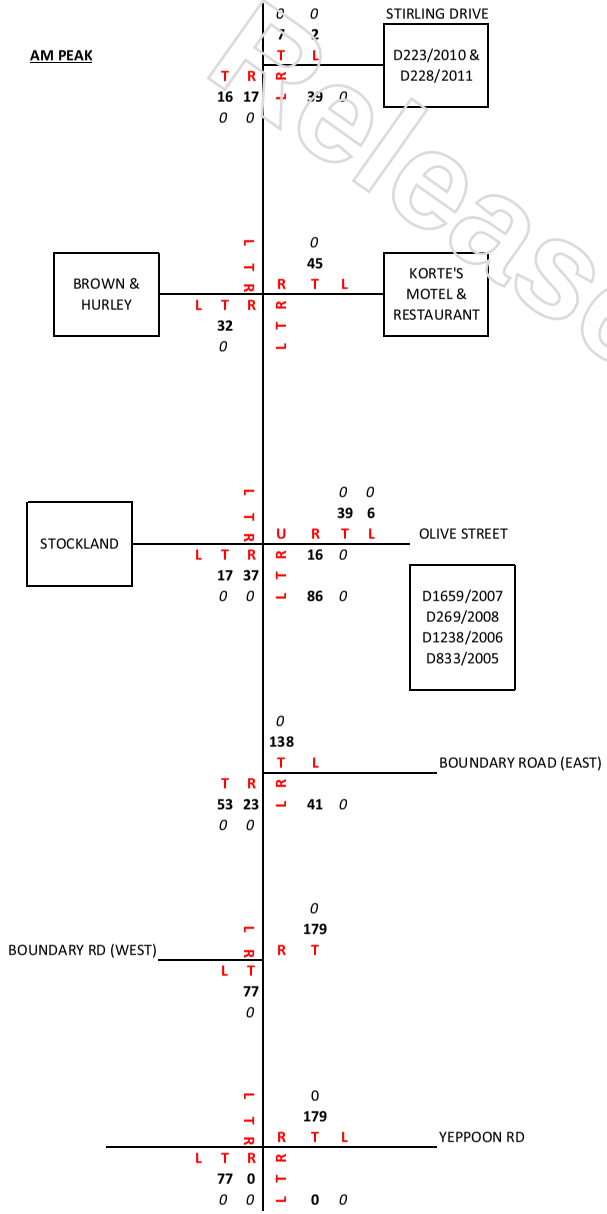
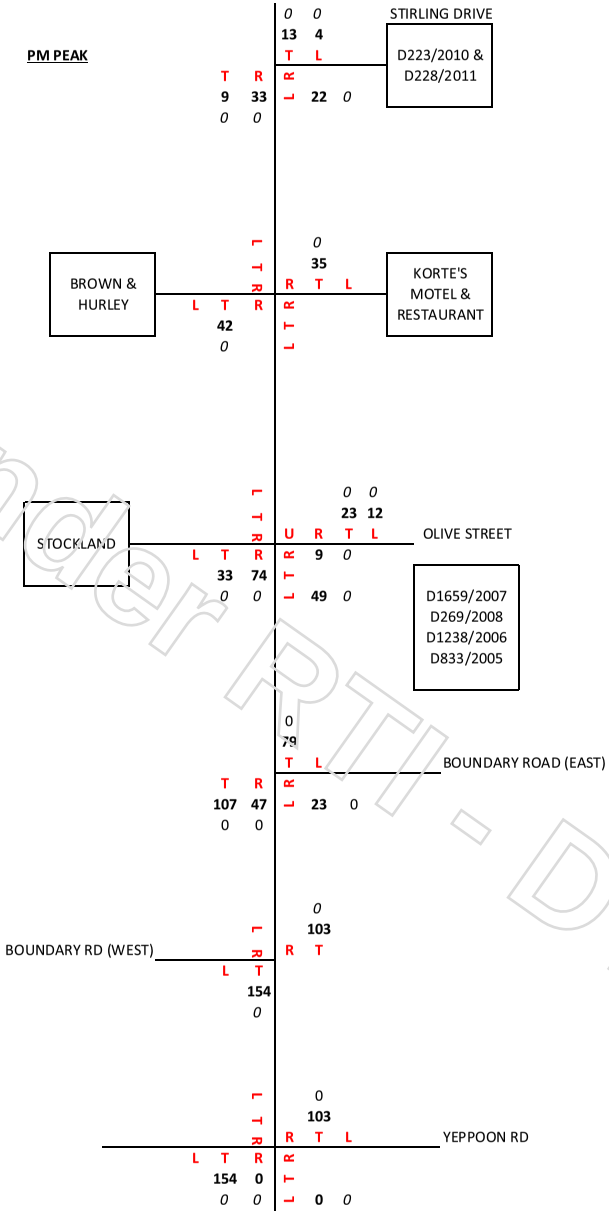
Road Network Volumes 2025

Approved Eastern Developments





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Background Road Network Calculations - 2035

Approved Eastern Development Parcels

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D223/2010 & D228/2011 (TMR j)

Yield	=	72 lots	
Gen Rate	=	0.85 trips/lot (peak)	
Gen Traffic Volume	=	61 trips	
AM PEAK			
% Trips IN	=	30%	
Vol Trips IN	=	18 trips	
% Trips from S	=	90%	
Vol Trips from S	=	17 trips	
% Trips from S via Stirling	=	100%	
Vol Trips from S via Stirling	=	**17** trips	A
% Trips from N	=	10%	
Vol Trips from N	=	2 trips	
% Trips from N via Stirling	=	100%	
Vol Trips from N via Stirling	=	**2** trips	B
% Trips OUT	=	70%	
Vol Trips OUT	=	43 trips	
% Trips to S	=	90%	
Vol Trips to S	=	39 trips	
% Trips to S via Stirling	=	100%	
Vol Trips to S via Stirling	=	**39** trips	C
% Trips to N	=	10%	
Vol Trips to N	=	4 trips	
% Trips to N via Stirling	=	0%	
Vol Trips to N via Stirling	=	**0** trips	D
% Trips to N via Angela Rd	=	100%	
Vol Trips to N via Angela Rd	=	**4** trips	E
PM PEAK			
% Trips IN	=	60%	
Vol Trips IN	=	37 trips	
% Trips from S	=	90%	
Vol Trips from S	=	33 trips	
% Trips from S via Stirling	=	100%	
Vol Trips from S via Stirling	=	**33** trips	F
% Trips from N	=	10%	
Vol Trips from N	=	4 trips	
% Trips from N via Stirling	=	100%	
Vol Trips from N via Stirling	=	**4** trips	G
% Trips OUT	=	40%	
Vol Trips OUT	=	24 trips	
% Trips to S	=	90%	
Vol Trips to S	=	22 trips	
% Trips to S via Stirling	=	100%	
Vol Trips to S via Stirling	=	**22** trips	H
% Trips to N	=	10%	
Vol Trips to N	=	2 trips	
% Trips to N via Stirling	=	0%	
Vol Trips to N via Stirling	=	**0** trips	I
% Trips to N via Angela Rd	=	100%	
Vol Trips to N via Angela Rd	=	**2** trips	J

D1659/2007 & D269/2008 (TMR f)

Yield	=	114 lots	
Gen Rate	=	0.85 trips/lot (peak)	
Gen Traffic Volume	=	97 trips	
AM PEAK			
% Trips IN	=	30%	
Vol Trips IN	=	29 trips	
% Trips from S	=	90%	
Vol Trips from S	=	26 trips	
% Trips from S via Olive St	=	50%	
Vol Trips from S via Olive St	=	**13** trips	K
% Trips from S via Yeppoon Rd	=	10%	
Vol Trips from S via Yeppoon Rd	=	**3** trips	L
% Trips from S via Norman	=	30%	
Vol Trips from S via Norman	=	**8** trips	M
% Trips from S via R-Y Rd	=	10%	
Vol Trips from S via R-Y Rd	=	**3** trips	N
% Trips from N	=	10%	
Vol Trips from N	=	3 trips	
% Trips from N via Olive St	=	100%	
Vol Trips from N via Olive St	=	**3** trips	O
% Trips OUT	=	70%	
Vol Trips OUT	=	68 trips	
% Trips to S	=	90%	
Vol Trips to S	=	61 trips	
% Trips to S via Olive St	=	50%	
Vol Trips to S via Olive St	=	**31** trips	P
% Trips to S via Yeppoon Rd	=	10%	
Vol Trips to S via Yeppoon Rd	=	**6** trips	Q
% Trips to S via Norman	=	30%	
Vol Trips to S via Norman	=	**18** trips	R
% Trips to S via R-Y Rd	=	10%	
Vol Trips to S via R-Y Rd	=	**6** trips	S
% Trips to N	=	10%	
Vol Trips to N	=	7 trips	
% Trips to N via Olive St	=	100%	
Vol Trips to N via Olive St	=	**7** trips	T
PM PEAK			
% Trips IN	=	60%	
Vol Trips IN	=	58 trips	
% Trips from S	=	90%	
Vol Trips from S	=	52 trips	
% Trips from S via Olive St	=	50%	
Vol Trips from S via Olive St	=	**26** trips	U
% Trips from S via Yeppoon Rd	=	10%	
Vol Trips from S via Yeppoon Rd	=	**5** trips	V
% Trips from S via Norman	=	30%	
Vol Trips from S via Norman	=	**16** trips	W
% Trips from S via R-Y Rd	=	10%	
Vol Trips from S via R-Y Rd	=	**5** trips	X
% Trips from N	=	10%	
Vol Trips from N	=	6 trips	
% Trips from N via Olive St	=	100%	
Vol Trips from N via Olive St	=	**6** trips	Y
% Trips OUT	=	40%	
Vol Trips OUT	=	39 trips	
% Trips to S	=	90%	
Vol Trips to S	=	35 trips	
% Trips to S via Olive St	=	50%	
Vol Trips to S via Olive St	=	**17** trips	Z
% Trips to S via Yeppoon Rd	=	10%	
Vol Trips to S via Yeppoon Rd	=	**3** trips	AA
% Trips to S via Norman	=	30%	
Vol Trips to S via Norman	=	**10** trips	AB
% Trips to S via R-Y Rd	=	10%	
Vol Trips to S via R-Y Rd	=	**3** trips	AC
% Trips to N	=	10%	
Vol Trips to N	=	4 trips	
% Trips to N via Olive St	=	100%	
Vol Trips to N via Olive St	=	**4** trips	AD

D1238/2006 (TMR B)

Yield	=	47 lots	
Gen Rate	=	0.85 trips/lot (peak)	
Gen Traffic Volume	=	40 trips	
AM PEAK			
% Trips IN	=	30%	
Vol Trips IN	=	12 trips	
% Trips from S	=	90%	
Vol Trips from S	=	11 trips	
% Trips from S via Olive St	=	50%	
Vol Trips from S via Olive St	=	**5** trips	AE
% Trips from S via Yeppoon Rd	=	10%	
Vol Trips from S via Yeppoon Rd	=	**1** trips	AF
% Trips from S via Norman	=	30%	
Vol Trips from S via Norman	=	**3** trips	AG
% Trips from S via R-Y Rd	=	10%	
Vol Trips from S via R-Y Rd	=	**1** trips	AH
% Trips from N	=	10%	
Vol Trips from N	=	1 trips	
% Trips from N via Olive St	=	100%	
Vol Trips from N via Olive St	=	**1** trips	AI
% Trips OUT	=	70%	
Vol Trips OUT	=	28 trips	
% Trips to S	=	90%	
Vol Trips to S	=	25 trips	
% Trips to S via Olive St	=	50%	
Vol Trips to S via Olive St	=	**13** trips	AJ
% Trips to S via Yeppoon Rd	=	10%	
Vol Trips to S via Yeppoon Rd	=	**3** trips	AK
% Trips to S via Norman	=	30%	
Vol Trips to S via Norman	=	**8** trips	AL
% Trips to S via R-Y Rd	=	10%	
Vol Trips to S via R-Y Rd	=	**3** trips	AM
% Trips to N	=	10%	
Vol Trips to N	=	3 trips	
% Trips to N via Olive St	=	100%	
Vol Trips to N via Olive St	=	**3** trips	AN
PM PEAK			
% Trips IN	=	60%	
Vol Trips IN	=	24 trips	
% Trips from S	=	90%	
Vol Trips from S	=	22 trips	
% Trips from S via Olive St	=	50%	
Vol Trips from S via Olive St	=	**11** trips	AO
% Trips from S via Yeppoon Rd	=	10%	
Vol Trips from S via Yeppoon Rd	=	**2** trips	AP
% Trips from S via Norman	=	30%	
Vol Trips from S via Norman	=	**6** trips	AQ
% Trips from S via R-Y Rd	=	10%	
Vol Trips from S via R-Y Rd	=	**2** trips	AR
% Trips from N	=	10%	
Vol Trips from N	=	2 trips	
% Trips from N via Olive St	=	100%	
Vol Trips from N via Olive St	=	**2** trips	AS
% Trips OUT	=	40%	
Vol Trips OUT	=	16 trips	
% Trips to S	=	90%	
Vol Trips to S	=	14 trips	
% Trips to S via Olive St	=	50%	
Vol Trips to S via Olive St	=	**7** trips	AT
% Trips to S via Yeppoon Rd	=	10%	
Vol Trips to S via Yeppoon Rd	=	**1** trips	AU
% Trips to S via Norman	=	30%	
Vol Trips to S via Norman	=	**4** trips	AV
% Trips to S via R-Y Rd	=	10%	
Vol Trips to S via R-Y Rd	=	**1** trips	AW
% Trips to N	=	10%	
Vol Trips to N	=	2 trips	
% Trips to N via Olive St	=	100%	
Vol Trips to N via Olive St	=	**2** trips	AX

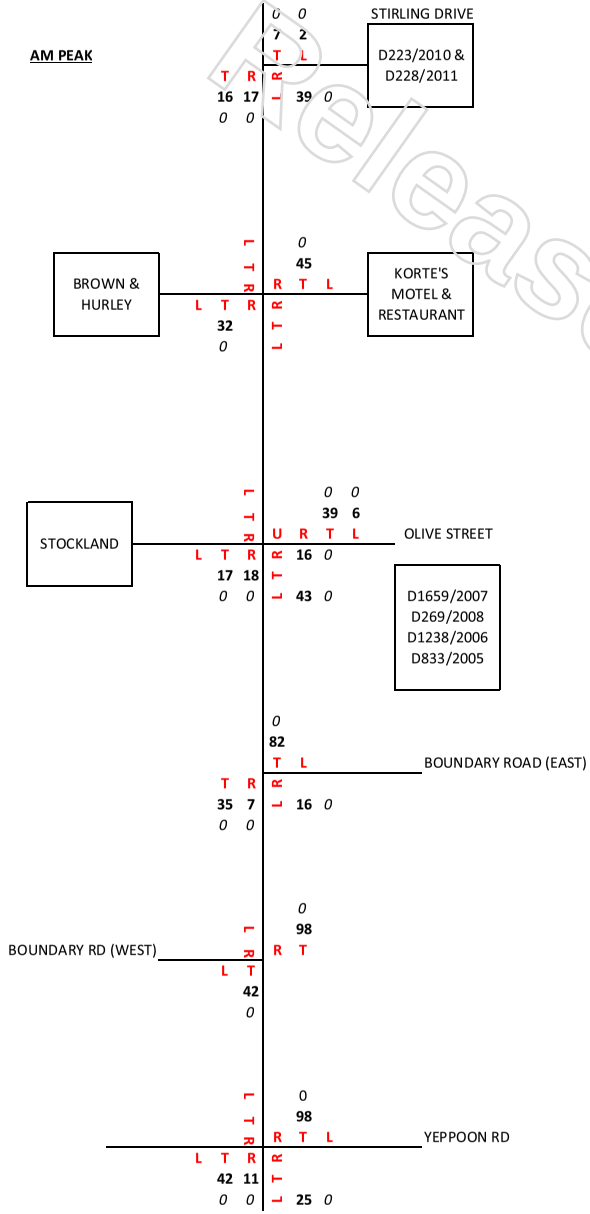
D833/2005 (TMR d)

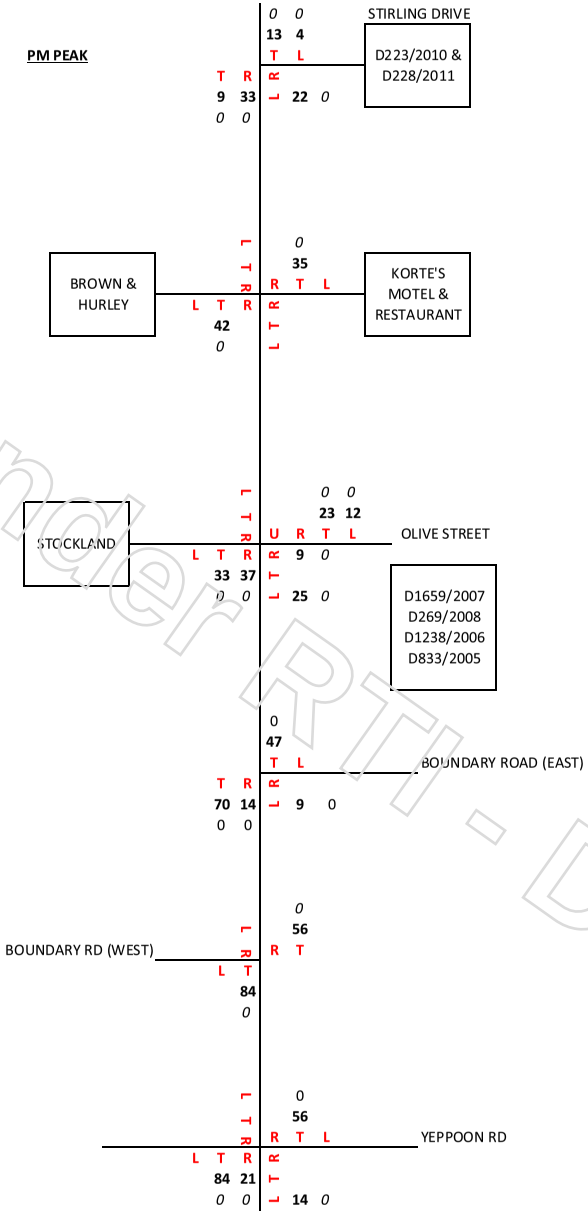
Yield	=	102 lots	
Gen Rate	=	0.85 trips/lot (peak)	
Gen Traffic Volume	=	87 trips	
AM PEAK			
% Trips IN	=	30%	
Vol Trips IN	=	26 trips	
% Trips from S	=	90%	
Vol Trips from S	=	23 trips	
% Trips from S via Boundary	=	30%	
Vol Trips from S via Boundary	=	**7** trips	AY
% Trips from S via Yeppoon Rd	=	30%	
Vol Trips from S via Yeppoon Rd	=	**7** trips	AZ
% Trips from S via Norman	=	30%	
Vol Trips from S via Norman	=	**7** trips	BA
% Trips from S via R-Y Rd	=	10%	
Vol Trips from S via R-Y Rd	=	**2** trips	BB
% Trips from N	=	10%	
Vol Trips from N	=	3 trips	
% Trips from N via Olive St	=	75%	
Vol Trips from N via Olive St	=	**2** trips	BC
% Trips from N via Mason	=	25%	
Vol Trips from N via Mason	=	**1** trips	BD
% Trips OUT	=	70%	
Vol Trips OUT	=	61 trips	
% Trips to S	=	90%	
Vol Trips to S	=	55 trips	
% Trips to S via Boundary	=	30%	
Vol Trips to S via Boundary	=	**16** trips	BE
% Trips to S via Yeppoon Rd	=	30%	
Vol Trips to S via Yeppoon Rd	=	**16** trips	BF
% Trips to S via Norman	=	30%	
Vol Trips to S via Norman	=	**16** trips	BG
% Trips to S via R-Y Rd	=	10%	
Vol Trips to S via R-Y Rd	=	**5** trips	BH
% Trips to N	=	10%	
Vol Trips to N	=	6 trips	
% Trips to N via Olive St	=	100%	
Vol Trips to N via Olive St	=	**6** trips	BI
PM PEAK			
% Trips IN	=	60%	
Vol Trips IN	=	52 trips	
% Trips from S	=	90%	
Vol Trips from S	=	47 trips	
% Trips from S via Boundary	=	30%	
Vol Trips from S via Boundary	=	**14** trips	BJ
% Trips from S via Yeppoon Rd	=	30%	
Vol Trips from S via Yeppoon Rd	=	**14** trips	BK
% Trips from S via Norman	=	30%	
Vol Trips from S via Norman	=	**14** trips	BL
% Trips from S via R-Y Rd	=	10%	
Vol Trips from S via R-Y Rd	=	**5** trips	BM
% Trips from N	=	10%	
Vol Trips from N	=	5 trips	
% Trips from N via Olive St	=	75%	
Vol Trips from N via Olive St	=	**4** trips	BN
% Trips from N via Mason	=	25%	
Vol Trips from N via Mason	=	**1** trips	BO
% Trips OUT	=	40%	
Vol Trips OUT	=	35 trips	
% Trips to S	=	90%	
Vol Trips to S	=	31 trips	
% Trips to S via Boundary	=	30%	
Vol Trips to S via Boundary	=	**9** trips	BP
% Trips to S via Yeppoon Rd	=	30%	
Vol Trips to S via Yeppoon Rd	=	**9** trips	BQ
% Trips to S via Norman	=	30%	
Vol Trips to S via Norman	=	**9** trips	BR
% Trips to S via R-Y Rd	=	10%	
Vol Trips to S via R-Y Rd	=	**3** trips	BS
% Trips to N	=	10%	
Vol Trips to N	=	3 trips	
% Trips to N via Olive St	=	100%	
Vol Trips to N via Olive St	=	**3** trips	BT

STO0111-01R - Stockland North Parkhurst

Road Network Volumes 2035

Approved Eastern Developments





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APPENDIX K

SIDRA Results

Bruce Highway / Olive Street

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APPENDIX L

SIDRA Results

Bruce Highway / Boundary Road (East)

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LANE SUMMARY

Site: POST 2025 AM PEAK - UPGRADE

Bruce Highway / Boundary Road (East)
Upgraded Intersection - Ultimate Development
POST DEV - 2025 AM Peak
Signals - Fixed Time Cycle Time = 125 seconds (Optimum Cycle Time - Shortest Queue)

Lane Use and Performance

	Demand Flows L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South: Bruce Highway																
Lane 1	0	449	0	449	6.9	1509	0.298	100	1.0	LOS A	1.9	13.8	500	–	0.0	0.0
Lane 2	0	449	0	449	6.9	1509	0.298	100	1.0	LOS A	1.9	13.8	500	–	0.0	0.0
Lane 3	0	0	108	108	3.7	132	0.821	100	77.6	LOS E	7.1	51.2	125	Turn Bay	0.0	0.0
Approach	0	898	108	1006	6.6		0.821		9.2	LOS A	7.1	51.2				
East: Boundary Road																
Lane 1	102	0	0	102	2.0	192	0.530	100	68.3	LOS E	6.1	43.5	500	–	0.0	0.0
Lane 2	0	0	2	2	0.0	195	0.010	100	62.9	LOS E	0.1	0.8	50	Turn Bay	0.0	0.0
Approach	102	0	2	104	1.9		0.530		68.2	LOS E	6.1	43.5				
North: Bruce Highway																
Lane 1	5	1113	0	1118	2.9	1315	0.850	100	16.1	LOS B	50.8	364.2	500	–	0.0	0.0
Lane 2	0	1119	0	1119	2.9	1315	0.850	100	16.0	LOS B	50.8	364.3	500	–	0.0	0.0
Approach	5	2232	0	2237	2.9		0.850		16.0	LOS B	50.8	364.3				
Intersection				3347	3.9		0.850		15.6	LOS B	50.8	364.3				

Level of Service (LOS) Method: Delay (HCM 2000).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model used.

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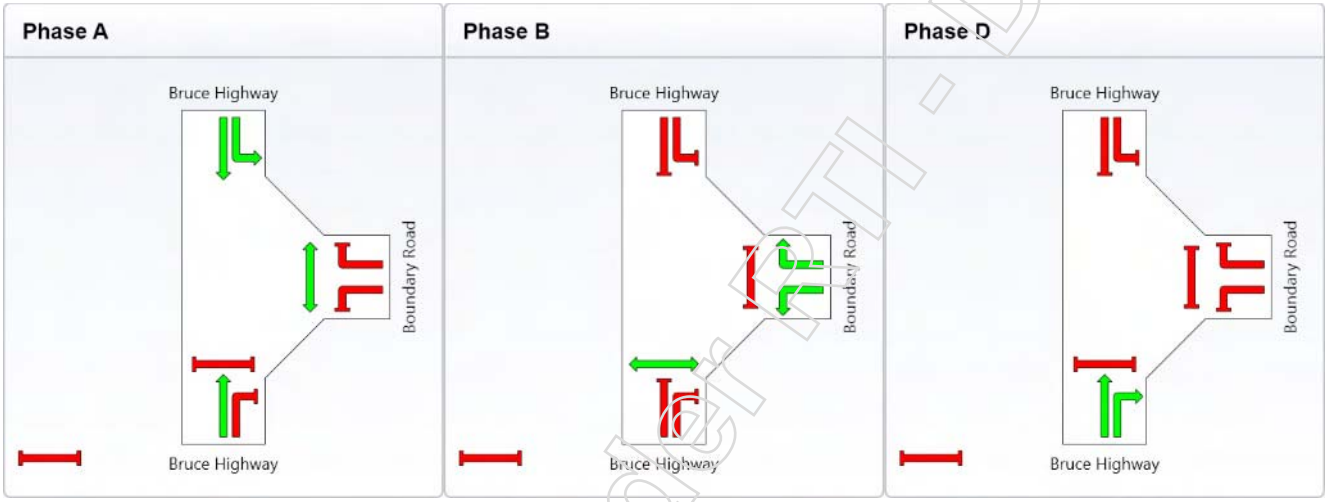
PHASING SUMMARY

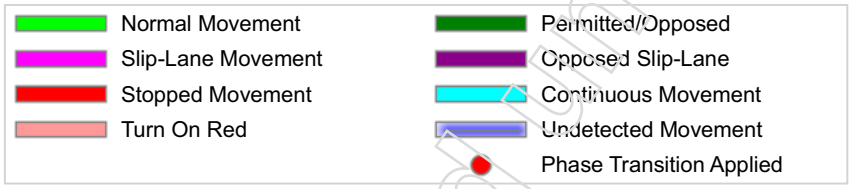
Bruce Highway / Boundary Road (East)
Upgraded Intersection - Ultimate Development
POST DEV - 2025 AM Peak
Signals - Fixed Time Cycle Time = 125 seconds (Optimum Cycle Time - Shortest Queue)

Phase times determined by the program
Sequence: CAMBRAY
Input Sequence: A, B, D
Output Sequence: A, B, D

Phase Timing Results

Phase	A	B	D
Green Time (sec)	85	13	9
Yellow Time (sec)	4	4	4
All-Red Time (sec)	2	2	2
Phase Time (sec)	91	19	15
Phase Split	73 %	15 %	12 %





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LANE SUMMARY

Site: POST 2025 PM PEAK - UPGRADE

Bruce Highway / Boundary Road (East)
Upgraded Intersection - Ultimate Development
POST DEV - 2025 PM Peak
Signals - Fixed Time Cycle Time = 95 seconds (Optimum Cycle Time - Shortest Queue)

Lane Use and Performance

	Demand Flows L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South: Bruce Highway																
Lane 1	0	942	0	942	1.9	1434	0.657	100	1.5	LOS A	5.7	40.7	500	–	0.0	0.0
Lane 2	0	942	0	942	1.9	1434	0.657	100	1.5	LOS A	5.7	40.7	500	–	0.0	0.0
Lane 3	0	0	402	402	0.0	474	0.848	100	51.4	LOS D	19.3	135.0	125	Turn Bay	0.0	12.0
Approach	0	1883	402	2285	1.6		0.848		10.3	LOS B	19.3	135.0				
East: Boundary Road																
Lane 1	203	0	0	203	0.0	257	0.791	100	56.9	LOS E	10.0	70.2	500	–	0.0	0.0
Lane 2	0	0	148	148	0.0	257	0.576	100	51.8	LOS D	6.7	46.8	50	Turn Bay	0.0	0.0
Approach	203	0	148	351	0.0		0.791		54.7	LOS D	10.0	70.2				
North: Bruce Highway																
Lane 1	18	662	0	680	3.5	810	0.839	100	32.1	LOS C	31.3	225.6	500	–	0.0	0.0
Lane 2	0	680	0	680	3.6	811	0.839	100	31.8	LOS C	31.3	225.9	500	–	0.0	0.0
Approach	18	1342	0	1360	3.5		0.839		31.9	LOS C	31.3	225.9				
Intersection				3996	2.1		0.848		21.5	LOS C	31.3	225.9				

Level of Service (LOS) Method: Delay (HCM 2000).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model used.

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PHASING SUMMARY

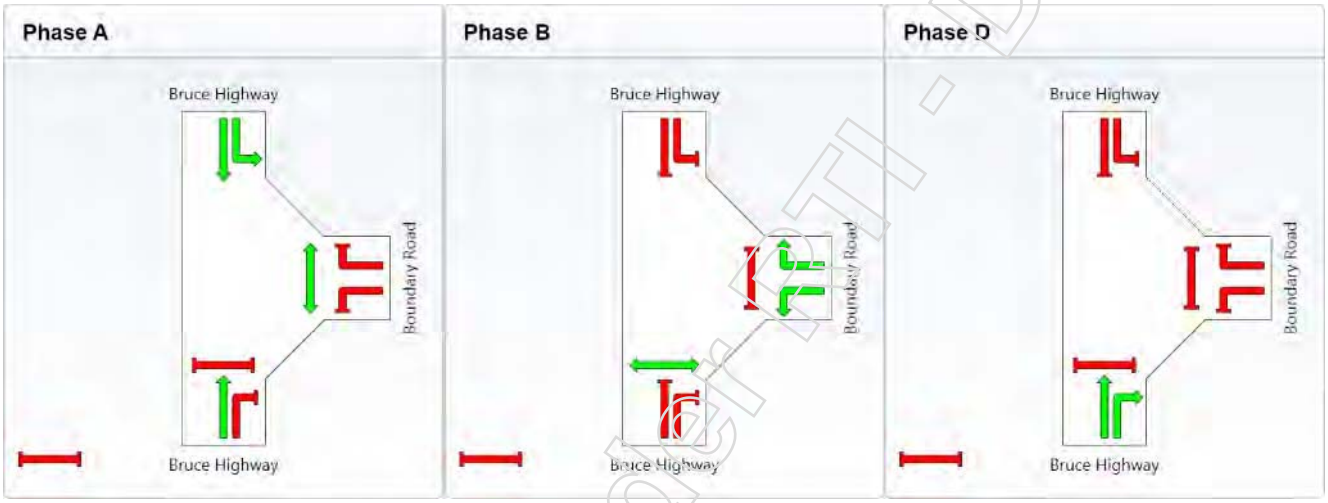
Site: POST 2025 PM PEAK - UPGRADE

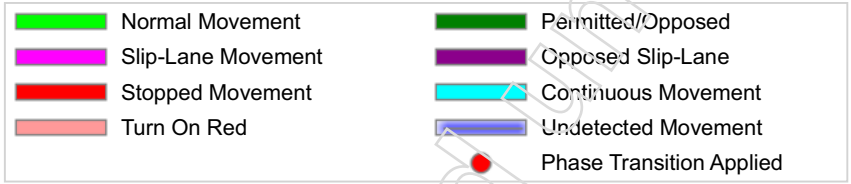
Bruce Highway / Boundary Road (East)
Upgraded Intersection - Ultimate Development
POST DEV - 2025 PM Peak
Signals - Fixed Time Cycle Time = 95 seconds (Optimum Cycle Time - Shortest Queue)

Phase times determined by the program
Sequence: CAMBRAY
Input Sequence: A, B, D
Output Sequence: A, B, D

Phase Timing Results

Phase	A	B	D
Green Time (sec)	40	13	24
Yellow Time (sec)	4	4	4
All-Red Time (sec)	2	2	2
Phase Time (sec)	46	19	30
Phase Split	48 %	20 %	32 %





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LANE SUMMARY

Site: POST 2035 AM PEAK - UPGRADE

Bruce Highway / Boundary Road (East)
Upgraded Intersection - Ultimate Development
POST DEV - 2035 AM Peak
Signals - Fixed Time Cycle Time = 130 seconds (Optimum Cycle Time - Shortest Queue)

Lane Use and Performance

	Demand Flows L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South: Bruce Highway																
Lane 1	0	462	0	462	7.5	1518	0.304	100	1.0	LOS A	2.0	14.9	500	–	0.0	0.0
Lane 2	0	462	0	462	7.5	1518	0.304	100	1.0	LOS A	2.0	14.9	500	–	0.0	0.0
Lane 3	0	0	92	92	4.3	112	0.821	100	81.5	LOS F	6.3	45.9	125	Turn Bay	0.0	0.0
Approach	0	924	92	1016	7.2		0.821		8.3	LOS A	6.3	45.9				
East: Boundary Road																
Lane 1	77	0	0	77	2.6	184	0.418	100	70.2	LOS E	4.7	33.9	500	–	0.0	0.0
Lane 2	0	0	2	2	0.0	188	0.011	100	65.6	LOS E	0.1	0.8	50	Turn Bay	0.0	0.0
Approach	77	0	2	79	2.5		0.418		70.1	LOS E	4.7	33.9				
North: Bruce Highway																
Lane 1	5	1141	0	1146	3.0	1352	0.848	100	15.2	LOS B	52.6	377.6	500	–	0.0	0.0
Lane 2	0	1147	0	1147	3.1	1352	0.848	100	15.2	LOS B	52.6	377.7	500	–	0.0	0.0
Approach	5	2288	0	2293	3.1		0.848		15.2	LOS B	52.6	377.7				
Intersection				3388	4.3		0.848		14.4	LOS B	52.6	377.7				

Level of Service (LOS) Method: Delay (HCM 2000).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model used.

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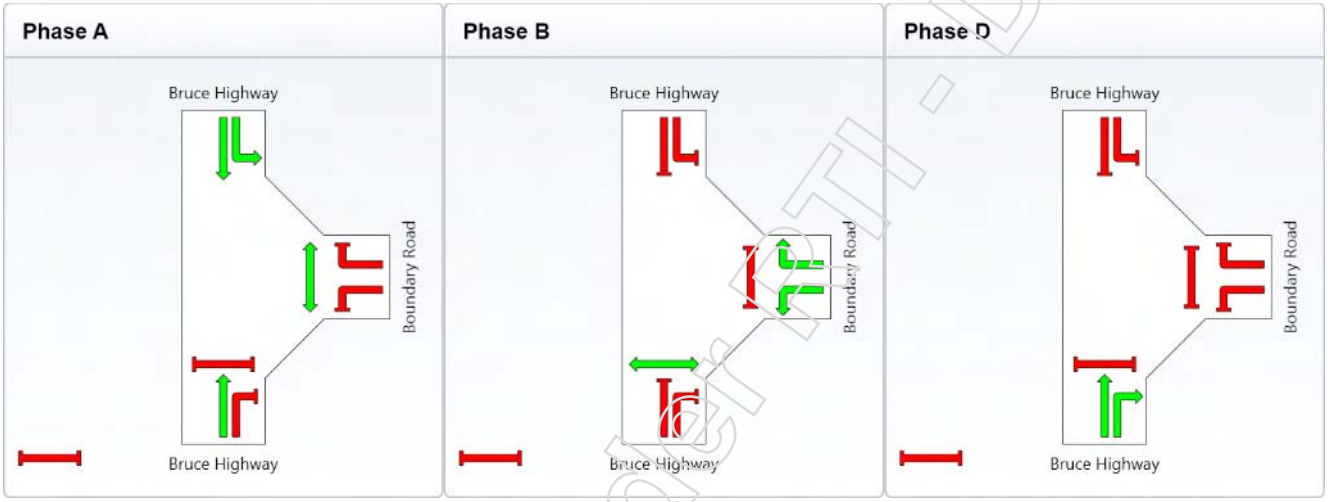
PHASING SUMMARY

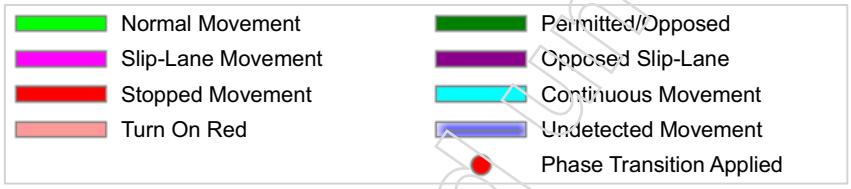
Bruce Highway / Boundary Road (East)
Upgraded Intersection - Ultimate Development
POST DEV - 2035 AM Peak
Signals - Fixed Time Cycle Time = 130 seconds (Optimum Cycle Time - Shortest Queue)

Phase times determined by the program
Sequence: CAMBRAY
Input Sequence: A, B, D
Output Sequence: A, B, D

Phase Timing Results

Phase	A	B	D
Green Time (sec)	91	13	8
Yellow Time (sec)	4	4	4
All-Red Time (sec)	2	2	2
Phase Time (sec)	97	19	14
Phase Split	75 %	15 %	11 %





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LANE SUMMARY

Site: POST 2035 PM PEAK - UPGRADE

Bruce Highway / Boundary Road (East)
Upgraded Intersection - Ultimate Development
POST DEV - 2035 PM Peak
Signals - Fixed Time Cycle Time = 95 seconds (Optimum Cycle Time - Shortest Queue)

Lane Use and Performance

	Demand Flows L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South: Bruce Highway																
Lane 1	0	968	0	968	2.1	1433	0.675	100	1.5	LOS A	6.2	43.9	500	–	0.0	0.0
Lane 2	0	968	0	968	2.1	1433	0.675	100	1.5	LOS A	6.2	43.9	500	–	0.0	0.0
Lane 3	0	0	369	369	0.0	454	0.812	100	49.7	LOS D	17.0	119.2	125	Turn Bay	0.0	0.7
Approach	0	1935	369	2304	1.7		0.812		9.2	LOS A	17.0	119.2				
East: Boundary Road																
Lane 1	189	0	0	189	0.0	257	0.736	100	54.9	LOS D	9.1	63.4	500	–	0.0	0.0
Lane 2	0	0	148	148	0.0	257	0.576	100	51.8	LOS D	6.7	46.8	50	Turn Bay	0.0	0.0
Approach	189	0	148	337	0.0		0.736		53.5	LOS D	9.1	63.4				
North: Bruce Highway																
Lane 1	18	671	0	689	3.7	829	0.831	100	30.5	LOS C	31.0	223.8	500	–	0.0	0.0
Lane 2	0	689	0	689	3.8	830	0.831	100	30.3	LOS C	31.0	224.1	500	–	0.0	0.0
Approach	18	1360	0	1378	3.8		0.831		30.4	LOS C	31.0	224.1				
Intersection				4019	2.3		0.831		20.2	LOS C	31.0	224.1				

Level of Service (LOS) Method: Delay (HCM 2000).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model used.

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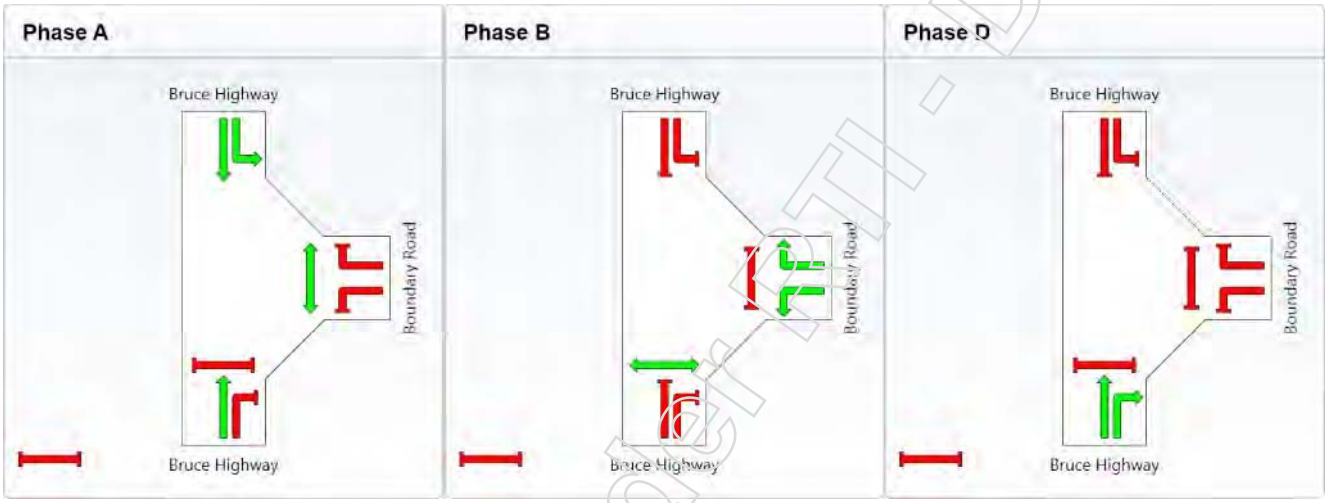
PHASING SUMMARY

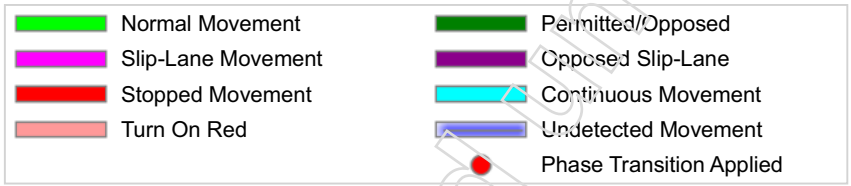
Bruce Highway / Boundary Road (East)
Upgraded Intersection - Ultimate Development
POST DEV - 2035 PM Peak
Signals - Fixed Time Cycle Time = 95 seconds (Optimum Cycle Time - Shortest Queue)

Phase times determined by the program
Sequence: CAMBRAY
Input Sequence: A, B, D
Output Sequence: A, B, D

Phase Timing Results

Phase	A	B	D
Green Time (sec)	41	13	23
Yellow Time (sec)	4	4	4
All-Red Time (sec)	2	2	2
Phase Time (sec)	47	19	29
Phase Split	49 %	20 %	31 %





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APPENDIX M

SIDRA Results

Bruce Highway / Boundary Road (West)

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LANE SUMMARY

Site: POST 2025 AM PEAK - UPGRADE

Bruce Highway / Boundary Road (West)
Upgraded Intersection - Ultimate Development
POST DEV - 2025 AM Peak
Signals - Fixed Time Cycle Time = 135 seconds (Optimum Cycle Time - Minimum Delay)

Lane Use and Performance

	Demand Flows L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South: Bruce Highway																
Lane 1	201	0	0	201	4.0	777[1]	0.259	100	16.0	LOS B	2.9	20.7	75	Turn Bay	0.0	0.0
Lane 2	0	468	0	468	7.0	1145	0.408	100	8.1	LOS A	8.6	63.5	500	–	0.0	0.0
Lane 3	0	468	0	468	7.0	1145	0.408	100	8.1	LOS A	8.6	63.5	500	–	0.0	0.0
Approach	201	935	0	1136	6.4		0.408		9.5	LOS A	8.6	63.5				
North: Bruce Highway																
Lane 1	0	1115	0	1115	2.4	1466	0.761	100	2.3	LOS A	12.9	92.3	500	–	0.0	0.0
Lane 2	0	1115	0	1115	2.4	1466	0.761	100	2.3	LOS A	12.9	92.3	500	–	0.0	0.0
Lane 3	0	0	76	76	7.9	185	0.410	100	72.1	LOS E	4.7	35.3	95	Turn Bay	0.0	0.0
Approach	0	2230	76	2306	2.6		0.761		4.6	LOS A	12.9	92.3				
West: Boundary Road																
Lane 1	18	0	0	18	16.7	164[1]	0.110	100	62.3	LOS E	1.0	8.1	50	Turn Bay	0.0	0.0
Lane 2	0	0	47	47	14.9	257	0.183	100	63.1	LOS E	2.7	21.5	500	–	0.0	0.0
Approach	18	0	47	65	15.4		0.183		62.9	LOS E	2.7	21.5				
Intersection				3507	4.0		0.761		7.3	LOS A	12.9	92.3				

Level of Service (LOS) Method: Delay (HCM 2000).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model used.

1 Reduced capacity due to a short lane effect

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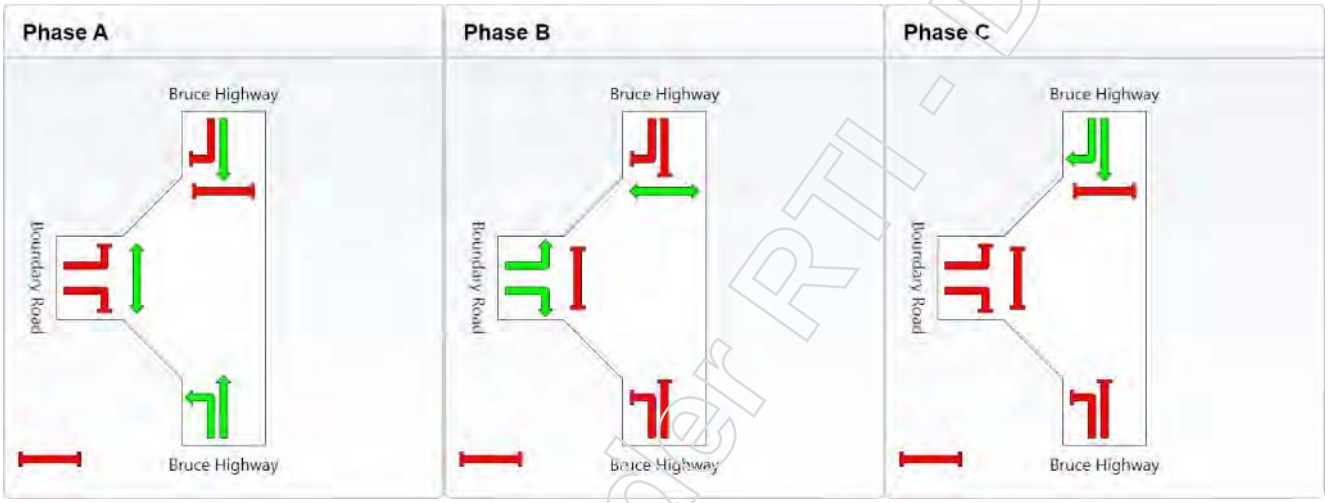
PHASING SUMMARY

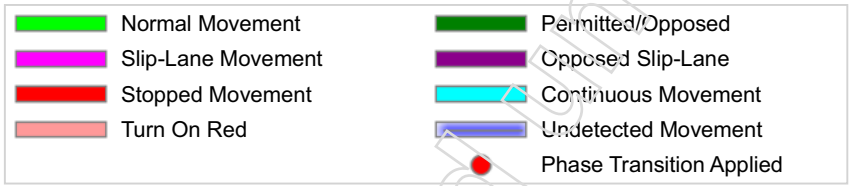
Bruce Highway / Boundary Road (West)
Upgraded Intersection - Ultimate Development
POST DEV - 2025 AM Peak
Signals - Fixed Time Cycle Time = 135 seconds (Optimum Cycle Time - Minimum Delay)

Phase times determined by the program
Sequence: CAMBRAY
Input Sequence: A, B, C
Output Sequence: A, B, C

Phase Timing Results

Phase	A	B	C
Green Time (sec)	82	21	14
Yellow Time (sec)	4	4	4
All-Red Time (sec)	2	2	2
Phase Time (sec)	88	27	20
Phase Split	65 %	20 %	15 %





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LANE SUMMARY

Bruce Highway / Boundary Road (West)
Upgraded Intersection - Ultimate Development
POST DEV - 2025 PM Peak
Signals - Fixed Time Cycle Time = 150 seconds (Optimum Cycle Time - Minimum Delay)

Lane Use and Performance

	Demand Flows L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South: Bruce Highway																
Lane 1	44	0	0	44	15.9	1126[1]	0.039	100	11.5	LOS B	0.2	1.7	75	Turn Bay	0.0	0.0
Lane 2	0	1016	0	1016	1.6	1365	0.744	100	3.8	LOS A	15.9	112.6	500	–	0.0	0.0
Lane 3	0	1016	0	1016	1.6	1365	0.744	100	3.8	LOS A	15.9	112.6	500	–	0.0	0.0
Approach	44	2031	0	2075	1.9		0.744		4.0	LOS A	15.9	112.6				
North: Bruce Highway																
Lane 1	0	710	0	710	2.7	1511	0.470	100	1.6	LOS A	4.6	32.6	500	–	0.0	0.0
Lane 2	0	710	0	710	2.7	1511	0.470	100	1.6	LOS A	4.6	32.6	500	–	0.0	0.0
Lane 3	0	0	38	38	31.6	62	0.617	100	93.7	LOS F	3.0	26.5	95	Turn Bay	0.0	0.0
Approach	0	1419	38	1457	3.4		0.617		4.0	LOS A	4.6	32.6				
West: Boundary Road																
Lane 1	92	0	0	92	9.8	153[1]	0.601	100	73.8	LOS E	6.2	47.4	50	Turn Bay	0.0	0.2
Lane 2	0	0	171	171	5.3	247	0.693	100	77.1	LOS E	12.3	90.0	500	–	0.0	0.0
Approach	92	0	171	263	6.8		0.693		76.0	LOS E	12.3	90.0				
Intersection				3795	2.8		0.744		9.0	LOS A	15.9	112.6				

Level of Service (LOS) Method: Delay (HCM 2000).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model used.

1 Reduced capacity due to a short lane effect

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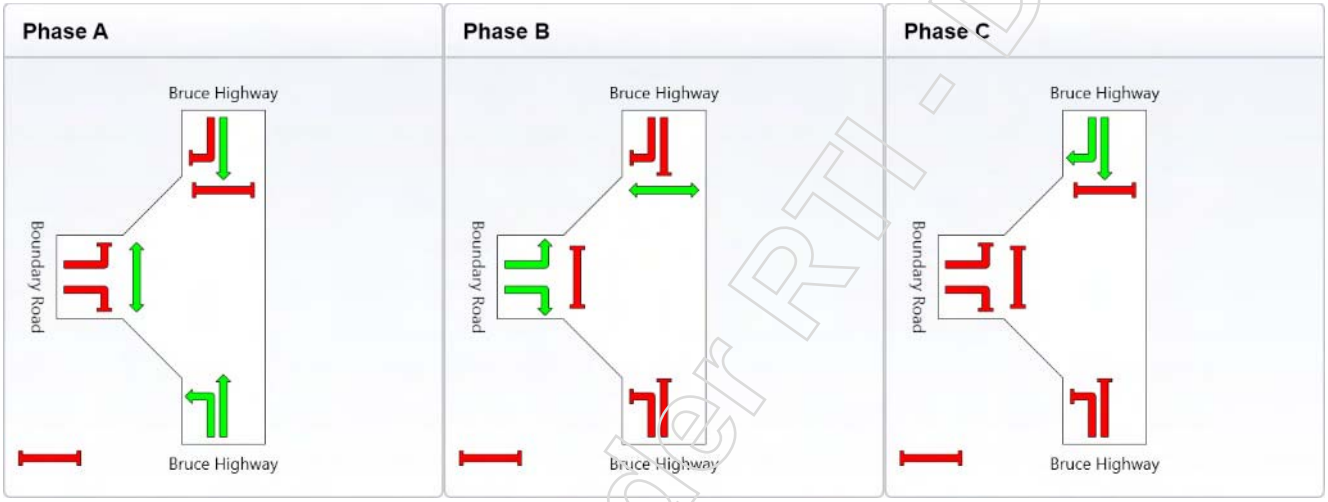
PHASING SUMMARY

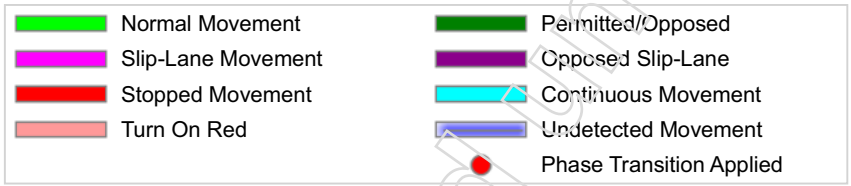
Bruce Highway / Boundary Road (West)
Upgraded Intersection - Ultimate Development
POST DEV - 2025 PM Peak
Signals - Fixed Time Cycle Time = 150 seconds (Optimum Cycle Time - Minimum Delay)

Phase times determined by the program
Sequence: CAMBRAY
Input Sequence: A, B, C
Output Sequence: A, B, C

Phase Timing Results

Phase	A	B	C
Green Time (sec)	105	21	6
Yellow Time (sec)	4	4	4
All-Red Time (sec)	2	2	2
Phase Time (sec)	111	27	12
Phase Split	74 %	18 %	8 %





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LANE SUMMARY

Site: POST 2035 AM PEAK - UPGRADE

Bruce Highway / Boundary Road (West)
Upgraded Intersection - Ultimate Development
POST DEV - 2035 AM Peak
Signals - Fixed Time Cycle Time = 150 seconds (Optimum Cycle Time - Minimum Delay)

Lane Use and Performance

	Demand Flows L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South: Bruce Highway																
Lane 1	201	0	0	201	4.0	822[1]	0.245	100	15.0	LOS B	2.6	18.6	75	Turn Bay	0.0	0.0
Lane 2	0	469	0	469	7.6	1189	0.394	100	6.9	LOS A	7.8	58.3	500	–	0.0	0.0
Lane 3	0	469	0	469	7.6	1189	0.394	100	6.9	LOS A	7.8	58.3	500	–	0.0	0.0
Approach	201	938	0	1139	6.9		0.394		8.3	LOS A	7.8	58.3				
North: Bruce Highway																
Lane 1	0	1129	0	1129	2.6	1511	0.747	100	2.4	LOS A	13.9	99.2	500	–	0.0	0.0
Lane 2	0	1129	0	1129	2.6	1511	0.747	100	2.4	LOS A	13.9	99.2	500	–	0.0	0.0
Lane 3	0	0	76	76	7.9	190	0.399	100	78.2	LOS E	5.2	38.8	95	Turn Bay	0.0	0.0
Approach	0	2258	76	2334	2.8		0.747		4.9	LOS A	13.9	99.2				
West: Boundary Road																
Lane 1	18	0	0	18	16.7	147[1]	0.123	100	70.4	LOS E	1.2	9.2	50	Turn Bay	0.0	0.0
Lane 2	0	0	47	47	14.9	231	0.203	100	71.3	LOS E	3.1	24.3	500	–	0.0	0.0
Approach	18	0	47	65	15.4		0.203		71.1	LOS E	3.1	24.3				
Intersection				3538	4.4		0.747		7.2	LOS A	13.9	99.2				

Level of Service (LOS) Method: Delay (HCM 2000).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model used.

1 Reduced capacity due to a short lane effect

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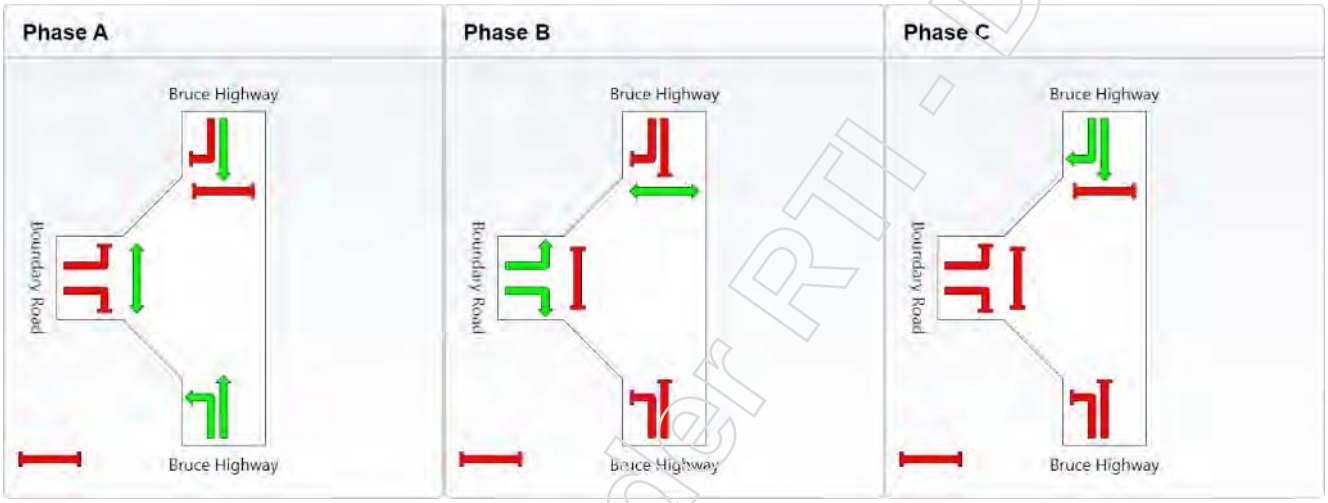
PHASING SUMMARY

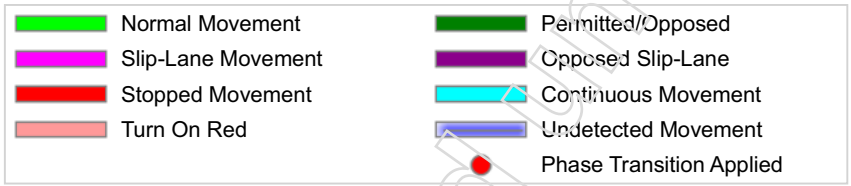
Bruce Highway / Boundary Road (West)
Upgraded Intersection - Ultimate Development
POST DEV - 2035 AM Peak
Signals - Fixed Time Cycle Time = 150 seconds (Optimum Cycle Time - Minimum Delay)

Phase times determined by the program
Sequence: CAMBRAY
Input Sequence: A, B, C
Output Sequence: A, B, C

Phase Timing Results

Phase	A	B	C
Green Time (sec)	95	21	16
Yellow Time (sec)	4	4	4
All-Red Time (sec)	2	2	2
Phase Time (sec)	101	27	22
Phase Split	67 %	18 %	15 %





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LANE SUMMARY

Bruce Highway / Boundary Road (West)
Upgraded Intersection - Ultimate Development
POST DEV - 2035 PM Peak
Signals - Fixed Time Cycle Time = 150 seconds (Optimum Cycle Time - Minimum Delay)

Lane Use and Performance

	Demand Flows L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South: Bruce Highway																
Lane 1	44	0	0	44	15.9	1126[1]	0.039	100	11.5	LOS B	0.2	1.7	75	Turn Bay	0.0	0.0
Lane 2	0	1017	0	1017	1.8	1364	0.746	100	3.8	LOS A	15.9	113.3	500	–	0.0	0.0
Lane 3	0	1017	0	1017	1.8	1364	0.746	100	3.8	LOS A	15.9	113.3	500	–	0.0	0.0
Approach	44	2033	0	2077	2.1		0.746		4.0	LOS A	15.9	113.3				
North: Bruce Highway																
Lane 1	0	708	0	708	3.0	1508	0.469	100	1.6	LOS A	4.5	32.6	500	–	0.0	0.0
Lane 2	0	708	0	708	3.0	1508	0.469	100	1.6	LOS A	4.5	32.6	500	–	0.0	0.0
Lane 3	0	0	38	38	31.6	62	0.617	100	93.7	LOS F	3.0	26.5	95	Turn Bay	0.0	0.0
Approach	0	1415	38	1453	3.7		0.617		4.0	LOS A	4.5	32.6				
West: Boundary Road																
Lane 1	92	0	0	92	9.8	153[1]	0.601	100	73.8	LOS E	6.2	47.4	50	Turn Bay	0.0	0.2
Lane 2	0	0	171	171	5.3	247	0.693	100	77.1	LOS E	12.3	90.0	500	–	0.0	0.0
Approach	92	0	171	263	6.8		0.693		76.0	LOS E	12.3	90.0				
Intersection				3793	3.0		0.746		9.0	LOS A	15.9	113.3				

Level of Service (LOS) Method: Delay (HCM 2000).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model used.

1 Reduced capacity due to a short lane effect

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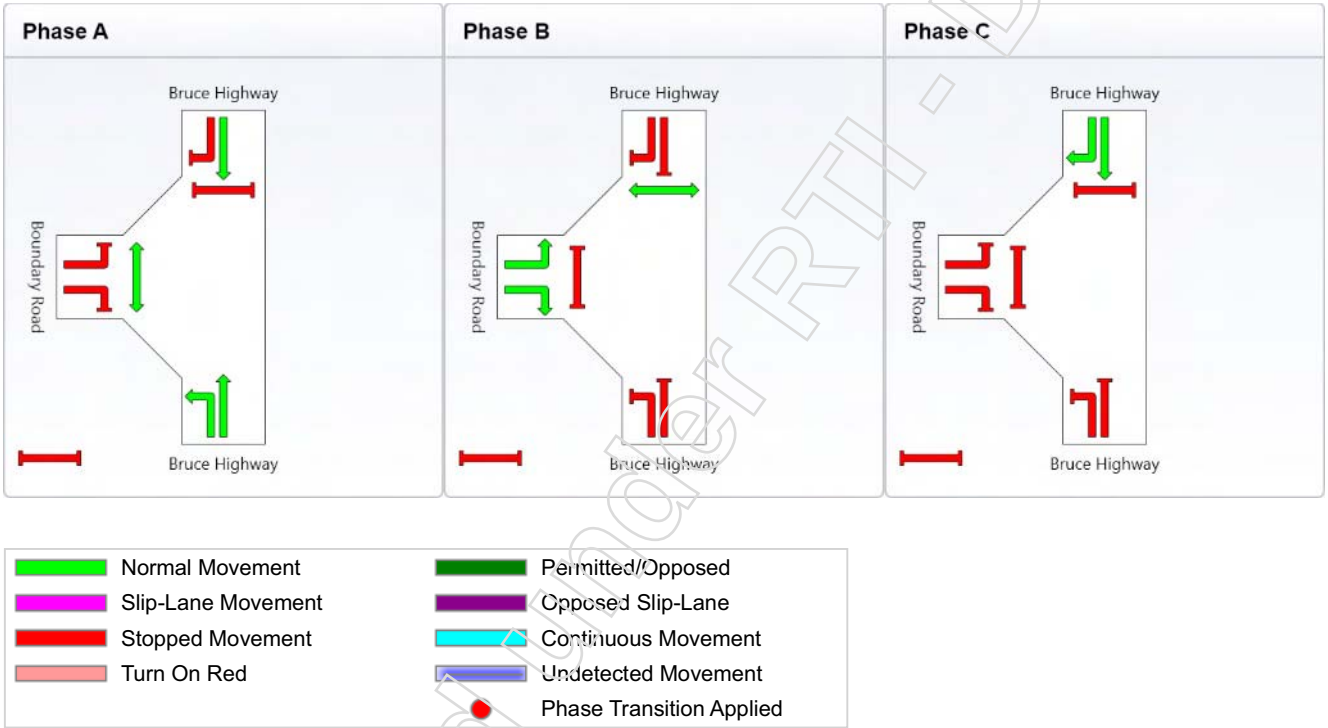
PHASING SUMMARY

Bruce Highway / Boundary Road (West)
Upgraded Intersection - Ultimate Development
POST DEV - 2035 PM Peak
Signals - Fixed Time Cycle Time = 150 seconds (Optimum Cycle Time - Minimum Delay)

Phase times determined by the program
Sequence: CAMBRAY
Input Sequence: A, B, C
Output Sequence: A, B, C

Phase Timing Results

Phase	A	B	C
Green Time (sec)	105	21	6
Yellow Time (sec)	4	4	4
All-Red Time (sec)	2	2	2
Phase Time (sec)	111	27	12
Phase Split	74 %	18 %	8 %



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APPENDIX N

SIDRA Results

Bruce Highway / Yeppoon Road

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LANE SUMMARY

Bruce Highway / Yeppoon Road
Existing Configuration - Utimate Development
PRE DEV - 2013 AM Peak
Signals - Fixed Time Cycle Time = 145 seconds (Optimum Cycle Time - Minimum Delay)

Lane Use and Performance

	Demand Flows L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South: Bruce Highway (South)																
Lane 1	4	0	0	4	0.0	332[1]	0.012	100	28.7	LOS C	0.1	1.0	60	Turn Bay	0.0	0.0
Lane 2	0	176	0	176	6.3	927	0.190	59[6]	21.9	LOS C	6.9	50.6	500	–	0.0	0.0
Lane 3	0	299	0	299	6.3	927	0.322	100	23.6	LOS C	12.6	92.6	500	–	0.0	0.0
Lane 4	0	0	146	146	16.4	194	0.753	100	81.7	LOS F	10.6	83.0	100	Turn Bay	0.0	0.0
Approach	4	475	146	625	8.6		0.753		36.7	LOS D	12.6	92.6				
East: Yeppoon Road																
Lane 1	419	0	0	419	2.1	1848	0.227	100	9.5	X	X	X	500	–	0.0	X
Lane 2	0	3	204	207	6.8	334	0.620	100	68.7	LOS E	13.2	97.4	500	–	0.0	0.0
Approach	419	3	204	626	3.7		0.620		29.1	LOS C	13.2	97.4				
North: Bruce Highway (North)																
Lane 1	162	0	0	162	9.9	1753	0.092	100	9.8	X	X	X	100	Turn Bay	0.0	X
Lane 2	0	356	0	356	4.2	478[1]	0.746	100	26.7	LOS C	15.9	115.4	100	Turn Bay	0.0	18.0
Lane 3	0	701	0	701	4.2	939	0.746	100	31.5	LOS C	39.2	284.2	500	–	0.0	0.0
Lane 4	0	0	1	1	0.0	90[1]	0.011	100	69.1	LOS E	0.1	0.4	25	Turn Bay	0.0	0.0
Approach	162	1057	1	1220	4.9		0.746		27.2	LOS C	39.2	284.2				
West: Cultural Centre Access																
Lane 1	1	3	14	18	5.6	81	0.222	100	83.9	LOS F	1.3	9.6	500	–	0.0	0.0
Approach	1	3	14	18	5.6		0.222		83.9	LOS F	1.3	9.6				
Intersection				2489	5.5		0.753		30.5	LOS C	39.2	284.2				

X: Not applicable for Continuous lane.

Level of Service (LOS) Method: Delay (HCM 2000).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model used.

1 Reduced capacity due to a short lane effect
6 Lane underutilisation due to downstream effects

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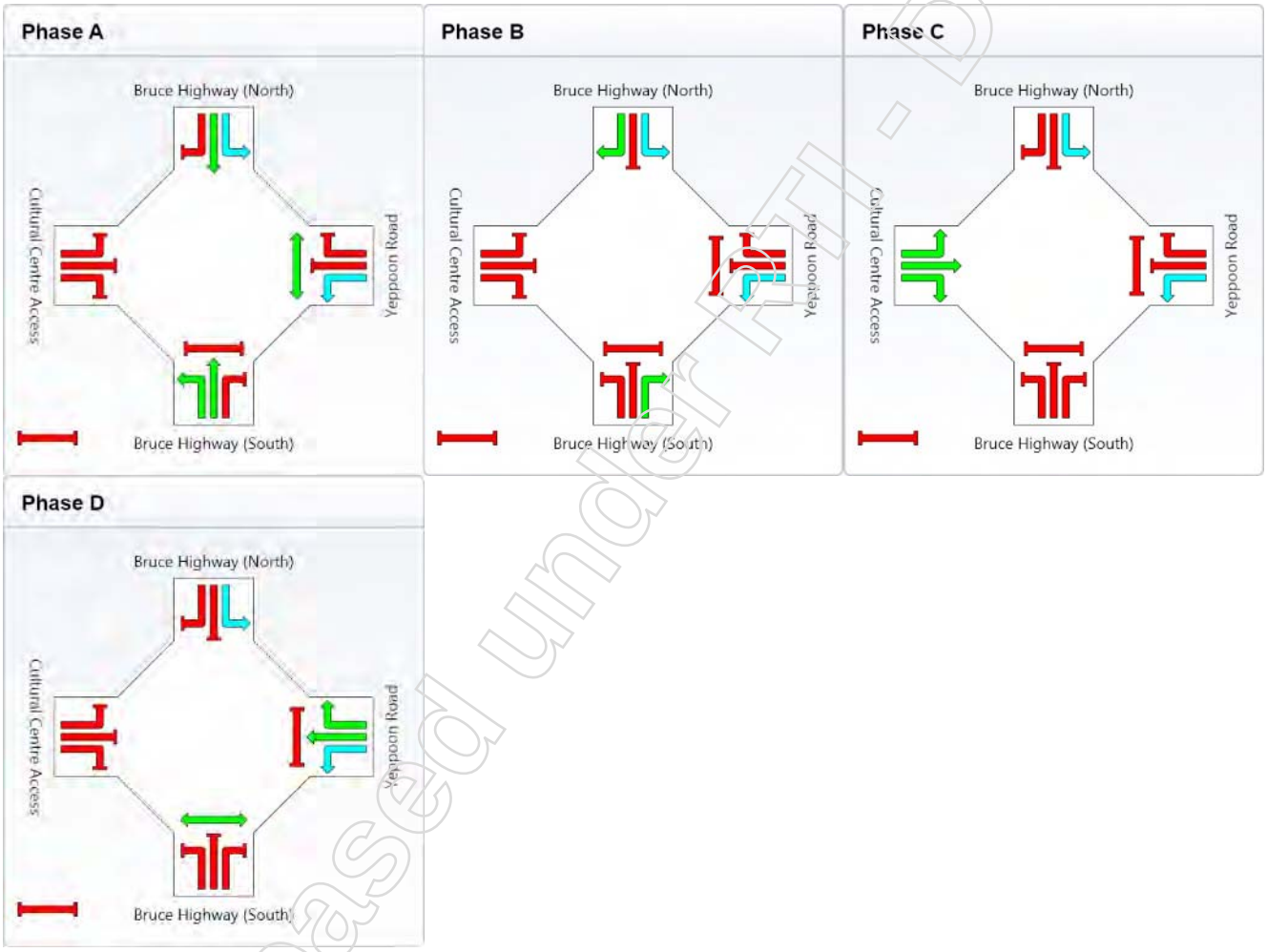
PHASING SUMMARY

Bruce Highway / Yeppoon Road
Existing Configuration - Utimate Development
PRE DEV - 2013 AM Peak
Signals - Fixed Time Cycle Time = 145 seconds (Optimum Cycle Time - Minimum Delay)

Phase times determined by the program
Sequence: CAMBRAY
Input Sequence: A, B, C, D
Output Sequence: A, B, C, D

Phase Timing Results

Phase	A	B	C	D
Green Time (sec)	71	17	6	27
Yellow Time (sec)	4	4	4	4
All-Red Time (sec)	2	2	2	2
Phase Time (sec)	77	23	12	33
Phase Split	53 %	16 %	8 %	23 %





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LANE SUMMARY

Bruce Highway / Yeppoon Road
Existing Configuration - Ultimate Development
PRE DEV - 2013 PM Peak
Signals - Fixed Time Cycle Time = 135 seconds (Optimum Cycle Time - Minimum Delay)

Lane Use and Performance

	Demand Flows L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South: Bruce Highway (South)																
Lane 1	7	0	0	7	0.0	284[1]	0.025	100	39.2	LOS D	0.3	2.1	60	Turn Bay	0.0	0.0
Lane 2	0	401	0	401	3.1	673	0.597	59[6]	38.7	LOS D	21.6	155.1	500	–	0.0	0.0
Lane 3	0	643	37[0]	680	3.1	671	1.013	100	132.2	LOS F	76.4	548.6	500	–	0.0	13.4
Lane 4	0	0	361	361	1.5	361[1]	1.000[3]	100	63.8[8]	LOS E[8]	23.0[8]	163.2[8]	100	Turn Bay	0.0	50.0
Approach	7	1044	398	1449	2.6		1.013		88.8	LOS F	76.4	548.6				
East: Yeppoon Road																
Lane 1	116	0	0	116	7.8	1778	0.065	100	9.7	X	X	X	500	–	0.0	X
Lane 2	0	4	209	213	4.7	364	0.586	100	62.7	LOS E	12.3	89.7	500	–	0.0	0.0
Approach	116	4	209	329	5.8		0.586		44.0	LOS D	12.3	89.7				
North: Bruce Highway (North)																
Lane 1	315	0	0	315	0.6	1868	0.169	100	9.4	X	X	X	100	Turn Bay	0.0	X
Lane 2	0	279	0	279	5.1	412[1]	0.678	100	35.8	LOS D	13.9	101.6	100	Turn Bay	0.0	6.4
Lane 3	0	450	0	450	5.1	664	0.678	100	40.1	LOS D	25.1	183.5	500	–	0.0	0.0
Lane 4	0	0	2	2	0.0	111[1]	0.018	100	51.1	LOS D	0.1	0.7	25	Turn Bay	0.0	0.0
Approach	315	729	2	1046	3.7		0.678		29.8	LOS C	25.1	183.5				
West: Cultural Centre Access																
Lane 1	1	2	2	5	0.0	92	0.055	100	74.3	LOS E	0.3	2.3	500	–	0.0	0.0
Approach	1	2	2	5	0.0		0.055		74.3	LOS E	0.3	2.3				
Intersection				2829	3.4		1.013		61.7	LOS E	76.4	548.6				

X: Not applicable for Continuous lane.

Level of Service (LOS) Method: Delay (HCM 2000).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model used.

0 Excess flow from back of an adjacent short lane
1 Reduced capacity due to a short lane effect
3 x = 1.00 due to short lane.
6 Lane underutilisation due to downstream effects
8 Delay, queue length and stops for the short lane have been cut down to fit in the queuing space. You may wish to change the short lane to a full lane to investigate the effect on the adjacent lane performance.

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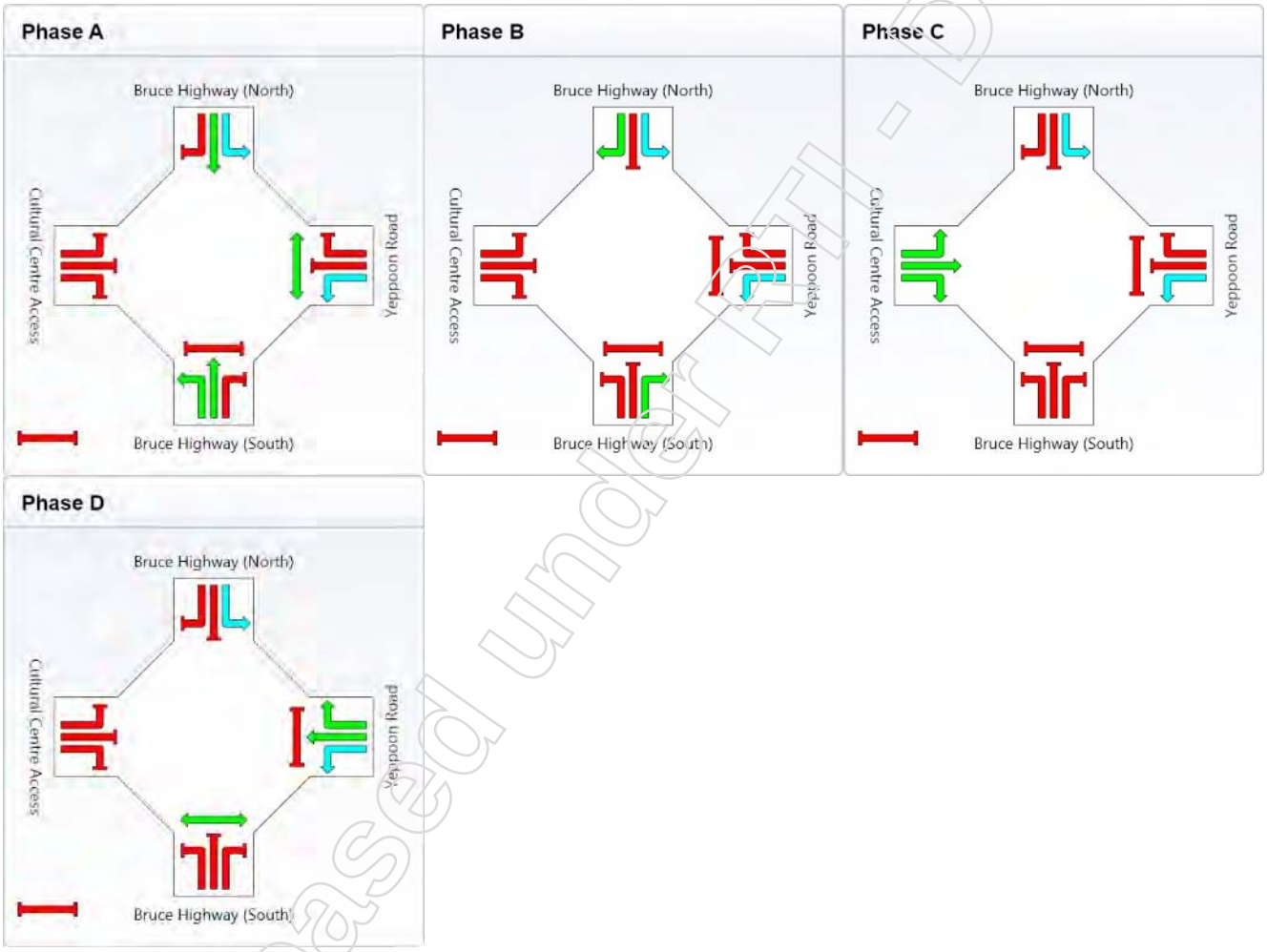
PHASING SUMMARY

Bruce Highway / Yeppoon Road
Existing Configuration - Ultimate Development
PRE DEV - 2013 PM Peak
Signals - Fixed Time Cycle Time = 135 seconds (Optimum Cycle Time - Minimum Delay)

Phase times determined by the program
Sequence: CAMBRAY
Input Sequence: A, B, C, D
Output Sequence: A, B, C, D

Phase Timing Results

Phase	A	B	C	D
Green Time (sec)	47	31	6	27
Yellow Time (sec)	4	4	4	4
All-Red Time (sec)	2	2	2	2
Phase Time (sec)	53	37	12	33
Phase Split	39 %	27 %	9 %	24 %





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LANE SUMMARY

Bruce Highway / Yeppoon Road
Proposed Intersection Upgrade - Utimate Development
PRE DEV - 2013 AM Peak
Signals - Fixed Time Cycle Time = 115 seconds (Optimum Cycle Time - Minimum Delay)

Lane Use and Performance

	Demand Flows L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South: Bruce Highway (South)																
Lane 1	4	0	0	4	0.0	340[1]	0.012	100	32.0	LOS C	0.1	0.9	60	Turn Bay	0.0	0.0
Lane 2	0	238	0	238	6.3	724	0.328	100	26.8	LOS C	9.3	68.9	500	–	0.0	0.0
Lane 3	0	238	0	238	6.3	724	0.328	100	26.8	LOS C	9.3	68.9	500	–	0.0	0.0
Lane 4	0	0	146	146	16.4	201	0.725	100	66.7	LOS E	8.5	67.6	250	Turn Bay	0.0	0.0
Approach	4	475	146	625	8.6		0.725		36.1	LOS D	9.3	68.9				
East: Yeppoon Road																
Lane 1	419	0	0	419	2.1	1848	0.227	100	9.5	X	X	X	500	–	0.0	X
Lane 2	0	3	204	207	6.8	421	0.492	100	51.0	LOS D	9.5	70.6	500	–	0.0	0.0
Approach	419	3	204	626	3.7		0.492		23.2	LOS C	9.5	70.6				
North: Bruce Highway (North)																
Lane 1	162	0	0	162	9.9	1753	0.092	100	9.8	X	X	X	100	Turn Bay	0.0	X
Lane 2	0	529	0	529	4.2	734	0.720	100	32.4	LOS C	25.2	182.6	500	–	0.0	0.0
Lane 3	0	529	0	529	4.2	734	0.720	100	32.4	LOS C	25.2	182.6	500	–	0.0	0.0
Lane 4	0	0	1	1	0.0	112[1]	0.009	100	56.4	LOS E	0.0	0.3	25	Turn Bay	0.0	0.0
Approach	162	1057	1	1220	4.9		0.720		29.5	LOS C	25.2	182.6				
West: Cultural Centre Access																
Lane 1	1	3	14	18	5.6	102	0.176	100	66.7	LOS E	1.0	7.5	500	–	0.0	0.0
Approach	1	3	14	18	5.6		0.176		66.7	LOS E	1.0	7.5				
Intersection				2489	5.5		0.725		29.8	LOS C	25.2	182.6				

X: Not applicable for Continuous lane.

Level of Service (LOS) Method: Delay (HCM 2000).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model used.

1 Reduced capacity due to a short lane effect

Processed: Tuesday, 2 July 2013 4:31:00 PM
SIDRA INTERSECTION 5.1.13.2093
Project: C:\Cambray Projects\STO0111\01R\Working\Sidra\13-06-19\Prelim Approval\Bruce Highway-Yeppoon Road.sip
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SIDRA INTERSECTION

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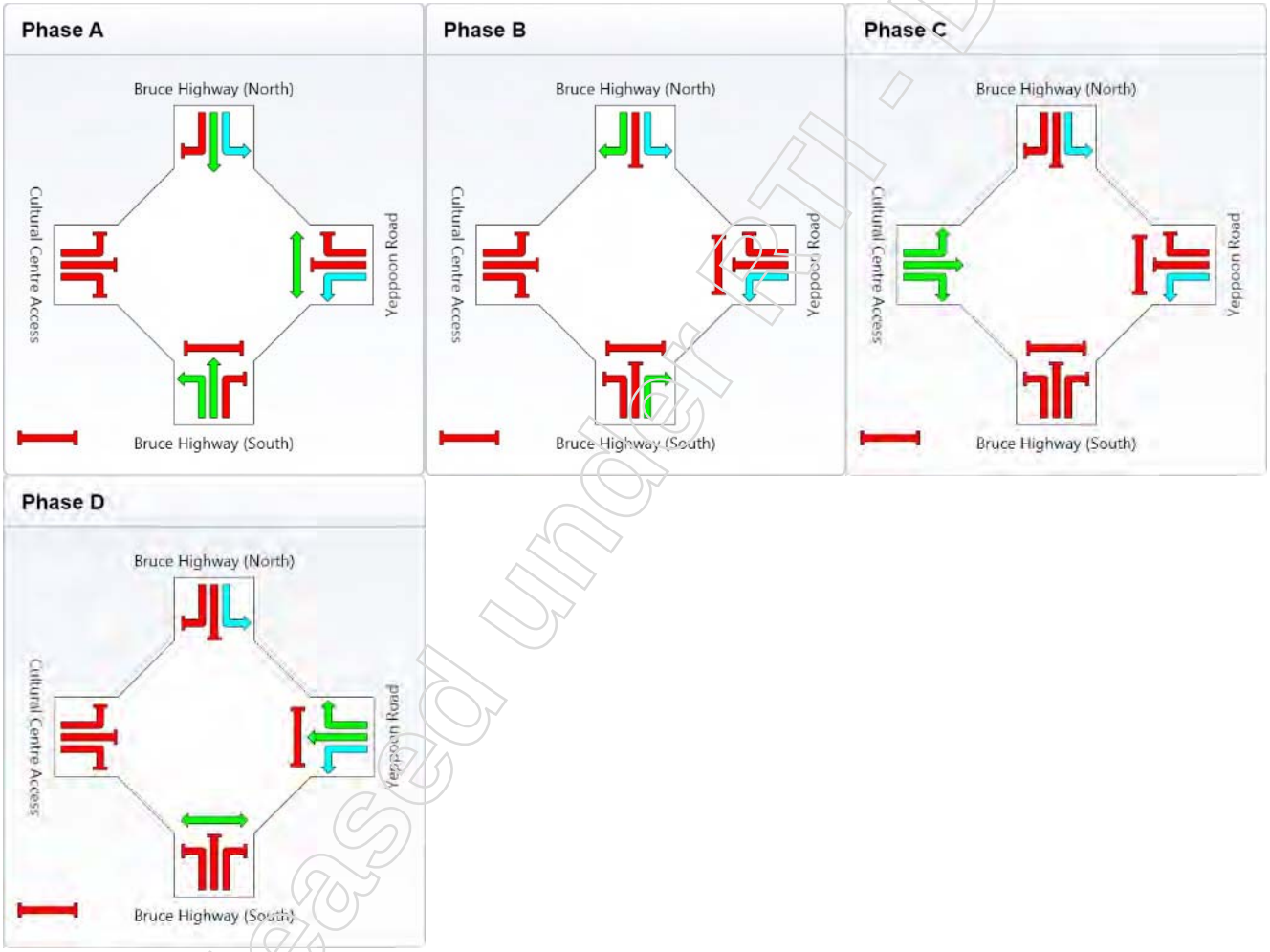
PHASING SUMMARY

Bruce Highway / Yeppoon Road
Proposed Intersection Upgrade - Utimate Development
PRE DEV - 2013 AM Peak
Signals - Fixed Time Cycle Time = 115 seconds (Optimum Cycle Time - Minimum Delay)

Phase times determined by the program
Sequence: CAMBRAY
Input Sequence: A, B, C, D
Output Sequence: A, B, C, D

Phase Timing Results

Phase	A	B	C	D
Green Time (sec)	44	14	6	27
Yellow Time (sec)	4	4	4	4
All-Red Time (sec)	2	2	2	2
Phase Time (sec)	50	20	12	33
Phase Split	43 %	17 %	10 %	29 %





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LANE SUMMARY

Site: PRE 2013 PM PEAK - UPGRADE

Bruce Highway / Yeppoon Road
Proposed Intersection Upgrade - Ultimate Development
PRE DEV - 2013 PM Peak
Signals - Fixed Time Cycle Time = 145 seconds (Optimum Cycle Time - Minimum Delay)

Lane Use and Performance

	Demand Flows L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South: Bruce Highway (South)																
Lane 1	7	0	0	7	0.0	264[1]	0.026	100	42.4	LOS D	0.3	2.2	60	Turn Bay	0.0	0.0
Lane 2	0	522	0	522	3.1	653	0.800	100	48.0	LOS D	34.0	243.9	500	–	0.0	0.0
Lane 3	0	522	0	522	3.1	653	0.800	100	48.0	LOS D	34.0	243.9	500	–	0.0	0.0
Lane 4	0	0	398	398	1.5	492	0.810	100	66.5	LOS E	27.6	195.4	250	Turn Bay	0.0	0.0
Approach	7	1044	398	1449	2.6		0.810		53.0	LOS D	34.0	243.9				
East: Yeppoon Road																
Lane 1	116	0	0	116	7.8	1778	0.065	100	9.7	X	X	X	500	–	0.0	X
Lane 2	0	4	209	213	4.7	339	0.629	100	68.6	LOS E	13.6	98.8	500	–	0.0	0.0
Approach	116	4	209	329	5.8		0.629		47.8	LOS D	13.6	98.8				
North: Bruce Highway (North)																
Lane 1	315	0	0	315	0.6	1868	0.169	100	9.4	X	X	X	100	Turn Bay	0.0	X
Lane 2	0	365	0	365	5.1	645	0.566	100	41.9	LOS D	20.9	152.8	500	–	0.0	0.0
Lane 3	0	365	0	365	5.1	645	0.566	100	41.9	LOS D	20.9	152.8	500	–	0.0	0.0
Lane 4	0	0	2	2	0.0	109[1]	0.018	100	49.5	LOS D	0.1	0.7	25	Turn Bay	0.0	0.0
Approach	315	729	2	1046	3.7		0.566		32.1	LOS C	20.9	152.8				
West: Cultural Centre Access																
Lane 1	1	2	2	5	0.0	85	0.059	100	79.9	LOS E	0.4	2.5	500	–	0.0	0.0
Approach	1	2	2	5	0.0		0.059		79.9	LOS E	0.4	2.5				
Intersection				2829	3.4		0.810		44.7	LOS D	34.0	243.9				

X: Not applicable for Continuous lane.

Level of Service (LOS) Method: Delay (HCM 2000).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model used.

1 Reduced capacity due to a short lane effect

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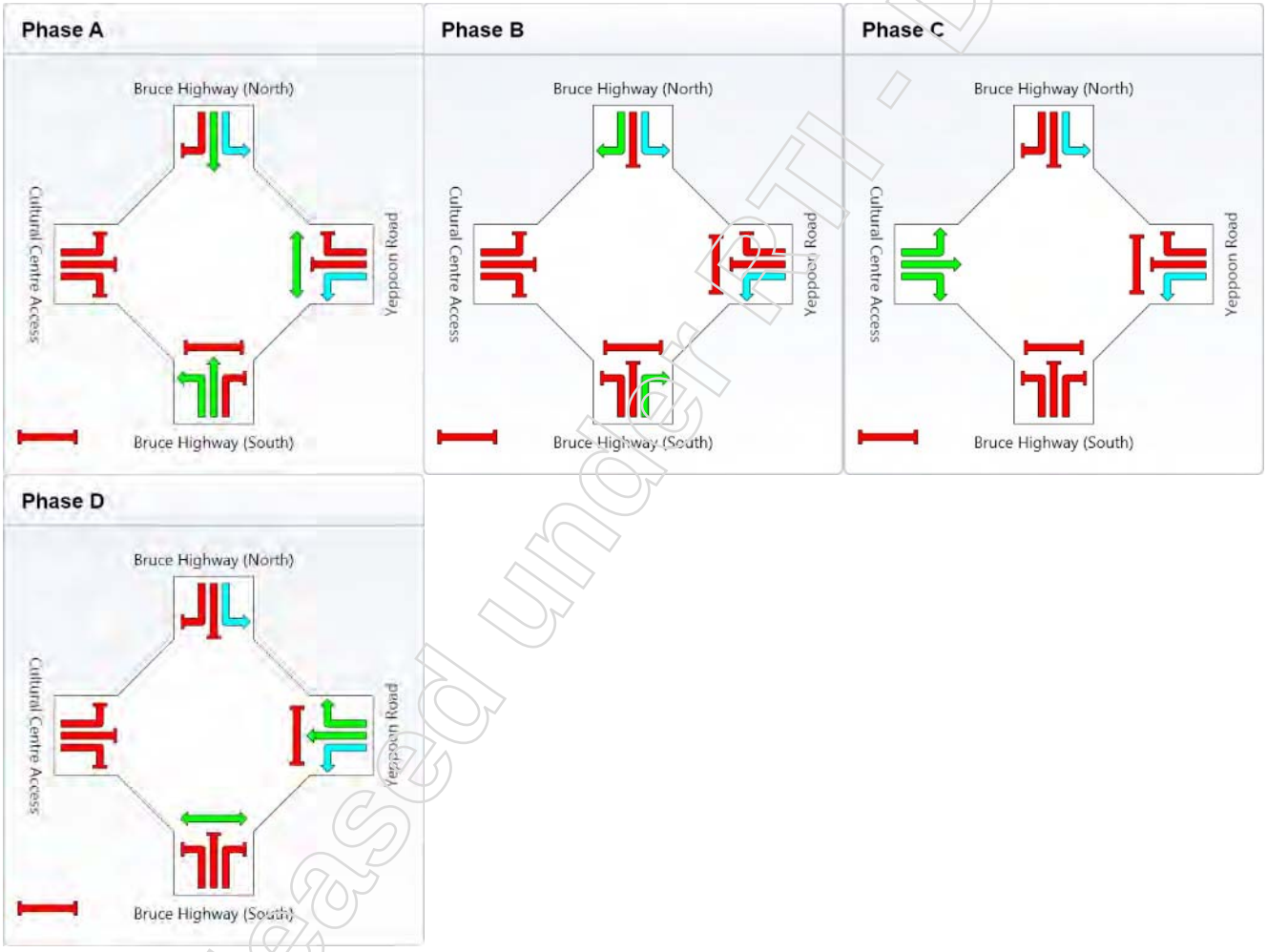
PHASING SUMMARY

Bruce Highway / Yeppoon Road
Proposed Intersection Upgrade - Ultimate Development
PRE DEV - 2013 PM Peak
Signals - Fixed Time Cycle Time = 145 seconds (Optimum Cycle Time - Minimum Delay)

Phase times determined by the program
Sequence: CAMBRAY
Input Sequence: A, B, C, D
Output Sequence: A, B, C, D

Phase Timing Results

Phase	A	B	C	D
Green Time (sec)	49	39	6	27
Yellow Time (sec)	4	4	4	4
All-Red Time (sec)	2	2	2	2
Phase Time (sec)	55	45	12	33
Phase Split	38 %	31 %	8 %	23 %





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LANE SUMMARY

Bruce Highway / Yeppoon Road
Proposed Intersection Upgrade - Utimate Development
PRE DEV - 2025 AM Peak
Signals - Fixed Time Cycle Time = 135 seconds (Optimum Cycle Time - Minimum Delay)

Lane Use and Performance

	Demand Flows L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South: Bruce Highway (South)																
Lane 1	4	0	0	4	0.0	316[1]	0.013	100	32.5	LOS C	0.1	1.0	60	Turn Bay	0.0	0.0
Lane 2	0	259	0	259	6.6	798	0.324	100	27.7	LOS C	11.2	83.0	500	–	0.0	0.0
Lane 3	0	259	0	259	6.6	798	0.324	100	27.7	LOS C	11.2	83.0	500	–	0.0	0.0
Lane 4	0	0	186	186	16.7	257	0.724	100	71.7	LOS E	12.2	97.8	250	Turn Bay	0.0	0.0
Approach	4	517	186	707	9.2		0.724		39.3	LOS D	12.2	97.8				
East: Yeppoon Road																
Lane 1	532	0	0	532	2.3	1847	0.288	100	9.5	X	X	X	500	–	0.0	X
Lane 2	0	3	250	253	7.1	357	0.708	100	65.0	LOS E	15.4	114.2	500	–	0.0	0.0
Approach	532	3	250	785	3.8		0.708		27.4	LOS C	15.4	114.2				
North: Bruce Highway (North)																
Lane 1	204	0	0	204	10.3	1748	0.117	100	9.8	X	X	X	100	Turn Bay	0.0	X
Lane 2	0	582	0	582	4.3	809	0.719	100	30.0	LOS C	27.8	202.1	500	–	0.0	0.0
Lane 3	0	582	0	582	4.3	809	0.719	100	30.0	LOS C	27.8	202.1	500	–	0.0	0.0
Lane 4	0	0	1	1	0.0	107[1]	0.009	100	59.9	LOS E	0.1	0.4	25	Turn Bay	0.0	0.0
Approach	204	1164	1	1369	5.2		0.719		27.0	LOS C	27.8	202.1				
West: Cultural Centre Access																
Lane 1	1	3	14	18	5.6	87	0.207	100	78.2	LOS E	1.2	8.9	500	–	0.0	0.0
Approach	1	3	14	18	5.6		0.207		78.2	LOS E	1.2	8.9				
Intersection				2879	5.8		0.724		30.4	LOS C	27.8	202.1				

X: Not applicable for Continuous lane.

Level of Service (LOS) Method: Delay (HCM 2000).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model used.

1 Reduced capacity due to a short lane effect

Processed: Tuesday, 2 July 2013 4:31:01 PM
SIDRA INTERSECTION 5.1.13.2093
Project: C:\Cambray Projects\STO0111\01R\Working\Sidra\13-06-19\Prelim Approval\Bruce Highway-Yeppoon Road.sip
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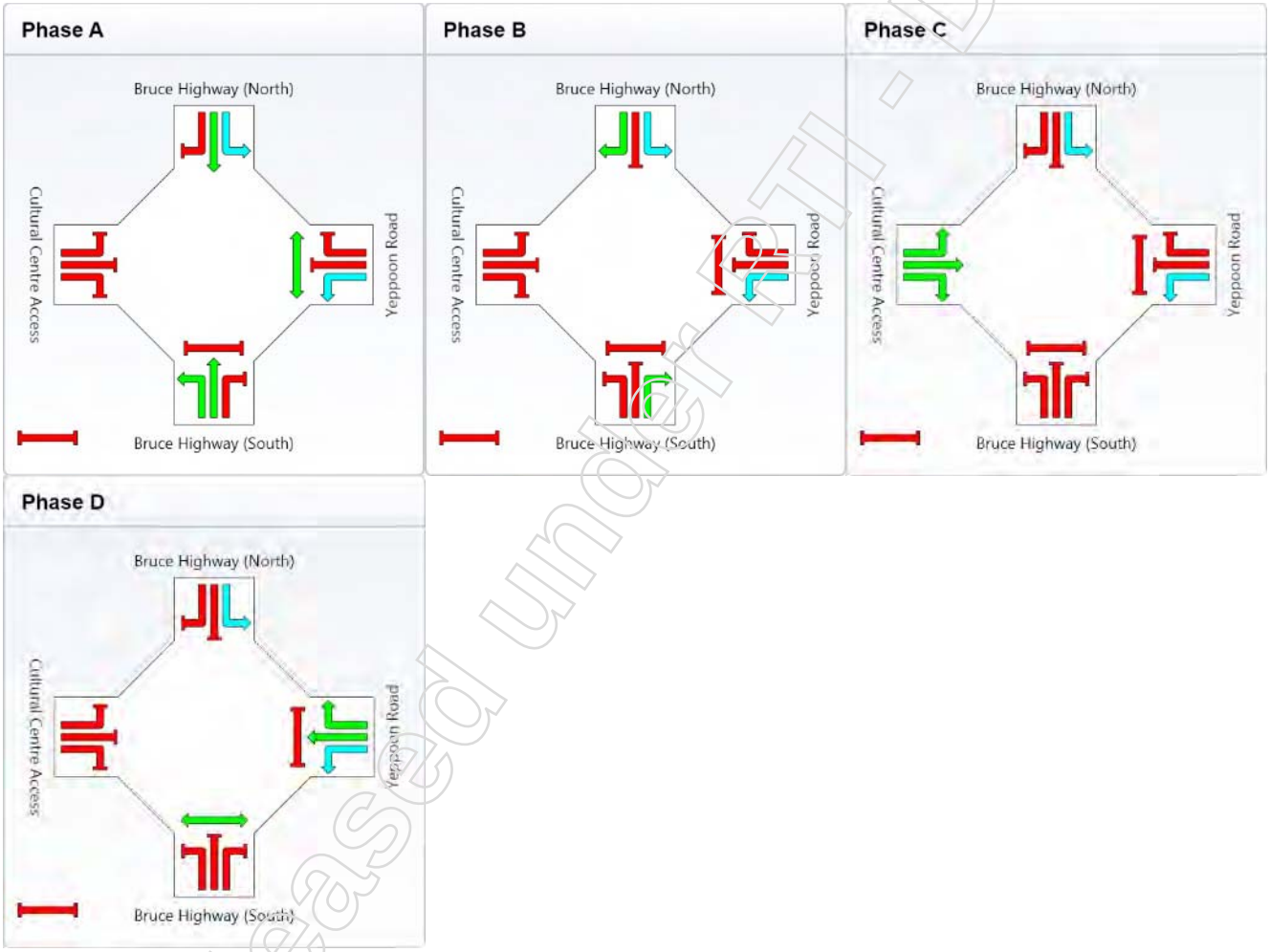
PHASING SUMMARY

Bruce Highway / Yeppoon Road
Proposed Intersection Upgrade - Utimate Development
PRE DEV - 2025 AM Peak
Signals - Fixed Time Cycle Time = 135 seconds (Optimum Cycle Time - Minimum Delay)

Phase times determined by the program
Sequence: CAMBRAY
Input Sequence: A, B, C, D
Output Sequence: A, B, C, D

Phase Timing Results

Phase	A	B	C	D
Green Time (sec)	57	21	6	27
Yellow Time (sec)	4	4	4	4
All-Red Time (sec)	2	2	2	2
Phase Time (sec)	63	27	12	33
Phase Split	47 %	20 %	9 %	24 %





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LANE SUMMARY

Bruce Highway / Yeppoon Road
Proposed Intersection Upgrade - Ultimate Development
PRE DEV - 2025 PM Peak
Signals - Fixed Time Cycle Time = 150 seconds (Optimum Cycle Time - Minimum Delay)

Lane Use and Performance

	Demand Flows L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South: Bruce Highway (South)																
Lane 1	7	0	0	7	0.0	251[1]	0.028	100	45.5	LOS D	0.3	2.4	60	Turn Bay	0.0	0.0
Lane 2	0	562	0	562	3.2	618	0.910	100	67.9	LOS E	46.0	330.7	500	–	0.0	0.0
Lane 3	0	562	0	562	3.2	618	0.910	100	67.9	LOS E	46.0	330.7	500	–	0.0	0.0
Lane 4	0	0	505	505	1.6	548	0.921	100	84.3	LOS F	43.2	306.6	250	Turn Bay	0.0	23.5
Approach	7	1124	505	1636	2.7		0.921		72.9	LOS E	46.0	330.7				
East: Yeppoon Road																
Lane 1	148	0	0	148	8.1	1774	0.083	100	9.7	X	X	X	500	–	0.0	X
Lane 2	0	4	249	253	5.1	326	0.776	100	75.4	LOS E	17.9	131.1	500	–	0.0	0.0
Approach	148	4	249	401	6.2		0.776		51.2	LOS D	17.9	131.1				
North: Bruce Highway (North)																
Lane 1	369	0	0	369	0.5	1869	0.197	100	9.4	X	X	X	100	Turn Bay	0.0	X
Lane 2	0	391	0	391	5.4	609	0.641	100	45.2	LOS D	22.4	163.9	500	–	0.0	0.0
Lane 3	0	391	0	391	5.4	609	0.641	100	45.2	LOS D	22.4	163.9	500	–	0.0	0.0
Lane 4	0	0	2	2	0.0	127[1]	0.016	100	46.7	LOS D	0.1	0.6	25	Turn Bay	0.0	0.0
Approach	369	781	2	1152	3.8		0.641		33.7	LOS C	22.4	163.9				
West: Cultural Centre Access																
Lane 1	1	2	2	5	0.0	82	0.061	100	82.7	LOS F	0.4	2.6	500	–	0.0	0.0
Approach	1	2	2	5	0.0		0.061		82.7	LOS F	0.4	2.6				
Intersection				3194	3.5		0.921		56.0	LOS E	46.0	330.7				

X: Not applicable for Continuous lane.

Level of Service (LOS) Method: Delay (HCM 2000).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model used.

1 Reduced capacity due to a short lane effect

Processed: Tuesday, 2 July 2013 4:31:01 PM
SIDRA INTERSECTION 5.1.13.2093
Project: C:\Cambray Projects\STO0111\01R\Working\Sidra\13-06-19\Prelim Approval\Bruce Highway-Yeppoon Road.sip
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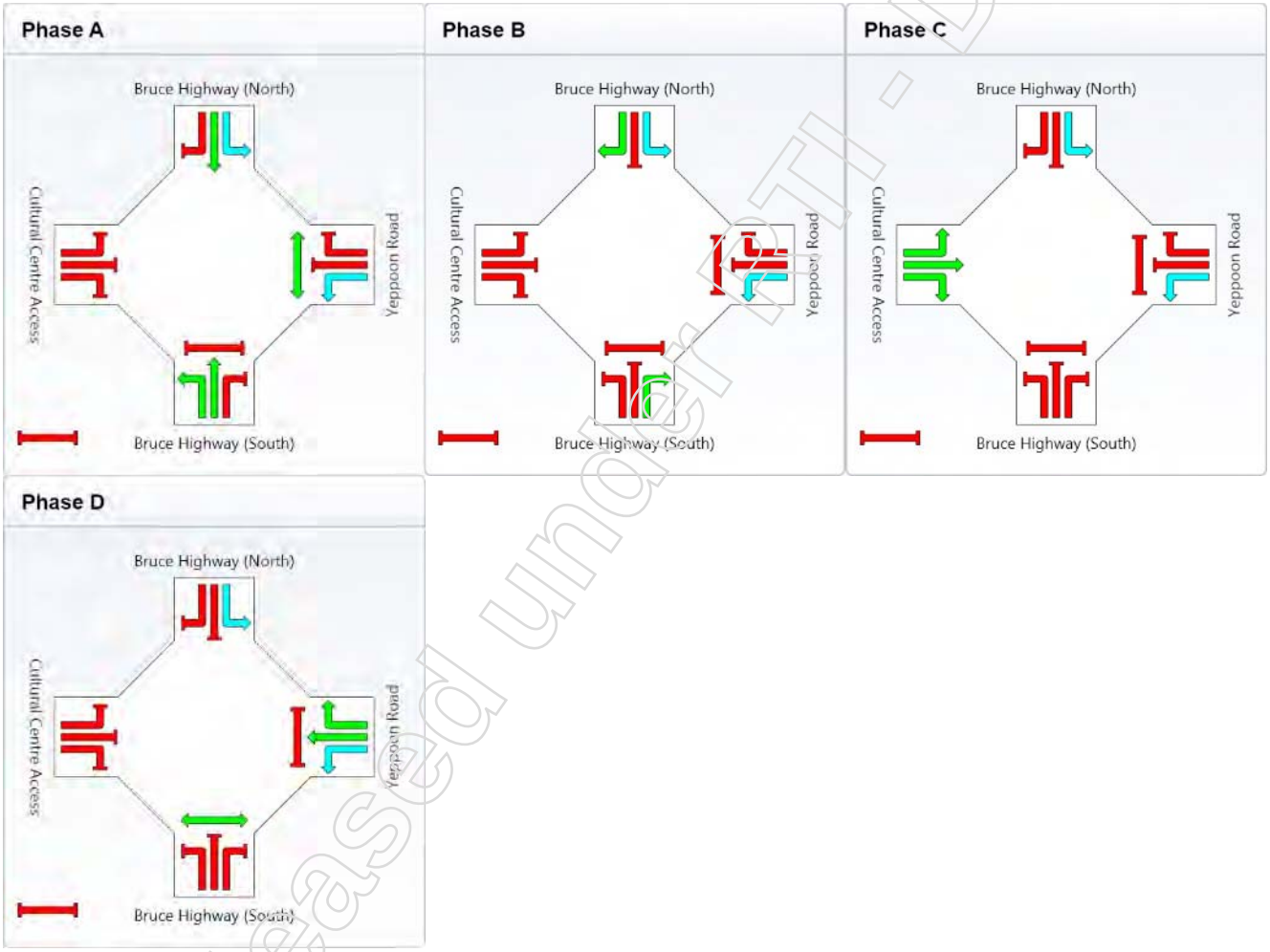
PHASING SUMMARY

Bruce Highway / Yeppoon Road
Proposed Intersection Upgrade - Ultimate Development
PRE DEV - 2025 PM Peak
Signals - Fixed Time Cycle Time = 150 seconds (Optimum Cycle Time - Minimum Delay)

Phase times determined by the program
Sequence: CAMBRAY
Input Sequence: A, B, C, D
Output Sequence: A, B, C, D

Phase Timing Results

Phase	A	B	C	D
Green Time (sec)	48	45	6	27
Yellow Time (sec)	4	4	4	4
All-Red Time (sec)	2	2	2	2
Phase Time (sec)	54	51	12	33
Phase Split	36 %	34 %	8 %	22 %





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LANE SUMMARY

Bruce Highway / Yeppoon Road
Proposed Intersection Upgrade - Utimate Development
PRE DEV - 2035 AM Peak
Signals - Fixed Time Cycle Time = 130 seconds (Optimum Cycle Time - Minimum Delay)

Lane Use and Performance

	Demand Flows L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South: Bruce Highway (South)																
Lane 1	4	0	0	4	0.0	309[1]	0.013	100	34.8	LOS C	0.2	1.1	60	Turn Bay	0.0	0.0
Lane 2	0	260	0	260	7.1	724	0.359	100	30.4	LOS C	11.6	86.5	500	–	0.0	0.0
Lane 3	0	260	0	260	7.1	724	0.359	100	30.4	LOS C	11.6	86.5	500	–	0.0	0.0
Lane 4	0	0	238	238	16.0	293	0.811	100	71.8	LOS E	15.8	125.7	250	Turn Bay	0.0	0.0
Approach	4	520	238	762	9.8		0.811		43.4	LOS D	15.8	125.7				
East: Yeppoon Road																
Lane 1	673	0	0	673	2.1	1849	0.364	100	9.5	X	X	X	500	–	0.0	X
Lane 2	0	3	297	300	7.0	371	0.808	100	66.4	LOS E	18.8	139.4	500	–	0.0	0.0
Approach	673	3	297	973	3.6		0.808		27.1	LOS C	18.8	139.4				
North: Bruce Highway (North)																
Lane 1	247	0	0	247	10.1	1750	0.141	100	9.8	X	X	X	100	Turn Bay	0.0	X
Lane 2	0	591	0	591	4.7	736	0.803	100	35.9	LOS D	31.5	229.4	500	–	0.0	0.0
Lane 3	0	591	0	591	4.7	736	0.803	100	35.9	LOS D	31.5	229.4	500	–	0.0	0.0
Lane 4	0	0	1	1	0.0	115[1]	0.009	100	55.4	LOS E	0.0	0.3	25	Turn Bay	0.0	0.0
Approach	247	1182	1	1430	5.6		0.803		31.4	LOS C	31.5	229.4				
West: Cultural Centre Access																
Lane 1	1	3	14	18	5.6	90	0.199	100	75.3	LOS E	1.2	8.5	500	–	0.0	0.0
Approach	1	3	14	18	5.6		0.199		75.3	LOS E	1.2	8.5				
Intersection				3183	6.0		0.811		33.2	LOS C	31.5	229.4				

X: Not applicable for Continuous lane.

Level of Service (LOS) Method: Delay (HCM 2000).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model used.

1 Reduced capacity due to a short lane effect

Processed: Tuesday, 2 July 2013 4:31:02 PM
SIDRA INTERSECTION 5.1.13.2093
Project: C:\Cambray Projects\STO0111\01R\Working\Sidra\13-06-19\Prelim Approval\Bruce Highway-Yeppoon Road.sip
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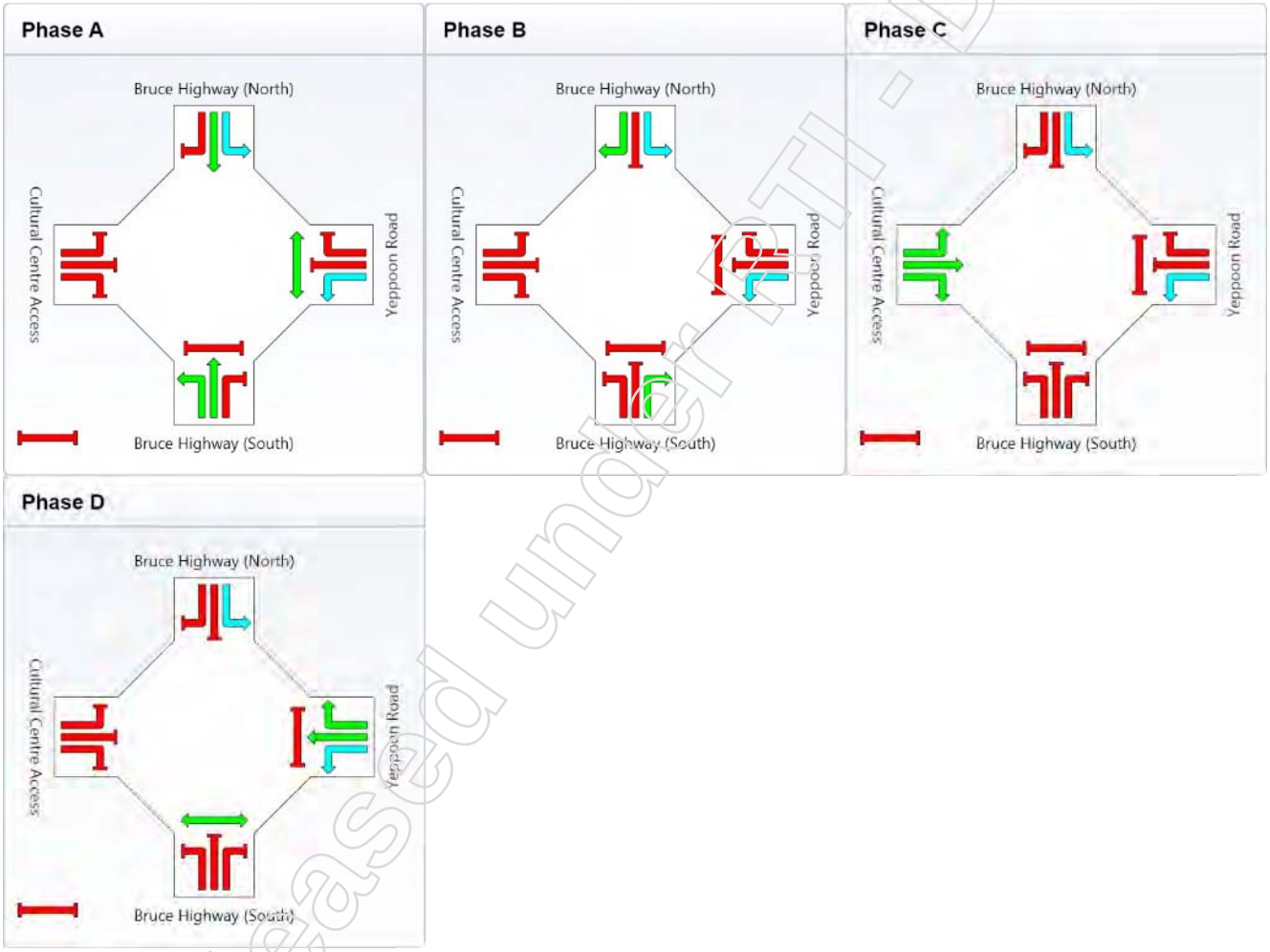
PHASING SUMMARY

Bruce Highway / Yeppoon Road
Proposed Intersection Upgrade - Utimate Development
PRE DEV - 2035 AM Peak
Signals - Fixed Time Cycle Time = 130 seconds (Optimum Cycle Time - Minimum Delay)

Phase times determined by the program
Sequence: CAMBRAY
Input Sequence: A, B, C, D
Output Sequence: A, B, C, D

Phase Timing Results

Phase	A	B	C	D
Green Time (sec)	50	23	6	27
Yellow Time (sec)	4	4	4	4
All-Red Time (sec)	2	2	2	2
Phase Time (sec)	56	29	12	33
Phase Split	43 %	22 %	9 %	25 %





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LANE SUMMARY

Site: PRE 2035 PM PEAK - UPGRADE

Bruce Highway / Yeppoon Road
Proposed Intersection Upgrade - Ultimate Development
PRE DEV - 2035 PM Peak
Signals - Fixed Time Cycle Time = 150 seconds (Optimum Cycle Time - Minimum Delay)

Lane Use and Performance

	Demand Flows L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South: Bruce Highway (South)																
Lane 1	7	0	0	7	0.0	244[1]	0.029	100	47.7	LOS D	0.4	2.5	60	Turn Bay	0.0	0.0
Lane 2	0	590	0	590	3.5	578	1.022	100	152.3	LOS F	73.3	528.4	500	–	0.0	10.0
Lane 3	0	538	51[0]	588	3.5	576	1.022	100	152.4	LOS F	73.1	526.1	500	–	0.0	9.6
Lane 4	0	0	585	585	1.4	585	1.000[3]	100	108.5[8]	LOS F[8]	57.6[8]	408.0[8]	250	Turn Bay	0.0	50.0
Approach	7	1128	636	1771	2.8		1.022		137.4	LOS F	73.3	528.4				
East: Yeppoon Road																
Lane 1	194	0	0	194	7.2	1784	0.109	100	9.7	X	X	X	500	–	0.0	X
Lane 2	0	4	289	293	5.1	326	0.898	100	86.0	LOS F	23.4	170.7	500	–	0.0	0.0
Approach	194	4	289	487	6.0		0.898		55.6	LOS E	23.4	170.7				
North: Bruce Highway (North)																
Lane 1	427	0	0	427	0.7	1867	0.229	100	9.4	X	X	X	100	Turn Bay	0.0	X
Lane 2	0	391	0	391	5.9	569	0.686	100	48.8	LOS D	23.5	172.8	500	–	0.0	0.0
Lane 3	0	391	0	391	5.9	569	0.686	100	48.8	LOS D	23.5	172.8	500	–	0.0	0.0
Lane 4	0	0	2	2	0.0	133[1]	0.015	100	44.0	LOS D	0.1	0.6	25	Turn Bay	0.0	0.0
Approach	427	781	2	1210	4.0		0.686		34.9	LOS C	23.5	172.8				
West: Cultural Centre Access																
Lane 1	1	2	2	5	0.0	82	0.061	100	82.7	LOS F	0.4	2.6	500	–	0.0	0.0
Approach	1	2	2	5	0.0		0.061		82.7	LOS F	0.4	2.6				
Intersection				3473	3.7		1.022		90.2	LOS F	73.3	528.4				

X: Not applicable for Continuous lane.

Level of Service (LOS) Method: Delay (HCM 2000).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model used.

0 Excess flow from back of an adjacent short lane
1 Reduced capacity due to a short lane effect
3 x = 1.00 due to short lane.
8 Delay, queue length and stops for the short lane have been cut down to fit in the queuing space. You may wish to change the short lane to a full lane to investigate the effect on the adjacent lane performance.

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SIDRA INTERSECTION

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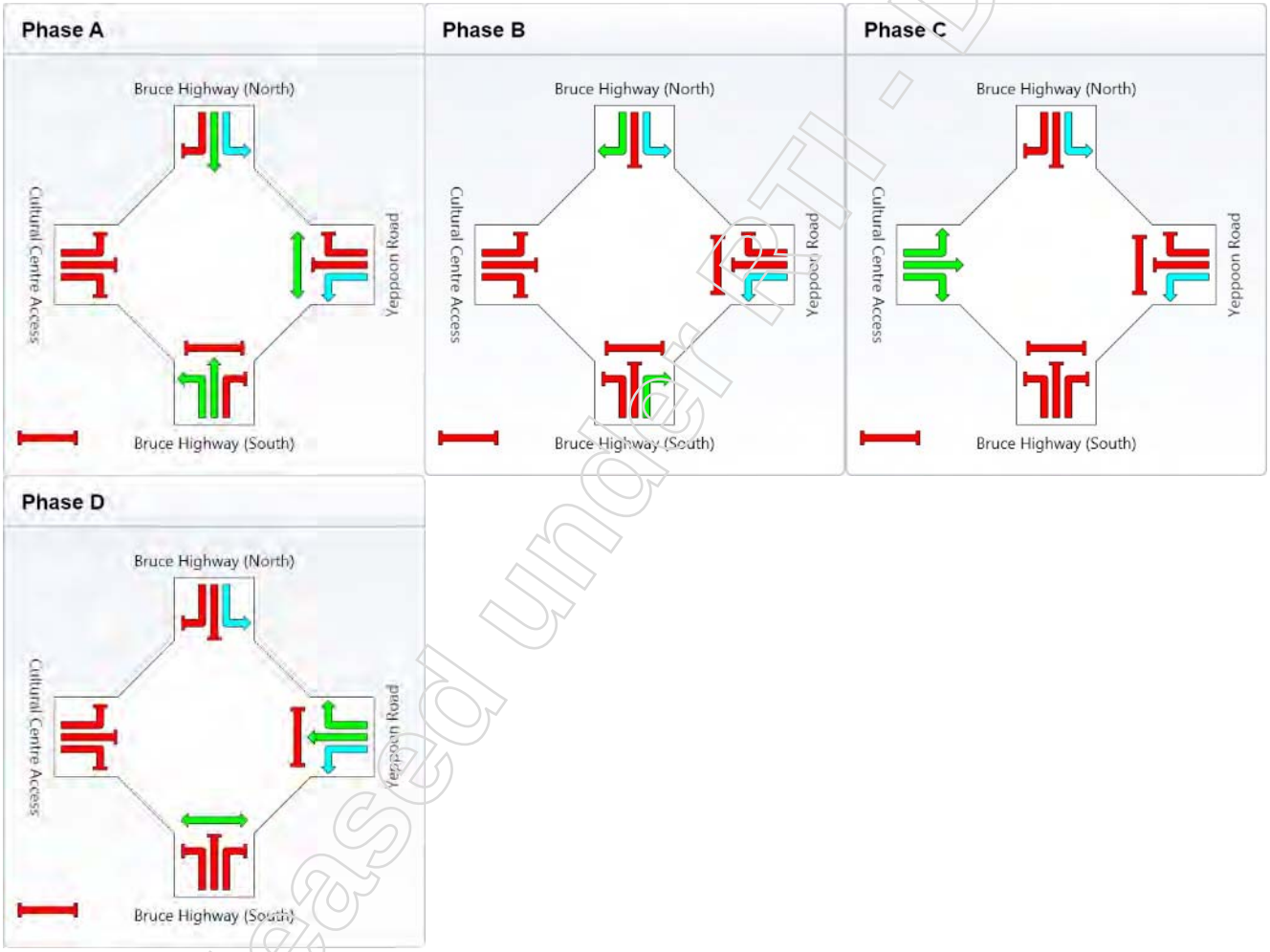
PHASING SUMMARY

Bruce Highway / Yeppoon Road
Proposed Intersection Upgrade - Ultimate Development
PRE DEV - 2035 PM Peak
Signals - Fixed Time Cycle Time = 150 seconds (Optimum Cycle Time - Minimum Delay)

Phase times determined by the program
Sequence: CAMBRAY
Input Sequence: A, B, C, D
Output Sequence: A, B, C, D

Phase Timing Results

Phase	A	B	C	D
Green Time (sec)	45	48	6	27
Yellow Time (sec)	4	4	4	4
All-Red Time (sec)	2	2	2	2
Phase Time (sec)	51	54	12	33
Phase Split	34 %	36 %	8 %	22 %





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LANE SUMMARY

Bruce Highway / Yeppoon Road
Proposed Intersection Upgrade 2 - Utimate Development
PRE DEV - 2025 AM Peak
Signals - Fixed Time Cycle Time = 125 seconds (Optimum Cycle Time - Minimum Delay)

Lane Use and Performance

	Demand Flows L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South: Bruce Highway (South)																
Lane 1	4	256	0	260	6.5	862	0.302	100	22.9	LOS C	9.9	72.9	500	–	0.0	0.0
Lane 2	0	261	0	261	6.6	862	0.302	100	22.7	LOS C	9.9	73.0	500	–	0.0	0.0
Lane 3	0	0	94	94	16.7	148	0.635	100	73.1	LOS E	5.9	46.9	150	Turn Bay	0.0	0.0
Lane 4	0	0	92	92	16.7	145	0.635	100	73.2	LOS E	5.8	46.2	150	Turn Bay	0.0	0.0
Approach	4	517	186	707	9.2		0.635		36.1	LOS D	9.9	73.0				
East: Yeppoon Road																
Lane 1	532	0	0	532	2.3	1847	0.288	100	9.5	X	X	X	500	–	0.0	X
Lane 2	0	3	250	253	7.1	386	0.655	100	58.4	LOS E	13.7	101.8	500	–	0.0	0.0
Approach	532	3	250	785	3.8		0.655		25.3	LOS C	13.7	101.8				
North: Bruce Highway (North)																
Lane 1	204	0	0	204	10.3	1414[1]	0.144	100	10.1	LOS B	0.5	3.6	100	Turn Bay	0.0	0.0
Lane 2	0	582	0	582	4.3	874	0.666	100	23.4	LOS C	23.1	167.8	500	–	0.0	0.0
Lane 3	0	582	0	582	4.3	874	0.666	100	23.4	LOS C	23.1	167.8	500	–	0.0	0.0
Lane 4	0	0	1	1	0.0	102[1]	0.010	100	65.1	LOS E	0.1	0.4	25	Turn Bay	0.0	0.0
Approach	204	1164	1	1369	5.2		0.666		21.5	LOS C	23.1	167.8				
West: Cultural Centre Access																
Lane 1	1	3	14	18	5.6	94	0.191	100	72.5	LOS E	1.1	8.2	500	–	0.0	0.0
Approach	1	3	14	18	5.6		0.191		72.5	LOS E	1.1	8.2				
Intersection				2879	5.8		0.666		26.4	LOS C	23.1	167.8				

X: Not applicable for Continuous lane.

Level of Service (LOS) Method: Delay (HCM 2000).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model used.

1 Reduced capacity due to a short lane effect

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Project: C:\Cambray Projects\STO0111\01R\Working\Sidra\13-06-19\Prelim Approval\Bruce Highway-Yeppoon Road.sip
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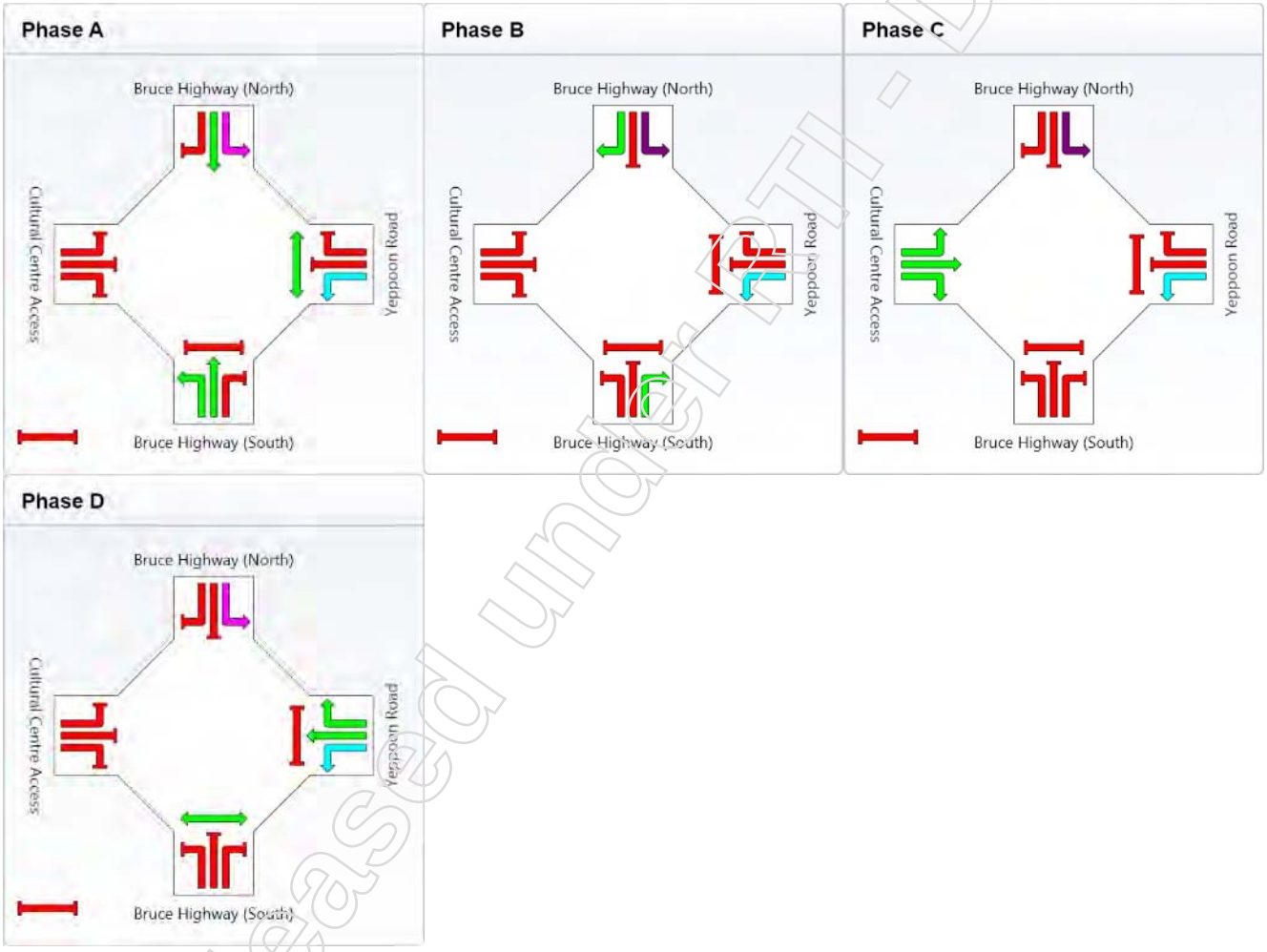
PHASING SUMMARY

Bruce Highway / Yeppoon Road
Proposed Intersection Upgrade 2 - Utimate Development
PRE DEV - 2025 AM Peak
Signals - Fixed Time Cycle Time = 125 seconds (Optimum Cycle Time - Minimum Delay)

Phase times determined by the program
Sequence: CAMBRAY
Input Sequence: A, B, C, D
Output Sequence: A, B, C, D

Phase Timing Results

Phase	A	B	C	D
Green Time (sec)	57	11	6	27
Yellow Time (sec)	4	4	4	4
All-Red Time (sec)	2	2	2	2
Phase Time (sec)	63	17	12	33
Phase Split	50 %	14 %	10 %	26 %





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LANE SUMMARY

Bruce Highway / Yeppoon Road
Proposed Intersection Upgrade 2 - Ultimate Development
PRE DEV - 2025 PM Peak
Signals - Fixed Time Cycle Time = 130 seconds (Optimum Cycle Time - Minimum Delay)

Lane Use and Performance

	Demand Flows L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South: Bruce Highway (South)																
Lane 1	7	558	0	565	3.2	742	0.762	100	37.3	LOS D	31.0	222.6	500	–	0.0	0.0
Lane 2	0	566	0	566	3.2	742	0.762	100	37.2	LOS D	31.0	222.9	500	–	0.0	0.0
Lane 3	0	0	254	254	1.6	328	0.775	100	68.3	LOS E	16.3	113.4	150	Turn Bay	0.0	0.0
Lane 4	0	0	251	251	1.6	323	0.775	100	68.4	LOS E	16.0	113.8	150	Turn Bay	0.0	0.0
Approach	7	1124	505	1636	2.7		0.775		46.8	LOS D	31.0	222.9				
East: Yeppoon Road																
Lane 1	148	0	0	148	8.1	1774	0.083	100	9.7	X	X	X	500	–	0.0	X
Lane 2	0	4	249	253	5.1	376	0.672	100	61.2	LOS E	14.4	105.4	500	–	0.0	0.0
Approach	148	4	249	401	6.2		0.672		42.2	LOS D	14.4	105.4				
North: Bruce Highway (North)																
Lane 1	369	0	0	369	0.5	1337[1]	0.276	100	10.2	LOS B	1.2	8.7	100	Turn Bay	0.0	0.0
Lane 2	0	391	0	391	5.4	732	0.533	100	30.1	LOS C	16.5	120.5	500	–	0.0	0.0
Lane 3	0	391	0	391	5.4	732	0.533	100	30.1	LOS C	16.5	120.5	500	–	0.0	0.0
Lane 4	0	0	2	2	0.0	114[1]	0.017	100	55.6	LOS E	0.1	0.7	25	Turn Bay	0.0	0.0
Approach	369	781	2	1152	3.8		0.533		23.7	LOS C	16.5	120.5				
West: Cultural Centre Access																
Lane 1	1	2	2	5	0.0	95	0.053	100	71.5	LOS E	0.3	2.2	500	–	0.0	0.0
Approach	1	2	2	5	0.0		0.053		71.5	LOS E	0.3	2.2				
Intersection				3194	3.5		0.775		38.0	LOS D	31.0	222.9				

X: Not applicable for Continuous lane.

Level of Service (LOS) Method: Delay (HCM 2000).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model used.

1 Reduced capacity due to a short lane effect

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Project: C:\Cambray Projects\STO0111\01R\Working\Sidra\13-06-19\Prelim Approval\Bruce Highway-Yeppoon Road.sip
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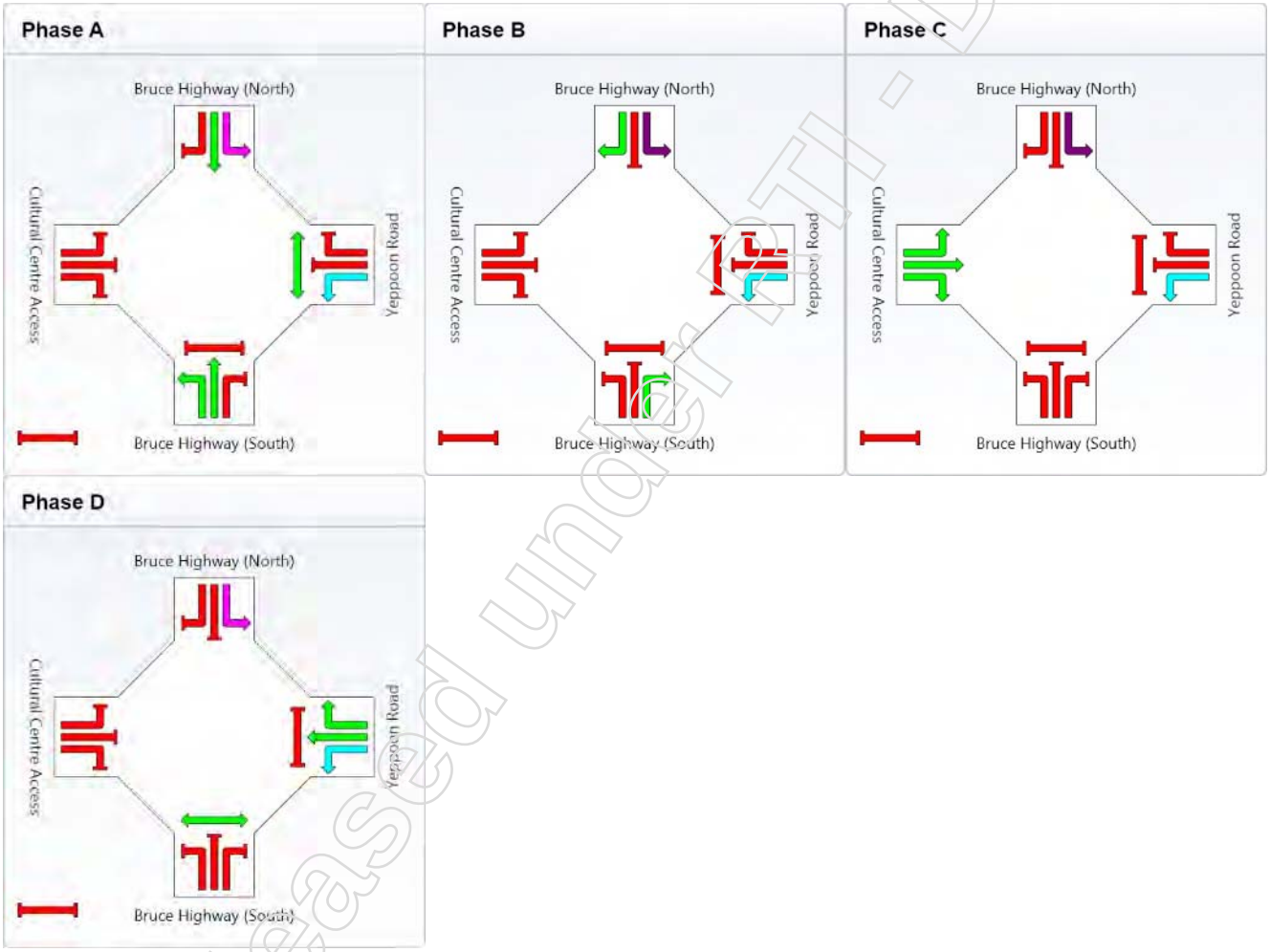
PHASING SUMMARY

Bruce Highway / Yeppoon Road
Proposed Intersection Upgrade 2 - Ultimate Development
PRE DEV - 2025 PM Peak
Signals - Fixed Time Cycle Time = 130 seconds (Optimum Cycle Time - Minimum Delay)

Phase times determined by the program
Sequence: CAMBRAY
Input Sequence: A, B, C, D
Output Sequence: A, B, C, D

Phase Timing Results

Phase	A	B	C	D
Green Time (sec)	50	23	6	27
Yellow Time (sec)	4	4	4	4
All-Red Time (sec)	2	2	2	2
Phase Time (sec)	56	29	12	33
Phase Split	43 %	22 %	9 %	25 %





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LANE SUMMARY

Bruce Highway / Yeppoon Road
Proposed Intersection Upgrade 2 - Ultimate Development
PRE DEV - 2035 AM Peak
Signals - Fixed Time Cycle Time = 115 seconds (Optimum Cycle Time - Minimum Delay)

Lane Use and Performance

	Demand Flows L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South: Bruce Highway (South)																
Lane 1	4	258	0	262	7.0	770	0.340	100	25.0	LOS C	10.0	74.2	500	–	0.0	0.0
Lane 2	0	262	0	262	7.1	770	0.340	100	24.9	LOS C	10.0	74.3	500	–	0.0	0.0
Lane 3	0	0	120	120	16.0	161	0.744	100	69.9	LOS E	7.1	53.6	150	Turn Bay	0.0	0.0
Lane 4	0	0	118	118	16.0	159	0.744	100	70.0	LOS E	7.0	55.8	150	Turn Bay	0.0	0.0
Approach	4	520	238	762	9.8		0.744		39.0	LOS D	10.0	74.3				
East: Yeppoon Road																
Lane 1	673	0	0	673	2.1	1849	0.364	100	9.5	X	X	X	500	–	0.0	X
Lane 2	0	3	297	300	7.0	420	0.714	100	54.4	LOS D	15.3	113.3	500	–	0.0	0.0
Approach	673	3	297	973	3.6		0.714		23.4	LOS C	15.3	113.3				
North: Bruce Highway (North)																
Lane 1	247	0	0	247	10.1	1413[1]	0.175	100	10.2	LOS B	0.6	4.4	100	Turn Bay	0.0	0.0
Lane 2	0	591	0	591	4.7	782	0.756	100	27.6	LOS C	25.5	186.0	500	–	0.0	0.0
Lane 3	0	591	0	591	4.7	782	0.756	100	27.6	LOS C	25.5	186.0	500	–	0.0	0.0
Lane 4	0	0	1	1	0.0	111[1]	0.009	100	59.7	LOS E	0.0	0.3	25	Turn Bay	0.0	0.0
Approach	247	1182	1	1430	5.6		0.756		24.6	LOS C	25.5	186.0				
West: Cultural Centre Access																
Lane 1	1	3	14	18	5.6	102	0.176	100	66.7	LOS E	1.0	7.5	500	–	0.0	0.0
Approach	1	3	14	18	5.6		0.176		66.7	LOS E	1.0	7.5				
Intersection				3183	6.0		0.756		27.9	LOS C	25.5	186.0				

X: Not applicable for Continuous lane.

Level of Service (LOS) Method: Delay (HCM 2000).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model used.

1 Reduced capacity due to a short lane effect

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Project: C:\Cambray Projects\STO0111\01R\Working\Sidra\13-06-19\Prelim Approval\Bruce Highway-Yeppoon Road.sip
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SIDRA INTERSECTION

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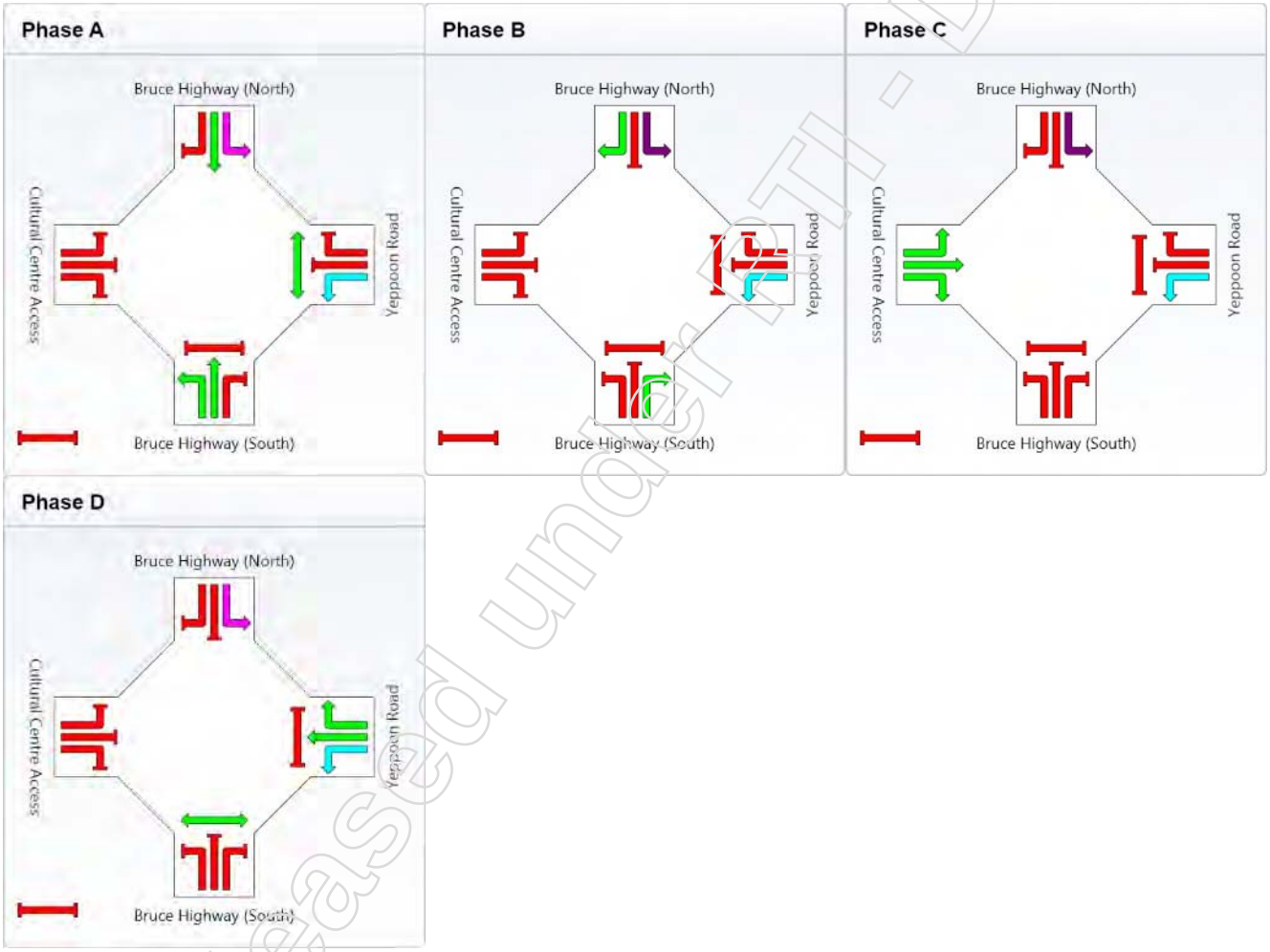
PHASING SUMMARY

Bruce Highway / Yeppoon Road
Proposed Intersection Upgrade 2 - Ultimate Development
PRE DEV - 2035 AM Peak
Signals - Fixed Time Cycle Time = 115 seconds (Optimum Cycle Time - Minimum Delay)

Phase times determined by the program
Sequence: CAMBRAY
Input Sequence: A, B, C, D
Output Sequence: A, B, C, D

Phase Timing Results

Phase	A	B	C	D
Green Time (sec)	47	11	6	27
Yellow Time (sec)	4	4	4	4
All-Red Time (sec)	2	2	2	2
Phase Time (sec)	53	17	12	33
Phase Split	46 %	15 %	10 %	29 %





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LANE SUMMARY

Bruce Highway / Yeppoon Road
Proposed Intersection Upgrade 2 - Ultimate Development
PRE DEV - 2035 PM Peak
Signals - Fixed Time Cycle Time = 135 seconds (Optimum Cycle Time - Minimum Delay)

Lane Use and Performance

	Demand Flows L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South: Bruce Highway (South)																
Lane 1	7	560	0	567	3.5	699	0.812	100	43.9	LOS D	34.7	250.0	500	–	0.0	0.0
Lane 2	0	568	0	568	3.5	699	0.812	100	43.7	LOS D	34.7	250.2	500	–	0.0	0.0
Lane 3	0	0	320	320	1.4	399	0.803	100	68.0	LOS E	21.2	150.5	150	Turn Bay	0.0	5.3
Lane 4	0	0	316	316	1.4	393	0.803	100	68.2	LOS E	21.0	148.4	150	Turn Bay	0.0	4.1
Approach	7	1128	636	1771	2.8		0.812		52.5	LOS D	34.7	250.2				
East: Yeppoon Road																
Lane 1	194	0	0	194	7.2	1784	0.109	100	9.7	X	X	X	500	–	0.0	X
Lane 2	0	4	289	293	5.1	362	0.809	100	69.0	LOS E	19.1	139.3	500	–	0.0	0.0
Approach	194	4	289	487	6.0		0.809		45.4	LOS D	19.1	139.3				
North: Bruce Highway (North)																
Lane 1	427	0	0	427	0.7	1255[1]	0.340	100	10.4	LOS B	1.7	11.7	100	Turn Bay	0.0	0.0
Lane 2	0	391	0	391	5.9	689	0.567	100	34.3	LOS C	18.1	133.4	500	–	0.0	0.0
Lane 3	0	391	0	391	5.9	689	0.567	100	34.3	LOS C	18.1	133.4	500	–	0.0	0.0
Lane 4	0	0	2	2	0.0	119[1]	0.017	100	52.8	LOS D	0.1	0.6	25	Turn Bay	0.0	0.0
Approach	427	781	2	1210	4.0		0.567		25.9	LOS C	18.1	133.4				
West: Cultural Centre Access																
Lane 1	1	2	2	5	0.0	92	0.055	100	74.3	LOS E	0.3	2.3	500	–	0.0	0.0
Approach	1	2	2	5	0.0		0.055		74.3	LOS E	0.3	2.3				
Intersection				3473	3.7		0.812		42.3	LOS D	34.7	250.2				

X: Not applicable for Continuous lane.

Level of Service (LOS) Method: Delay (HCM 2000).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model used.

1 Reduced capacity due to a short lane effect

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Project: C:\Cambray Projects\STO0111\01R\Working\Sidra\13-06-19\Prelim Approval\Bruce Highway-Yeppoon Road.sip
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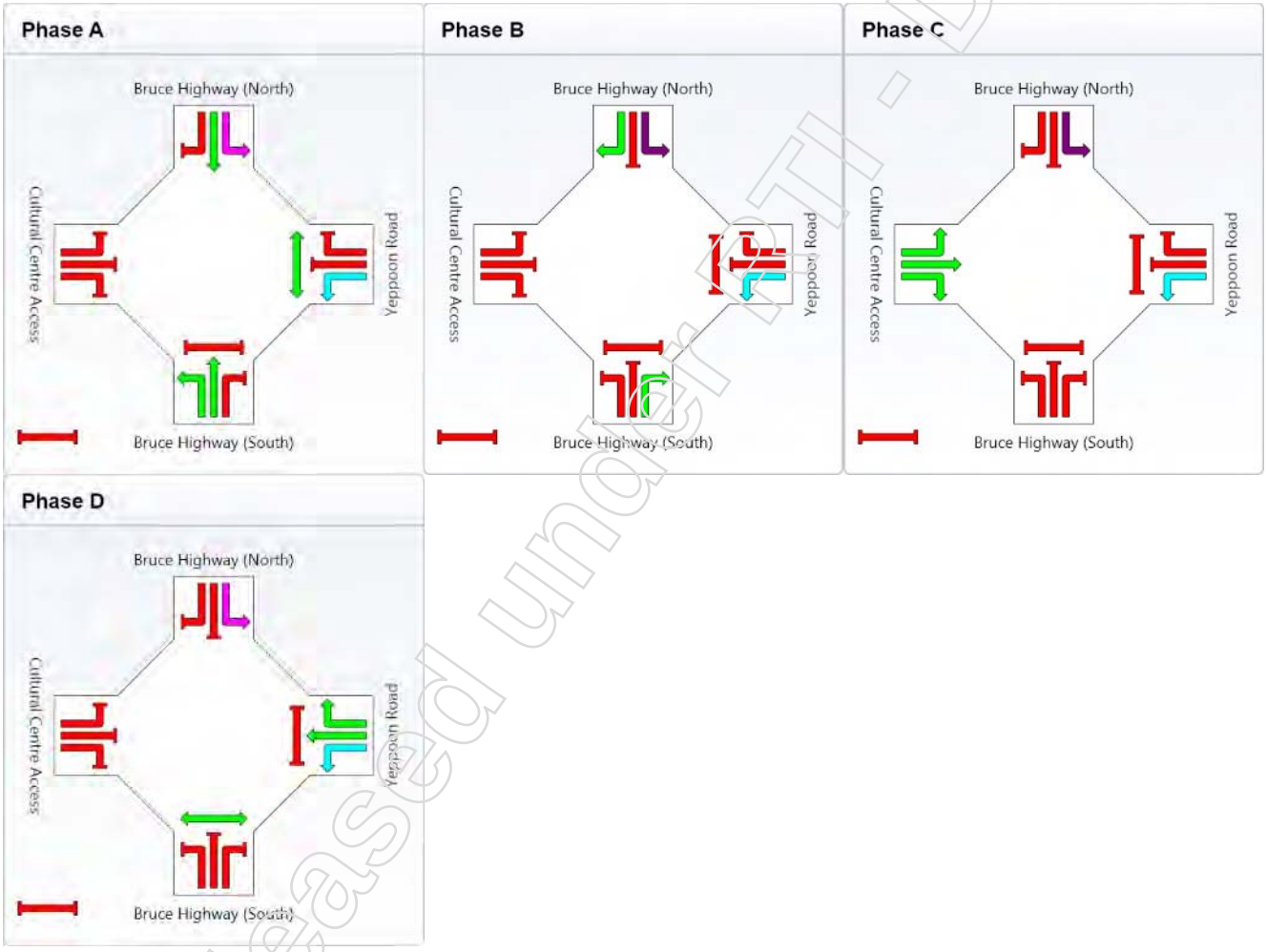
PHASING SUMMARY

Bruce Highway / Yeppoon Road
Proposed Intersection Upgrade 2 - Ultimate Development
PRE DEV - 2035 PM Peak
Signals - Fixed Time Cycle Time = 135 seconds (Optimum Cycle Time - Minimum Delay)

Phase times determined by the program
Sequence: CAMBRAY
Input Sequence: A, B, C, D
Output Sequence: A, B, C, D

Phase Timing Results

Phase	A	B	C	D
Green Time (sec)	49	29	6	27
Yellow Time (sec)	4	4	4	4
All-Red Time (sec)	2	2	2	2
Phase Time (sec)	55	35	12	33
Phase Split	41 %	26 %	9 %	24 %





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LANE SUMMARY

Bruce Highway / Yeppoon Road
Proposed Intersection Upgrade 2 - Ultimate Development
POST DEV - 2025 AM Peak
Signals - Fixed Time Cycle Time = 150 seconds (Optimum Cycle Time - Minimum Delay)

Lane Use and Performance

	Demand Flows L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South: Bruce Highway (South)																
Lane 1	4	385	0	389	4.3	1009	0.386	100	22.3	LOS C	16.5	120.1	500	–	0.0	0.0
Lane 2	0	389	0	389	4.4	1009	0.386	100	22.2	LOS C	16.5	120.1	500	–	0.0	0.0
Lane 3	0	0	94	94	16.7	101	0.932	100	107.2	LOS F	8.2	65.5	150	Turn Bay	0.0	0.0
Lane 4	0	0	92	92	16.7	99	0.932	100	107.4	LOS F	8.1	64.6	150	Turn Bay	0.0	0.0
Approach	4	774	186	964	6.7		0.932		38.7	LOS D	16.5	120.1				
East: Yeppoon Road																
Lane 1	532	0	0	532	2.3	1847	0.288	100	9.5	X	X	X	500	–	0.0	X
Lane 2	0	3	379	382	4.7	388	0.986	100	120.0	LOS F	38.5	280.7	500	–	0.0	0.0
Approach	532	3	379	914	3.3		0.986		55.7	LOS E	38.5	280.7				
North: Bruce Highway (North)																
Lane 1	349	0	0	349	6.0	1410[1]	0.247	100	10.1	LOS B	1.1	8.4	100	Turn Bay	0.0	0.0
Lane 2	0	993	0	993	2.5	1021	0.973	100	60.2	LOS E	90.1	644.3	500	–	0.0	28.1
Lane 3	0	993	0	993	2.5	1021	0.973	100	60.2	LOS E	90.1	644.3	500	–	0.0	28.1
Lane 4	0	0	1	1	0.0	82[1]	0.012	100	81.1	LOS F	0.1	0.5	25	Turn Bay	0.0	0.0
Approach	349	1986	1	2336	3.0		0.973		52.7	LOS D	90.1	644.3				
West: Cultural Centre Access																
Lane 1	1	3	14	18	5.6	78	0.230	100	86.8	LOS F	1.4	9.9	500	–	0.0	0.0
Approach	1	3	14	18	5.6		0.230		86.8	LOS F	1.4	9.9				
Intersection				4232	3.9		0.986		50.3	LOS D	90.1	644.3				

X: Not applicable for Continuous lane.

Level of Service (LOS) Method: Delay (HCM 2000).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model used.

1 Reduced capacity due to a short lane effect

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SIDRA INTERSECTION 5.1.13.2093
Project: C:\Cambray Projects\STO0111\01R\Working\Sidra\13-06-19\Prelim Approval\Bruce Highway-Yeppoon Road.sip
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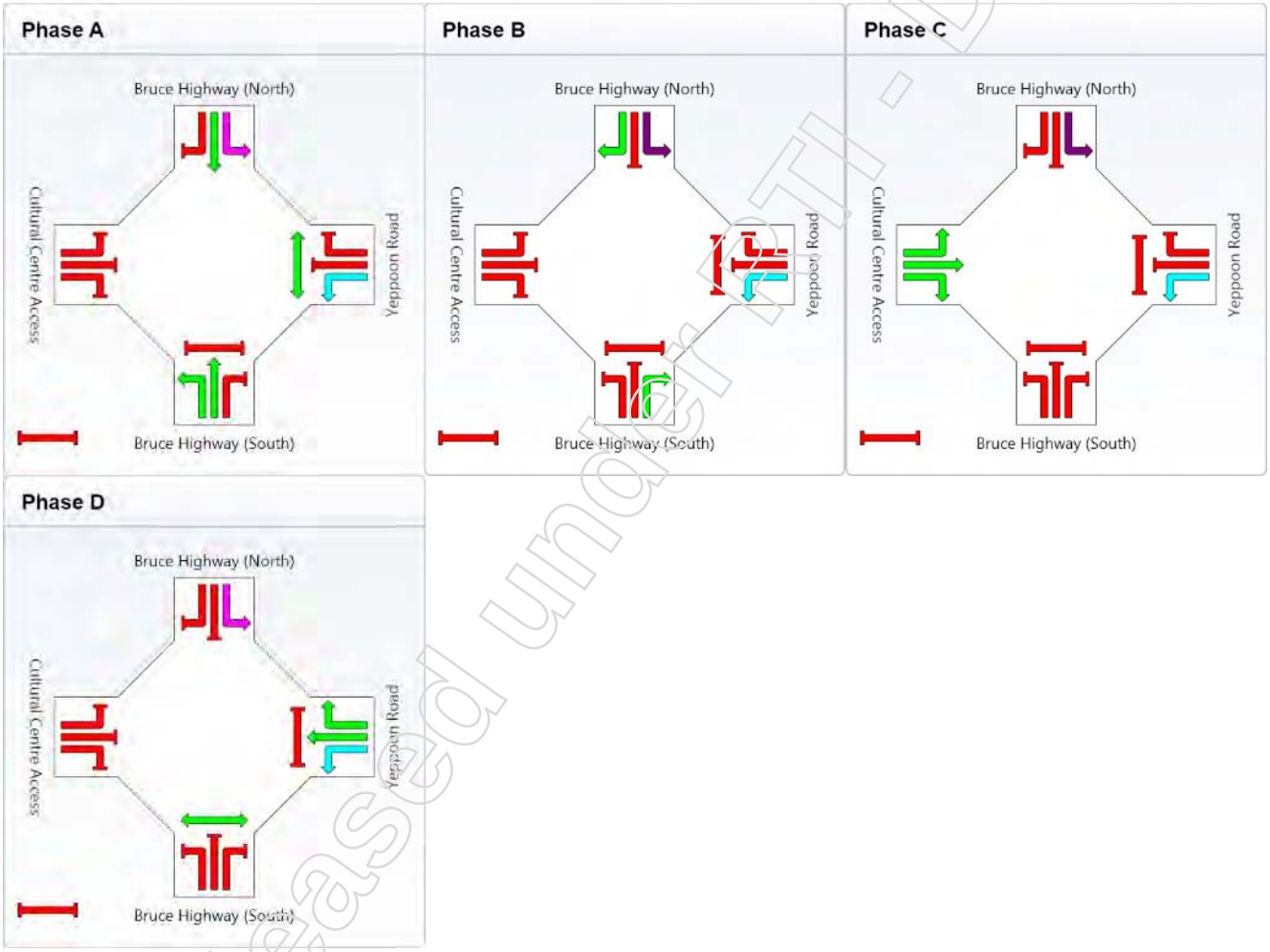
PHASING SUMMARY

Bruce Highway / Yeppoon Road
Proposed Intersection Upgrade 2 - Ultimate Development
POST DEV - 2025 AM Peak
Signals - Fixed Time Cycle Time = 150 seconds (Optimum Cycle Time - Minimum Delay)

Phase times determined by the program
Sequence: CAMBRAY
Input Sequence: A, B, C, D
Output Sequence: A, B, C, D

Phase Timing Results

Phase	A	B	C	D
Green Time (sec)	79	9	6	32
Yellow Time (sec)	4	4	4	4
All-Red Time (sec)	2	2	2	2
Phase Time (sec)	85	15	12	38
Phase Split	57 %	10 %	8 %	25 %





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LANE SUMMARY

Bruce Highway / Yeppoon Road
Proposed Intersection Upgrade 2 - Ultimate Development
POST DEV - 2025 PM Peak
Signals - Fixed Time Cycle Time = 150 seconds (Optimum Cycle Time - Minimum Delay)

Lane Use and Performance

	Demand Flows L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South: Bruce Highway (South)																
Lane 1	7	911	0	918	2.0	869	1.057	100	192.7	LOS F	133.6	950.7	500	–	0.0	64.5
Lane 2	0	919	0	919	2.0	869	1.057	100	192.6	LOS F	133.6	951.0	500	–	0.0	64.5
Lane 3	0	0	254	254	1.6	247	1.029	100	178.4	LOS F	31.3	222.1	150	Turn Bay	0.0	40.9
Lane 4	0	0	251	251	1.6	244	1.029	100	178.7	LOS F	30.9	219.0	150	Turn Bay	0.0	39.6
Approach	7	1830	505	2342	1.9		1.057		189.6	LOS F	133.6	951.0				
East: Yeppoon Road																
Lane 1	148	0	0	148	8.1	1774	0.083	100	9.7	X	X	X	500	–	0.0	X
Lane 2	0	4	415	419	3.1	404	1.037	100	178.6	LOS F	52.8	379.3	500	–	0.0	0.0
Approach	148	4	415	567	4.4		1.037		134.5	LOS F	52.8	379.3				
North: Bruce Highway (North)																
Lane 1	562	0	0	562	0.4	1300[1]	0.432	100	10.4	LOS B	2.7	18.8	100	Turn Bay	0.0	0.0
Lane 2	0	584	0	584	3.6	860	0.679	100	29.4	LOS C	28.6	206.2	500	–	0.0	0.0
Lane 3	0	584	0	584	3.6	860	0.679	100	29.4	LOS C	28.6	206.2	500	–	0.0	0.0
Lane 4	0	0	2	2	0.0	93[1]	0.022	100	68.9	LOS E	0.1	0.8	25	Turn Bay	0.0	0.0
Approach	562	1168	2	1732	2.5		0.679		23.3	LOS C	28.6	206.2				
West: Cultural Centre Access																
Lane 1	1	2	2	5	0.0	82	0.061	100	82.7	LOS F	0.4	2.6	500	–	0.0	0.0
Approach	1	2	2	5	0.0		0.061		82.7	LOS F	0.4	2.6				
Intersection				4646	2.4		1.057		120.7	LOS F	133.6	951.0				

X: Not applicable for Continuous lane.

Level of Service (LOS) Method: Delay (HCM 2000).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model used.

1 Reduced capacity due to a short lane effect

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SIDRA INTERSECTION 5.1.13.2093
Project: C:\Cambray Projects\STO0111\01R\Working\Sidra\13-06-19\Prelim Approval\Bruce Highway-Yeppoon Road.sip
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SIDRA INTERSECTION

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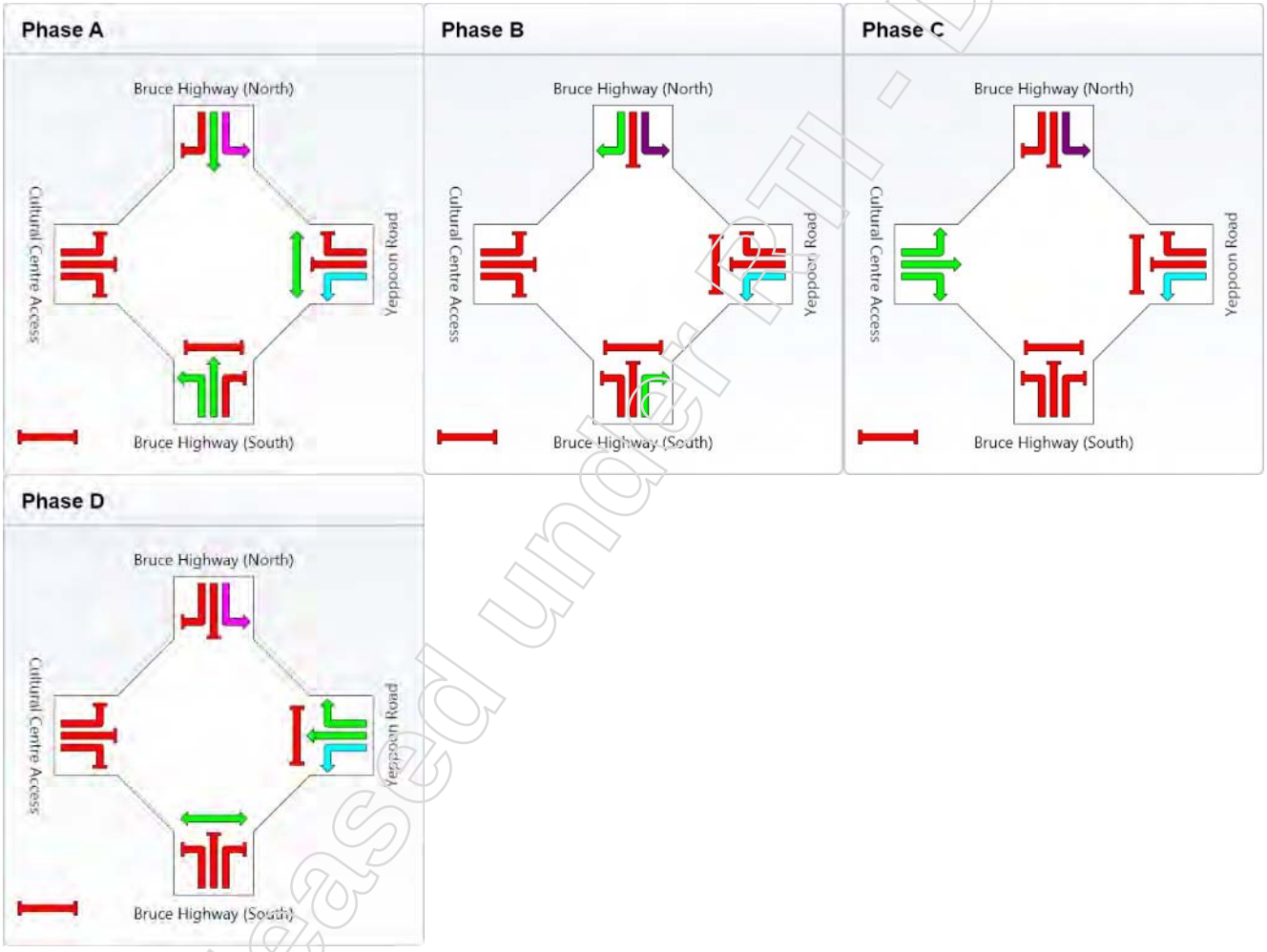
PHASING SUMMARY

Bruce Highway / Yeppoon Road
Proposed Intersection Upgrade 2 - Ultimate Development
POST DEV - 2025 PM Peak
Signals - Fixed Time Cycle Time = 150 seconds (Optimum Cycle Time - Minimum Delay)

Phase times determined by the program
Sequence: CAMBRAY
Input Sequence: A, B, C, D
Output Sequence: A, B, C, D

Phase Timing Results

Phase	A	B	C	D
Green Time (sec)	67	20	6	33
Yellow Time (sec)	4	4	4	4
All-Red Time (sec)	2	2	2	2
Phase Time (sec)	73	26	12	39
Phase Split	49 %	17 %	8 %	26 %





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LANE SUMMARY

Bruce Highway / Yeppoon Road
Proposed Intersection Upgrade 2 - Ultimate Development
POST DEV - 2035 AM Peak
Signals - Fixed Time Cycle Time = 150 seconds (Optimum Cycle Time - Minimum Delay)

Lane Use and Performance

	Demand Flows L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South: Bruce Highway (South)																
Lane 1	4	386	0	390	4.7	955	0.409	100	24.9	LOS C	17.6	128.1	500	–	0.0	0.0
Lane 2	0	391	0	391	4.8	956	0.409	100	24.8	LOS C	17.6	128.2	500	–	0.0	0.0
Lane 3	0	0	120	120	16.0	124	0.971	100	122.8	LOS F	11.5	91.5	150	Turn Bay	0.0	0.0
Lane 4	0	0	118	118	16.0	122	0.971	100	123.0	LOS F	11.3	90.2	150	Turn Bay	0.0	0.0
Approach	4	777	238	1019	7.4		0.971		47.8	LOS D	17.6	128.2				
East: Yeppoon Road																
Lane 1	673	0	0	673	2.1	1849	0.364	100	9.5	X	X	X	500	–	0.0	X
Lane 2	0	3	426	429	4.9	411	1.043	100	188.2	LOS F	55.8	406.7	500	–	0.0	0.0
Approach	673	3	426	1102	3.2		1.043		79.1	LOS E	55.8	406.7				
North: Bruce Highway (North)																
Lane 1	392	0	0	392	6.4	1376[1]	0.285	100	10.2	LOS B	1.4	10.2	100	Turn Bay	0.0	0.0
Lane 2	0	1002	0	1002	2.7	968	1.035	100	136.5	LOS F	127.4	912.7	500	–	0.0	60.6
Lane 3	0	1002	0	1002	2.7	968	1.035	100	136.5	LOS F	127.4	912.7	500	–	0.0	60.6
Lane 4	0	0	1	1	0.0	84[1]	0.012	100	78.5	LOS E	0.1	0.5	25	Turn Bay	0.0	0.0
Approach	392	2004	1	2397	3.3		1.035		115.8	LOS F	127.4	912.7				
West: Cultural Centre Access																
Lane 1	1	3	14	18	5.6	78	0.230	100	86.8	LOS F	1.4	9.9	500	–	0.0	0.0
Approach	1	3	14	18	5.6		0.230		86.8	LOS F	1.4	9.9				
Intersection				4536	4.2		1.043		91.5	LOS F	127.4	912.7				

X: Not applicable for Continuous lane.

Level of Service (LOS) Method: Delay (HCM 2000).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model used.

1 Reduced capacity due to a short lane effect

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SIDRA INTERSECTION

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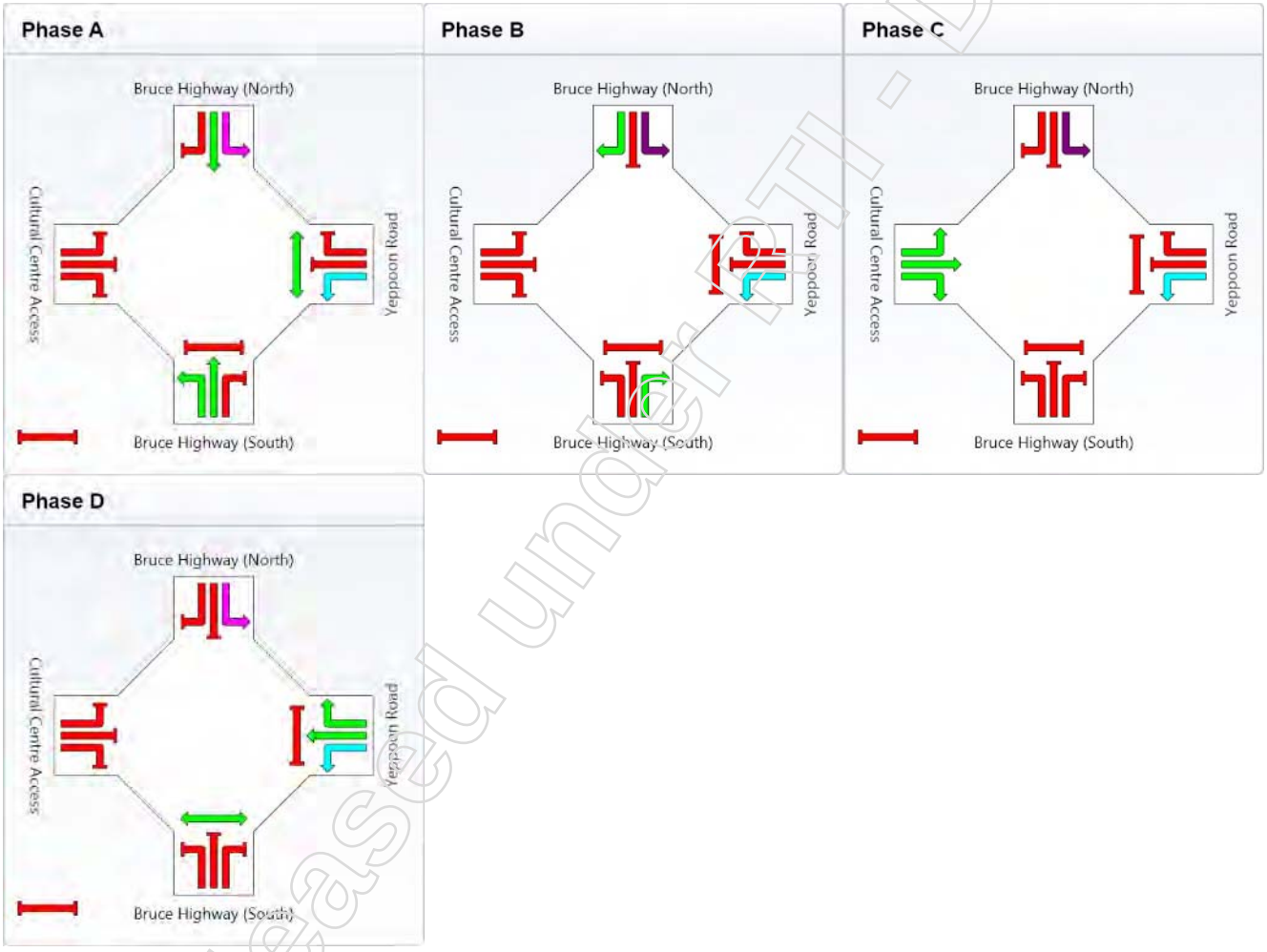
PHASING SUMMARY

Bruce Highway / Yeppoon Road
Proposed Intersection Upgrade 2 - Ultimate Development
POST DEV - 2035 AM Peak
Signals - Fixed Time Cycle Time = 150 seconds (Optimum Cycle Time - Minimum Delay)

Phase times determined by the program
Sequence: CAMBRAY
Input Sequence: A, B, C, D
Output Sequence: A, B, C, D

Phase Timing Results

Phase	A	B	C	D
Green Time (sec)	75	11	6	34
Yellow Time (sec)	4	4	4	4
All-Red Time (sec)	2	2	2	2
Phase Time (sec)	81	17	12	40
Phase Split	54 %	11 %	8 %	27 %





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LANE SUMMARY

Bruce Highway / Yeppoon Road
Proposed Intersection Upgrade 2 - Ultimate Development
POST DEV - 2035 PM Peak
Signals - Fixed Time Cycle Time = 150 seconds (Optimum Cycle Time - Minimum Delay)

Lane Use and Performance

	Demand Flows L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South: Bruce Highway (South)																
Lane 1	7	988	0	995	2.2	868	1.147	100	342.3	LOS F	197.2	1405.7	500	–	0.0	100.0
Lane 2	0	847	142[0]	989	2.2	862	1.147	100	342.4	LOS F	196.0	1396.3	500	–	0.0	100.0
Lane 3	0	0	249	249	1.4	235	1.057	100	220.0	LOS F	34.5	244.7	150	Turn Bay	0.0	50.0
Lane 4	0	0	246	246	1.4	232	1.060	100	224.6	LOS F	34.5	244.7	150	Turn Bay	0.0	50.0
Approach	7	1835	636	2478	2.0		1.147		318.4	LOS F	197.2	1405.7				
East: Yeppoon Road																
Lane 1	194	0	0	194	7.2	1784	0.109	100	9.7	X	X	X	500	–	0.0	X
Lane 2	0	4	455	459	3.3	416	1.104	100	284.4	LOS F	76.0	546.7	500	–	0.0	13.1
Approach	194	4	455	653	4.4		1.104		202.8	LOS F	76.0	546.7				
North: Bruce Highway (North)																
Lane 1	620	0	0	620	0.5	1313[1]	0.472	100	10.4	LOS B	3.1	21.8	100	Turn Bay	0.0	0.0
Lane 2	0	585	0	585	3.9	858	0.681	100	29.4	LOS C	28.7	207.4	500	–	0.0	0.0
Lane 3	0	585	0	585	3.9	858	0.681	100	29.4	LOS C	28.7	207.4	500	–	0.0	0.0
Lane 4	0	0	2	2	0.0	92[1]	0.022	100	69.9	LOS E	0.1	0.8	25	Turn Bay	0.0	0.0
Approach	620	1169	2	1791	2.7		0.681		22.9	LOS C	28.7	207.4				
West: Cultural Centre Access																
Lane 1	1	2	2	5	0.0	82	0.061	100	82.7	LOS F	0.4	2.6	500	–	0.0	0.0
Approach	1	2	2	5	0.0		0.061		82.7	LOS F	0.4	2.6				
Intersection				4927	2.6		1.147		195.4	LOS F	197.2	1405.7				

X: Not applicable for Continuous lane.

Level of Service (LOS) Method: Delay (HCM 2000).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model used.

0 Excess flow from back of an adjacent short lane
1 Reduced capacity due to a short lane effect

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SIDRA INTERSECTION

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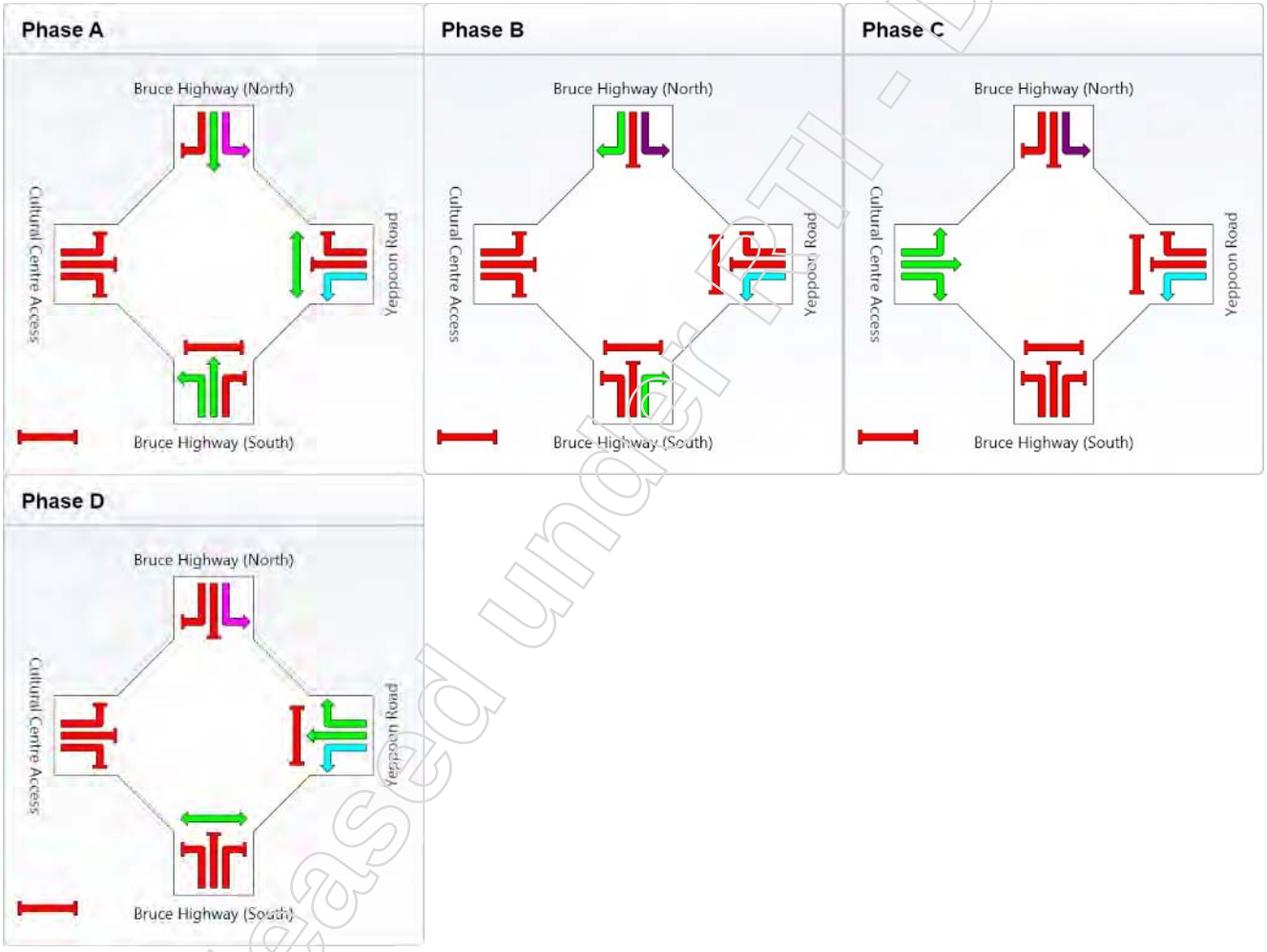
PHASING SUMMARY

Bruce Highway / Yeppoon Road
Proposed Intersection Upgrade 2 - Ultimate Development
POST DEV - 2035 PM Peak
Signals - Fixed Time Cycle Time = 150 seconds (Optimum Cycle Time - Minimum Delay)

Phase times determined by the program
Sequence: CAMBRAY
Input Sequence: A, B, C, D
Output Sequence: A, B, C, D

Phase Timing Results

Phase	A	B	C	D
Green Time (sec)	67	19	6	34
Yellow Time (sec)	4	4	4	4
All-Red Time (sec)	2	2	2	2
Phase Time (sec)	73	25	12	40
Phase Split	49 %	17 %	8 %	27 %





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LANE SUMMARY

Site: POST 2025 AM PEAK - FINAL UPGRADE

Bruce Highway / Yeppoon Road
Proposed Intersection Upgrade (Final) - Ultimate Development
POST DEV - 2025 AM Peak
Signals - Fixed Time Cycle Time = 150 seconds (Optimum Cycle Time - Shortest Queue)

Lane Use and Performance

	Demand Flows L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South: Bruce Highway (South)																
Lane 1	4	385	0	389	4.3	1111	0.350	100	17.5	LOS B	14.6	106.3	500	–	0.0	0.0
Lane 2	0	389	0	389	4.4	1111	0.350	100	17.4	LOS B	14.6	106.3	500	–	0.0	0.0
Lane 3	0	0	94	94	16.7	145	0.645	100	85.1	LOS F	7.0	55.7	150	Turn Bay	0.0	0.0
Lane 4	0	0	92	92	16.7	143	0.645	100	85.1	LOS F	6.9	54.9	150	Turn Bay	0.0	0.0
Approach	4	774	186	964	6.7		0.645		30.5	LOS C	14.6	106.3				
East: Yeppoon Road																
Lane 1	266	0	0	266	2.3	480	0.554	100	61.0	LOS E	15.7	112.1	150	Turn Bay	0.0	0.0
Lane 2	266	0	0	266	2.3	480	0.554	100	61.0	LOS E	15.7	112.1	500	–	0.0	0.0
Lane 3	0	3	188	191	4.9	242	0.789	100	81.5	LOS F	14.1	102.6	500	–	0.0	0.0
Lane 4	0	0	191	191	4.5	242	0.789	100	81.6	LOS F	14.1	102.4	150	Turn Bay	0.0	0.0
Approach	532	3	379	914	3.3		0.789		69.6	LOS E	15.7	112.1				
North: Bruce Highway (North)																
Lane 1	349	220	0	569	4.7	833[1]	0.684	87[6]	13.9	LOS B	11.3	82.5	100	Turn Bay	0.0	0.0
Lane 2	0	883	0	883	2.5	1124	0.785	100	15.9	LOS B	36.5	261.2	500	–	0.0	0.0
Lane 3	0	883	0	883	2.5	1124	0.785	100	15.9	LOS B	36.5	261.2	500	–	0.0	0.0
Lane 4	0	0	1	1	0.0	86[1]	0.012	100	76.1	LOS E	0.1	0.5	25	Turn Bay	0.0	0.0
Approach	349	1986	1	2336	3.0		0.785		15.4	LOS B	36.5	261.2				
West: Cultural Centre Access																
Lane 1	1	3	14	18	5.6	78	0.230	100	86.8	LOS F	1.4	9.9	500	–	0.0	0.0
Approach	1	3	14	18	5.6		0.230		86.8	LOS F	1.4	9.9				
Intersection				4232	3.9		0.789		30.9	LOS C	36.5	261.2				

Level of Service (LOS) Method: Delay (HCM 2000).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model used.

1 Reduced capacity due to a short lane effect
6 Lane underutilisation due to downstream effects

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Project: C:\Cambray Projects\STO0111\01R\Working\Sidra\13-06-19\Prelim Approval\Bruce Highway-Yeppoon Road.sip
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SIDRA INTERSECTION

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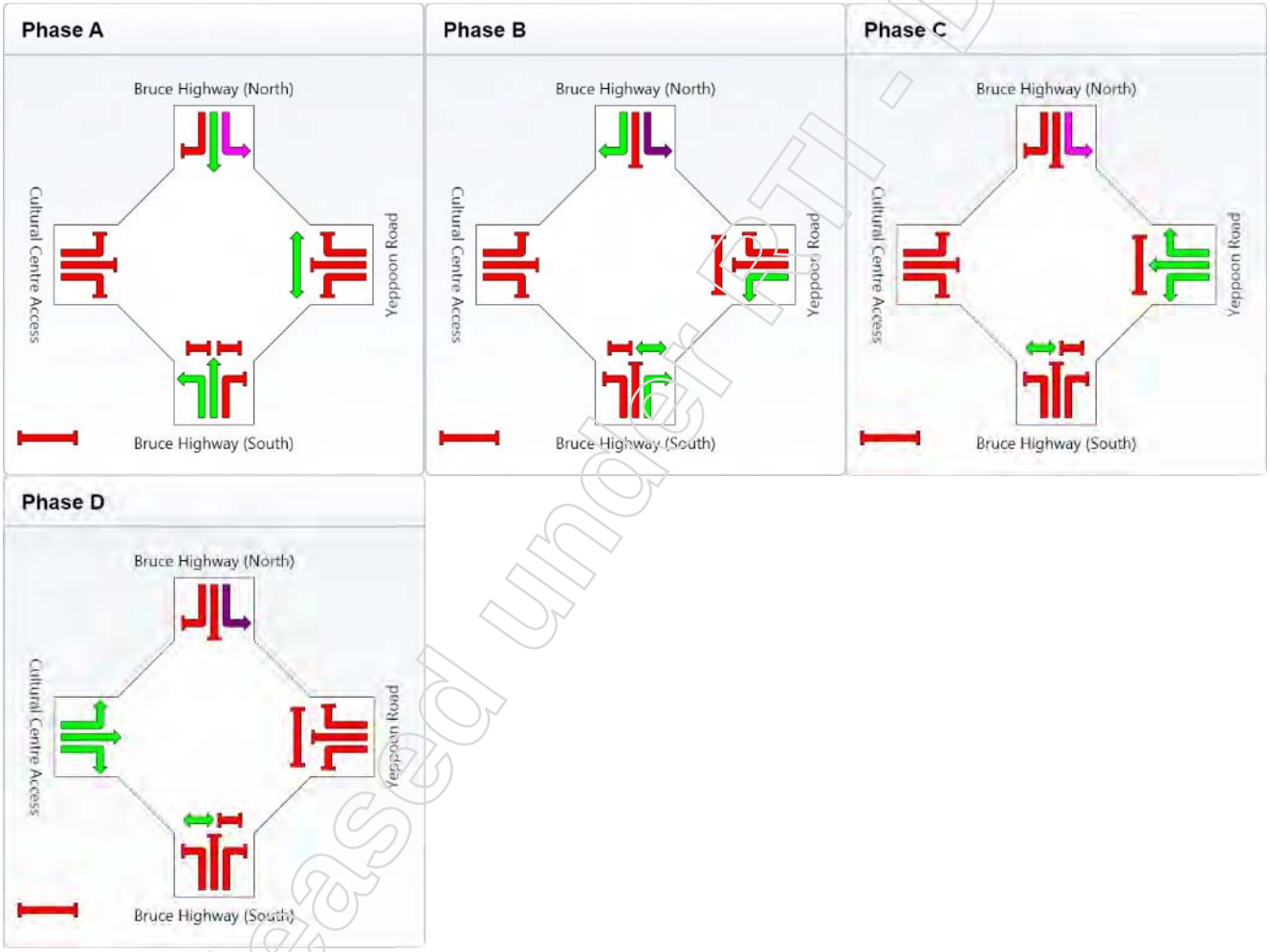
PHASING SUMMARY

Bruce Highway / Yeppoon Road
Proposed Intersection Upgrade (Final) - Ultimate Development
POST DEV - 2025 AM Peak
Signals - Fixed Time Cycle Time = 150 seconds (Optimum Cycle Time - Shortest Queue)

Phase times determined by the program
Sequence: CAMBRAY
Input Sequence: A, B, C, D
Output Sequence: A, B, C, D

Phase Timing Results

Phase	A	B	C	D
Green Time (sec)	87	13	20	6
Yellow Time (sec)	4	4	4	4
All-Red Time (sec)	2	2	2	2
Phase Time (sec)	93	19	26	12
Phase Split	62 %	13 %	17 %	8 %





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LANE SUMMARY

Bruce Highway / Yeppoon Road
Proposed Intersection Upgrade (Final) - Ultimate Development
POST DEV - 2025 AM Peak
Signals - Fixed Time Cycle Time = 125 seconds (Optimum Cycle Time - Shortest Queue)

Lane Use and Performance

	Demand Flows L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South: Bruce Highway (South)																
Lane 1	7	908	0	915	2.0	1112	0.823	100	22.7	LOS C	44.3	315.2	500	–	0.0	0.0
Lane 2	0	922	0	922	2.0	1121	0.823	100	22.6	LOS C	44.6	317.5	500	–	0.0	0.0
Lane 3	0	0	254	254	1.6	312	0.816	100	69.5	LOS E	16.3	113.3	150	Turn Bay	0.0	0.0
Lane 4	0	0	251	251	1.6	307	0.816	100	69.6	LOS E	16.0	113.7	150	Turn Bay	0.0	0.0
Approach	7	1830	505	2342	1.9		0.823		32.8	LOS C	44.6	317.5				
East: Yeppoon Road																
Lane 1	74	0	0	74	8.1	624	0.119	100	37.1	LOS D	2.5	18.7	150	Turn Bay	0.0	0.0
Lane 2	74	0	0	74	8.1	624	0.119	100	37.1	LOS D	2.5	18.7	500	–	0.0	0.0
Lane 3	0	4	205	209	3.3	250	0.839	100	72.6	LOS E	13.4	96.7	500	–	0.0	0.0
Lane 4	0	0	210	210	2.9	250	0.839	100	72.7	LOS E	13.4	96.5	150	Turn Bay	0.0	0.0
Approach	148	4	415	567	4.4		0.839		63.4	LOS E	13.4	96.7				
North: Bruce Highway (North)																
Lane 1	562	122	0	684	0.9	1319[1]	0.519	87[6]	8.8	LOS A	3.1	21.9	100	Turn Bay	0.0	0.0
Lane 2	0	523	0	523	3.6	878	0.596	100	22.4	LOS C	19.4	139.8	500	–	0.0	0.0
Lane 3	0	523	0	523	3.6	878	0.596	100	22.4	LOS C	19.4	139.8	500	–	0.0	0.0
Lane 4	0	0	2	2	0.0	88	0.023	100	72.2	LOS E	0.1	0.8	25	Turn Bay	0.0	0.0
Approach	562	1168	2	1732	2.5		0.596		17.1	LOS B	19.4	139.8				
West: Cultural Centre Access																
Lane 1	1	2	2	5	0.0	99	0.051	100	68.7	LOS E	0.3	2.1	500	–	0.0	0.0
Approach	1	2	2	5	0.0		0.051		68.7	LOS E	0.3	2.1				
Intersection				4646	2.4		0.839		30.7	LOS C	44.6	317.5				

Level of Service (LOS) Method: Delay (HCM 2000).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model used.

1 Reduced capacity due to a short lane effect
6 Lane underutilisation due to downstream effects

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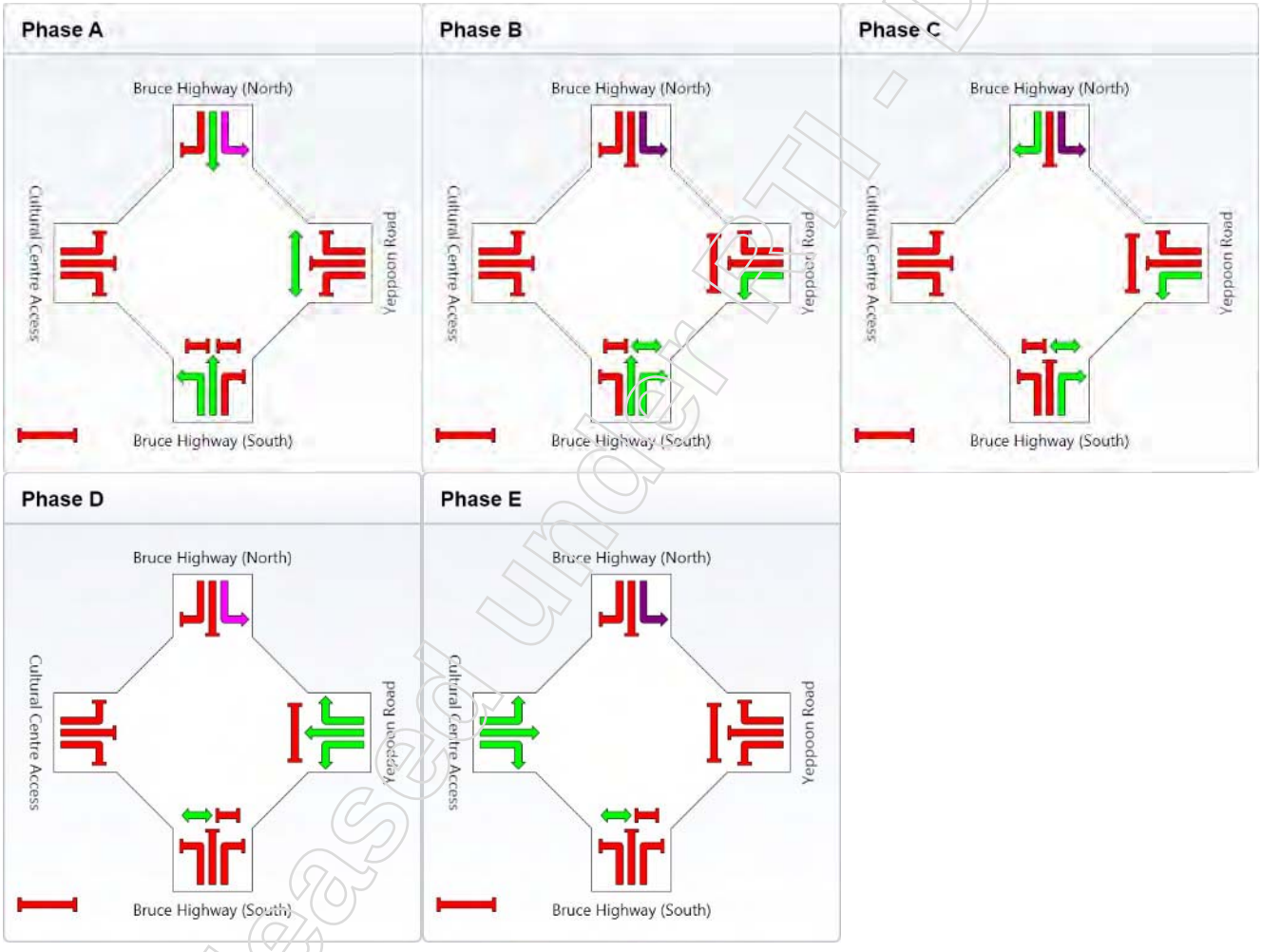
PHASING SUMMARY

Bruce Highway / Yeppoon Road
Proposed Intersection Upgrade (Final) - Ultimate Development
POST DEV - 2025 AM Peak
Signals - Fixed Time Cycle Time = 125 seconds (Optimum Cycle Time - Shortest Queue)

Phase times determined by the program
Sequence: CAMBRAY
Input Sequence: A, B , C, D, E
Output Sequence: A, B , C, D, E

Phase Timing Results

Phase	A	B	C	D	E
Green Time (sec)	57	9	6	17	6
Yellow Time (sec)	4	4	4	4	4
All-Red Time (sec)	2	2	2	2	2
Phase Time (sec)	63	15	12	23	12
Phase Split	50 %	12 %	10 %	18 %	10 %



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LANE SUMMARY

Site: POST 2035 AM PEAK - FINAL UPGRADE

Bruce Highway / Yeppoon Road
Proposed Intersection Upgrade (Final) - Ultimate Development
POST DEV - 2035 AM Peak
Signals - Fixed Time Cycle Time = 150 seconds (Optimum Cycle Time - Shortest Queue)

Lane Use and Performance

	Demand Flows L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South: Bruce Highway (South)																
Lane 1	4	386	0	390	4.7	1083	0.361	100	18.7	LOS B	15.2	110.7	500	–	0.0	0.0
Lane 2	0	391	0	391	4.8	1083	0.361	100	18.6	LOS B	15.2	110.7	500	–	0.0	0.0
Lane 3	0	0	120	120	16.0	146	0.822	100	90.9	LOS F	9.5	73.3	150	Turn Bay	0.0	0.0
Lane 4	0	0	118	118	16.0	144	0.822	100	91.1	LOS F	9.3	74.2	150	Turn Bay	0.0	0.0
Approach	4	777	238	1019	7.4		0.822		35.5	LOS D	15.2	110.7				
East: Yeppoon Road																
Lane 1	335	0	0	335	2.1	500[1]	0.669	100	61.4	LOS E	20.5	145.9	150	Turn Bay	0.0	2.5
Lane 2	338	0	0	338	2.1	505	0.669	100	61.5	LOS E	20.8	147.9	500	–	0.0	0.0
Lane 3	0	3	211	214	5.1	266	0.806	100	80.8	LOS F	15.8	115.7	500	–	0.0	0.0
Lane 4	0	0	215	215	4.7	266	0.806	100	80.9	LOS F	15.9	115.5	150	Turn Bay	0.0	0.0
Approach	673	3	426	1102	3.2		0.806		69.0	LOS E	20.8	147.9				
North: Bruce Highway (North)																
Lane 1	392	194	0	586	5.2	815[1]	0.719	87[6]	14.7	LOS B	12.1	88.5	100	Turn Bay	0.0	0.0
Lane 2	0	905	0	905	2.7	1097	0.825	100	18.1	LOS B	42.2	302.1	500	–	0.0	0.0
Lane 3	0	905	0	905	2.7	1097	0.825	100	18.1	LOS B	42.2	302.1	500	–	0.0	0.0
Lane 4	0	0	1	1	0.0	86[1]	0.012	100	76.1	LOS E	0.1	0.5	25	Turn Bay	0.0	0.0
Approach	392	2004	1	2397	3.3		0.825		17.3	LOS B	42.2	302.1				
West: Cultural Centre Access																
Lane 1	1	3	14	18	5.6	78	0.230	100	86.8	LOS F	1.4	9.9	500	–	0.0	0.0
Approach	1	3	14	18	5.6		0.230		86.8	LOS F	1.4	9.9				
Intersection				4536	4.2		0.825		34.2	LOS C	42.2	302.1				

Level of Service (LOS) Method: Delay (HCM 2000).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model used.

1 Reduced capacity due to a short lane effect
6 Lane underutilisation due to downstream effects

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SIDRA INTERSECTION 5.1.13.2093
Project: C:\Cambray Projects\STO0111\01R\Working\Sidra\13-06-19\Prelim Approval\Bruce Highway-Yeppoon Road.sip
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SIDRA INTERSECTION

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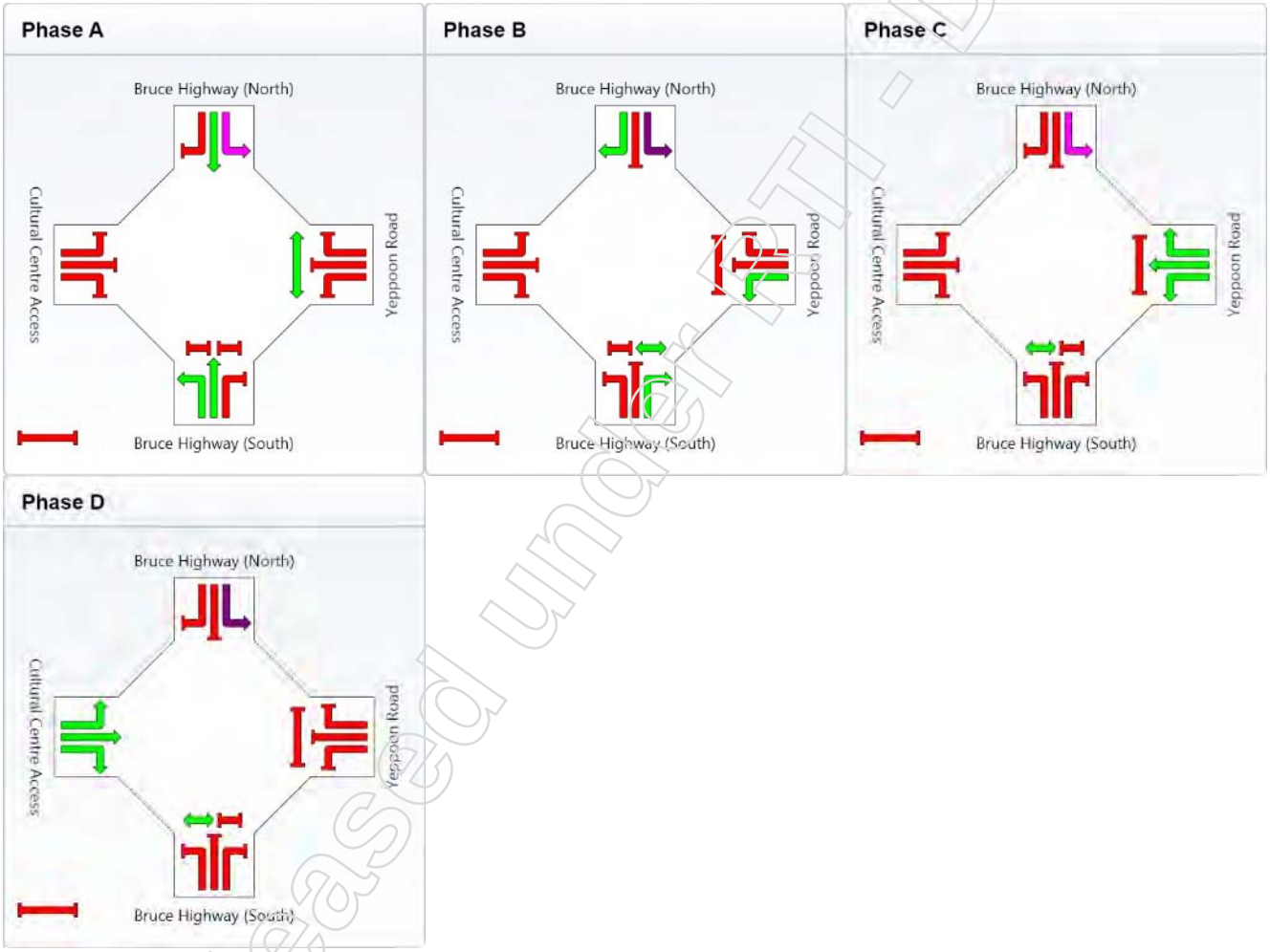
PHASING SUMMARY

Bruce Highway / Yeppoon Road
Proposed Intersection Upgrade (Final) - Ultimate Development
POST DEV - 2035 AM Peak
Signals - Fixed Time Cycle Time = 150 seconds (Optimum Cycle Time - Shortest Queue)

Phase times determined by the program
Sequence: CAMBRAY
Input Sequence: A, B, C, D
Output Sequence: A, B, C, D

Phase Timing Results

Phase	A	B	C	D
Green Time (sec)	85	13	22	6
Yellow Time (sec)	4	4	4	4
All-Red Time (sec)	2	2	2	2
Phase Time (sec)	91	19	28	12
Phase Split	61 %	13 %	19 %	8 %





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LANE SUMMARY

Bruce Highway / Yeppoon Road
Proposed Intersection Upgrade (Final) - Ultimate Development
POST DEV - 2035 AM Peak
Signals - Fixed Time Cycle Time = 125 seconds (Optimum Cycle Time - Shortest Queue)

Lane Use and Performance

	Demand Flows L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South: Bruce Highway (South)																
Lane 1	7	909	0	916	2.2	1091	0.839	100	24.7	LOS C	46.3	329.9	500	–	0.0	0.0
Lane 2	0	926	0	926	2.2	1103	0.839	100	24.5	LOS C	46.7	332.7	500	–	0.0	0.0
Lane 3	0	0	320	320	1.4	372	0.863	100	71.0	LOS E	21.3	150.8	150	Turn Bay	0.0	5.5
Lane 4	0	0	316	316	1.4	366	0.863	100	71.1	LOS E	21.0	148.8	150	Turn Bay	0.0	4.3
Approach	7	1835	636	2478	2.0		0.863		36.5	LOS D	46.7	332.7				
East: Yeppoon Road																
Lane 1	96	0	0	96	7.2	690[1]	0.140	100	33.1	LOS C	3.0	22.1	150	Turn Bay	0.0	0.0
Lane 2	98	0	0	98	7.2	700	0.140	100	33.1	LOS C	3.0	22.5	500	–	0.0	0.0
Lane 3	0	4	225	229	3.5	264	0.869	100	74.2	LOS E	15.1	108.6	500	–	0.0	0.0
Lane 4	0	0	230	230	3.1	264	0.869	100	74.4	LOS E	15.1	108.4	150	Turn Bay	0.0	0.0
Approach	194	4	455	653	4.4		0.869		62.0	LOS E	15.1	108.6				
North: Bruce Highway (North)																
Lane 1	620	106	0	726	1.0	1255[1]	0.579	87[6]	9.4	LOS A	3.8	26.7	100	Turn Bay	0.0	0.0
Lane 2	0	531	0	531	3.9	799	0.665	100	27.6	LOS C	22.7	164.0	500	–	0.0	0.0
Lane 3	0	531	0	531	3.9	799	0.665	100	27.6	LOS C	22.7	164.0	500	–	0.0	0.0
Lane 4	0	0	2	2	0.0	88	0.023	100	72.2	LOS E	0.1	0.8	25	Turn Bay	0.0	0.0
Approach	620	1169	2	1791	2.7		0.665		20.2	LOS C	22.7	164.0				
West: Cultural Centre Access																
Lane 1	1	2	2	5	0.0	99	0.051	100	68.7	LOS E	0.3	2.1	500	–	0.0	0.0
Approach	1	2	2	5	0.0		0.051		68.7	LOS E	0.3	2.1				
Intersection				4927	2.6		0.869		34.0	LOS C	46.7	332.7				

Level of Service (LOS) Method: Delay (HCM 2000).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model used.

1 Reduced capacity due to a short lane effect
6 Lane underutilisation due to downstream effects

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SIDRA INTERSECTION 5.1.13.2093
Project: C:\Cambray Projects\STO0111\01R\Working\Sidra\13-06-19\Prelim Approval\Bruce Highway-Yeppoon Road.sip
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SIDRA INTERSECTION

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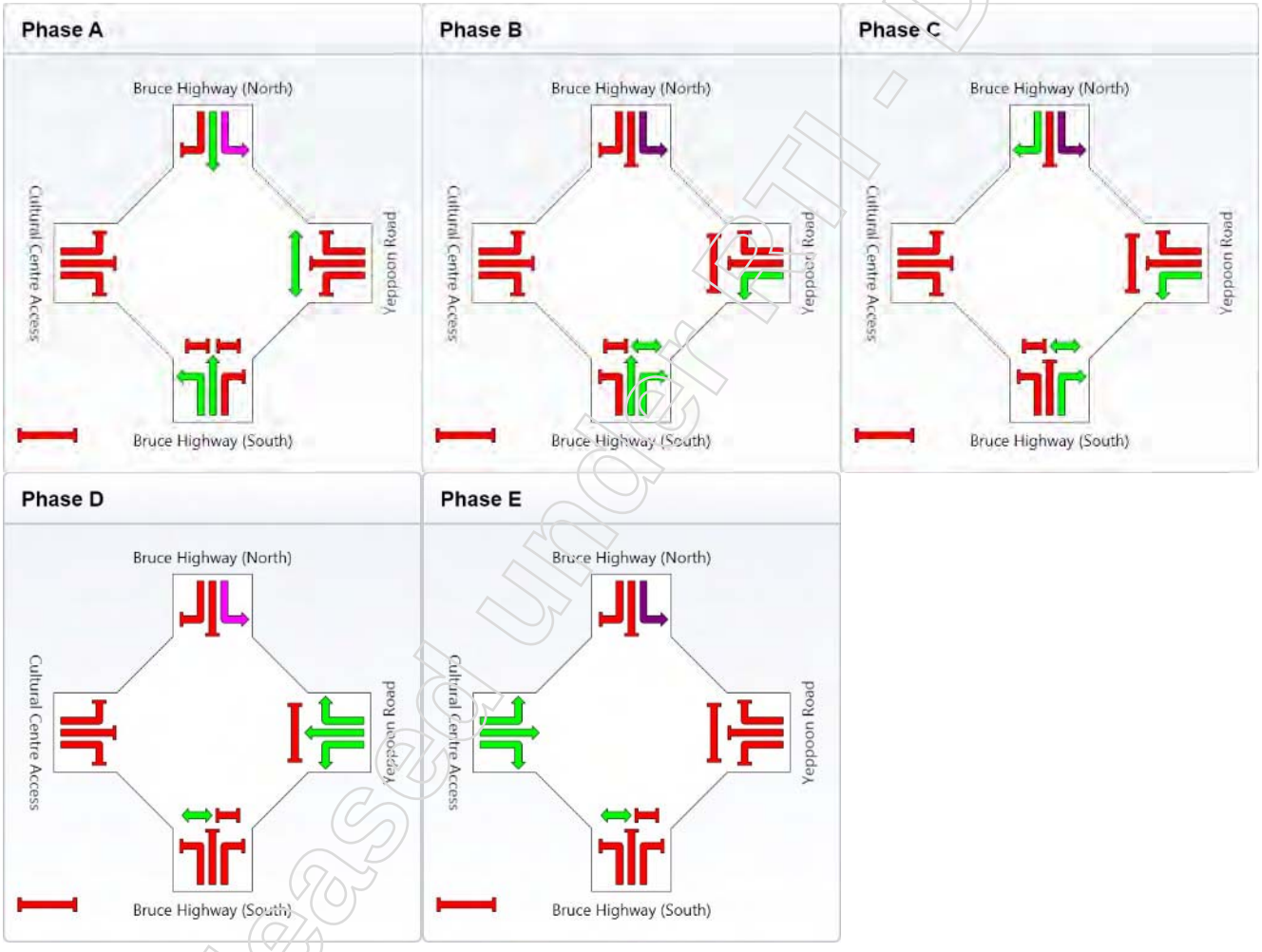
PHASING SUMMARY

Bruce Highway / Yeppoon Road
Proposed Intersection Upgrade (Final) - Ultimate Development
POST DEV - 2035 AM Peak
Signals - Fixed Time Cycle Time = 125 seconds (Optimum Cycle Time - Shortest Queue)

Phase times determined by the program
Sequence: CAMBRAY
Input Sequence: A, B , C, D, E
Output Sequence: A, B , C, D, E

Phase Timing Results

Phase	A	B	C	D	E
Green Time (sec)	52	13	6	18	6
Yellow Time (sec)	4	4	4	4	4
All-Red Time (sec)	2	2	2	2	2
Phase Time (sec)	58	19	12	24	12
Phase Split	46 %	15 %	10 %	19 %	10 %



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APPENDIX O

Internal Road Network – Forecast Daily Traffic Volumes

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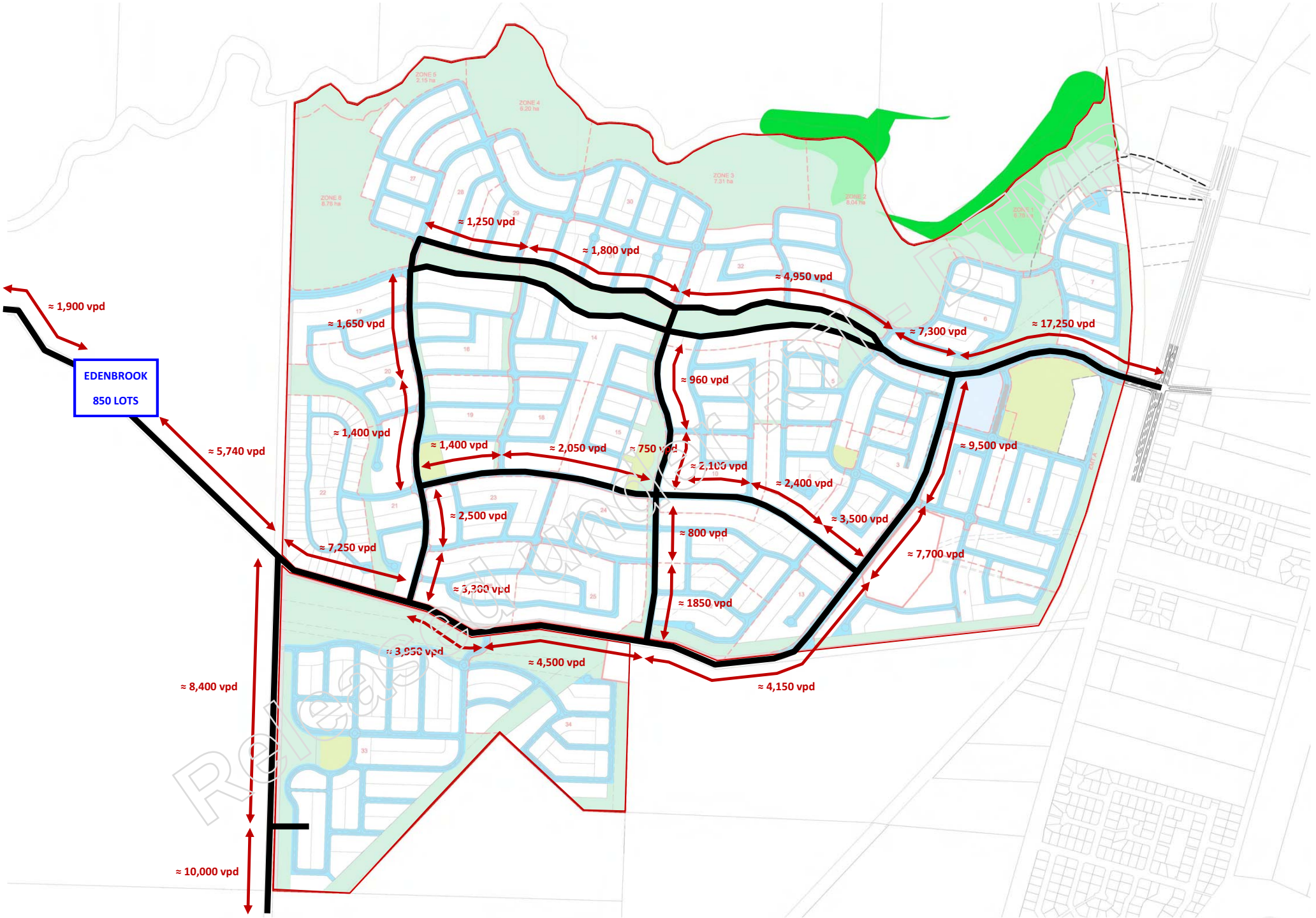
EDENBROOK
850 LOTS
≈ 1,900 vpd
≈ 5,740 vpd
≈ 1,650 vpd
≈ 1,400 vpd
≈ 7,250 vpd
≈ 8,400 vpd
≈ 10,000 vpd
≈ 1,250 vpd
≈ 1,800 vpd
≈ 4,950 vpd
≈ 7,300 vpd
≈ 17,250 vpd
≈ 960 vpd
≈ 1,400 vpd
≈ 2,050 vpd
≈ 2,100 vpd
≈ 2,400 vpd
≈ 9,500 vpd
≈ 2,500 vpd
≈ 3,500 vpd
≈ 800 vpd
≈ 7,700 vpd
≈ 1850 vpd
≈ 4,500 vpd
≈ 4,150 vpd



APPENDIX P

SIDRA Results

William Palfrey Road / McLaughlin Street

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LANE SUMMARY

William Palfrey Road / McLaughlin Street
Full Buildout (North Parkhurst and Edenbrook)
AM Peak
Roundabout

Lane Use and Performance

	Demand Flows L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South: McLaughlin Street																
Lane 1	103	0	149	252	2.0	1370	0.184	100	9.3	LOS A	1.1	7.7	500	–	0.0	0.0
Approach	103	0	149	252	2.0		0.184		9.3	LOS A	1.1	7.7				
East: William Palfrey Road																
Lane 1	347	0	69	416	2.0	1135	0.366	100	8.8	LOS A	2.4	17.3	500	–	0.0	0.0
Approach	347	0	69	416	2.0		0.366		8.8	LOS A	2.4	17.3				
North West: William Palfrey Road																
Lane 1	161	0	241	402	2.0	1265	0.318	100	9.3	LOS A	2.0	14.1	500	–	0.0	0.0
Approach	161	0	241	402	2.0		0.318		9.3	LOS A	2.0	14.1				
Intersection				1070	2.0		0.366		9.1	LOS A	2.4	17.3				

Level of Service (LOS) Method: Delay (HCM 2000).
Roundabout LOS Method: Same as Signalised Intersections.
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model used.

Processed: Tuesday, 2 July 2013 3:09:32 PM
SIDRA INTERSECTION 5.1.13.2093
Project: C:\Cambray Projects\STO0111\01R\Working\Sidra\13-06-19\WP - McLaughlin.sip
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SIDRA INTERSECTION

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LANE SUMMARY

William Palfrey Road / McLaughlin Street
Full Buildout (North Parkhurst and Edenbrook)
PM Peak
Roundabout

Lane Use and Performance

	Demand Flows L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South: McLaughlin Street																
Lane 1	207	0	297	504	2.0	1292	0.390	100	9.8	LOS A	2.7	19.4	500	–	0.0	0.0
Approach	207	0	297	504	2.0		0.390		9.8	LOS A	2.7	19.4				
East: William Palfrey Road																
Lane 1	198	0	138	336	2.0	1258	0.267	100	8.8	LOS A	1.7	12.0	500	–	0.0	0.0
Approach	198	0	138	336	2.0		0.267		8.8	LOS A	1.7	12.0				
North West: William Palfrey Road																
Lane 1	92	0	138	230	2.0	1060	0.217	100	10.0	LOS B	1.3	9.0	500	–	0.0	0.0
Approach	92	0	138	230	2.0		0.217		10.0	LOS B	1.3	9.0				
Intersection				1070	2.0		0.390		9.5	LOS A	2.7	19.4				

Level of Service (LOS) Method: Delay (HCM 2000).
Roundabout LOS Method: Same as Signalised Intersections.
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model used.

Processed: Tuesday, 2 July 2013 3:09:32 PM
SIDRA INTERSECTION 5.1.13.2093
Project: C:\Cambray Projects\STO0111\01R\Working\Sidra\13-06-19\WP - McLaughlin.sip
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APPENDIX Q

SIDRA Results

Proposed Internal Signals

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LANE SUMMARY

Internal Signals
Full Buildout
AM PEAK
Signals - Fixed Time Cycle Time = 56 seconds (Optimum Cycle Time - Minimum Delay)

Lane Use and Performance

	Demand Flows L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South: William Palfrey																
Lane 1	50	0	315	365	2.0	549	0.665	100	30.4	LOS C	8.9	63.6	500	–	0.0	0.0
Lane 2	0	0	352	352	2.0	529	0.665	100	28.4	LOS C	9.0	64.0	100	Turn Bay	0.0	0.0
Approach	50	0	667	717	2.0		0.665		29.4	LOS C	9.0	64.0				
East: Arterial Access																
Lane 1	286	0	0	286	2.0	1458	0.196	100	8.6	LOS A	1.2	8.8	500	–	0.0	0.0
Lane 2	0	218	0	218	2.0	556	0.392	100	17.8	LOS B	4.9	35.2	500	–	0.0	0.0
Approach	286	218	0	504	2.0		0.392		12.6	LOS B	4.9	35.2				
West: Major Collector																
Lane 1	0	509	0	509	2.0	972	0.523	100	10.3	LOS B	9.5	67.9	500	–	0.0	0.0
Lane 2	0	0	50	50	2.0	198	0.252	100	34.8	LOS C	1.3	9.6	100	Turn Bay	0.0	0.0
Approach	0	509	50	559	2.0		0.523		12.5	LOS B	9.5	67.9				
Intersection				1780	2.0		0.665		19.4	LOS B	9.5	67.9				

Level of Service (LOS) Method: Delay (HCM 2000).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model used.

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SIDRA INTERSECTION

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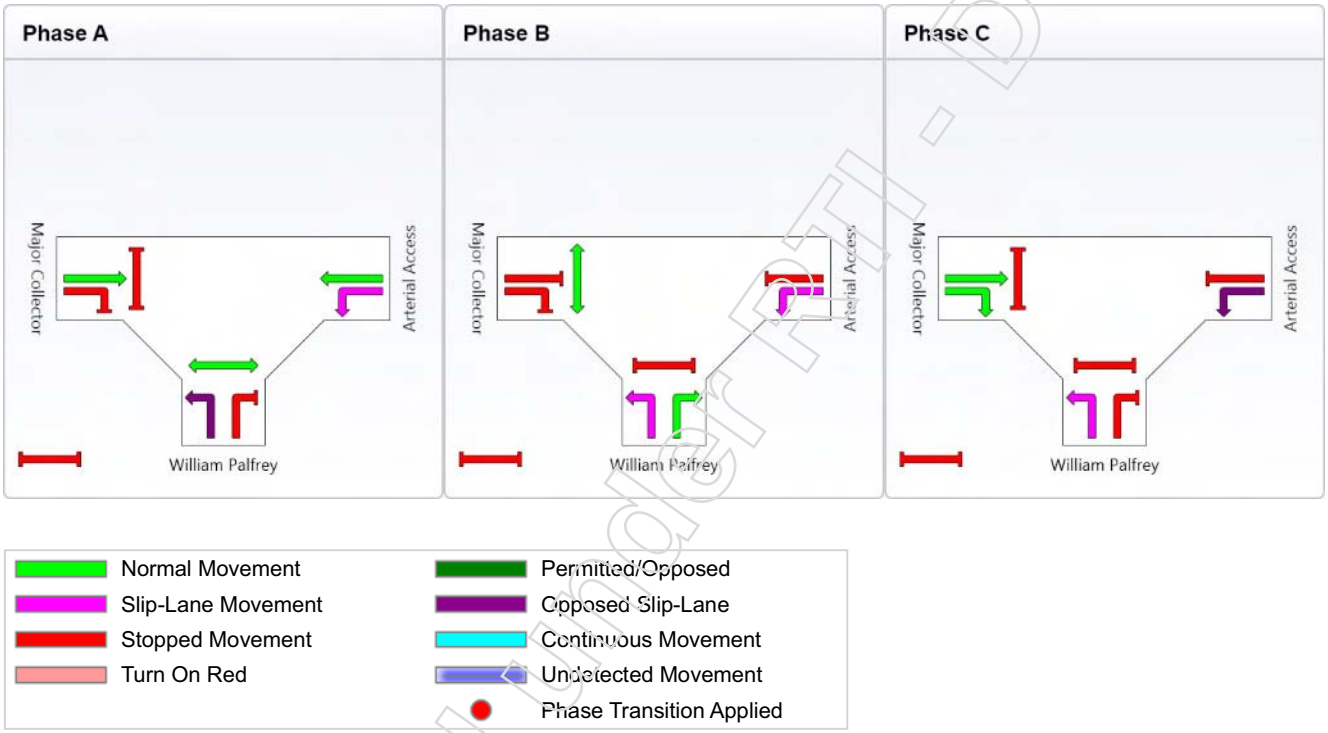
PHASING SUMMARY

Internal Signals
Full Buildout
AM PEAK
Signals - Fixed Time Cycle Time = 56 seconds (Optimum Cycle Time - Minimum Delay)

Phase times determined by the program
Sequence: CAMBRAY
Input Sequence: A, B, C
Output Sequence: A, B, C

Phase Timing Results

Phase	A	B	C
Green Time (sec)	16	16	6
Yellow Time (sec)	4	4	4
All-Red Time (sec)	2	2	2
Phase Time (sec)	22	22	12
Phase Split	39 %	39 %	21 %



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LANE SUMMARY

Internal Signals
Full Buildout
PM PEAK
Signals - Fixed Time Cycle Time = 60 seconds (Optimum Cycle Time - Minimum Delay)

Lane Use and Performance

	Demand Flows L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South: William Palfrey																
Lane 1	50	0	173	223	2.0	528	0.422	100	29.6	LOS C	4.9	35.0	500	–	0.0	0.0
Lane 2	0	0	208	208	2.0	493	0.422	100	28.3	LOS C	5.2	37.1	100	Turn Bay	0.0	0.0
Approach	50	0	381	431	2.0		0.422		28.9	LOS C	5.2	37.1				
East: Arterial Access																
Lane 1	572	0	0	572	2.0	1481	0.386	100	8.8	LOS A	2.9	20.8	500	–	0.0	0.0
Lane 2	0	436	0	436	2.0	648	0.672	100	19.3	LOS B	11.4	81.2	500	–	0.0	0.0
Approach	572	436	0	1008	2.0		0.672		13.3	LOS B	11.4	81.2				
West: Major Collector																
Lane 1	0	291	0	291	2.0	1037	0.281	100	8.3	LOS A	4.7	33.4	500	–	0.0	0.0
Lane 2	0	0	50	50	2.0	185	0.270	100	37.1	LOS D	1.5	10.4	100	Turn Bay	0.0	0.0
Approach	0	291	50	341	2.0		0.281		12.5	LOS B	4.7	33.4				
Intersection				1780	2.0		0.672		17.0	LOS B	11.4	81.2				

Level of Service (LOS) Method: Delay (HCM 2000).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model used.

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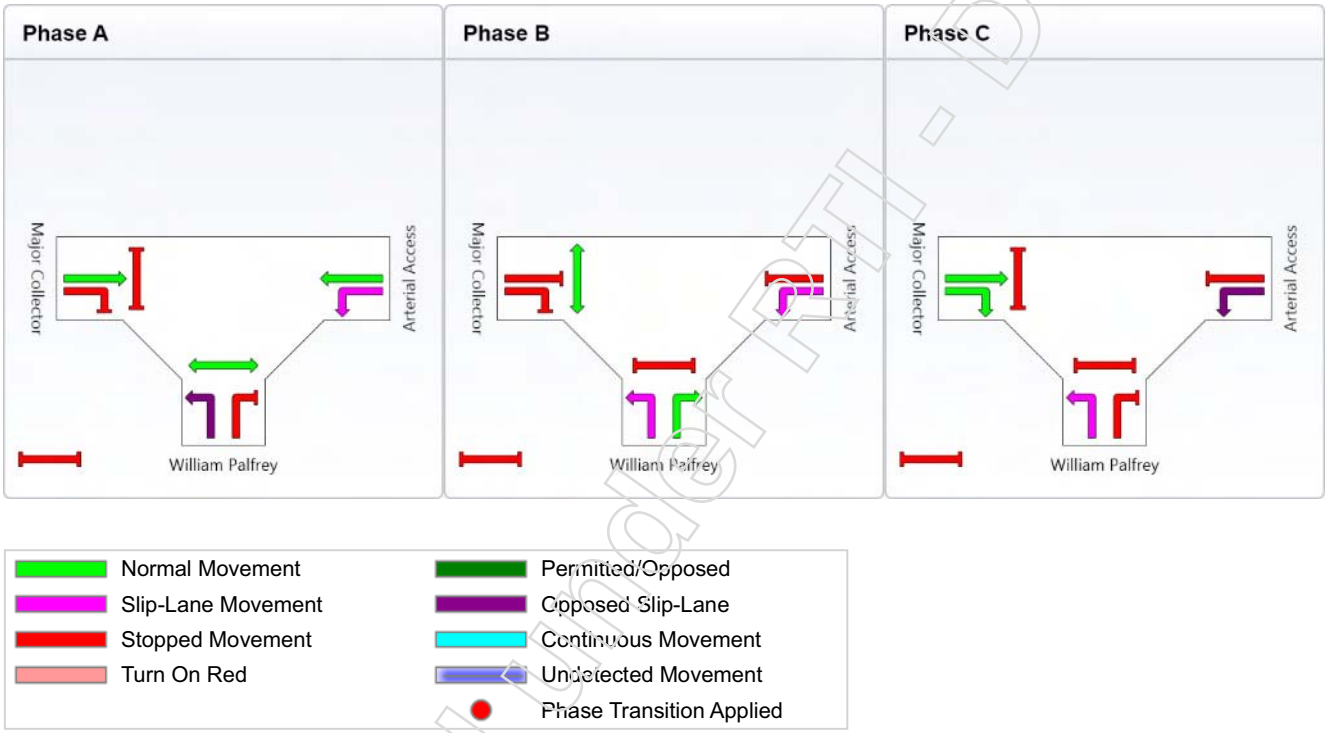
PHASING SUMMARY

Internal Signals
Full Buildout
PM PEAK
Signals - Fixed Time Cycle Time = 60 seconds (Optimum Cycle Time - Minimum Delay)

Phase times determined by the program
Sequence: CAMBRAY
Input Sequence: A, B, C
Output Sequence: A, B, C

Phase Timing Results

Phase	A	B	C
Green Time (sec)	20	16	6
Yellow Time (sec)	4	4	4
All-Red Time (sec)	2	2	2
Phase Time (sec)	26	22	12
Phase Split	43 %	37 %	20 %



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APPENDIX R

Count Data
Alexandra Street / Belmont Road / Birkbeck Drive
(Prepared by Austraffic)

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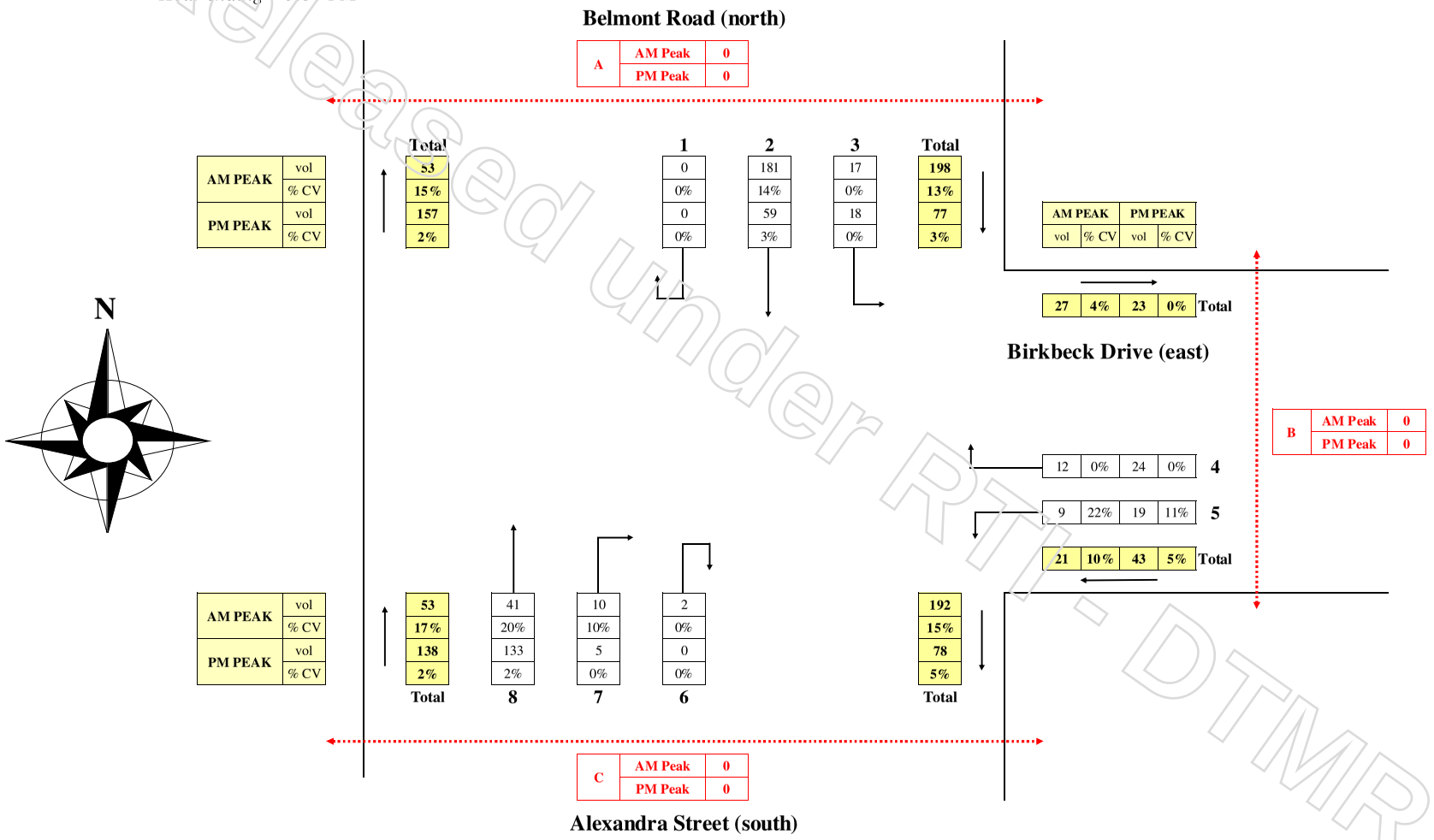
AUSTRAFFIC MANUAL INTERSECTION COUNT

Site No.: 1
Location: Alexandra Street/Belmont Road/Birkbeck Drive, Rockhampton
Day/Date: Tuesday 28 May 2013
Summary: AM Peak : *Hour ending - 8:30 AM*
PM Peak : *Hour ending - 5:30 PM*



Legend
vol = total vehicle volume
% CV = percentage of commercial vehicles (trucks and buses)

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APPENDIX S

SIDRA Results

Alexandra Street / Belmont Road / Birkbeck Drive

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LANE SUMMARY

Alexandra Street / Belmont Road / Birkbeck Drive
Post Development - Full Build-Out
AM Peak
Giveway / Yield (Two-Way)

Lane Use and Performance

	Demand Flows L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South: Alexandra Street																
Lane 1	0	126	0	126	7.5	1859	0.068	100	0.0	LOS A	0.0	0.0	500	–	0.0	0.0
Lane 2	0	0	247	247	2.4	1825	0.135	100	8.5	LOS A	0.0	0.0	100	Turn Bay	0.0	0.0
Approach	0	126	247	373	4.1		0.135		5.6	NA	0.0	0.0				
East: Birkbeck Drive																
Lane 1	562	0	13	575	2.3	1728	0.333	100	15.0	LOS C	5.8	41.5	500	–	0.0	0.0
Approach	562	0	13	575	2.3		0.333		15.0	LOS C	5.8	41.5				
North: Belmont Road																
Lane 1	18	0	0	18	0.0	918	0.019	100	9.4	LOS A	0.1	0.5	50	Turn Bay	0.0	0.0
Lane 2	0	384	0	384	7.9	1854	0.207	100	7.2	LOS A	0.0	0.0	500	–	0.0	0.0
Approach	18	384	0	402	7.6		0.207		7.3	LOS A	0.1	0.5				
Intersection				1350	4.4		0.333		10.1	NA	5.8	41.5				

Level of Service (LOS) Method: Delay (HCM 2000).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road lanes.
SIDRA Standard Delay Model used.

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LANE SUMMARY

Alexandra Street / Belmont Road / Birkbeck Drive
Post Development - Full Build-Out
PM Peak
Giveway / Yield (Two-Way)

Lane Use and Performance

	Demand Flows L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South: Alexandra Street																
Lane 1	0	306	0	306	2.1	1924	0.159	100	0.0	LOS A	0.0	0.0	500	–	0.0	0.0
Lane 2	0	0	480	480	1.9	1833	0.262	100	8.5	LOS A	0.0	0.0	100	Turn Bay	0.0	0.0
Approach	0	306	480	786	1.9		0.262		5.2	NA	0.0	0.0				
East: Birkbeck Drive																
Lane 1	335	0	25	360	2.5	1254	0.287	100	29.2	LOS D	7.5	53.5	500	–	0.0	0.0
Approach	335	0	25	360	2.5		0.287		29.2	LOS D	7.5	53.5				
North: Belmont Road																
Lane 1	19	0	0	19	0.0	671	0.028	100	11.2	LOS B	0.1	0.7	50	Turn Bay	0.0	0.0
Lane 2	0	173	0	173	3.0	1912	0.090	100	7.0	LOS A	0.0	0.0	500	–	0.0	0.0
Approach	19	173	0	192	2.7		0.090		7.5	LOS A	0.1	0.7				
Intersection				1338	2.2		0.287		12.0	NA	7.5	53.5				

Level of Service (LOS) Method: Delay (HCM 2000).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road lanes.
SIDRA Standard Delay Model used.

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ATTACHMENT B

Revised Traffic Impact Assessment Report

Stage 1-3 ROL Application

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CAMBRAY consulting
Traffic Engineering and Transport Planning



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Proposed Master Planned Community
Stockland North Parkhurst
Traffic Impact Assessment (Stage 1-3 Reconfiguration of Lot)

Prepared for Stockland
7 August 2013

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Appendices

APPENDIX A

Proposal Plan Stage 1 to 3
(Prepared by RPS)

APPENDIX B

2012 TMR Intersection Counts

APPENDIX C

Background Traffic Network Volumes

APPENDIX D

Approved Development Calculations and Associated Bruce Highway Network Volumes

APPENDIX E

SIDRA Results
Bruce Highway / Olive Street

APPENDIX F

SIDRA Results
Bruce Highway / Boundary Road (East)

APPENDIX G

SIDRA Results
Bruce Highway / Boundary Road (West)

APPENDIX H

SIDRA Results
Bruce Highway / Yeppoon Road

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1.0 Introduction

Cambray Consulting was engaged to assist Stockland with developing a master plan for the planned residential site located in North Parkhurst, QLD. As part of this assessment a Traffic Impact Assessment report (dated 5 March 2013) was completed and lodged with Council as part of the development application for the proposed development. IN addition a second TIA report was prepared to accompany a reconfiguration of lot application to provide a detailed assessment of Stages 1 to 3 of the development (198 lots) as it relates to traffic engineering and transport planning matters

Requests for additional information were then received from both Rockhampton Regional Council and the Department of Transport and Main Roads (TMR) in relation to the proposed development, which have led to minor amendments to the internal site layout and the methodology of the traffic impact assessment for the site and the inclusion of additional analysis regarding the impact of the development on key local government controlled intersections.

This updated report has therefore been prepared in response to these requests for additional information, addressing the traffic-related issues identified and revising the assessment previously undertaken regarding the traffic impacts of Stages 1-3 (198 lots) of the proposed North Parkhurst development.

1.1 Limits of Report

This report takes into account the particular instructions and requirements of our client. Cambray Consulting has taken care in the preparation of this report, however it neither accepts liability nor responsibility whatsoever in respect of:

- Any use of this report by any third party;
- Any third party whose interests may be affected by any decision made regarding the contents of this report; and/or
- Any conclusion drawn resulting from omission or lack of full disclosure by our client, our client's consultants, or any other parties.

1.2 Safety In Design

Within the scope of our design activities, we have identified safety in design issues and potential hazards, whenever reasonably practicable within our field of expertise. Due to our limited and upfront role on this project, it is not considered reasonably practicable to identify all potential hazards which may occur throughout the life of a project, including during detailed design and construction activities. It is strongly recommended that safety in design issues be reviewed during all ensuing design and construction stages of the project.

1.3 RPEQ Certification

I NR confirm that I have prepared and/or reviewed the contents of this document.

NR

BEng (Civil) NR | CPEng | MIEAust |NPER
Senior Transport Engineer
Cambray Consulting Pty Ltd

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2.0 Site Location

The proposed development site is located on the western side of the Bruce Highway in Parkhurst as shown in **Figure 2a** below.



Figure 2a: Site Location

As shown in the figure above, it is proposed that Stages 1 to 3 of the development will be located in the eastern portion of the site, within the area of the site identified to fall within the Priority Infrastructure Area (PIA) for the Parkhurst area as shown in Council's *Planning Assumptions Report*, as shown in **Figure 2b** below.

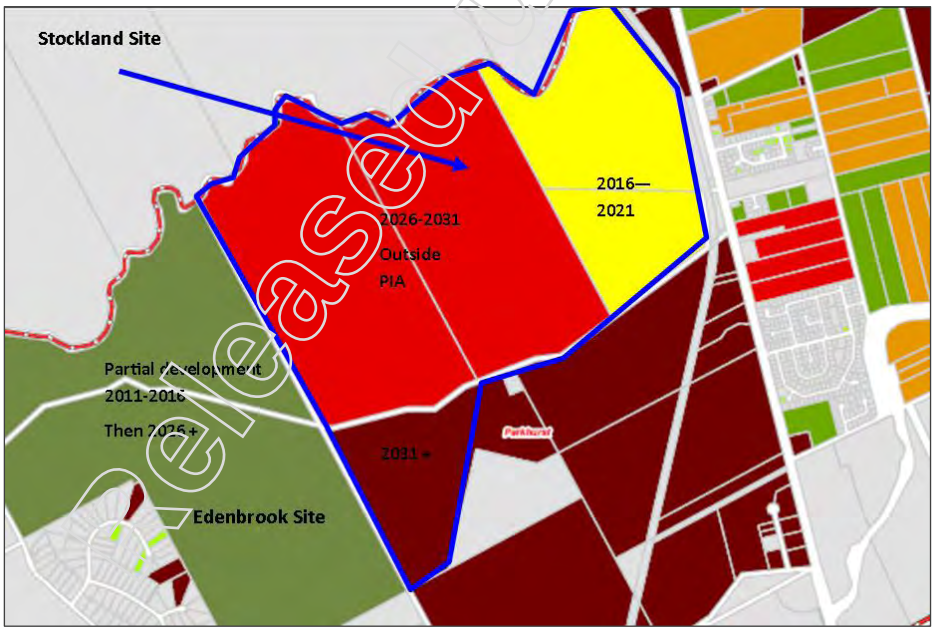

Figure 2b – Extract from Council's Planning Assumptions Report

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3.0 Proposal

This report has been completed in support of a Reconfiguration of Lot (ROL) application for the first three (3) stages of the proposed Stockland Master Planned Community. Drawing 109116-82 Rev G, prepared by RPS (refer to **Appendix A**) shows the proposed plan of development for Stages 1 to 3, identifying 198 lots across the three (3) stages.

3.1 Access Strategy

The proposed access strategy for Stages 1 to 3 is in line with the access strategy identified for the overall Masterplan as detailed in the Traffic Impact Assessment Report (dated 5 March 2013) which accompanied the preliminary approval application for the overall development. Due to their location on the eastern portion of the site, Stages 1 to 3 are proposed to access the external road network via a new fourth western leg to the proposed traffic signals at the Bruce Highway / Olive Street intersection. The geometry of this intersection is shown diagrammatically in **Figure 3.1a** below.

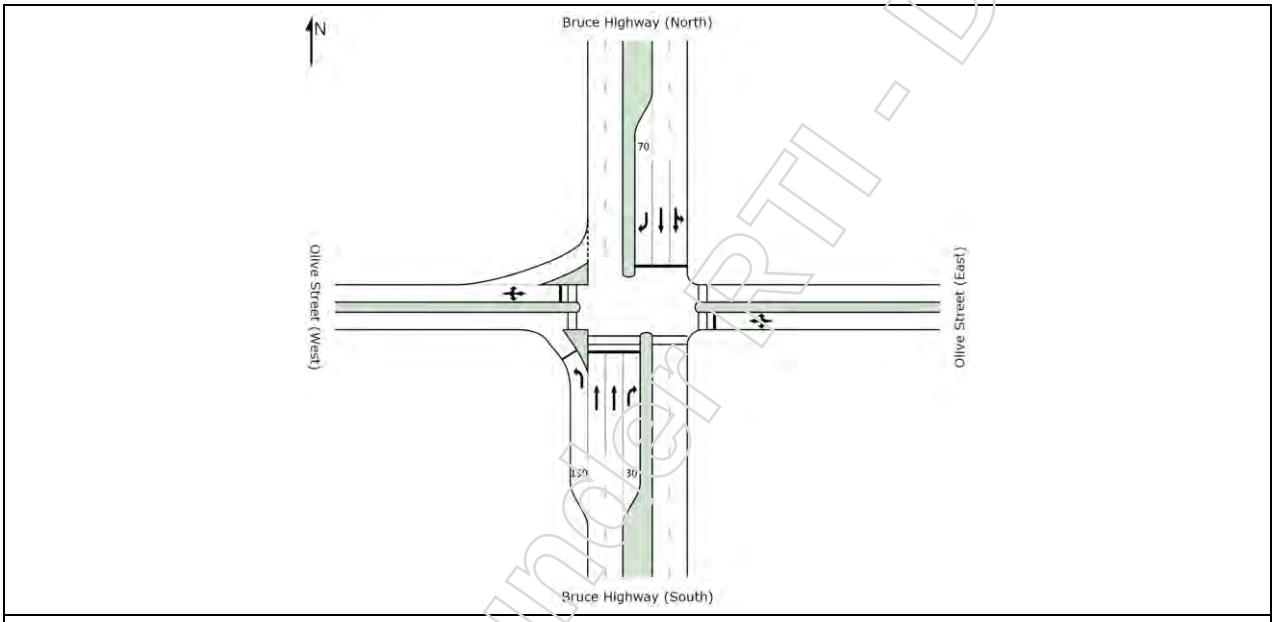

Figure 3.1a: Proposed Interim Four-Way Signalised Intersection Configuration - Bruce Highway / Olive Street Intersection
****NOTE : Values shown on auxiliary lanes indicate storage length only.**

The layout depicted in Figure 3.1a is the interim geometry. This geometry is expected to have sufficient spare capacity to accommodate in the order of 1,275 residential lots. The proposed access strategy for Stages 1 to 3 will require development traffic to use the proposed rail crossing on the western leg of Olive Street, which will be relocated from its existing location on William Palfrey Road.

Further commentary on intersection geometry as well as the rail crossing is included in the traffic report prepared for the overall masterplan.

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3.2 Internal Road Network

The internal road network proposed for Stages 1 to 3 is in accordance with the road classifications identified in the Road Hierarchy Plan for the overall masterplan. This is discussed in detail in the accompanying TIA for the overall site, which also includes commentary on the road cross sections proposed. We recommend that the reader refer to this report for further detail in this regard.

The staging of the infrastructure as it relates to this application is discussed below:

- The Bruce Highway /Olive Street intersection will ultimately be ungraded to include four (4) lanes on the western leg in addition to two (2) left turn lanes from the Bruce Highway into the subject site. As part of this ROL application, only two (2) lanes are required on the western leg and a single left turn lane from the Bruce Highway into the subject site (refer to Figure 3.1a);
- Under the ultimate scenario the Urban Arterial Road will be (4) four lanes from the Bruce Highway to the internal signalised intersection. As part of this application only two (2) lanes are required;
- As part of this ROL application, the existing William Palfrey at-grade rail crossing will be relocated to Olive Street having a two (2) lane cross section. To maintain access for the existing traffic that currently utilises the crossing, a two-lane road similar to the existing William Palfrey Road standard and ultimately the two lane sub arterial road will provide connectivity with William Palfrey Road (which will remain in its current form).
- Under the ultimate masterplan traffic signals are proposed on the Urban Arterial Road to the west of the mixed use lot. These traffic signals are not required until such point as the western leg (Major Collector) is constructed which is not proposed as part of this ROL application. As part of Stages 1 to 3, this intersection will operate as a continuous road turning through 90 degrees at this location.

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4.0 Traffic Impact Assessment

4.1 Development Traffic Generation

We have applied the standard traffic generation rates for single dwelling lots from the RTA's *Guide to Traffic Generating Developments* to estimate the traffic volumes generated by Stages 1 to 3 (198 lots) of the proposed development.

Table 4.1a: Development Traffic Generation

USE	YIELD (LOTS)	PEAK HOUR TRAFFIC GENERATION RATE	FORECAST PEAK HOUR TRAFFIC GENERATION
Single Dwelling Lots	198	0.85 trips / lot	168 trips
		TOTAL	**168 trips**

4.2 Development Traffic Distribution

To estimate the distribution of the forecast development traffic the expected vehicle travel routes associated with the proposed development were considered. It is noted that the distribution assumptions are generally in accordance with those identified for the site in TMR's preliminary network planning spread sheet model. A summary of the traffic distribution assumptions used during the analysis is presented in **Table 4.2a** below.

Table 4.2a: Estimated Development Traffic Distribution (Stage 1 – 3)

Assumed Traffic Distributions	
AM Peak	**PM Peak**
Stockland North Parkhurst Development	
Arrival / Departure Split ▪ 30% Incoming to Development; ▪ 70% Outgoing from Development. ***External Network Distribution*** ▪ 100% to/from the Bruce Highway; of which • 10% to/from Bruce Highway (North); and • 90% to/from Bruce Highway (South).	***Arrival / Departure Split*** ▪ 60% Incoming to Development; ▪ 40% Outgoing from Development. ***External Network Distribution*** ▪ 100% to/from the Bruce Highway; of which • 10% to/from Bruce Highway (North); and • 90% to/from Bruce Highway (South).

Figure 4.2b and **Figure 4.2c** below show the assumed development volumes at the proposed access intersection with the Bruce Highway for the both the AM and PM peak hours based on the assumptions above. It is noted that at the request of Council a volume of 20 vph[1] has been assigned to the through movements between Olive Street East and West during the AM peak hour to represent the expected traffic movements between the proposed development and the Parkhurst State School on the eastern side of the Highway

[1] Note – the value of 20 vph for the Olive Street through movements has been reduced from the agreed 50 vph as applied to the overall development, due to the obvious reduction in the number of lots from the overall development (2350 lots) to Stage 1-3 (198 lots).

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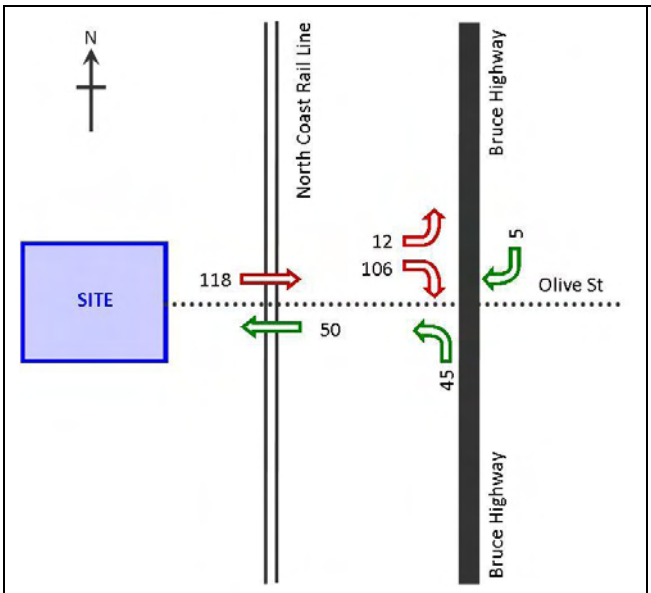

Figure 4.2b: Development Traffic Volumes (AM Peak)

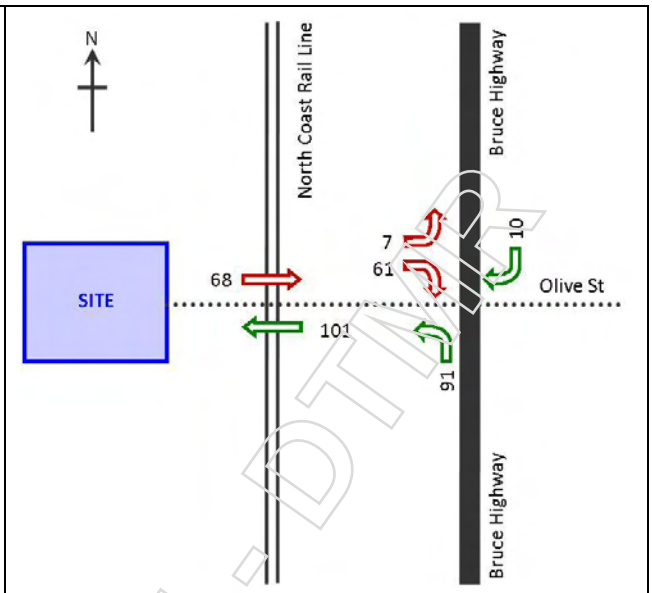

Figure 4.2c: Development Traffic Volumes (PM Peak)

The peak hour development traffic volumes identified for the proposed access intersection above were then distributed along Bruce Highway corridor through Parkhurst, with the volumes at the each of the relevant intersections including Olive Street, Boundary Road (East), Boundary Road (West) and Yeppoon Road summarised in **Figure 4.2d** below.

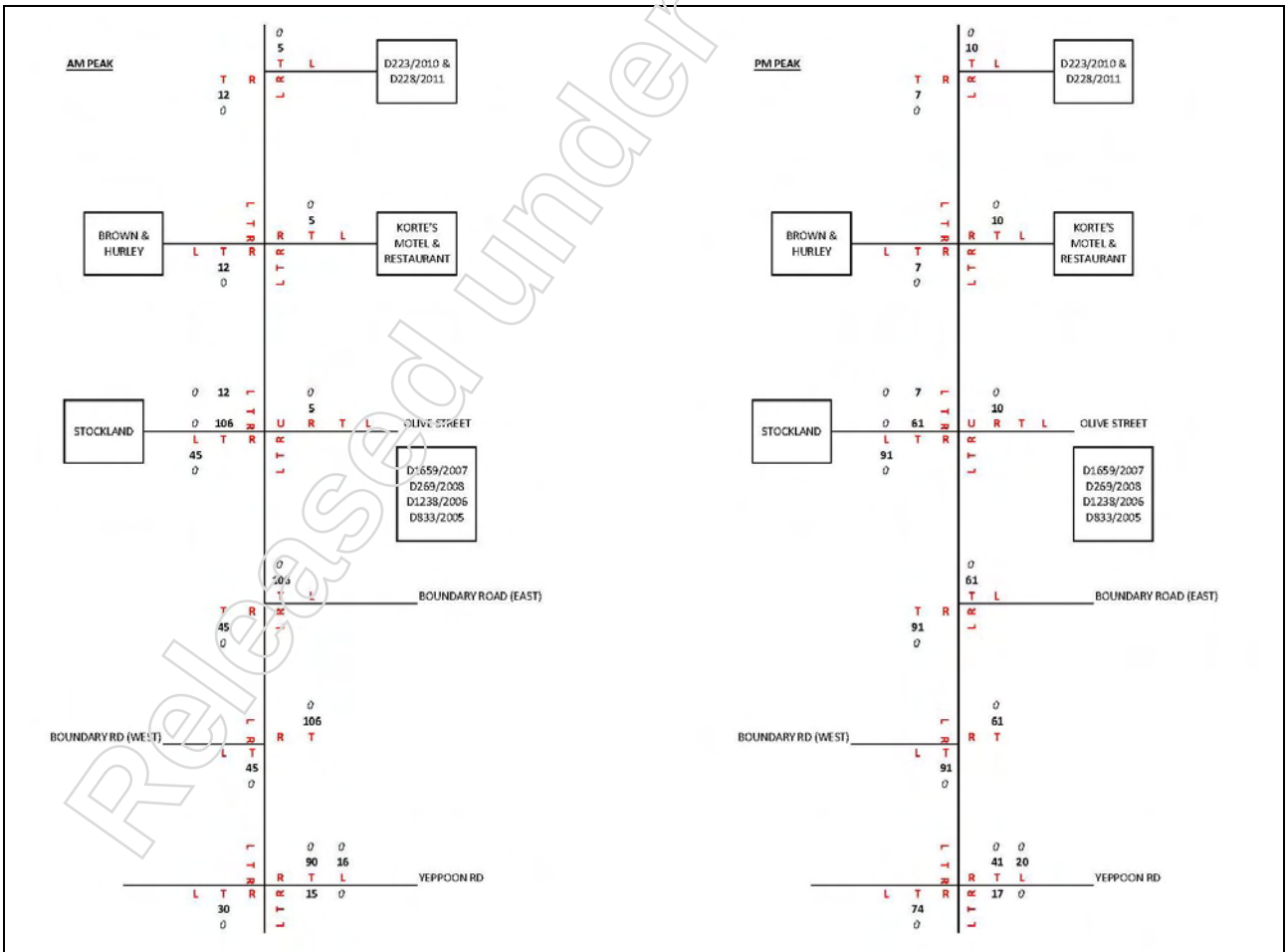

Figure 4.2d: Stockland North Parkhurst (Stage 1-3) - Development Traffic Volumes (Bruce Highway Corridor)

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4.3 Pre Development Traffic

To establish the background traffic volumes on the surrounding road network, the latest intersection count data for the relevant intersections along the Bruce Highway corridor were obtained from the Department of Transport and Main Roads (TMR). These included the intersections of the Bruce Highway with Olive Street, Boundary Road (East), Boundary Road (West) and Yeppoon Road. This data was collected via manual turning counts at the intersections which were undertaken throughout 2012, with the raw data for each intersection included as **Appendix B**.

For the purpose of the analysis it has been assumed that Stage 1 to 3 of the proposed master planned community development will be completed by 2015, with a 10 year design horizon of 2025. To establish the expected future background traffic volumes along the Bruce Highway corridor a growth rate of 1% p.a. (compound) was conservatively applied to the through movements on the Bruce Highway. The resultant background traffic volumes along the Parkhurst Bruce Highway corridor can be seen in **Appendix C**.

In addition to the background traffic volumes on the Bruce Highway, the traffic volumes expected to be generated by developments already approved in the Parkhurst corridor were also considered at the request of both Rockhampton Regional Council and TMR. These developments included Korte's Motel and Restaurant development, the proposed 1 into 5 ROL application over the Brown and Hurley site, several residential developments on the eastern side of the Bruce Highway (D223/2010, D228/2011, D1659/2007, D269/2008, D1238/2006 and D833/2005) and the retail development (shopping centre) on the corner of Boundary Road East and the Highway.

The traffic generation and distribution from these additional developments were based on the *Traffic Impact Assessment* reports submitted for each application. Where such reports were unavailable the traffic distributions adopted were in accordance with those identified in TMR's future planning network spread sheet model. The traffic calculations for each development can be seen in **Appendix D** with the forecast approved development volumes at the relevant intersections along the Parkhurst Bruce Highway corridor also included.

It is noted that the inclusion of additional traffic from the approved developments identified above **in addition** to the application of the proposed 1% p.a. compound growth rate for the through movements on the highway is expected to exceed the historical growth rate (1.5% p.a. compound) identified for this section of the highway by TMR, as shown in **Table 4.3a** below.

Table 4.3a: Adopted Background Traffic Growth Rate

Scenario	Traffic Volumes (vph)		Growth Rate	
	AM Peak	PM Peak	AM Peak	PM Peak
2012 Bruce Highway / Olive Street Count Volumes	942 (120)	920 (94)		
Forecast 2025 Pre Development Volumes	1,364 (139)	1,476 (106)	2.71%	3.48%

Note: Volumes calculated for midblock section south of Olive Street based on recorded and forecast Bruce Highway / Olive Street intersection volumes. All growth rates identified are compound growth rates per annum.

The pre development volumes were then calculated by combining the forecast background traffic volumes with the volumes generated by the approved developments previously identified. The resultant 2015 and 2025 AM and PM peak pre development traffic volumes for the road network are summarised in **Figure 4.3a** and **Figure 4.3b** below.

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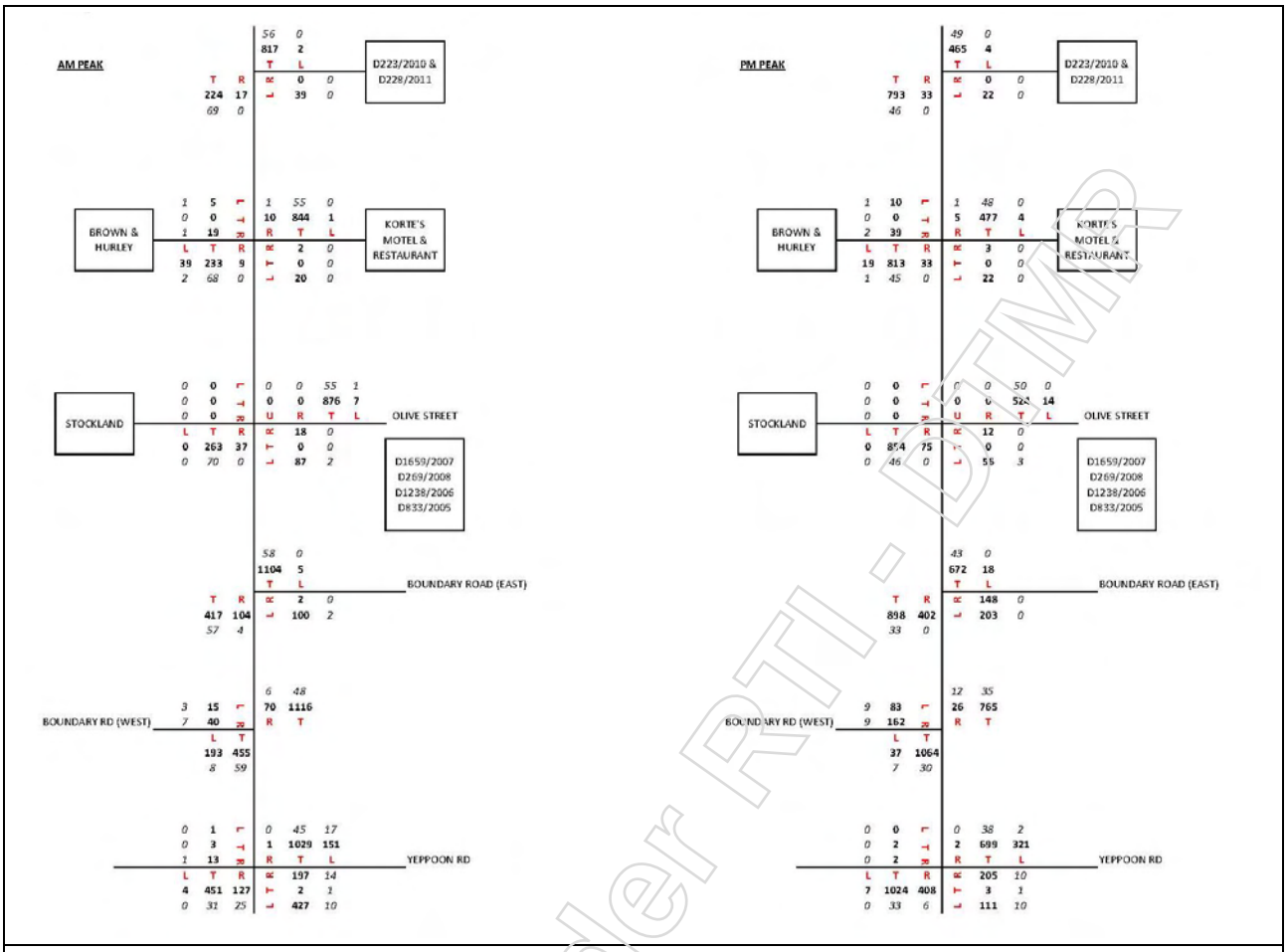

Figure 4.3a: 2015 Pre Development Traffic Volumes (Bruce Highway Corridor)

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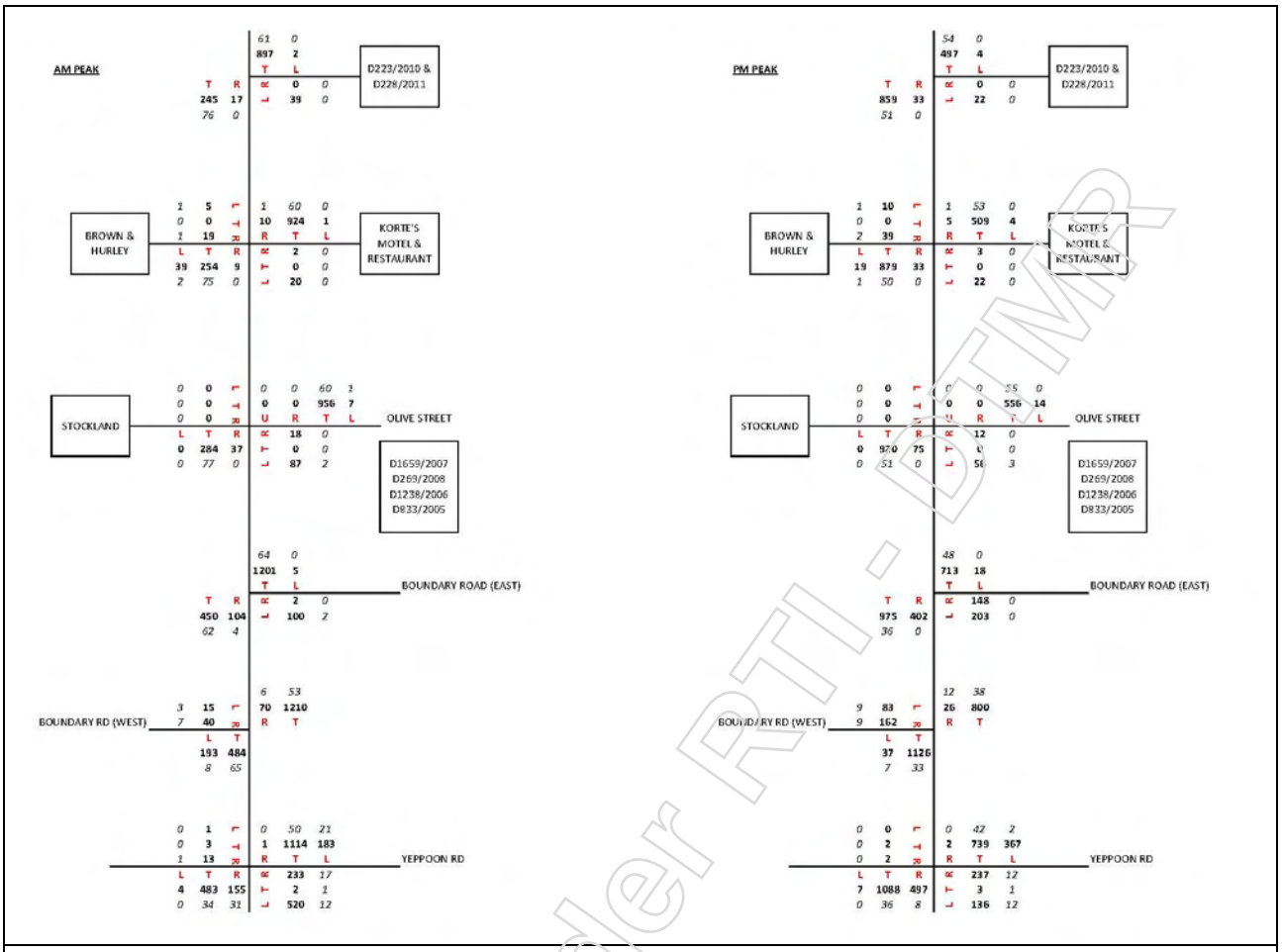

Figure 4.3b: 2025 Pre Development Traffic Volumes (Bruce Highway Corridor)

4.4 Post Development Traffic

The post development traffic volumes were determined by combining the:

- Background traffic volumes (including a growth rate of 1%);
- Traffic volumes from existing approvals; and
- Traffic generated by Stages 1-3 of the proposed development.

Using these volumes, the future performance of the intersections along the Bruce Highway for the post development traffic scenario (Stage 1-3) can be analysed. This analysis was completed using SIDRA 5.1 software for both the identified AM and PM peak periods, at the year of completion (2015) and the ten year design horizon (2025) for Stages 1 to 3 of the development. The resultant 2015 and 2025 peak hour post development traffic volumes for the road network are summarised in **Figure 4.4a** and **Figure 4.4b** below.

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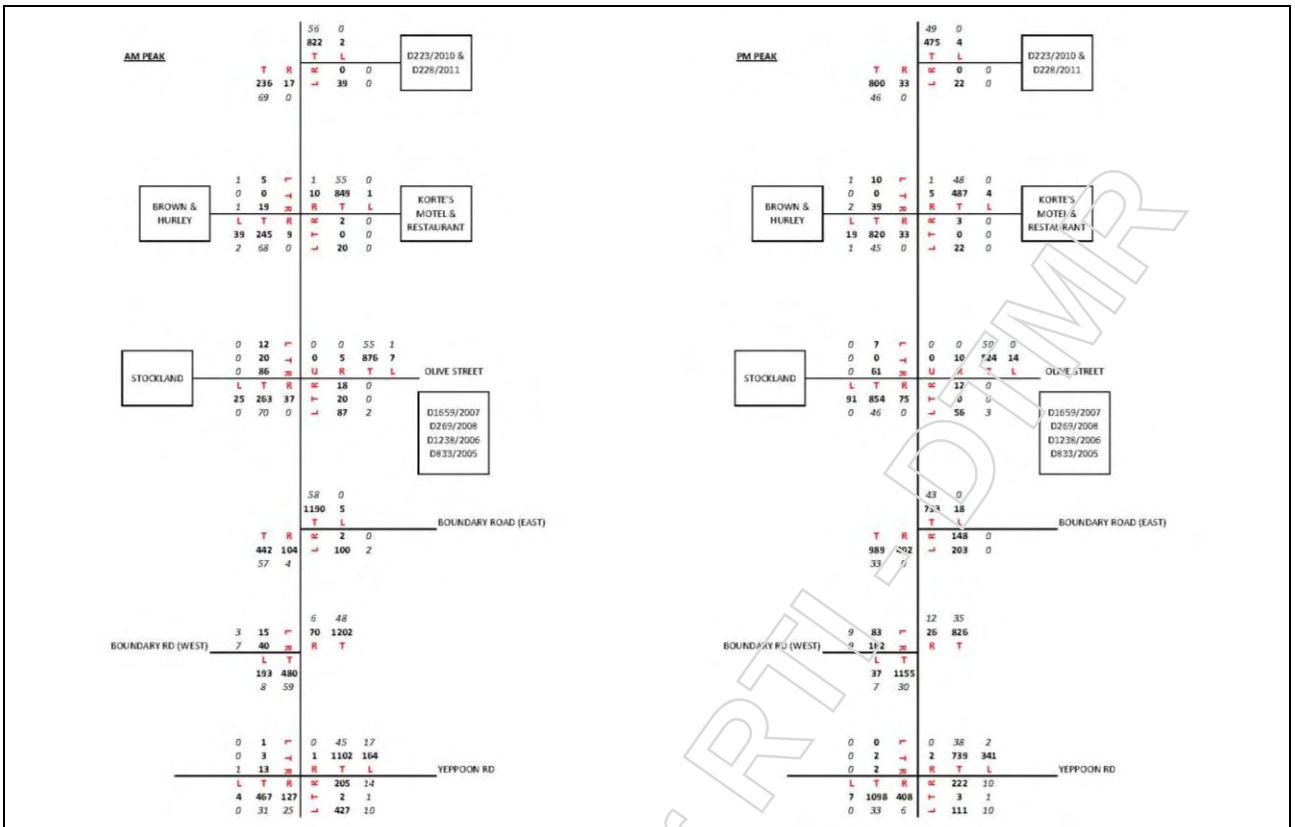

Figure 4.4a: 2015 Post Development (Stage 1 to 3) Traffic Volumes (Bruce Highway Corridor)

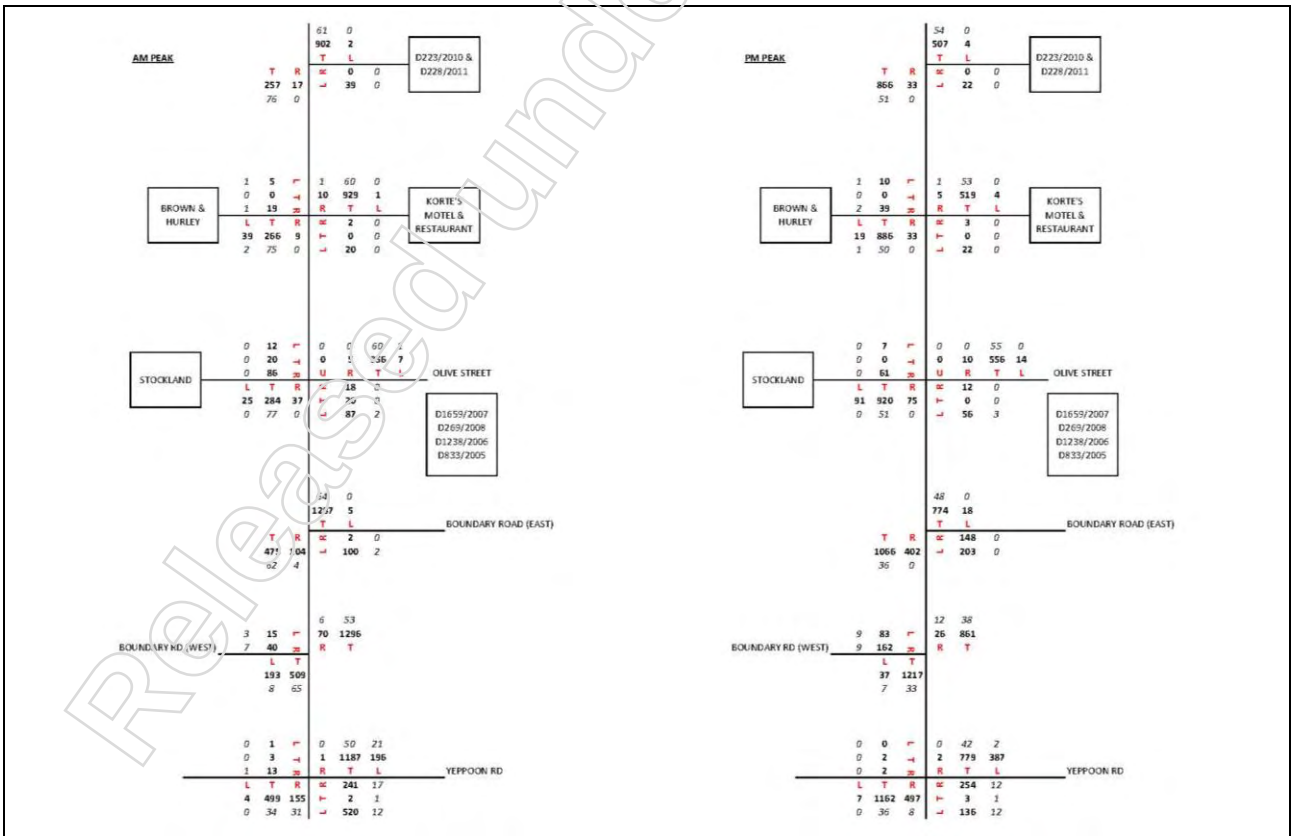

Figure 4.4b: 2025 Post Development (Stage 1 to 3) Traffic Volumes (Bruce Highway Corridor)

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4.5 Traffic Impact Assessment

Traffic analysis has been carried out to determine the impact of Stages 1 to 3 of the proposed master planned community on the external road network. This investigation will focus on the relevant section of the Bruce Highway (Yeppoon Road to Olive Street) including mid-block volumes and the operation of the major intersections including:

- Olive Street;
- Boundary Road (East);
- Boundary Road (West); and
- Yeppoon Road.

These analyses are discussed in further detail in the following sections.

4.5.1.1 Midblock Volumes – Capacity of Current Cross Section

TMR has previously advised that the desired maximum daily flow and hence trigger volume for an upgrade from two lanes to four is 15,000 vehicles per day. Whilst Annual Average Daily Traffic (AADT) segment volumes for the relevant sections of the highway are currently available, these do not include the additional traffic generated by the approved developments in the area and as such do not provide an accurate representation of the expected pre-development traffic volumes.

The mid-block volumes have been derived from the pre-development intersection volumes. This was achieved by extracting the approach and departure volumes. **Figure 4.5.1.1a** below identifies the intersection volumes and corresponding mid-block volumes for the forecast 2013 pre development traffic scenario.

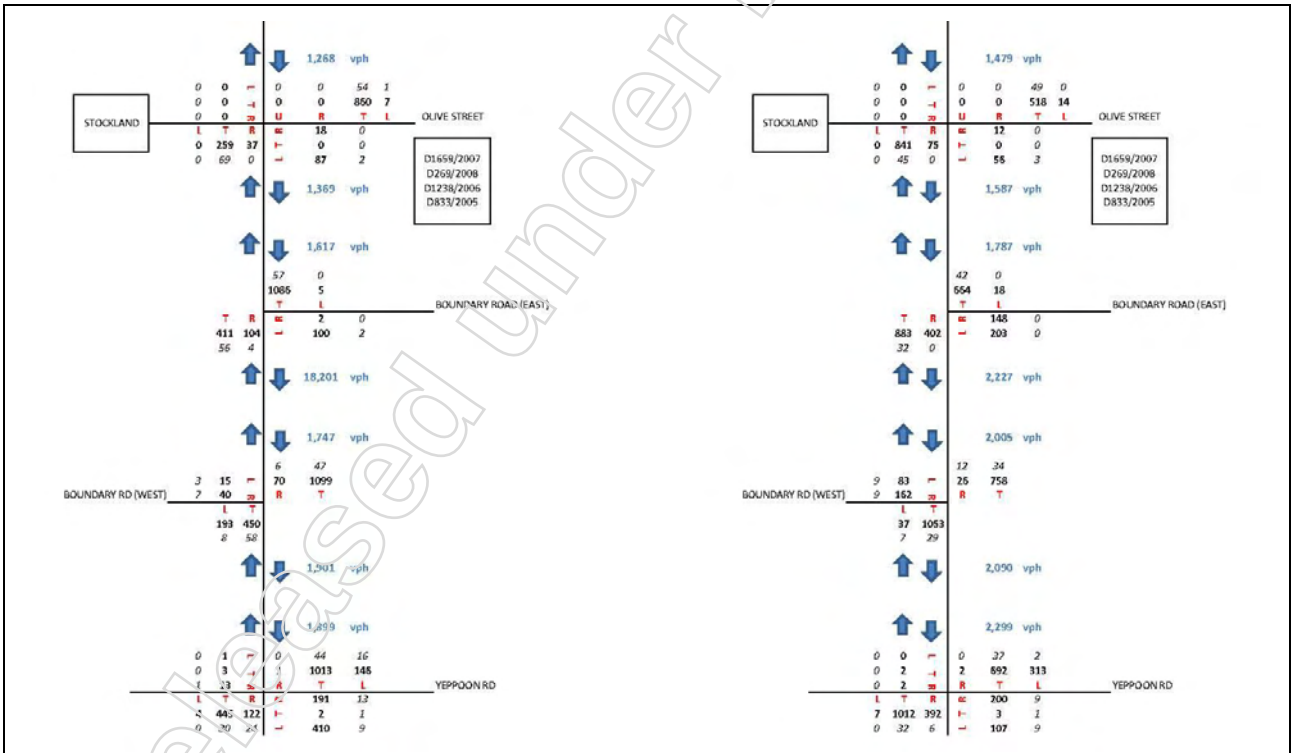

Figure 4.5.1.1a: 2013 Forecast Pre Development Peak Hour Mid-Block Traffic Volumes (Bruce Highway Corridor)

Section 5.2 of TMR's *Road Planning and Design Manual* describes the generally accepted method of applying a factor of ten (10) for urban arterial roads to calculated peak hour volumes from daily traffic volumes, and vice versa. By applying this factor of ten to the peak hour mid-block values shown above the expected daily volumes were estimated, as shown in **Figure 4.5.1.1b** below.

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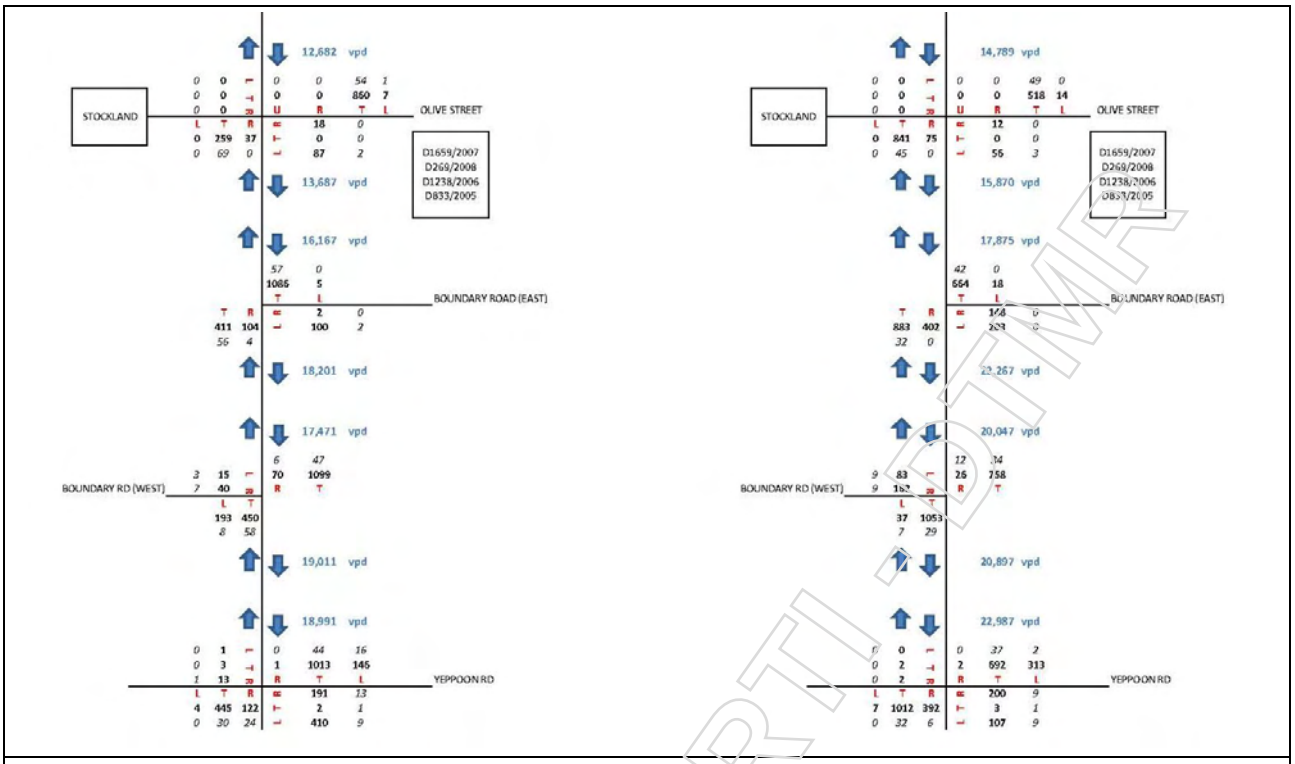

Figure 4.5.1.1b: 2013 Forecast Pre Development Daily Mid-Block Traffic Volumes (Bruce Highway Corridor)

From the values identified in the figure above it can be seen that the predicted pre development daily mid-block volumes on each relevant section of the Bruce Highway between Yeppoon Road and Olive Street exceed the TMR trigger volume of 15,000 vehicles per day. These volumes validate DTMR's future intent to duplicate the highway. These volumes also support the recommendations in the 2008 *Rockhampton Traffic Study* (prepared by Arup) which suggest that initial section of the Bruce Highway from Yeppoon Road to Boundary Road East required duplication by 2011.

As such it is expected that an upgrade of the Highway from two to four lanes, including the provision of additional through lanes at existing intersections, will be required irrespective of the proposed North Parkhurst development.

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4.5.1.2 Bruce Highway / Olive Street

The analysis of the intersections was then completed using SIDRA 5.1 software, adopting a proposed four-way signalised intersection for the Bruce Highway / Olive Street intersection in accordance with the future planning intent of both TMR and Council. The intersection configuration adopted during the analysis of the post development traffic conditions for the development can be seen in **Figure 4.5.1.2a** below, which is considered the interim configuration of the proposed access intersection and is expected to accommodate the traffic from approximately 1,275 lots.

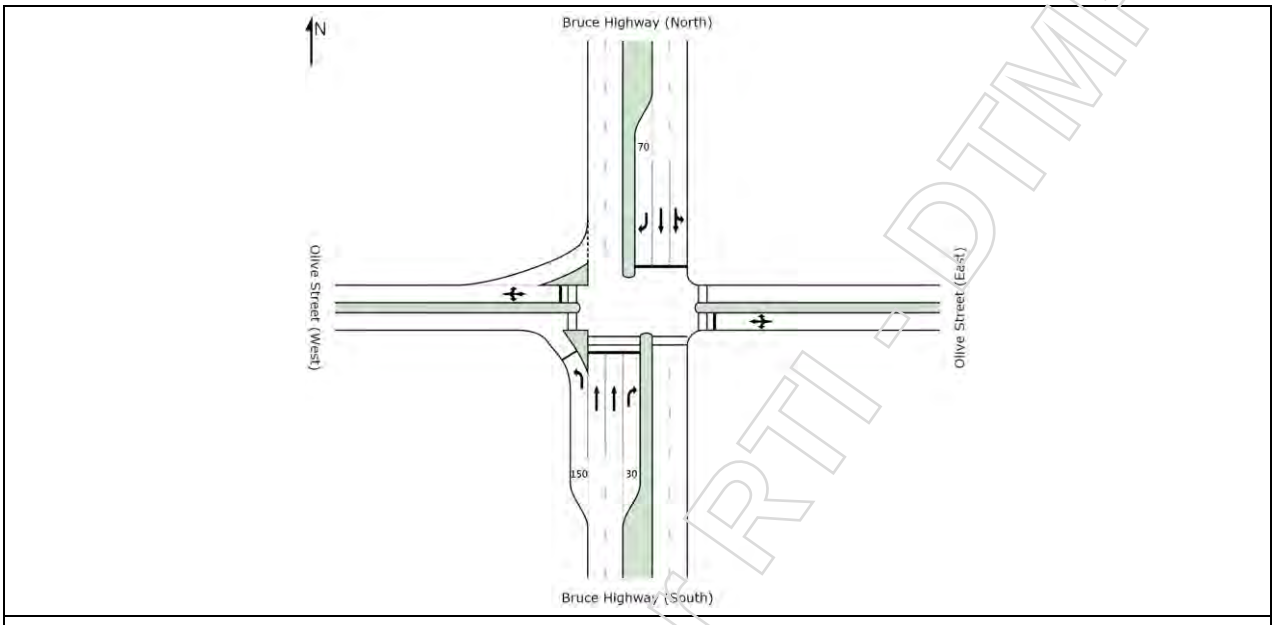

Figure 4.5.1.2a: Proposed Four-Way Signalised Intersection Configuration - Bruce Highway / Olive Street Intersection
****NOTE : Values shown on auxiliary lanes indicate storage length only.**

The intersection configuration identified above includes the provision of a four lane cross section for the Highway which in Section 4.5.1.1 was identified to be required irrespective of the proposed development due to the forecast pre development mid-block volumes exceeding 15,000 vehicles per day.

In addition, the required storage lengths of the auxiliary lanes for the left turn into the site from the south and the right turn from the north have been sized to accommodate the expected queue lengths developed during a train passing over the proposed level crossing on the new access road into the site. These storage lengths have been calculated assuming a two and a half minute delay to vehicles at the level crossing.

A four (4) phase signal configuration with pedestrian crossings on the southern, western and eastern approaches was adopted for the purpose of the intersection analysis. The modelled phasing is shown in **Figure 4.5.1.2b** below.

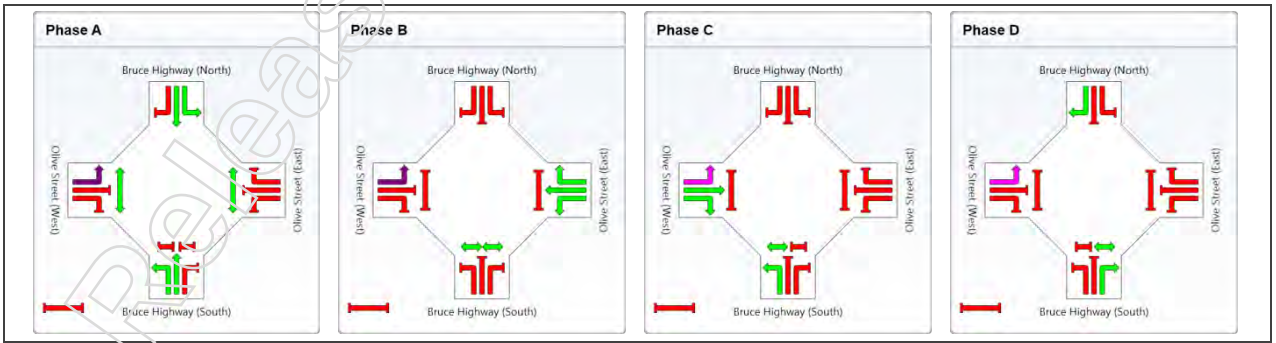

Figure 4.5.1.2b: Adopted Signal Phasing – Bruce Highway / Olive Street Intersection

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The results of the analyses detailing the predicted operation of the proposed Bruce Highway / Olive Street intersection for the forecast post development traffic conditions are attached as **Appendix E.** A summary of these results is provided in **Table 4.5.1.2a** over page.

Table 4.5.1.2a: Summary of SIDRA Analysis Results – Bruce Highway / Olive Street Intersection Post Development Scenarios – Proposed Signalised Intersection Configuration

Intersection	Intersection Control	Year	Peak Hour	DOS %
Bruce Highway / Olive Street	Four-Way Signalised	2015	AM	52.7
			PM	52.4
		2025	AM	56.6
			PM	54.2

From the results above it can be seen that the proposed four-way signalised intersection configuration of the Bruce Highway / Olive Street intersection is expected to operate satisfactorily for Stages 1-3 of the development, with all calculated values for intersection Degree of Saturation (DOS) below the acceptable limit of operation (90%) for signalised intersections.

4.5.1.3 Bruce Highway / Boundary Road (East)

Following consultation with TMR the signalised configuration of the Boundary Road (East) / Bruce Highway intersection conditioned as part of a recently approved shopping centre development (on Boundary Road East) was identified, as shown in **Figure 4.5.1.3a** below.

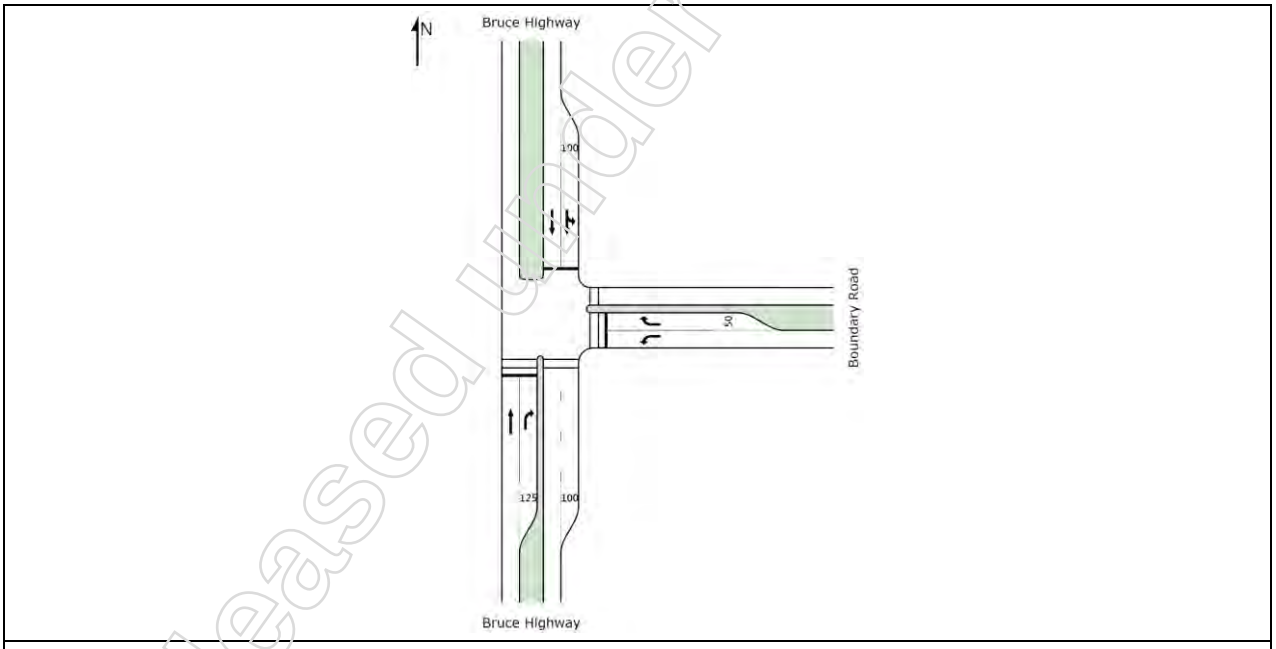

Figure 4.5.1.3a: Approved Signalised Intersection Configuration - Bruce Highway / Boundary Road (East) Intersection

It is noted that the geometry indicated in this approved intersection configuration only provides one through lane for northbound traffic and a short secondary through lane for southbound traffic. Therefore to align with the previously identified requirement for a four lane cross section of the Highway on both approaches to the intersection, an alternative, upgraded intersection configuration to address this existing deficiency has been proposed as shown in **Figure 4.5.1.3b** below.

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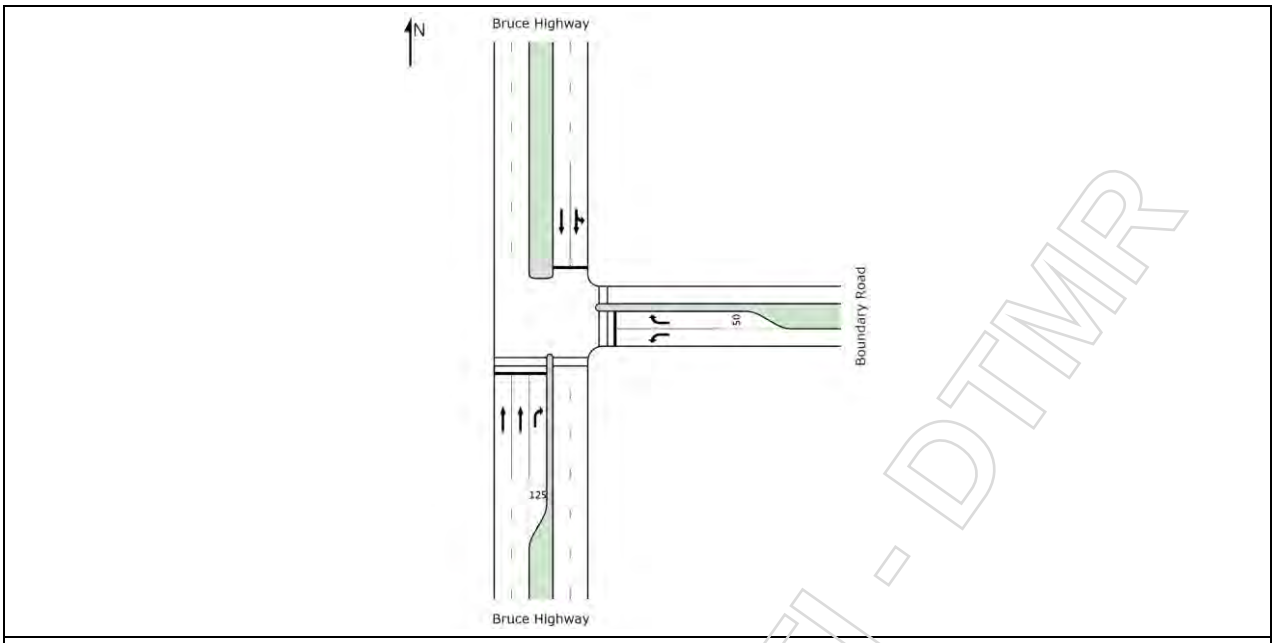

Figure 4.5.1.3b: Upgraded Intersection Configuration - Bruce Highway / Boundary Road (East) Intersection

A three (3) phase signal configuration with pedestrian crossings on the southern and eastern approaches was adopted for the purpose of the intersection analysis. An indicative signal phasing is shown in **Figure 4.5.1.3c** below.

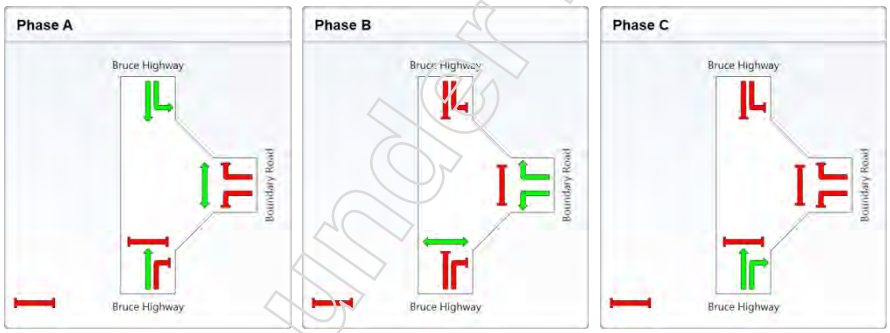

Figure 4.5.1.3c: Adopted Signal Phasing – Bruce Highway / Boundary Road (East) Intersection

The results of the analyses detailing the predicted operation of the proposed upgraded configuration of the Bruce Highway / Boundary Road (East) intersection for the forecast post development traffic conditions are attached as **Appendix F.** A summary of these results is provided in **Table 4.5.1.3a** below

Table 4.5.1.3a: Summary of SIDRA Analysis Results – Bruce Highway / Boundary Road (East) Intersection
Post Development Scenarios – Proposed Upgraded Signalised Intersection Configuration

Intersection	Intersection Control	Year	Peak Hour	DOS %
Bruce Highway / Boundary Road (East)	Three-Way Signalised	2015	AM	**71.7**
			PM	**79.2**
		2025	AM	**70.2**
			PM	**77.1**

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Once TMR upgrade this intersection to address the existing deficiencies (i.e. Figure 4.5.1.3b), this intersection is expected to operate satisfactorily for all post development scenarios, with all calculated values for intersection Degree of Saturation (DOS) below the acceptable limit of operation (90%) for signalised intersections.

4.5.1.4 Bruce Highway / Boundary Road (West)

The existing priority controlled geometry of the Bruce Highway / Boundary Road West intersection is shown in **Figure 4.5.1.4a** below.

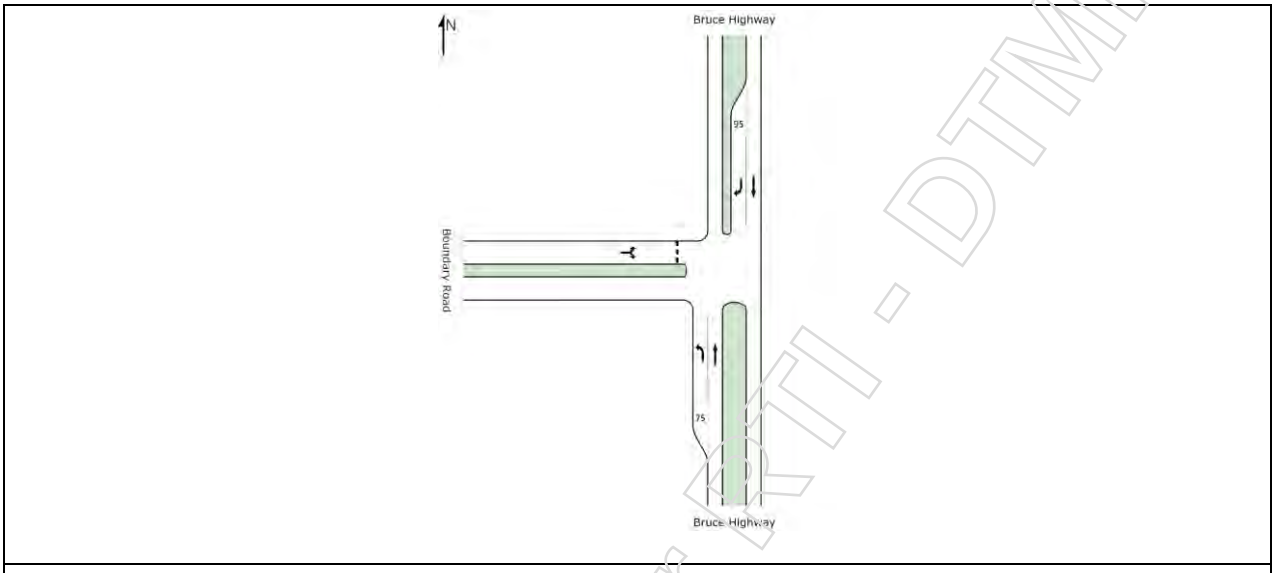

Figure 4.5.1.4a: Existing Intersection Configuration - Bruce Highway / Boundary Road (West) Intersection

The geometry above is based on the existing two-lane Bruce Highway configuration, however as established in Section 4.5.1.1 the Bruce Highway requires duplication to provide a four lane cross section and as such the requirement to provide these additional through lanes on both Bruce Highway approaches to the intersection can be considered an existing deficiency of the road network.

The geometry that will be required to address the existing deficiencies is shown in **Figure 4.5.1.4b** below. This alternative configuration includes additional through lanes in both directions, as well as including pedestrian crossings on both the northern and western approaches.

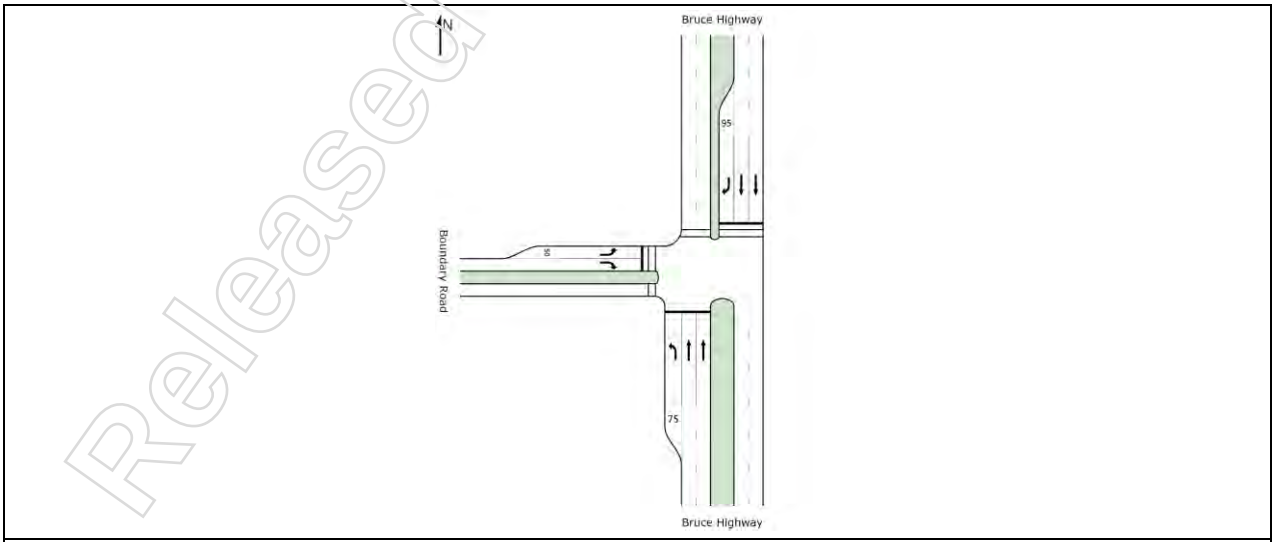

Figure 4.5.1.4b: Alternative Intersection Configuration - Bruce Highway / Boundary Road (West) Intersection

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A three (3) phase signal configuration with pedestrian crossings on the northern and western approaches was adopted for the purpose of the intersection analysis. A generalised summary of the adopted signal phasing is shown in **Figure 4.5.1.4c** below.

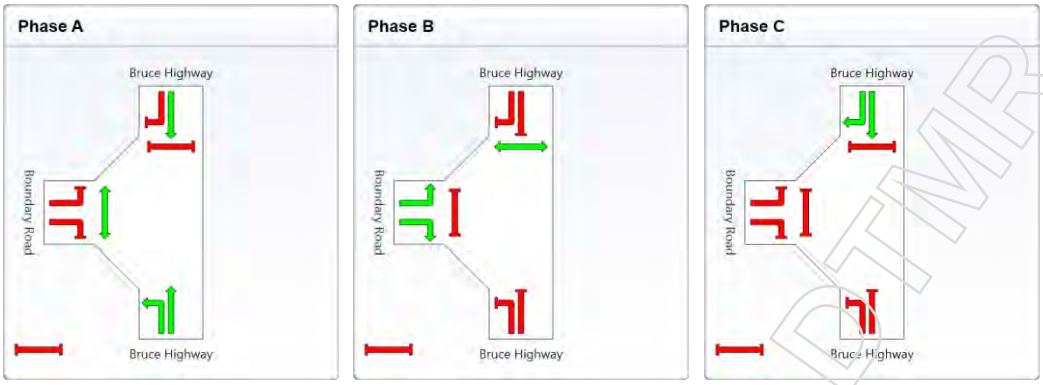

Figure 4.5.1.4c: Adopted Signal Phasing – Bruce Highway / Boundary Road (West) Proposed Signalised Intersection

Once the existing deficiencies have been addressed the upgraded intersection will operate within the acceptable limit of operation for the Stage 1 to 3 post development traffic scenarios. The results of this analysis are included in **Appendix G** and a summary in **Table 4.5.1.4b** below.

Table 4.5.1.4b: Summary of SIDRA Analysis Results – Bruce Highway / Boundary Road (West) Intersection Post Development Scenarios – Proposed Upgraded Intersection Configuration

Intersection	Intersection Control	Year	Peak Hour	DOS %
Bruce Highway / Boundary Road (West)	Three-Way Signalised	2015	AM	**43.6**
			PM	**51.7**
		2025	AM	**47.1**
			PM	**53.1**

From the results above it can be seen that an upgraded Bruce Highway / Boundary Road (West) intersection (carried out by TMR as part of their four-lane upgrade works) is expected to operate satisfactorily during the analysed post development scenarios, with all calculated values for intersection Degree of Saturation (DOS) within the acceptable limits of operation (90%) for signalised intersections.

4.5.1.5 Bruce Highway / Yeppoon Road

Initial analysis was completed to assess the future operation of the existing signalised intersection configuration of the Bruce Highway / Yeppoon Road intersection. A diagram of the configuration adopted for this analysis is in **Figure 4.5.1.5a** below.

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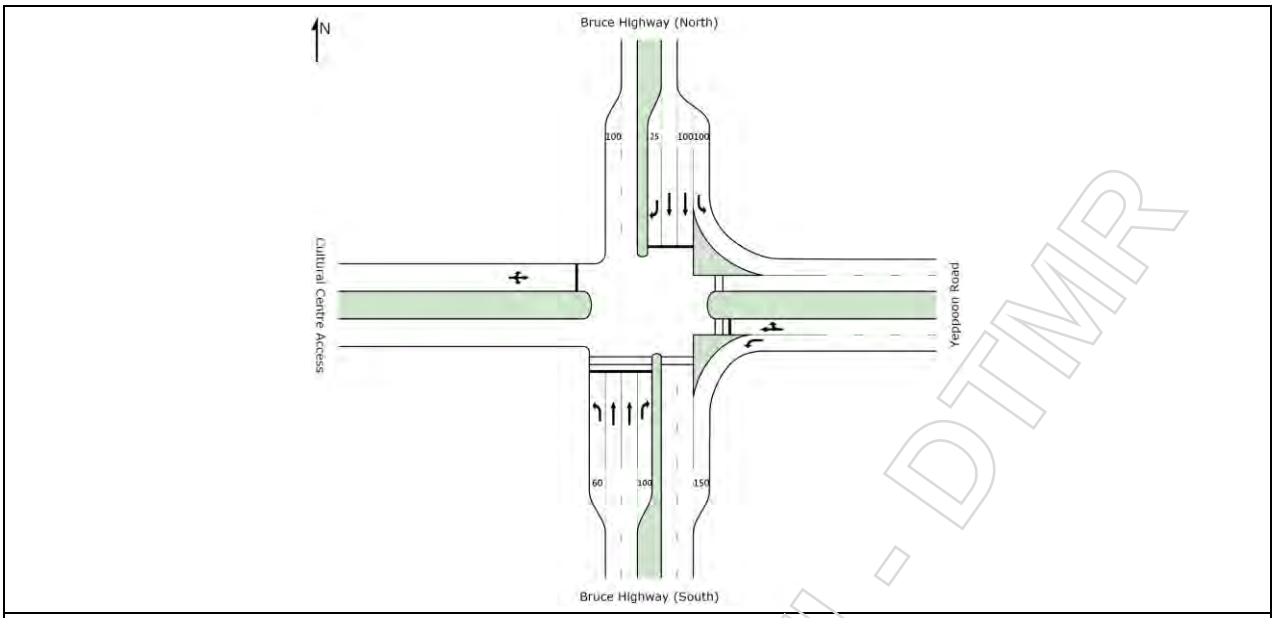

Figure 4.5.1.5a: Existing Intersection Configuration - Bruce Highway / Yeppoon Road (West) Intersection

A four (4) phase signal configuration with pedestrian crossings on the southern and eastern approaches was adopted for the purpose of the intersection analysis. A generalised summary of the adopted signal phasing is shown in **Figure 4.5.1.5b** below.

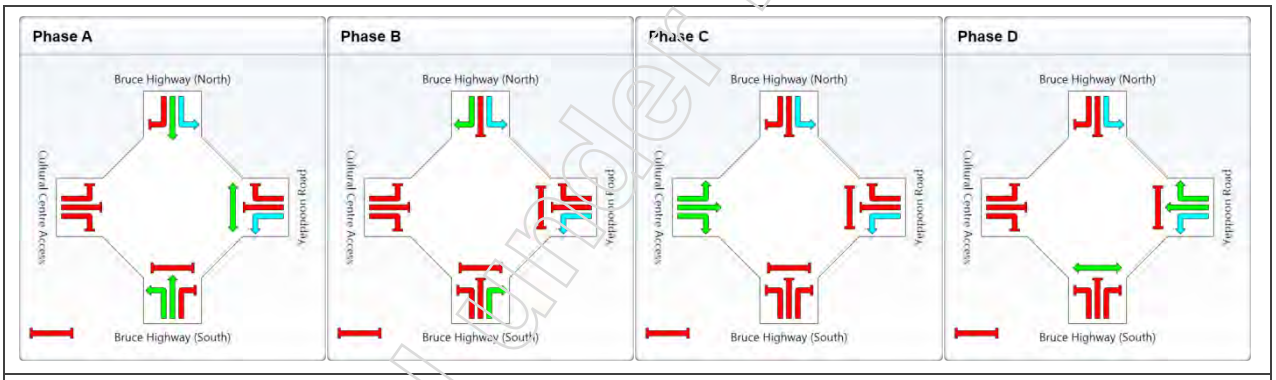

Figure 4.5.1.5b: Adopted Signal Phasing – Bruce Highway / Yeppoon Road Intersection

The results of the analysis detailing the predicted operation of the existing Bruce Highway / Yeppoon Road intersection for the forecast pre development traffic conditions are attached as **Appendix H.** A summary of these results is provided in **Table 4.5.1.5a** over page.

Table 4.5.1.5a: Summary of SIDRA Analysis Results – Bruce Highway / Yeppoon Road Intersection
Pre Development Scenarios – Existing Signalised Intersection Configuration

Intersection	Intersection Control	Year	Peak Hour	DOS %
Bruce Highway / Yeppoon Road	Four-Way Signalised	2013	AM	75.3
			PM	101.3

The results above indicate that the current intersection configuration of the Bruce Highway / Yeppoon Road intersection is not expected to operate satisfactorily during the 2013 PM pre development scenario, with the calculated value for intersection Degree of Saturation (DOS) outside the acceptable limits of operation (90%) for signalised intersections.

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A detailed investigation of the calculated results for the 2013 PM peak analysis indicates that the failure mechanism for the current intersection configuration is the right turn lane and adjacent through lanes on the southern approach to the intersection. Furthermore the results indicate an underutilisation of the outside or westernmost through lane on the southern approach, which can be attributed to the provision of a short (100m) auxiliary through lane downstream of this movement. The results further reinforce the need for the provision of a four lane cross section of the highway north of Yeppoon Road as identified earlier, and also demonstrate that the current configuration of the Bruce Highway / Yeppoon Road intersection will need to be upgraded irrespective of the proposed Stockland North Parkhurst development.

An upgraded intersection configuration, including the provision of the full four through lane cross section on the northern approach, as shown in **Figure 4.5.1.5c** below, was then analysed. This alternative configuration also incorporated an increase in the current length of the right turn pocket on the southern approach from 100m to 250m, and adopted that same signal phasing as the existing configuration analysis shown above.

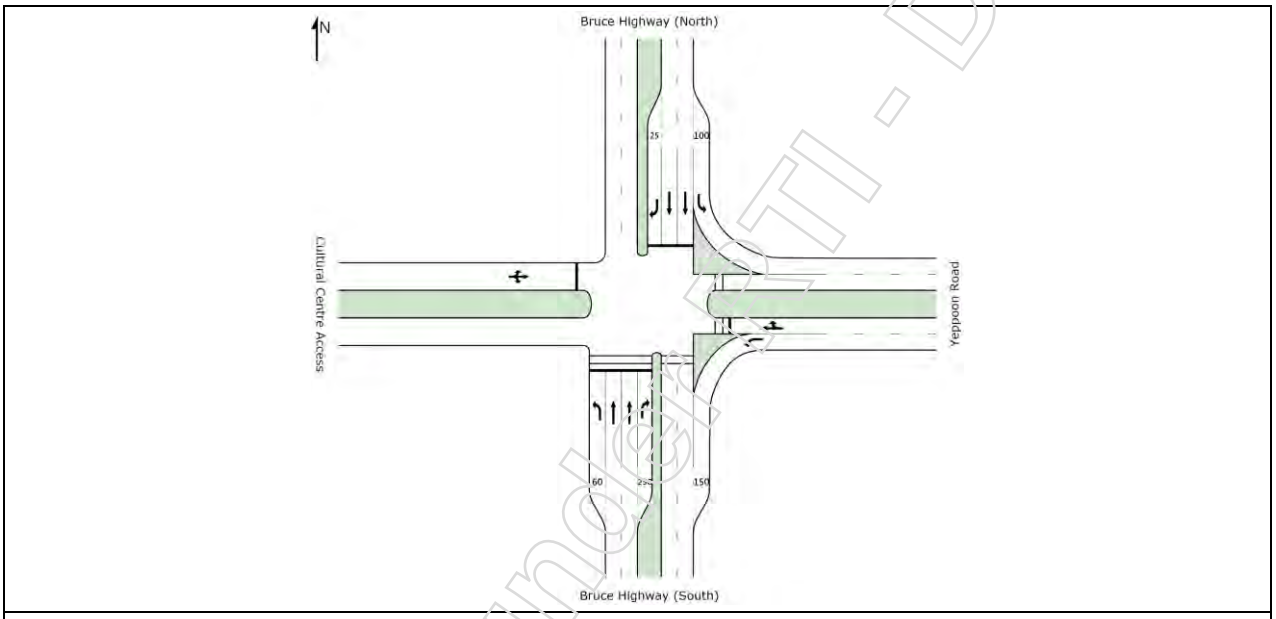

Figure 4.5.1.5c: Upgraded Intersection Configuration - Bruce Highway / Yeppoon Road Intersection

The results of the analyses detailing the predicted operation of the proposed upgraded Bruce Highway / Yeppoon Road intersection for the forecast pre development traffic conditions are attached as **Appendix H.** A summary of these results is provided in **Table 4.5.1.5b** over page.

Table 4.5.1.5b: Summary of SIDRA Analysis Results – Bruce Highway / Yeppoon Road Intersection
Pre Development Scenarios – Proposed Upgraded Signalised Intersection Configuration

Intersection	Intersection Control	Year	Peak Hour	DOS %
Bruce Highway / Yeppoon Road	Four-Way Signalised	2013	AM	**72.5**
			PM	**81.0**
		2015	AM	**66.4**
			PM	**80.9**
		2025	AM	**72.4**
			PM	**92.1**

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From the results above it can be seen that an upgrade of the Bruce Highway / Yeppoon Road intersection as shown in Figure 4.5.1.5c which includes the required four lane upgrade of the Highway is still not expected to operate satisfactorily during the analysed pre development scenarios, with the calculated values of intersection Degree of Saturation (DOS) for the 2025 PM peak period outside the acceptable limits of operation (90%) for signalised intersections.

A second iteration of an upgraded intersection layout was then developed to improve the operational performance of the intersection under the forecast pre development traffic conditions. This second iteration of the layout included the provision of two right turn pockets on the southern approach, which in turn led to the formation of a combined through and left lane on this approach and the modification of the left turn lane on the northern approach from a continuous lane with designated downstream lane to a standard priority controlled slip lane. A diagram of the analysed intersection configuration is shown in **Figure 4.5.1.5d** below

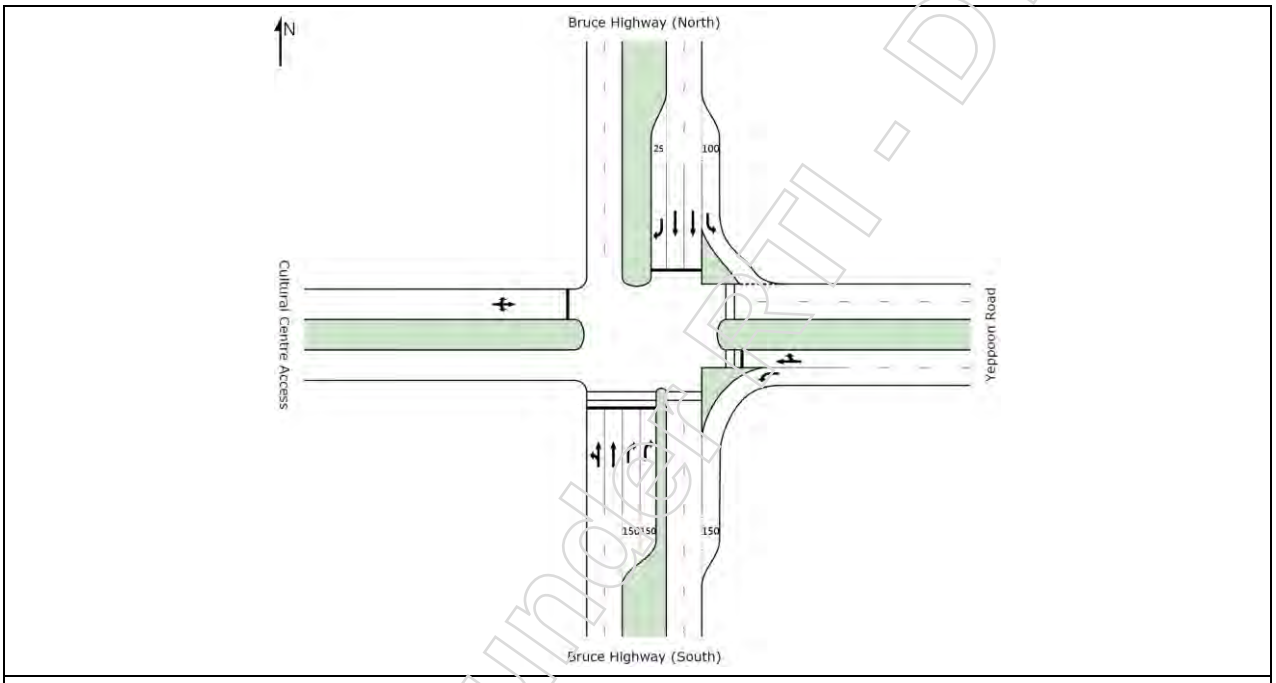

Figure 4.5.1.5d: Upgraded (Second Iteration) Intersection Configuration - Bruce Highway / Yeppoon Road Intersection

These alterations to the intersection configuration also led to minor modifications to the movement restrictions during each phase of the signal cycle, primarily concerning the left turn from the northern approach, as shown in the signal phasing summary shown in **Figure 4.5.1.5e** below.

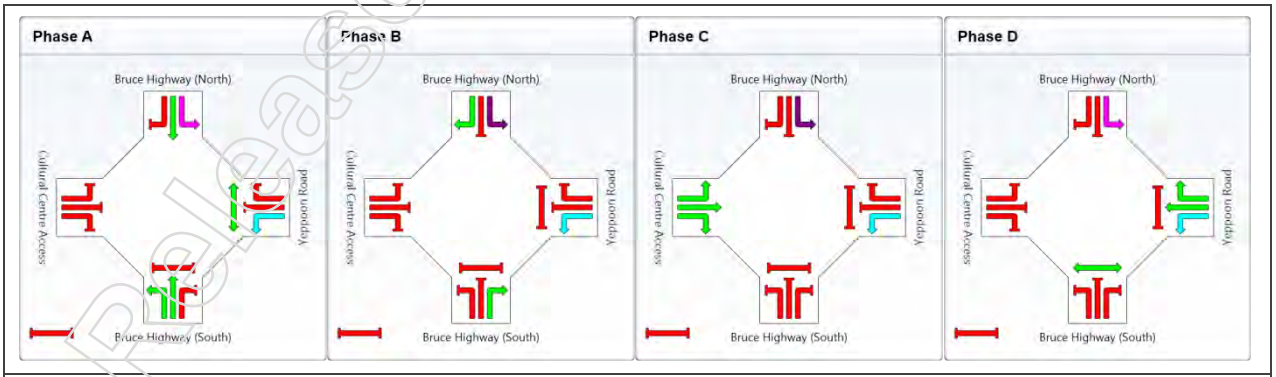

Figure 4.5.1.5e: Adopted Signal Phasing (Second Upgrade Iteration) – Bruce Highway / Yeppoon Road Intersection

The results of the analysis detailing the predicted operation of the Bruce Highway / Yeppoon Road intersection based on the layout shown in Figure 4.5.1.5d for the forecast pre development traffic conditions are attached as **Appendix H.** A summary of these results is provided in **Table 4.5.1.5c** below.

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Table 4.5.1.5c: Summary of SIDRA Analysis Results – Bruce Highway / Yeppoon Road Intersection
Pre Development Scenarios – Proposed Upgraded (Second Iteration) Signalised Intersection Configuration

Intersection	Intersection Control	Year	Peak Hour	DOS %
Bruce Highway / Yeppoon Road	Four-Way Signalised	2025	AM	**66.6**
			PM	**77.5**

From the results above it can be seen that the layout shown in Figure 4.5.1.5d is expected to operate satisfactorily during the analysed 2025 pre development scenarios, with all calculated values for intersection Degree of Saturation (DOS) within the acceptable limits of operation (90%) for signalised intersections.

The results also demonstrate that the proposed upgraded layout (second iteration) identified above represents the minimum infrastructure provision requirements at the intersection to cater for the pre development traffic up to 2025, and that the provision of these upgrades will be required irrespective of the proposed development of Stages 1 to 3 of the Stockland North Parkhurst site. This geometry is required to address the existing deficiencies.

This geometry was then analysed for the forecast post development scenarios. The results of this analysis are attached as **Appendix H** and summary of these results is provided in **Table 4.5.1.5d** below.

Table 4.5.1.5d: Summary of SIDRA Analysis Results – Bruce Highway / Yeppoon Road Intersection
Post Development Scenarios – Proposed Upgraded (Second Iteration) Signalised Intersection Configuration

Intersection	Intersection Control	Year	Peak Hour	DOS %
Bruce Highway / Yeppoon Road	Four-Way Signalised	2015	AM	**61.6**
			PM	**75.1**
		2025	AM	**69.9**
			PM	**78.0**

From the results above it can be seen that once the Bruce Highway / Yeppoon Road intersection is upgraded to address the existing deficiencies, it is expected to operate satisfactorily during the analysed post development scenarios, with all calculated values for intersection Degree of Saturation (DOS) within the acceptable limits of operation (90%) for signalised intersections.

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5.0 Conclusion and Recommendations

The proposed access for Stages 1 to 3 is consistent with the overall access strategy as detailed in the Traffic Impact Assessment Report (dated 5 March 2013) prepared as part of the application for preliminary approval over the subject site. Due to their location on the eastern portion of the site, Stages 1 to 3 are proposed to access the external road network via a new fourth western leg to the proposed traffic signals at the Bruce Highway / Olive Street intersection. The proposed access strategy for Stages 1 to 3 will require development traffic to use the proposed rail crossing on the western leg of Olive Street, which will be relocated from its existing location on William Palfrey Road..

The internal road network proposed for Stages 1 to 3 is in accordance with the road classifications identified in the Road Hierarchy Plan for the development as discussed in the previous TIA for the overall site masterplan. As also discussed in this document, it is proposed that the main access road into the site from the Bruce Highway (Olive Street West) will be constructed in two stages, first providing a two lane cross section and then the ultimate four lane arterial lane cross section. It is proposed that Stages 1 to 3 of this development will utilise the initial two lane configuration of the access road.

Furthermore, it is proposed that as part of Stages 1 to 3 the first main internal intersection to the site will operate a continuous road to the south via the sub-arterial road. It is noted that this intersection will ultimately be controlled by traffic signals, however as the third western leg to this intersection is proposed to be constructed as part of latter stages of the development, the signals are not warranted as part of this ROL application.

Analysis was completed to determine the impact of Stages 1 to 3 of the proposed master planned community on the external road network. This investigation focused on the impact on the relevant section of the Parkhurst Bruce Highway corridor, including the major intersections.

Our analysis shows that the pre development daily volumes on the Highway exceeded TMR's acceptable limit of 15,000 vehicles per day in 2013. As such this is an existing deficiency which in accordance with TMR's requirements necessitates the duplication of the highway and upgrading of the following intersections:

- Olive Street / Bruce Highway (traffic signals required);
- Boundary Road East / Bruce Highway (traffic signals required);
- Boundary Road West / Bruce Highway (traffic signals required); and
- Yeppoon Road / Bruce Highway (additional lanes).

Addressing these existing deficiencies is not the responsibility of the Applicant. Once these existing deficiencies have been addressed by TMR all of the above mentioned intersections are shown to operate within the acceptable limits with the addition of traffic generated by this ROL application (i.e. 198 lots)

In our opinion the applicant is only responsible for the additional lanes required at the Bruce Highway / Olive Street intersection to accommodate site generated traffic. Specifically:

- The western approach road;
- The right turn lane from the Bruce Highway into the subject site; and
- The left turn lane from the Bruce Highway into the subject site.

Based on our review and analysis we consider that the proposal is satisfactory from a traffic operations perspective, and recommend that the development application be approved from a traffic engineering viewpoint.

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APPENDIX A

Proposal Plan Stage 1 to 3

(Prepared by RPS)

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Parkhurst Stages 1-3

DEVELOPMENT STATISTICS - OVERALL

			STAGE 1	STAGE 2	STAGE 3	BALANCE LOT	OVERALL	TOTAL %
Total Precinct Area			**4.26 ha**	**9.62 ha**	**11.95 ha**	**2.56 ha**	**25.83 ha**	**100.0%**
Total Saleable Area			**2.08 ha**	**5.10 ha**	**6.78 ha**	**—**	**13.96 ha**	**54.0%**
28m Deep Lots	**Typical Lot**	**Area**						
Terrace Allotment	8.5 x 28m	238m²	—	—	—	—	—	0.0%
Villa Allotment	10.0 x 28m	280m²	—	—	—	—	—	0.0%
Premium Villa	12.5 x 28m	350m²	—	—	—	—	—	0.0%
Courtyard Allotment	15.0 x 28m	420m²	3	6	1	—	10	5.0%
Premium Courtyard Allotment	17.5 x 28m	490m²	6	6	3	—	15	7.5%
Traditional Allotment	19.0 x 28m	532m²	4	10	3	—	17	8.5%
Premium Traditional Allotment	20.5 x 28m	574m²	4	11	5	—	20	10.1%
Sub Total			**17**	**33**	**12**	**—**	**62**	**31.2%**
32m Deep Lots	**Typical Lot**	**Area**						
Premium Villa	12.5 x 32m	400m²	1	4	2	—	7	3.5%
Courtyard Allotment	15.0 x 32m	480m²	2	15	8	—	25	12.6%
Premium Courtyard Allotment	17.5 x 32m	560m²	3	16	17	—	36	18.1%
Traditional Allotment	19.0 x 32m	608m²	4	15	16	—	35	17.6%
Premium Traditional Allotment	20.5 x 32m	656m²	6	7	6	—	19	9.5%
Lifestyle Allotment	22.0 x 32m	704m²	3	1	9	—	13	6.5%
Sub Total			**19**	**58**	**58**	**—**	**135**	**67.8%**
Super Lot	**1.208 ha**		**—**	**—**	**1**	**—**	**1**	**0.5%**
Mixed Use	**1.337 ha**		**—**	**—**	**1**	**—**	**1**	**0.5%**
Total Dwellings			**36**	**91**	**72**	**0**	**199**	**100.0%**

Open Space	STAGE 1	STAGE 2	STAGE 3	BALANCE LOT	OVERALL	TOTAL %
Active & Passive Open Space	0.19 ha	0.55 ha	—	2.56 ha	3.30 ha	71.6%
Ergon Easement	—	1.31 ha	—	—	1.31 ha	28.4%
Total Open Space	**0.19 ha**	**1.86 ha**	**—**	**2.56 ha**	**4.60 ha**	**100.0%**

Road Type					
Total Length of New Road	**1179 m**	**1717 m**	**1481 m**	**—**	**4376 m**
3.5m Wide New Driveway	—	—	72 m	—	**72 m**
15m Wide New Road	225 m	1264 m	713 m	—	**2202 m**
18m Wide New Road	692 m	392 m	230 m	—	**1314 m**
25.5m Wide New Road	—	—	335 m	—	**335 m**
32.5m Wide New Road (Half Constructed)	263 m	60 m	131 m	—	**453 m**

Legend
- Site Boundary
- Stage Boundary
- Balance Lot
- Open Space (Active & Passive)
- Existing Trees

20 0 20 40 60 80 100 120 140 160 180 200 220m

Note:
All dimensions and areas are approximate only, and are subject to survey and Council approval.

Dimensions have been rounded to the nearest 0.1 metres.

Areas have been rounded down to the nearest 5m².

The boundaries shown on this plan should not be used for final detailed engineers design.

Source Information:
Site boundaries: Registered Survey Plans.
Adjoining information: DCDB.
Contours: Capricorn Survey
Aerial photography: NA
Environment constraints: RPS / DNRM
Flood: Browns Consulting

REVISION
A: Update Stage Boundaries + Statistics
B: Update Lot Layout + Statistics
C: Update Lot Layout + Statistics
D: Update Lot Layout + Statistics
E: Update Lot Layout + Statistics
F: Update Lot Layout + Statistics
G: Update Road Layout + Statistics

CLIENT
STOCKLAND

PROJECT
ELLIDA

PROPOSAL PLAN

Level Datum	
Origin	
Date	19 FEBRUARY 2013
Comp By.	BDC
DWG Name.	109116-82g
Local Authority	ROCKHAMPTON REGIONAL COUNCIL
Locality	ROCKHAMPTON
Job Reference	109116
Scale	*1:1500*
Sheet	*A1*
Plan Ref	**109116-82**
Rev	**G**

RPS
RPS Australia East Pty Ltd
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Stockland

Under RTI-DTMR



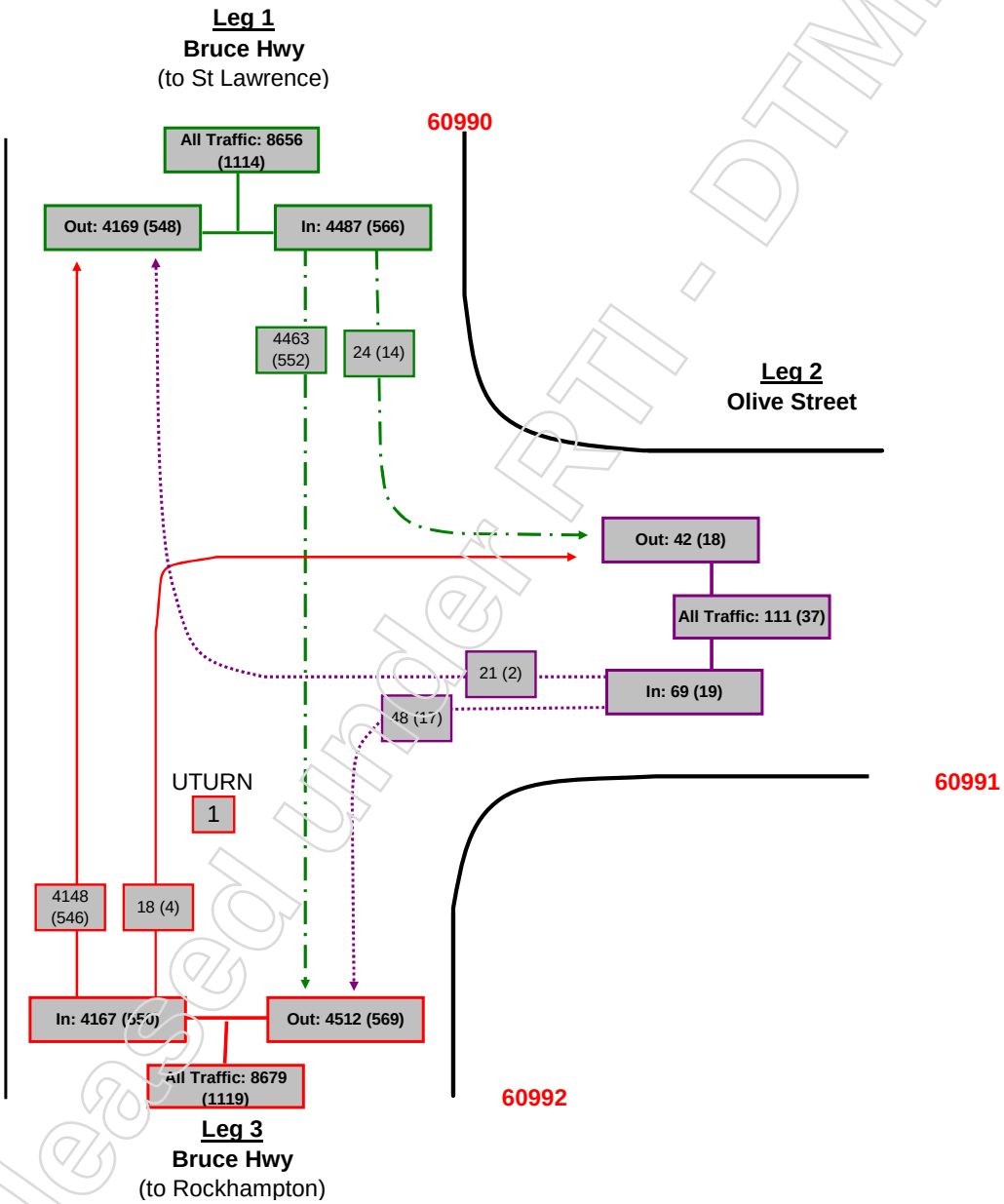
APPENDIX B

2012 TMR Intersection Counts

Released under RTI - DTMR

r_RTI-3295 file1 Release.pdf - Page Number: 275 of 672

LOCATION: Bruce Hwy & Olive Street
ROAD No: 10F (Int. 588 @ Tdist 11.1Km)
DATE: Thu, 15/03/12
TIME: 06:00 - 18:00



Released under RTI - DTMR

Count Tally Sheet With Totals and Peak Flows.

Queensland Government

LOCATION: Bruce Hwy & Olive Street
ROAD No: 10F (Int. 588 @ Tdist 11.1Km)
DATE: Thu, 15/03/12
TIME: 06:00 - 18:00

	Leg 1						Leg 2						Leg 3					
	Left		Thru		U-turn	Leg	Left		Right		U-turn	Leg	Thru		Right		U-turn	Leg
Time	*Light*	*Heavy*	*Light*	*Heavy*	*All*	Total	*Light*	*Heavy*	*Light*	*Heavy*	*All*	Total	*Light*	*Heavy*	*Light*	*Heavy*	*All*	Total
6:00 - 6:15	0	0	60	4		**64**	0	0	0	0		**0**	19	18	1	0	0	**38**
6:15 - 6:30	0	0	73	9		**82**	1	0	0	0		**1**	40	6	0	0	0	**46**
6:30 - 6:45	0	0	91	3		**94**	0	0	0	0		**0**	47	9	0	0	0	**56**
6:45 - 7:00	0	1	81	9		**91**	0	0	1	0		**1**	52	13	0	0	0	**65**
7:00 - 7:15	1	2	125	2		**130**	1	0	0	0		**1**	46	15	1	1	0	**63**
7:15 - 7:30	0	0	155	12		**167**	0	0	1	0		**1**	56	12	0	0	0	**68**
7:30 - 7:45	1	0	175	16		**192**	0	0	1	0		**1**	47	18	0	0	0	**65**
7:45 - 8:00	0	0	190	16		**206**	0	2	0	0		**2**	45	11	0	0	0	**56**
8:00 - 8:15	0	1	228	8		**237**	1	0	0	0		**1**	45	25	0	0	0	**70**
8:15 - 8:30	0	0	165	6		**171**	0	1	0	0		**1**	53	11	0	0	0	**64**
8:30 - 8:45	0	1	127	14		**142**	2	0	3	0		**5**	54	13	0	0	0	**67**
8:45 - 9:00	1	0	81	15		**97**	1	0	1	0		**2**	71	11	0	0	0	**82**
9:00 - 9:15	1	0	82	7		**90**	0	0	0	0		**0**	58	10	1	0	0	**69**
9:15 - 9:30	0	0	74	11		**85**	0	0	0	0		**0**	63	11	0	0	0	**74**
9:30 - 9:45	0	0	76	11		**87**	1	1	0	0		**2**	59	16	2	0	1	**78**
9:45 - 10:00	0	0	60	11		**71**	0	0	0	0		**0**	76	4	0	0	0	**80**
10:00 - 10:15	0	0	66	12		**78**	1	0	0	0		**1**	49	9	1	0	0	**59**
10:15 - 10:30	0	0	44	13		**57**	0	0	1	0		**1**	58	11	0	1	0	**70**
10:30 - 10:45	0	0	72	6		**78**	0	0	0	0		**0**	50	5	0	0	0	**55**
10:45 - 11:00	0	1	50	9		**60**	0	1	0	0		**1**	55	12	0	0	0	**67**
11:00 - 11:15	0	0	45	16		**61**	1	0	0	0		**1**	57	9	0	0	0	**66**
11:15 - 11:30	1	0	65	13		**79**	1	0	0	0		**1**	60	9	1	0	0	**70**
11:30 - 11:45	0	0	42	12		**54**	0	0	2	0		**2**	43	24	0	0	0	**67**
11:45 - 12:00	0	0	59	9		**68**	0	0	0	0		**0**	68	8	0	0	0	**76**

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Data Compiled Date: 19/03/2012
Compiled by: ALH

Count Tally Sheet With Totals and Peak Flows.

Queensland Government

LOCATION: Bruce Hwy & Olive Street
ROAD No: 10F (Int. 588 @ Tdist 11.1Km)
DATE: Thu, 15/03/12
TIME: 06:00 - 18:00

	Leg 1						Leg 2						Leg 3					
	Left		Thru		U-turn	Leg	Left		Right		U-turn	Leg	Thru		Right		U-turn	Leg
Time	*Light*	*Heavy*	*Light*	*Heavy*	*All*	Total	*Light*	*Heavy*	*Light*	*Heavy*	*All*	Total	*Light*	*Heavy*	*Light*	*Heavy*	*All*	Total
12:00 - 12:15	0	0	54	13		**67**	1	0	1	0		**2**	56	13	0	0	0	**69**
12:15 - 12:30	0	0	52	13		**65**	0	1	0	1		**2**	64	4	0	0	0	**68**
12:30 - 12:45	0	1	55	15		**71**	0	0	1	0		**1**	61	7	0	0	0	**68**
12:45 - 13:00	0	0	56	20		**76**	1	0	0	0		**1**	66	12	1	1	0	**80**
13:00 - 13:15	0	0	59	11		**70**	0	0	0	0		**0**	63	14	1	0	0	**78**
13:15 - 13:30	0	0	62	16		**78**	1	0	0	0		**1**	58	11	0	0	0	**69**
13:30 - 13:45	2	0	56	10		**68**	0	0	0	0		**0**	57	10	1	0	0	**68**
13:45 - 14:00	0	0	49	14		**63**	1	0	1	0		**2**	62	11	0	0	0	**73**
14:00 - 14:15	0	1	57	10		**68**	0	2	0	0		**2**	68	15	0	0	0	**83**
14:15 - 14:30	0	1	56	12		**69**	0	1	0	0		**1**	69	15	0	0	0	**84**
14:30 - 14:45	0	1	92	20		**113**	1	1	0	0		**2**	75	12	0	0	0	**87**
14:45 - 15:00	0	1	84	15		**100**	0	1	0	0		**1**	55	11	0	0	0	**66**
15:00 - 15:15	0	0	78	15		**93**	5	1	1	0		**7**	95	11	0	0	0	**106**
15:15 - 15:30	0	1	77	8		**86**	0	0	0	0		**0**	132	9	0	0	0	**141**
15:30 - 15:45	0	1	55	8		**64**	1	1	0	0		**2**	126	13	1	1	0	**141**
15:45 - 16:00	0	1	84	11		**96**	0	1	1	1		**3**	105	12	1	0	0	**118**
16:00 - 16:15	0	0	90	22		**112**	0	0	1	0		**1**	100	11	0	0	0	**111**
16:15 - 16:30	0	0	87	10		**97**	0	0	0	0		**0**	126	5	0	0	0	**131**
16:30 - 16:45	0	0	80	19		**99**	3	0	0	0		**3**	131	15	0	0	0	**146**
16:45 - 17:00	0	0	83	7		**90**	1	0	0	0		**1**	135	9	1	0	0	**145**
17:00 - 17:15	1	0	80	10		**91**	3	3	3	0		**9**	162	14	0	0	0	**176**
17:15 - 17:30	1	0	54	11		**66**	0	0	0	0		**0**	187	6	0	0	0	**193**
17:30 - 17:45	0	0	62	12		**74**	0	0	0	0		**0**	136	6	1	0	0	**143**
17:45 - 18:00	1	0	63	6		**70**	3	0	0	0		**3**	142	10	0	0	0	**152**
Total:	10	14	3911	552	0	**4487**	31	17	19	2	0	**69**	3602	546	14	4	1	**4167**
Peak Count:	3	4	758	62	0	806	7	5	4	1	0	13	627	66	3	1	1	664
Peak Hour:	17:00 to 18:00	14:00 to 15:00	07:30 to 08:30	12:30 to 13:30	06:00 to 07:00	07:30 to 08:30	16:15 to 17:15	14:00 to 15:00	08:00 to 09:00	11:30 to 12:30	06:00 to 07:00	16:15 to 17:15	17:00 to 18:00	07:15 to 08:15	08:45 to 09:45	06:15 to 07:15	08:45 to 09:45	17:00 to 18:00

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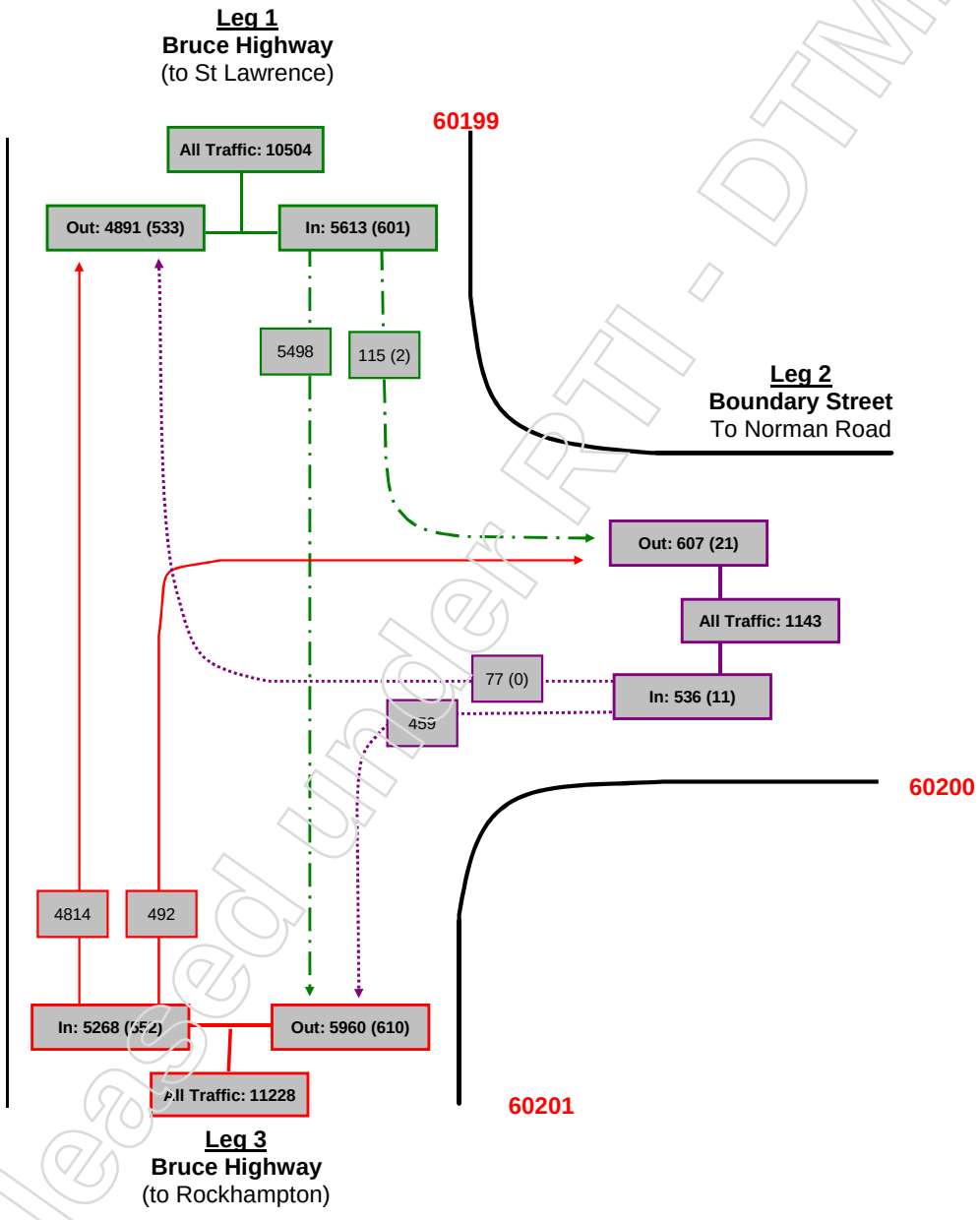
Data Compiled Date: 19/03/2012
Compiled by: ALH

LOCATION: Bruce Hwy & Boundary Street
ROAD No: 10F (Int. 583 @ Tdist 9.489)
DATE: Thu, 08/03/12
TIME: 06:00 - 18:00



Released under RTI - DTMR

Count Tally Sheet With Totals and Peak Flows.

Queensland Government

LOCATION: Bruce Hwy & Boundary Street
ROAD No: 10F (Int. 583 @ Tdist 9.489)
DATE: Thu, 08/03/12
TIME: 06:00 - 18:00

	Leg 1						Leg 2						Leg 3					
	Left		Thru		U-turn	Leg	Left		Right		U-turn	Leg	Thru		Right		U-turn	Leg
Time	*Light*	*Heavy*	*Light*	*Heavy*	*All*	Total	*Light*	*Heavy*	*Light*	*Heavy*	*All*	Total	*Light*	*Heavy*	*Light*	*Heavy*	*All*	Total
6:00 - 6:15	0	0	77	6		**83**	3	0	0	0		**0**	31	10	3	0	0	**3**
6:15 - 6:30	1	0	80	12		**92**	3	0	0	0		**3**	48	6	2	0	0	**56**
6:30 - 6:45	0	0	115	8		**123**	6	0	0	0		**6**	64	9	2	0	0	**75**
6:45 - 7:00	0	0	102	4		**106**	1	0	0	0		**1**	61	14	2	0	0	**77**
7:00 - 7:15	0	0	120	8		**128**	6	0	0	0		**6**	33	17	4	1	0	**55**
7:15 - 7:30	1	0	184	16		**200**	9	0	1	0		**10**	57	12	6	1	0	**76**
7:30 - 7:45	1	0	207	10		**217**	11	0	1	0		**12**	68	8	7	1	0	**84**
7:45 - 8:00	2	0	230	14		**244**	18	1	1	0		**20**	71	11	7	0	0	**89**
8:00 - 8:15	1	0	241	11		**252**	21	0	0	0		**21**	84	18	7	3	0	**112**
8:15 - 8:30	1	0	221	20		**241**	9	1	0	0		**10**	84	16	6	0	0	**106**
8:30 - 8:45	2	0	144	14		**158**	14	0	1	0		**15**	103	19	6	0	0	**128**
8:45 - 9:00	2	0	125	5		**130**	12	0	1	0		**13**	77	26	12	0	0	**115**
9:00 - 9:15	2	0	109	12		**121**	6	0	1	0		**7**	61	19	11	0	1	**92**
9:15 - 9:30	0	0	80	14		**94**	3	0	0	0		**3**	65	12	5	0	0	**82**
9:30 - 9:45	2	0	77	13		**90**	1	0	0	0		**1**	62	9	3	0	0	**74**
9:45 - 10:00	1	0	107	11		**118**	3	0	0	0		**3**	74	8	9	0	0	**91**
10:00 - 10:15	0	0	85	18		**103**	5	0	2	0		**7**	70	15	5	1	0	**91**
10:15 - 10:30	0	0	72	7		**79**	3	0	0	0		**3**	58	8	4	0	0	**70**
10:30 - 10:45	2	0	65	11		**78**	4	0	0	0		**4**	44	14	1	0	0	**59**
10:45 - 11:00	1	0	52	9		**61**	8	0	0	0		**8**	62	13	2	0	0	**77**
11:00 - 11:15	1	0	69	21		**90**	5	0	2	0		**7**	58	11	7	0	1	**77**
11:15 - 11:30	2	0	62	18		**80**	11	0	1	0		**12**	72	13	10	1	0	**96**
11:30 - 11:45	2	0	79	13		**92**	3	2	5	0		**10**	62	12	13	0	0	**87**
11:45 - 12:00	1	0	70	18		**88**	8	1	3	0		**12**	57	9	12	0	0	**78**

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Data Compiled Date: 13/03/2012
Compiled by: ALH

Count Tally Sheet With Totals and Peak Flows.

Queensland Government

LOCATION: Bruce Hwy & Boundary Street
ROAD No: 10F (Int. 583 @ Tdist 9.489)
DATE: Thu, 08/03/12
TIME: 06:00 - 18:00

	Leg 1						Leg 2						Leg 3					
	Left		Thru		U-turn	Leg	Left		Right		U-turn	Leg	Thru		Right		U-turn	Leg
Time	*Light*	*Heavy*	*Light*	*Heavy*	*All*	Total	*Light*	*Heavy*	*Light*	*Heavy*	*All*	Total	*Light*	*Heavy*	*Light*	*Heavy*	*All*	Total
12:00 - 12:15	2	0	79	10		**89**	5	3	0	0		**8**	74	6	10	1	0	**91**
12:15 - 12:30	1	0	73	9		**82**	6	0	2	0		**8**	86	12	14	1	0	**113**
12:30 - 12:45	4	0	59	15		**74**	8	0	1	0		**9**	75	8	7	1	0	**91**
12:45 - 13:00	2	1	71	13		**84**	9	0	2	0		**11**	75	4	14	0	0	**93**
13:00 - 13:15	3	0	70	13		**83**	13	1	1	0		**15**	80	8	16	0	0	**104**
13:15 - 13:30	0	0	77	18		**95**	13	0	0	0		**13**	72	11	9	0	0	**92**
13:30 - 13:45	3	0	81	11		**92**	14	0	0	0		**14**	70	5	4	0	1	**80**
13:45 - 14:00	9	0	88	25		**113**	12	0	0	0		**12**	67	10	4	1	0	**82**
14:00 - 14:15	16	1	91	13		**104**	11	0	1	0		**12**	72	4	12	0	0	**88**
14:15 - 14:30	3	0	75	14		**89**	12	0	1	0		**13**	71	8	6	0	0	**85**
14:30 - 14:45	1	0	106	16		**122**	10	0	5	0		**15**	77	12	10	1	0	**100**
14:45 - 15:00	1	0	90	19		**109**	14	0	2	0		**16**	125	17	7	0	0	**149**
15:00 - 15:15	7	0	136	14		**150**	26	1	3	0		**30**	113	16	13	0	0	**142**
15:15 - 15:30	2	0	91	10		**101**	12	0	4	0		**16**	128	8	18	1	0	**155**
15:30 - 15:45	2	0	100	8		**108**	6	0	4	0		**10**	127	13	11	3	0	**154**
15:45 - 16:00	1	0	85	14		**99**	6	0	3	0		**9**	113	11	17	2	0	**143**
16:00 - 16:15	4	0	105	11		**116**	16	0	5	0		**21**	150	12	19	0	0	**181**
16:15 - 16:30	1	0	93	13		**106**	6	0	0	0		**6**	167	12	16	0	0	**195**
16:30 - 16:45	3	0	79	15		**94**	21	1	7	0		**29**	133	10	22	0	0	**165**
16:45 - 17:00	4	0	96	17		**113**	15	0	7	0		**22**	158	7	18	0	0	**183**
17:00 - 17:15	2	0	94	5		**99**	7	0	2	0		**9**	186	10	18	0	0	**214**
17:15 - 17:30	8	0	109	9		**118**	9	0	1	0		**10**	214	8	28	0	0	**250**
17:30 - 17:45	4	0	87	9		**96**	15	0	4	0		**19**	159	6	22	0	0	**187**
17:45 - 18:00	5	0	91	5		**96**	9	0	3	0		**12**	163	6	12	0	0	**181**
Total:	113	2	4899	599	0	**5613**	448	11	77	0	0	**536**	4281	533	473	19	3	**5268**
Peak Count:	0	0	0	70	0	954	62	6	19	0	0	78	722	80	86	6	3	834
Peak Hour:	#N/A	#N/A	#N/A	11:00 to 12:00	06:00 to 07:00	07:30 to 08:30	07:45 to 08:45	11:15 to 12:15	16:00 to 17:00	06:00 to 07:00	06:00 to 07:00	16:00 to 17:00	17:00 to 18:00	08:15 to 09:15	16:30 to 17:30	15:00 to 16:00	17:15 to 18:15	16:45 to 17:45

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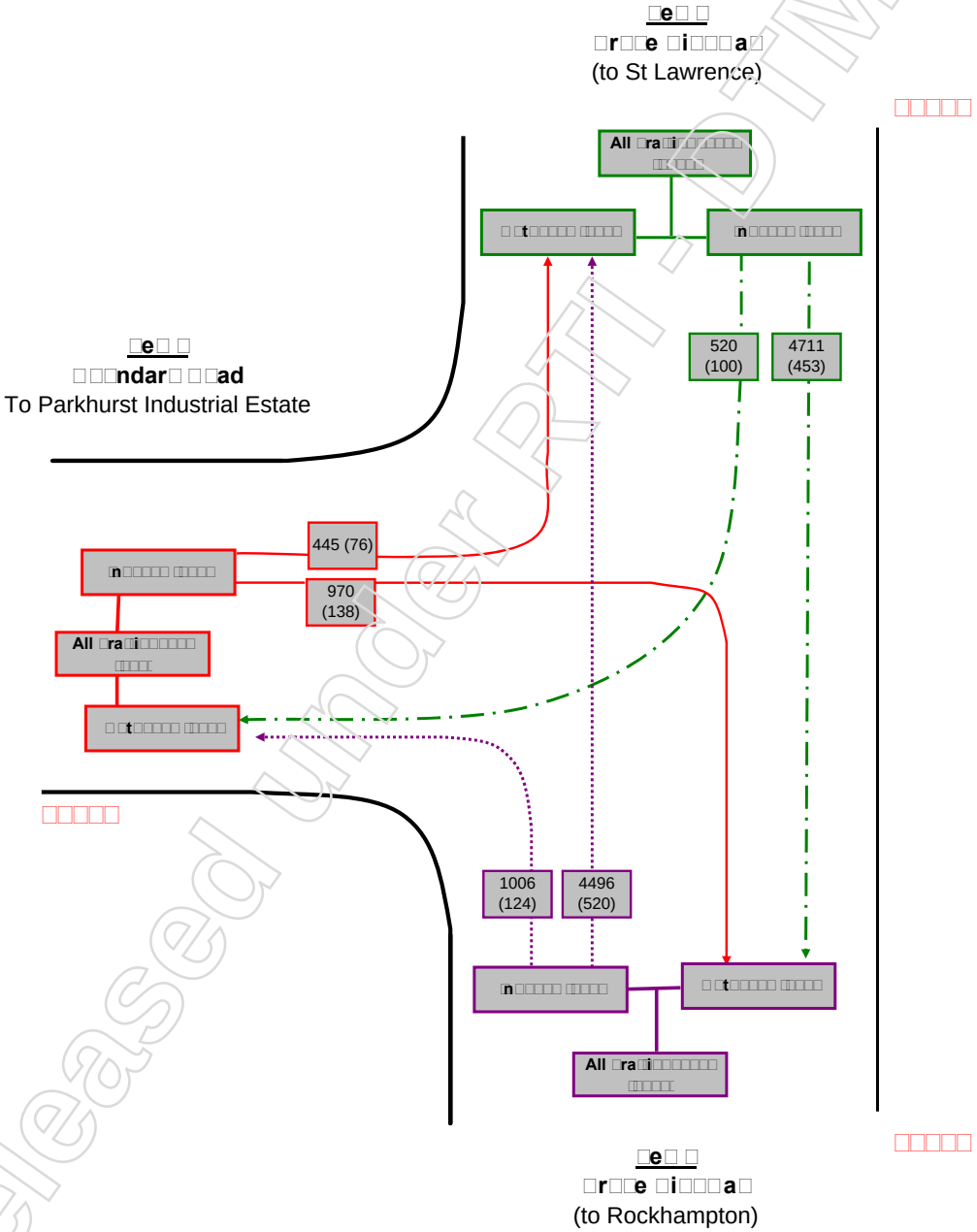
Data Compiled Date: 13/03/2012
Compiled by: ALH

□□ □**A**□□□ □□10F (Rockhampton-St Lawrence) & Boundary Rd
□□**A**□ □□□10F (Int. 582 @ Tdist 9.016km)
□**A**□**E**□Tue, 06/03/12
□□**ME**□06:00 - 18:00



Released under RTI - DTMR

Count Tally Sheet With Totals and Peak Flows.

Queensland Government

□□□**A**□□ □□□10F (Rockhampton-St Lawrence) & Boundary Rd
□□**A**□ □□□10F (Int. 582 @ Tdist 9.016km)
□**A**□**E**□Tue, 06/03/12
□□**ME**□06:00 - 18:00

	□e□ □						□e□ □						□e□ □					
	□□r□		□i□□t		U□t□rn	□e□	□e□t		□□r□		U□t□rn	□e□	□e□t		□i□□t		U□t□rn	□e□
□i□e	*Light*	*Heavy*	*Light*	*Heavy*	*All*	□□tal	*Light*	*Heavy*	*Light*	*Heavy*	*All*	□□tal	*Light*	*Heavy*	*Light*	*Heavy*	*All*	□□tal
6:00 - 6:15	78	4	6	2		□□	26	2	40	5		□□	4	0	7	4		□□
6:15 - 6:30	57	13	17	0		□□	39	1	54	8		□□□	7	4	5	6		□□
6:30 - 6:45	82	8	36	3		□□□	77	1	80	14		□□□	5	5	5	8		□□
6:45 - 7:00	95	5	26	2		□□□	43	4	46	23		□□□	3	0	5	2		□□
7:00 - 7:15	121	12	34	3		□□□	36	0	53	11		□□□	6	6	14	4		□□
7:15 - 7:30	201	9	24	1		□□□	56	0	67	10		□□□	1	0	7	0		□
7:30 - 7:45	218	16	21	4		□□□	45	5	71	12		□□□	0	1	14	1		□□
7:45 - 8:00	211	9	10	0		□□□	49	1	58	13		□□□	4	0	12	5		□□
8:00 - 8:15	241	12	15	1		□□□	43	2	72	20		□□□	10	2	7	1		□□
8:15 - 8:30	210	5	15	4		□□□	22	0	89	9		□□□	3	0	7	5		□□
8:30 - 8:45	142	11	14	6		□□□	21	3	91	11		□□□	3	2	10	2		□□
8:45 - 9:00	147	10	10	1		□□□	17	2	87	15		□□□	5	5	6	3		□□
9:00 - 9:15	101	12	10	1		□□□	8	1	71	13		□□	5	2	12	2		□□
9:15 - 9:30	70	11	4	2		□□	9	2	72	11		□□	3	0	4	1		□
9:30 - 9:45	65	9	8	2		□□	14	5	62	10		□□	8	1	6	3		□□
9:45 - 10:00	55	15	6	1		□□	10	1	59	12		□□	6	2	9	4		□□
10:00 - 10:15	68	6	8	1		□□	13	4	56	10		□□	5	0	12	1		□□
10:15 - 10:30	56	18	5	2		□□	12	7	66	18		□□□	5	2	13	1		□□
10:30 - 10:45	50	5	4	4		□□	9	3	64	9		□□	6	3	11	3		□□
10:45 - 11:00	64	8	7	2		□□	8	3	41	13		□□	3	1	14	4		□□
11:00 - 11:15	45	9	2	3		□□	10	3	64	14		□□	2	1	8	4		□□
11:15 - 11:30	60	10	5	0		□□	11	4	69	13		□□	2	2	12	3		□□
11:30 - 11:45	69	8	2	2		□□	10	3	66	9		□□	7	5	4	8		□□
11:45 - 12:00	57	9	11	6		□□	11	2	62	15		□□	10	2	8	1		□□

Released under RTI DTMR

Data Compiled Date: 12/03/12
Compiled by: ALH

Count Tally Sheet With Totals and Peak Flows.

Queensland Government

□□□**A**□□□ □□10F (Rockhampton-St Lawrence) & Boundary Rd
□□**A**□ □□□10F (Int. 582 @ Tdist 9.016km)
□**A**□**E**□Tue, 06/03/12
□□**ME**□06:00 - 18:00

	□e□ □						□e□ □						□e□ □					
	□□r□		□i□□t		U□t□rn	□e□	□e□t		□□r□		U□t□rn	□e□	□e□t		□i□□t		U□t□rn	□e□
□i□e	*Light*	*Heavy*	*Light*	*Heavy*	*All*	□□tal	*Light*	*Heavy*	*Light*	*Heavy*	*All*	□□tal	*Light*	*Heavy*	*Light*	*Heavy*	*All*	□□tal
12:00 - 12:15	43	16	2	3		□□	7	5	71	15		□□	9	0	19	1		□□
12:15 - 12:30	56	11	6	1		□□	20	2	65	9		□□	4	0	11	2		□□
12:30 - 12:45	53	13	3	0		□□	16	4	68	9		□□	4	0	12	3		□□
12:45 - 13:00	42	13	2	1		□□	7	2	47	13		□□	0	0	14	4		□□
13:00 - 13:15	67	11	5	1		□□	15	2	52	12		□□	6	1	9	4		□□
13:15 - 13:30	52	15	5	3		□□	7	4	61	8		□□	3	0	6	3		□□
13:30 - 13:45	64	7	4	3		□□	15	4	78	13		□□□	4	2	9	3		□□
13:45 - 14:00	59	7	2	2		□□	17	1	62	6		□□	3	1	13	5		□□
14:00 - 14:15	76	8	2	0		□□	14	4	62	10		□□	3	0	10	6		□□
14:15 - 14:30	85	15	4	4		□□□	9	1	79	9		□□	7	0	11	4		□□
14:30 - 14:45	92	12	9	3		□□□	12	4	79	8		□□□	7	1	21	6		□□
14:45 - 15:00	66	10	5	3		□□	9	5	81	10		□□□	11	7	18	1		□□
15:00 - 15:15	125	8	9	0		□□□	11	5	115	14		□□□	13	2	33	2		□□
15:15 - 15:30	80	8	7	5		□□□	19	1	144	6		□□□	7	2	33	2		□□
15:30 - 15:45	52	5	4	2		□□	20	2	116	13		□□□	4	0	33	2		□□
15:45 - 16:00	67	6	7	0		□□	12	3	123	12		□□□	25	2	62	2		□□
16:00 - 16:15	102	4	7	3		□□□	8	3	121	4		□□□	13	1	66	2		□□
16:15 - 16:30	87	7	7	2		□□□	9	4	130	5		□□□	18	1	28	2		□□
16:30 - 16:45	72	11	3	3		□□	12	1	131	9		□□□	17	2	48	3		□□
16:45 - 17:00	69	7	7	4		□□	7	2	143	6		□□□	18	2	33	1		□□
17:00 - 17:15	96	7	9	3		□□□	9	0	168	8		□□□	30	4	53	3		□□
17:15 - 17:30	51	4	3	0		□□	9	1	147	8		□□□	22	0	15	0		□□
17:30 - 17:45	61	8	5	1		□□	15	3	146	7		□□□	14	0	32	1		□□
17:45 - 18:00	78	6	3	0		□□	4	2	127	8		□□□	14	2	31	0		□□
Total:	4258	453	420	100	0	□□□□	882	124	3976	520	0	□□□□	369	76	832	138	0	□□□□
Peak Count:	880	53	120	12	0	993	212	17	604	58	0	679	87	15	204	21	0	292
Peak Hour:	07:30 to 08:30	12:00 to 13:00	06:30 to 07:30	08:00 to 09:00	06:00 to 07:00	07:15 to 08:15	06:30 to 07:30	09:30 to 10:30	16:45 to 17:45	06:30 to 07:30	06:00 to 07:00	16:45 to 17:45	16:30 to 17:30	06:15 to 07:15	15:45 to 16:45	13:45 to 14:45	06:00 to 07:00	15:45 to 16:45

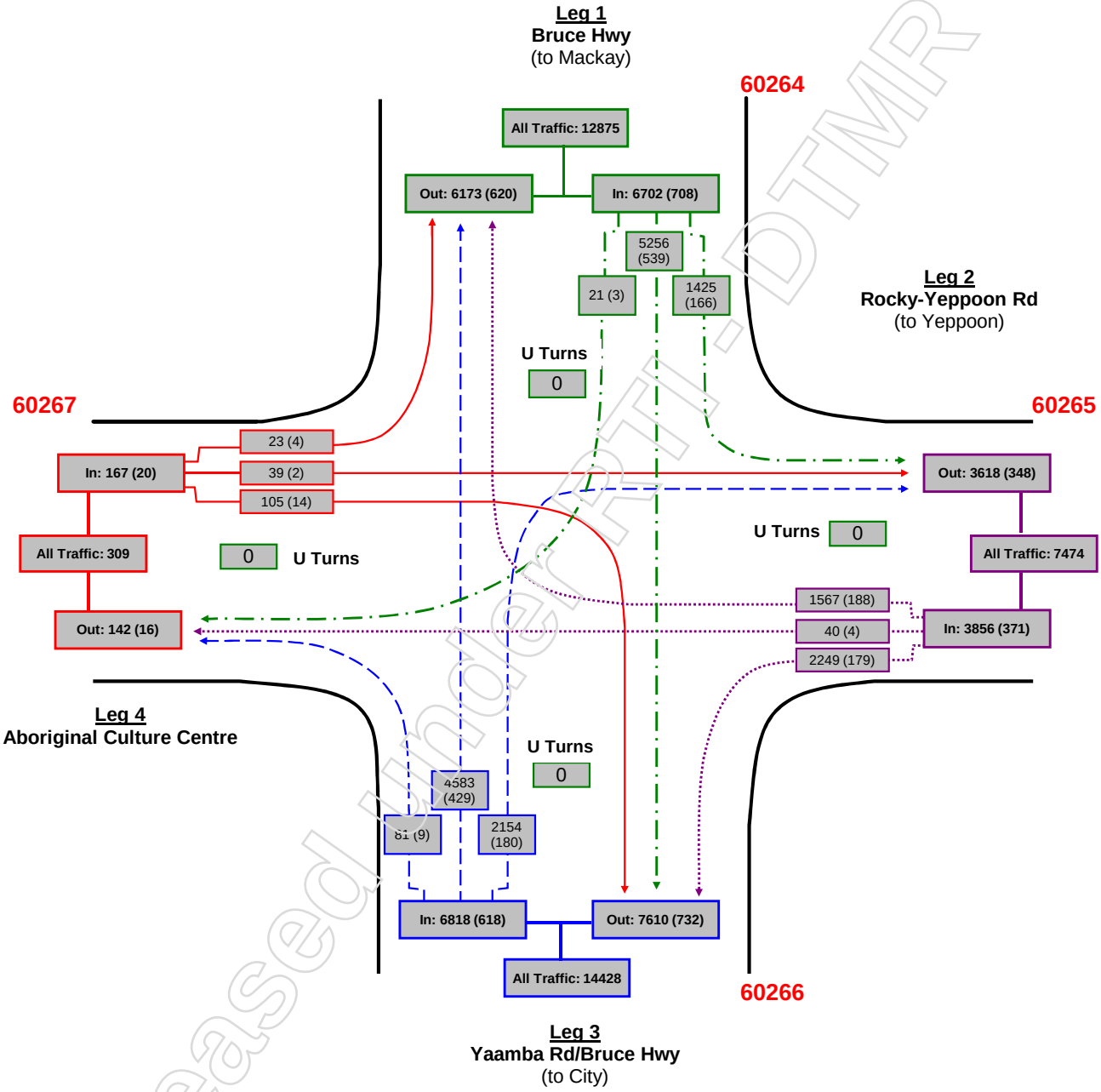
Released under RTI-DTMR

Data Compiled Date: 12/03/12
Compiled by: ALH

Count Tally Sheet

LOCATION: Intersection Of Bruce Hwy & Rton-Yeppoon Rd
ROAD No: 10F (Int 827 @ Tdist 8.550km)
DATE: Thu, 02/08/12
TIME: 06:00 - 18:00

Queensland Government



Released Under RTI - DTMR

Data Collection Date:
Compiled by:

Count Tally Sheet

Intersectiomn of bruce Hwy Rton-Yeppoon Rd

10F Int 827 @ 8.550km

	Leg 1								Leg 2								Leg 3								Leg 4							
	Left		Thru		Right		U-turn	Leg Total	Left		Thru		Right		U-turn	Leg Total	Left		Thru		Right		U-turn	Leg Total	Left		Thru		Right		U-turn	Leg Total
	2	2H	3	3H	4	4H			3	3H	4	4H	1	1H			4	4H	1	1H	2	2H			1	1H	2	2H	3	3H		
Time	*Light*	*Heavy*	*Light*	*Heavy*	*Light*	*Heavy*	*All*		*Light*	*Heavy*	*Light*	*Heavy*	*Light*	*Heavy*	*All*		*Light*	*Heavy*	*Light*	*Heavy*	*Light*	*Heavy*	*All*		*Light*	*Heavy*	*Light*	*Heavy*	*Light*	*Heavy*	*All*	
6:00 - 6:15	12	3	52	8	0	0		**75**	47	1	1	0	25	2		**76**	9	0	21	9	13	2		**54**	0	0	14	1	3	1		**19**
6:15 - 6:30	12	3	72	8	0	0		**95**	43	2	0	0	33	2		**80**	0	0	36	6	23	1		**66**	1	1	0	0	0	0		**2**
6:30 - 6:45	14	3	73	8	0	0		**98**	56	1	2	0	55	3		**117**	4	0	60	6	11	10		**91**	0	0	0	0	1	0		**1**
6:45 - 7:00	14	4	87	12	0	0		**117**	56	3	1	0	91	3		**154**	1	0	66	10	12	3		**92**	0	0	0	0	2	0		**2**
7:00 - 7:15	9	5	83	4	0	0		**101**	58	3	2	0	44	7		**114**	0	0	48	9	13	6		**76**	3	0	2	0	6	0		**11**
7:15 - 7:30	17	5	124	5	0	0		**151**	78	3	2	0	55	2		**140**	2	0	62	6	9	3		**82**	0	0	0	0	3	0		**3**
7:30 - 7:45	24	3	157	9	1	0		**194**	88	6	3	0	40	4		**141**	1	1	64	3	23	4		**96**	0	0	0	0	2	1		**3**
7:45 - 8:00	36	3	208	17	0	0		**264**	107	1	1	0	55	2		**166**	1	0	74	5	17	7		**104**	1	0	1	0	1	0		**3**
8:00 - 8:15	40	7	210	16	1	0		**274**	112	4	1	0	32	1		**150**	1	0	64	12	35	5		**117**	0	0	2	0	5	0		**7**
8:15 - 8:30	46	3	212	5	0	0		**266**	104	2	0	0	35	4		**145**	0	0	76	8	34	7		**125**	0	0	0	0	5	1		**6**
8:30 - 8:45	15	3	162	5	0	0		**185**	79	2	0	1	32	5		**119**	2	0	83	4	34	5		**128**	0	0	0	0	2	0		**2**
8:45 - 9:00	18	4	134	6	2	0		**164**	73	4	0	0	35	9		**121**	1	0	75	12	42	4		**134**	1	1	2	0	1	0		**5**
9:00 - 9:15	19	2	98	18	0	0		**137**	46	4	0	0	26	2		**78**	0	1	93	6	37	8		**135**	1	0	0	0	2	0		**3**
9:15 - 9:30	20	2	99	9	1	0		**131**	37	5	2	0	23	6		**73**	2	0	70	5	42	5		**124**	0	1	2	0	1	0		**4**
9:30 - 9:45	26	4	85	12	0	0		**127**	57	7	6	0	22	2		**94**	1	0	84	9	26	5		**125**	0	0	1	0	2	0		**3**
9:45 - 10:00	12	2	89	8	1	0		**112**	42	4	0	0	19	6		**71**	2	0	59	10	25	5		**101**	0	0	1	0	2	0		**3**
10:00 - 10:15	14	2	77	12	0	1		**106**	45	3	0	0	22	3		**73**	1	0	62	10	32	5		**110**	1	0	0	0	1	0		**2**
10:15 - 10:30	9	5	76	9	1	0		**100**	25	6	0	0	22	2		**55**	1	0	57	8	29	3		**98**	0	0	0	0	1	3		**4**
10:30 - 10:45	15	2	97	6	0	0		**120**	32	3	0	0	15	5		**55**	2	0	78	9	32	1		**122**	1	0	1	0	1	0		**3**
10:45 - 11:00	22	4	66	11	0	0		**103**	32	4	0	0	17	4		**57**	2	0	61	11	29	4		**107**	1	0	0	0	2	0		**3**
11:00 - 11:15	7	1	75	12	0	0		**95**	32	3	1	0	18	2		**56**	2	0	69	9	27	2		**109**	0	0	1	0	4	0		**5**
11:15 - 11:30	17	2	71	10	0	0		**100**	35	4	1	0	20	5		**65**	1	0	61	10	23	6		**101**	0	0	0	0	1	0		**1**
11:30 - 11:45	11	6	67	6	1	0		**91**	32	1	0	0	12	3		**48**	1	1	86	6	24	4		**122**	0	0	0	0	1	0		**1**
11:45 - 12:00	15	6	83	12	1	0		**117**	38	5	1	0	13	3		**60**	1	0	72	10	33	3		**119**	0	0	0	0	0	0		**0**

Released under RTI

Compilation Date:29/08/12

Compiled by: KRA

Count Tally Sheet

Intersectiomn of bruce Hwy Rton-Yeppoon Rd

10F Int 827 @ 8.550km

	Leg 1								Leg 2								Leg 3								Leg 4							
	Left		Thru		Right		U-turn	Leg Total	Left		Thru		Right		U-turn	Leg Total	Left		Thru		Right		U-turn	Leg Total	Left		Thru		Right		U-turn	Leg Total
	2	2H	3	3H	4	4H			3	3H	4	4H	1	1H			4	4H	1	1H	2	2H			1	1H	2	2H	3	3H		
Time	*Light*	*Heavy*	*Light*	*Heavy*	*Light*	*Heavy*	*All*		*Light*	*Heavy*	*Light*	*Heavy*	*Light*	*Heavy*	*All*		*Light*	*Heavy*	*Light*	*Heavy*	*Light*	*Heavy*	*All*		*Light*	*Heavy*	*Light*	*Heavy*	*Light*	*Heavy*	*All*	
12:00 - 12:15	19	5	72	14	0	0		**110**	29	3	0	0	20	4		**56**	1	0	72	16	40	3		**132**	0	0	0	0	4	0		**4**
12:15 - 12:30	18	3	67	9	0	0		**97**	31	5	2	0	21	3		**62**	1	0	86	8	21	4		**120**	1	0	0	0	0	1		**2**
12:30 - 12:45	24	3	89	11	0	0		**127**	20	6	1	0	26	3		**56**	1	0	71	13	25	2		**112**	0	0	0	0	3	0		**3**
12:45 - 13:00	16	6	89	17	1	2		**131**	29	4	0	0	20	5		**58**	1	1	87	7	34	1		**131**	0	0	0	0	5	0		**5**
13:00 - 13:15	14	8	86	17	0	0		**125**	36	7	0	0	11	5		**59**	1	0	101	11	34	9		**156**	1	0	0	0	1	1		**3**
13:15 - 13:30	17	6	76	11	0	0		**110**	28	6	0	1	16	2		**53**	1	0	75	14	32	2		**124**	0	0	1	0	1	1		**3**
13:30 - 13:45	17	4	69	15	0	0		**105**	20	2	0	0	11	4		**37**	1	0	91	10	38	4		**144**	0	0	1	0	1	0		**2**
13:45 - 14:00	19	5	74	7	0	0		**105**	22	3	0	0	15	6		**46**	3	1	79	11	32	1		**127**	0	0	0	0	4	1		**5**
14:00 - 14:15	21	3	80	10	1	0		**115**	27	4	2	0	13	3		**49**	0	0	82	7	37	5		**131**	0	0	1	0	1	0		**2**
14:15 - 14:30	25	3	79	18	0	0		**125**	28	2	0	0	28	4		**62**	2	1	78	4	28	6		**119**	0	0	0	0	1	0		**1**
14:30 - 14:45	36	3	82	15	0	0		**136**	40	4	0	0	23	5		**72**	2	1	91	15	49	3		**161**	0	0	1	1	1	1		**4**
14:45 - 15:00	18	5	105	12	0	0		**140**	33	4	0	0	36	5		**78**	1	0	110	7	36	2		**176**	2	0	0	0	2	1		**5**
15:00 - 15:15	45	1	124	18	0	0		**188**	38	6	1	0	38	14		**97**	1	0	114	11	45	2		**173**	0	0	0	0	4	0		**4**
15:15 - 15:30	30	5	106	20	0	0		**161**	37	4	1	0	30	4		**76**	2	0	102	11	64	5		**184**	2	0	0	0	1	1		**4**
15:30 - 15:45	53	5	107	18	2	0		**185**	34	12	0	0	30	10		**86**	4	0	125	17	59	6		**211**	0	0	0	0	2	1		**3**
15:45 - 16:00	29	6	98	15	0	0		**148**	39	3	0	0	27	4		**73**	1	1	120	8	74	1		**205**	0	0	1	0	3	0		**4**
16:00 - 16:15	71	6	103	15	2	0		**197**	38	5	0	0	19	6		**68**	1	0	125	9	72	5		**212**	0	0	1	0	3	0		**4**
16:15 - 16:30	38	3	94	5	1	0		**141**	35	6	0	0	32	3		**76**	2	1	115	9	88	0		**215**	2	1	1	0	0	0		**4**
16:30 - 16:45	62	0	101	16	0	0		**179**	29	2	1	0	27	0		**59**	1	0	130	11	66	4		**212**	1	0	0	0	1	0		**2**
16:45 - 17:00	52	1	84	15	1	0		**153**	26	1	0	0	37	3		**67**	1	0	130	14	90	3		**238**	0	0	0	0	1	0		**1**
17:00 - 17:15	59	0	96	7	1	0		**163**	19	3	1	0	22	1		**46**	0	0	152	4	104	1		**261**	0	0	0	0	0	0		**0**
17:15 - 17:30	39	0	91	8	0	0		**138**	35	4	1	1	44	4		**89**	1	0	156	7	117	0		**281**	0	0	1	0	0	0		**1**
17:30 - 17:45	49	0	95	6	0	0		**150**	25	1	1	0	33	1		**61**	5	0	154	6	73	2		**240**	0	0	1	0	1	0		**2**
17:45 - 18:00	44	1	93	12	0	0		**150**	18	1	1	1	39	2		**62**	0	0	137	6	71	1		**215**	0	0	1	0	2	0		**3**
Total:	1259	166	4717	539	18	3	0	**6702**	2070	179	36	4	1379	188	0	**3856**	72	9	4154	429	1974	180	0	**6818**	19	4	37	2	91	14	0	**167**
Peak Count:	233		835		5		0	998	424		8		260		0	602	14		623		390		0	1020	5		15		15		0	24
Peak Hour:	16:00 to 17:00		07:45 to 08:45		15:30 to 16:30		06:00 to 07:00	07:30 to 08:30	07:30 to 08:30		06:45 to 07:45		06:30 to 07:30		06:00 to 07:00	07:30 to 08:30	06:00 to 07:00		16:45 to 17:45		16:45 to 17:45		06:00 to 07:00	16:45 to 17:45	06:15 to 07:15		06:00 to 07:00		07:30 to 08:30		06:00 to 07:00	06:00 to 07:00

Released under RTI

Compilation Date:29/08/12

Compiled by: KRA



APPENDIX C

Background Traffic Network Volumes

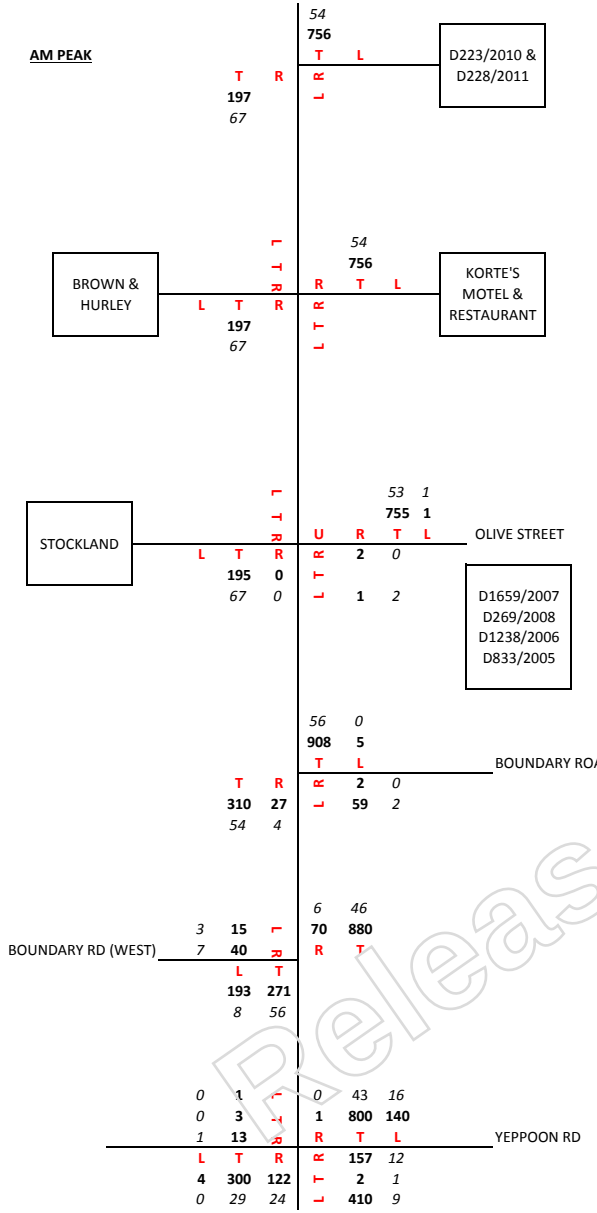
Released under RTI - DTMR

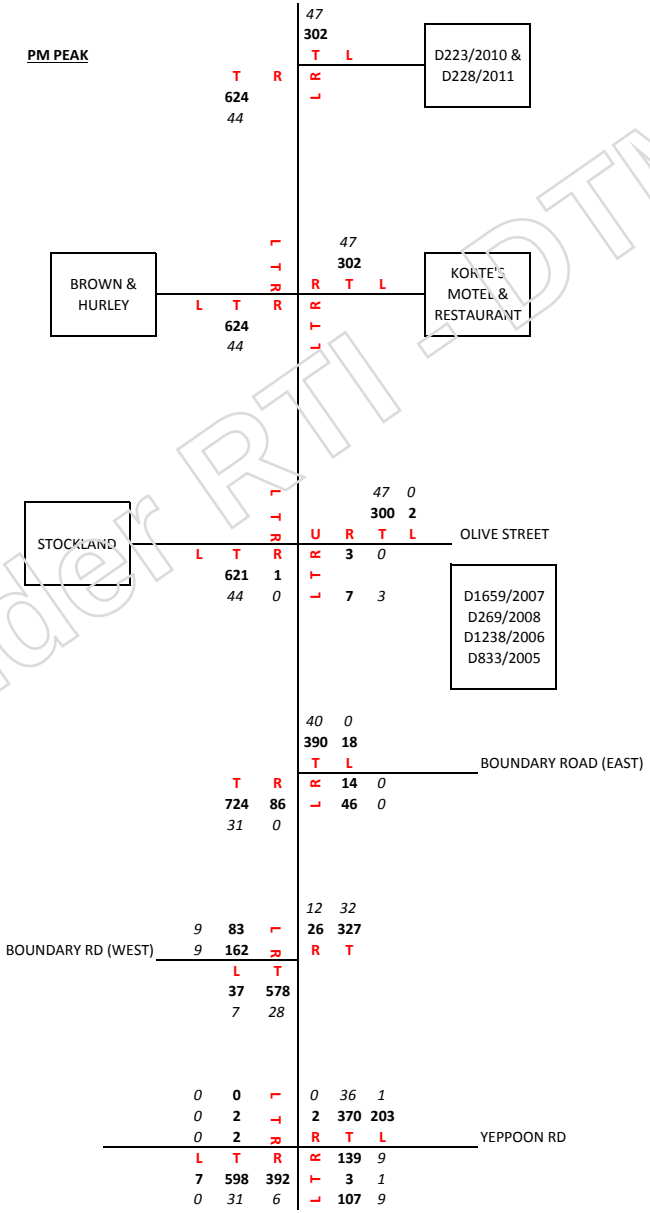
r_RTI-3295 file1 Release.pdf - Page Number: 288 of 672

STO0111-01R - Stockland North Parkhurst

Background Road Network Volumes

Design Year - 2013



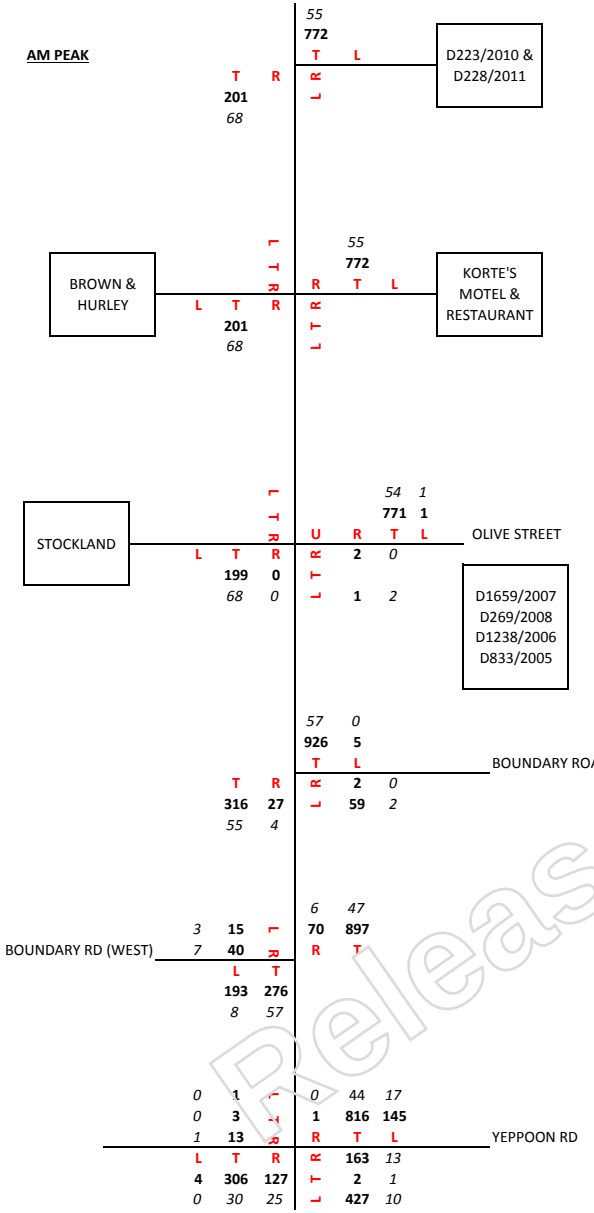


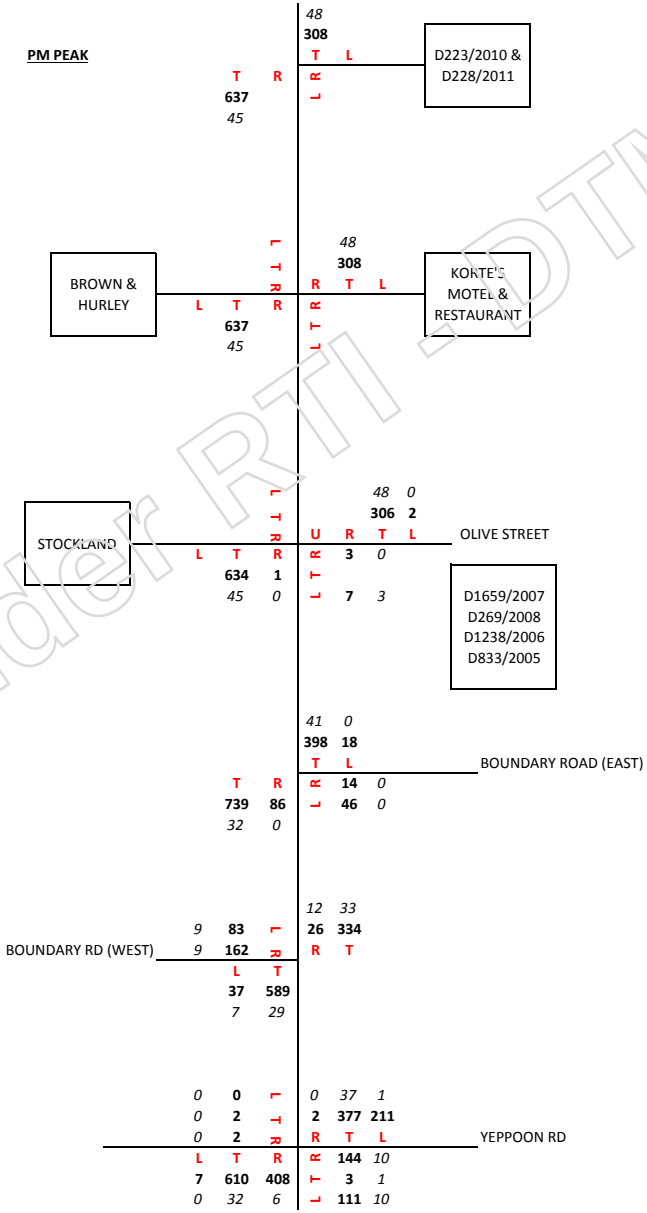
Released under RTI - DTMR

STO0111-01R - Stockland North Parkhurst

Background Road Network Volumes

Design Year - 2015



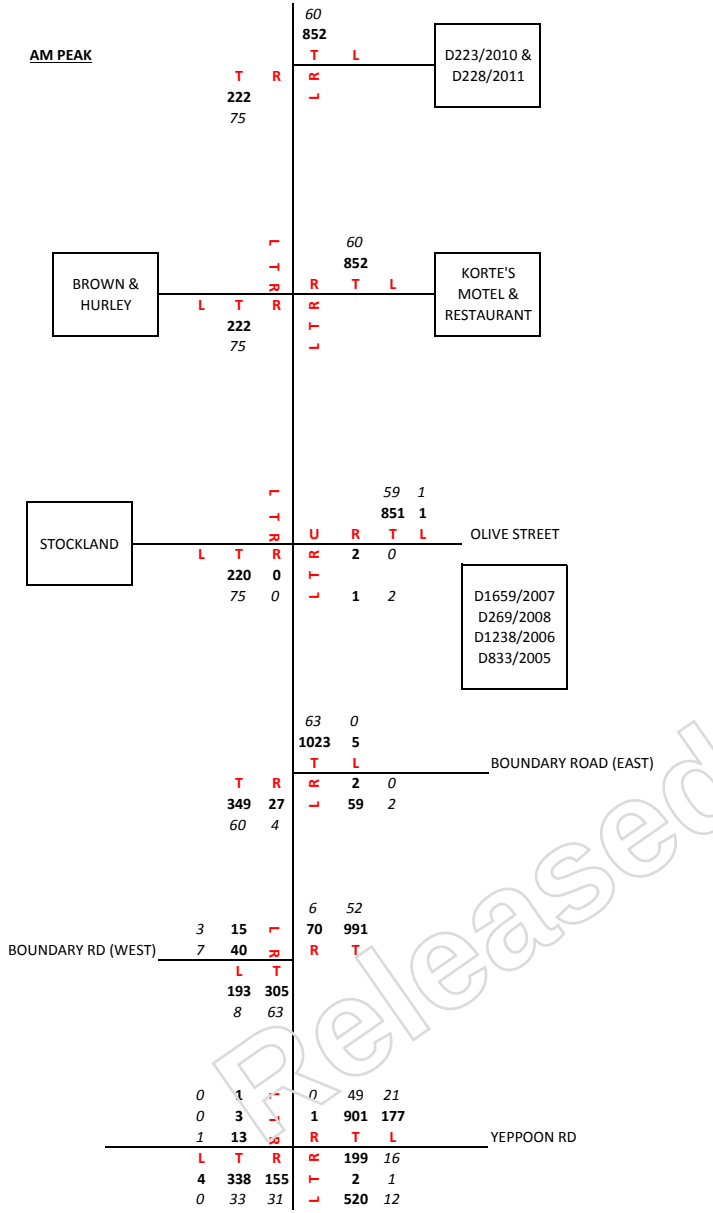


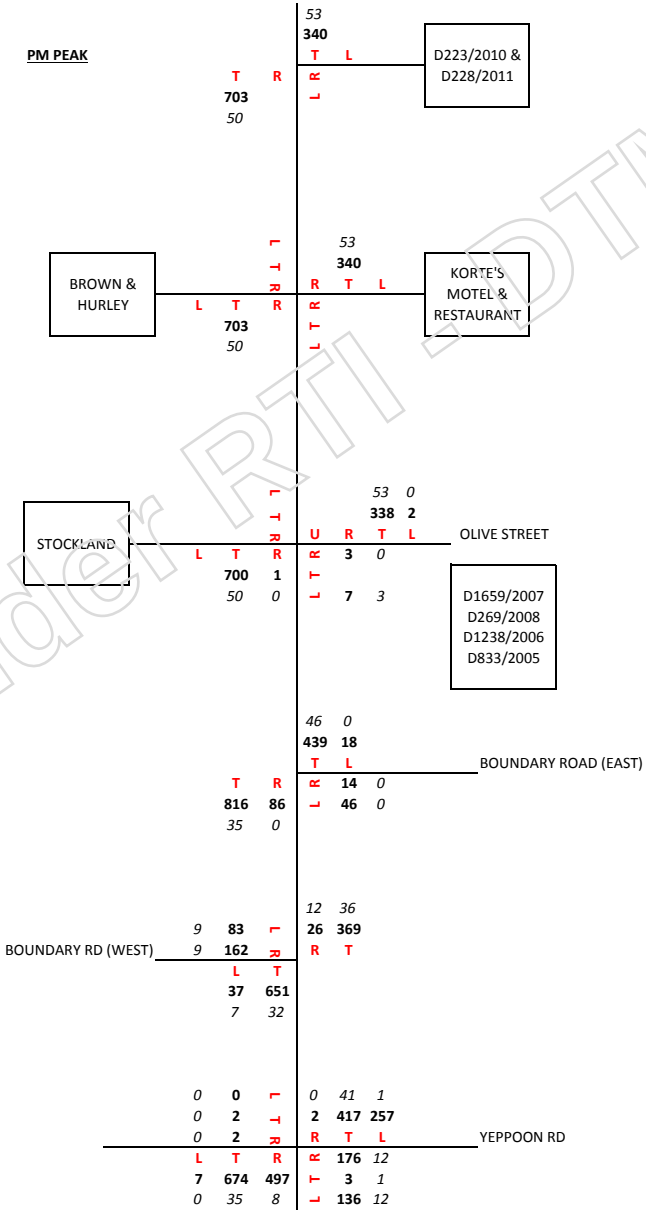
Released under RTI - DTMR

STO0111-01R - Stockland North Parkhurst

Background Road Network Volumes

Design Year - 2025





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APPENDIX D

Approved Development Calculations and Associated Bruce Highway Network Volumes

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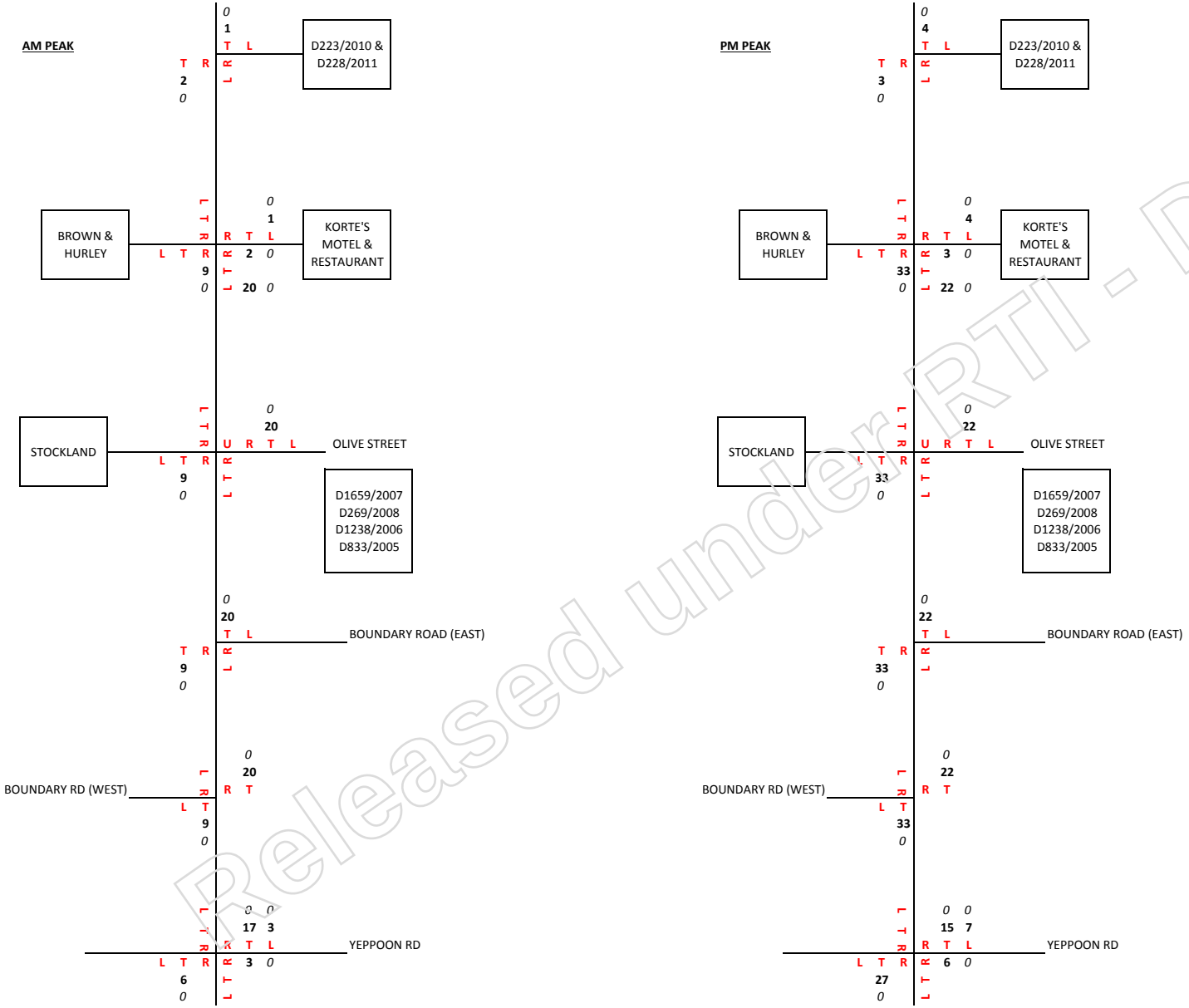
Road Network Volumes

Korte's Motel & Restaurant



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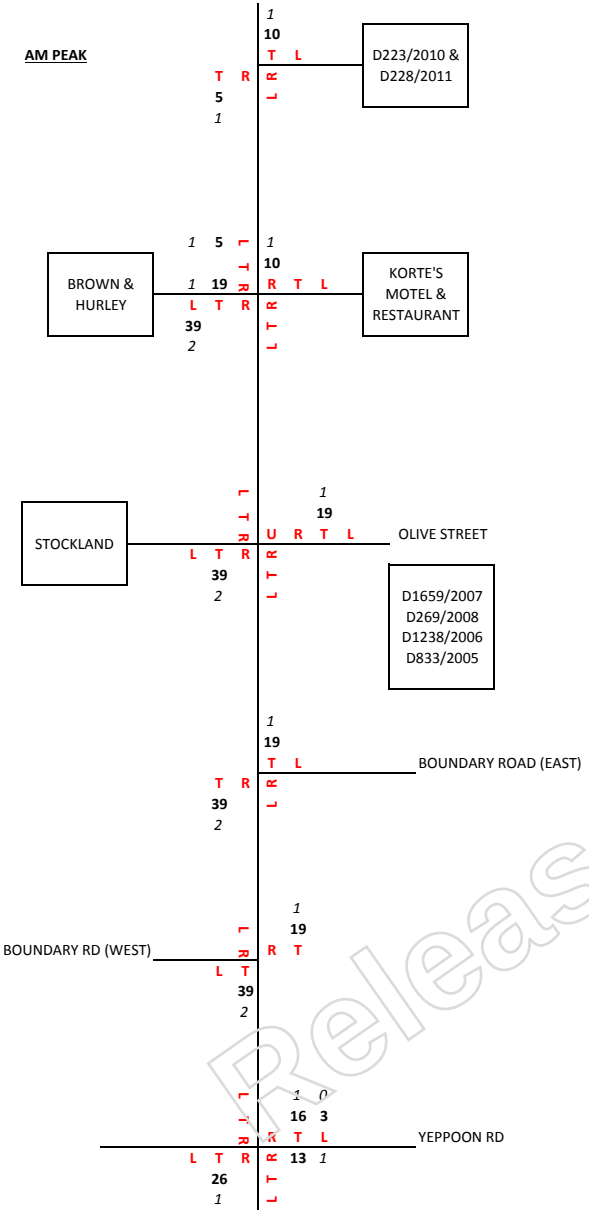
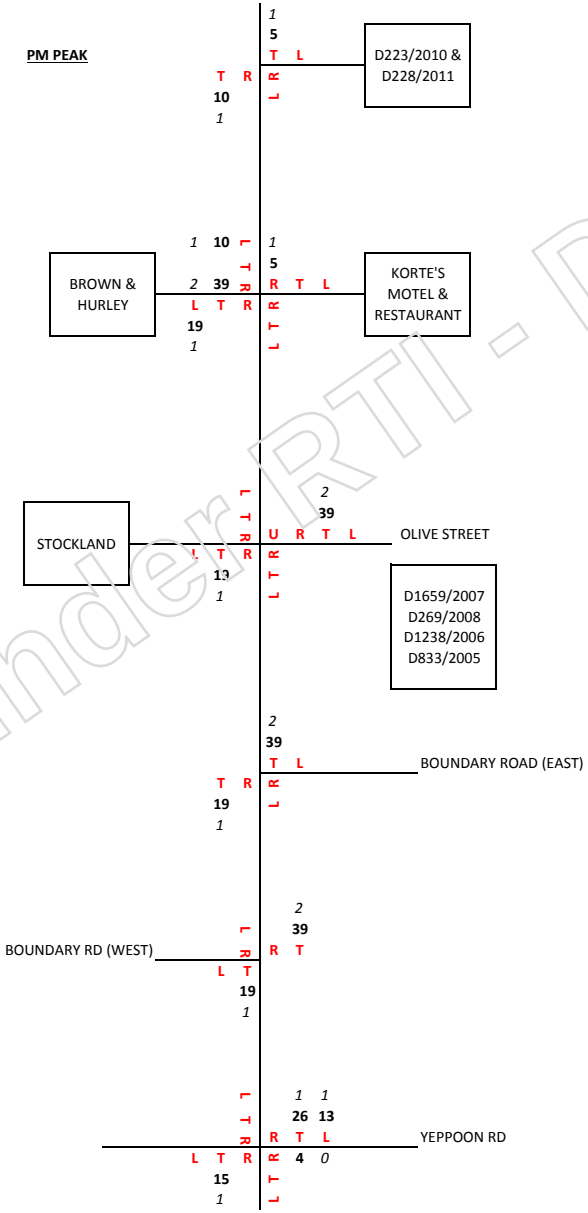
Road Network Volumes

Brown & Hurley Approved Development





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Background Road Network Calculations - 2025

Approved Eastern Development Parcels

D223/2010 & D228/2011 (TMR j)

Yield	=	72	lots	
Gen Rate	=	0.85	trips/lot (peak)	
Gen Traffic Volume	=	61	trips	
AM PEAK				
% Trips IN	=	30%		
Vol Trips IN	=	18	trips	
% Trips from S	=	90%		
Vol Trips from S	=	17	trips	
% Trips from S via Stirling	=	100%		
Vol Trips from S via Stirling	=	**17**	trips	A
% Trips from N	=	10%		
Vol Trips from N	=	2	trips	
% Trips from N via Stirling	=	100%		
Vol Trips from N via Stirling	=	**2**	trips	B
% Trips OUT	=	70%		
Vol Trips OUT	=	43	trips	
% Trips to S	=	90%		
Vol Trips to S	=	39	trips	
% Trips to S via Stirling	=	100%		
Vol Trips to S via Stirling	=	**39**	trips	C
% Trips to N	=	10%		
Vol Trips to N	=	4	trips	
% Trips to N via Stirling	=	0%		
Vol Trips to N via Stirling	=	**0**	trips	D
% Trips to N via Angela Rd	=	100%		
Vol Trips to N via Angela Rd	=	**4**	trips	E
PM PEAK				
% Trips IN	=	60%		
Vol Trips IN	=	37	trips	
% Trips from S	=	90%		
Vol Trips from S	=	33	trips	
% Trips from S via Stirling	=	100%		
Vol Trips from S via Stirling	=	**33**	trips	F
% Trips from N	=	10%		
Vol Trips from N	=	4	trips	
% Trips from N via Stirling	=	100%		
Vol Trips from N via Stirling	=	**4**	trips	G
% Trips OUT	=	40%		
Vol Trips OUT	=	24	trips	
% Trips to S	=	90%		
Vol Trips to S	=	22	trips	
% Trips to S via Stirling	=	100%		
Vol Trips to S via Stirling	=	**22**	trips	H
% Trips to N	=	10%		
Vol Trips to N	=	2	trips	
% Trips to N via Stirling	=	0%		
Vol Trips to N via Stirling	=	**0**	trips	I
% Trips to N via Angela Rd	=	100%		
Vol Trips to N via Angela Rd	=	**2**	trips	J

D1659/2007 & D269/2008 (TMR f)

Yield	=	114	lots	
Gen Rate	=	0.85	trips/lot (peak)	
Gen Traffic Volume	=	97	trips	
AM PEAK				
% Trips IN	=	30%		
Vol Trips IN	=	29	trips	
% Trips from S	=	90%		
Vol Trips from S	=	26	trips	
% Trips from S via Olive St	=	100%		
Vol Trips from S via Olive St	=	**26**	trips	K
% Trips from S via Yeppoon Rd	=	0%		
Vol Trips from S via Yeppoon Rd	=	**0**	trips	L
% Trips from S via Norman	=	0%		
Vol Trips from S via Norman	=	**0**	trips	M
% Trips from S via R-Y Rd	=	0%		
Vol Trips from S via R-Y Rd	=	**0**	trips	N
% Trips from N	=	10%		
Vol Trips from N	=	3	trips	
% Trips from N via Olive St	=	100%		
Vol Trips from N via Olive St	=	**3**	trips	O
% Trips OUT	=	70%		
Vol Trips OUT	=	68	trips	
% Trips to S	=	90%		
Vol Trips to S	=	61	trips	
% Trips to S via Olive St	=	100%		
Vol Trips to S via Olive St	=	**61**	trips	P
% Trips to S via Yeppoon Rd	=	0%		
Vol Trips to S via Yeppoon Rd	=	**0**	trips	Q
% Trips to S via Norman	=	0%		
Vol Trips to S via Norman	=	**0**	trips	R
% Trips to S via R-Y Rd	=	0%		
Vol Trips to S via R-Y Rd	=	**0**	trips	S
% Trips to N	=	10%		
Vol Trips to N	=	7	trips	
% Trips to N via Olive St	=	100%		
Vol Trips to N via Olive St	=	**7**	trips	T
PM PEAK				
% Trips IN	=	60%		
Vol Trips IN	=	58	trips	
% Trips from S	=	90%		
Vol Trips from S	=	52	trips	
% Trips from S via Olive St	=	100%		
Vol Trips from S via Olive St	=	**52**	trips	U
% Trips from S via Yeppoon Rd	=	0%		
Vol Trips from S via Yeppoon Rd	=	**0**	trips	V
% Trips from S via Norman	=	0%		
Vol Trips from S via Norman	=	**0**	trips	W
% Trips from S via R-Y Rd	=	0%		
Vol Trips from S via R-Y Rd	=	**0**	trips	X
% Trips from N	=	10%		
Vol Trips from N	=	6	trips	
% Trips from N via Olive St	=	100%		
Vol Trips from N via Olive St	=	**6**	trips	Y
% Trips OUT	=	40%		
Vol Trips OUT	=	39	trips	
% Trips to S	=	90%		
Vol Trips to S	=	35	trips	
% Trips to S via Olive St	=	100%		
Vol Trips to S via Olive St	=	**35**	trips	Z
% Trips to S via Yeppoon Rd	=	0%		
Vol Trips to S via Yeppoon Rd	=	**0**	trips	AA
% Trips to S via Norman	=	0%		
Vol Trips to S via Norman	=	**0**	trips	AB
% Trips to S via R-Y Rd	=	0%		
Vol Trips to S via R-Y Rd	=	**0**	trips	AC
% Trips to N	=	10%		
Vol Trips to N	=	4	trips	
% Trips to N via Olive St	=	100%		
Vol Trips to N via Olive St	=	**4**	trips	AD

D1238/2006 (TMR B)

Yield	=	47	lots	
Gen Rate	=	0.85	trips/lot (peak)	
Gen Traffic Volume	=	40	trips	
AM PEAK				
% Trips IN	=	30%		
Vol Trips IN	=	12	trips	
% Trips from S	=	90%		
Vol Trips from S	=	11	trips	
% Trips from S via Olive St	=	100%		
Vol Trips from S via Olive St	=	**11**	trips	AE
% Trips from S via Yeppoon Rd	=	0%		
Vol Trips from S via Yeppoon Rd	=	**0**	trips	AF
% Trips from S via Norman	=	0%		
Vol Trips from S via Norman	=	**0**	trips	AG
% Trips from S via R-Y Rd	=	0%		
Vol Trips from S via R-Y Rd	=	**0**	trips	AH
% Trips from N	=	10%		
Vol Trips from N	=	1	trips	
% Trips from N via Olive St	=	100%		
Vol Trips from N via Olive St	=	**1**	trips	AI
% Trips OUT	=	70%		
Vol Trips OUT	=	28	trips	
% Trips to S	=	90%		
Vol Trips to S	=	25	trips	
% Trips to S via Olive St	=	100%		
Vol Trips to S via Olive St	=	**25**	trips	AJ
% Trips to S via Yeppoon Rd	=	0%		
Vol Trips to S via Yeppoon Rd	=	**0**	trips	AK
% Trips to S via Norman	=	0%		
Vol Trips to S via Norman	=	**0**	trips	AL
% Trips to S via R-Y Rd	=	0%		
Vol Trips to S via R-Y Rd	=	**0**	trips	AM
% Trips to N	=	10%		
Vol Trips to N	=	3	trips	
% Trips to N via Olive St	=	100%		
Vol Trips to N via Olive St	=	**3**	trips	AN
PM PEAK				
% Trips IN	=	60%		
Vol Trips IN	=	24	trips	
% Trips from S	=	90%		
Vol Trips from S	=	22	trips	
% Trips from S via Olive St	=	100%		
Vol Trips from S via Olive St	=	**22**	trips	AO
% Trips from S via Yeppoon Rd	=	0%		
Vol Trips from S via Yeppoon Rd	=	**0**	trips	AP
% Trips from S via Norman	=	0%		
Vol Trips from S via Norman	=	**0**	trips	AQ
% Trips from S via R-Y Rd	=	0%		
Vol Trips from S via R-Y Rd	=	**0**	trips	AR
% Trips from N	=	10%		
Vol Trips from N	=	2	trips	
% Trips from N via Olive St	=	100%		
Vol Trips from N via Olive St	=	**2**	trips	AS
% Trips OUT	=	40%		
Vol Trips OUT	=	16	trips	
% Trips to S	=	90%		
Vol Trips to S	=	14	trips	
% Trips to S via Olive St	=	100%		
Vol Trips to S via Olive St	=	**14**	trips	AT
% Trips to S via Yeppoon Rd	=	0%		
Vol Trips to S via Yeppoon Rd	=	**0**	trips	AU
% Trips to S via Norman	=	0%		
Vol Trips to S via Norman	=	**0**	trips	AV
% Trips to S via R-Y Rd	=	0%		
Vol Trips to S via R-Y Rd	=	**0**	trips	AW
% Trips to N	=	10%		
Vol Trips to N	=	2	trips	
% Trips to N via Olive St	=	100%		
Vol Trips to N via Olive St	=	**2**	trips	AX

D833/2005 (TMR d)

Yield	=	102	lots	
Gen Rate	=	0.85	trips/lot (peak)	
Gen Traffic Volume	=	87	trips	
AM PEAK				
% Trips IN	=	30%		
Vol Trips IN	=	26	trips	
% Trips from S	=	90%		
Vol Trips from S	=	23	trips	
% Trips from S via Boundary	=	100%		
Vol Trips from S via Boundary	=	**23**	trips	AY
% Trips from S via Yeppoon Rd	=	0%		
Vol Trips from S via Yeppoon Rd	=	**0**	trips	AZ
% Trips from S via Norman	=	0%		
Vol Trips from S via Norman	=	**0**	trips	BA
% Trips from S via R-Y Rd	=	0%		
Vol Trips from S via R-Y Rd	=	**0**	trips	BB
% Trips from N	=	10%		
Vol Trips from N	=	3	trips	
% Trips from N via Olive St	=	75%		
Vol Trips from N via Olive St	=	**2**	trips	BC
% Trips from N via Mason	=	25%		
Vol Trips from N via Mason	=	**1**	trips	BD
% Trips OUT	=	70%		
Vol Trips OUT	=	61	trips	
% Trips to S	=	90%		
Vol Trips to S	=	55	trips	
% Trips to S via Boundary	=	75%		
Vol Trips to S via Boundary	=	**41**	trips	BE
% Trips to S via Rachel Dr	=	25%		
Vol Trips to S via Rachel Dr	=	**14**	trips	BF
% Trips to N	=	10%		
Vol Trips to N	=	6	trips	
% Trips to N via Olive St	=	100%		
Vol Trips to N via Olive St	=	**6**	trips	BI
PM PEAK				
% Trips IN	=	60%		
Vol Trips IN	=	52	trips	
% Trips from S	=	90%		
Vol Trips from S	=	47	trips	
% Trips from S via Boundary	=	100%		
Vol Trips from S via Boundary	=	**47**	trips	BJ
% Trips from S via Yeppoon Rd	=	0%		
Vol Trips from S via Yeppoon Rd	=	**0**	trips	BK
% Trips from S via Norman	=	0%		
Vol Trips from S via Norman	=	**0**	trips	BL
% Trips from S via R-Y Rd	=	0%		
Vol Trips from S via R-Y Rd	=	**0**	trips	BM
% Trips from N	=	10%		
Vol Trips from N	=	5	trips	
% Trips from N via Olive St	=	75%		
Vol Trips from N via Olive St	=	**4**	trips	BN
% Trips from N via Mason	=	25%		
Vol Trips from N via Mason	=	**1**	trips	BO
% Trips OUT	=	40%		
Vol Trips OUT	=	35	trips	
% Trips to S	=	90%		
Vol Trips to S	=	31	trips	
% Trips to S via Boundary	=	75%		
Vol Trips to S via Boundary	=	**23**	trips	BP
% Trips to S via Rachel Dr	=	25%		
Vol Trips to S via Rachel Dr	=	**8**	trips	BQ
% Trips to N	=	10%		
Vol Trips to N	=	3	trips	
% Trips to N via Olive St	=	100%		
Vol Trips to N via Olive St	=	**3**	trips	BT

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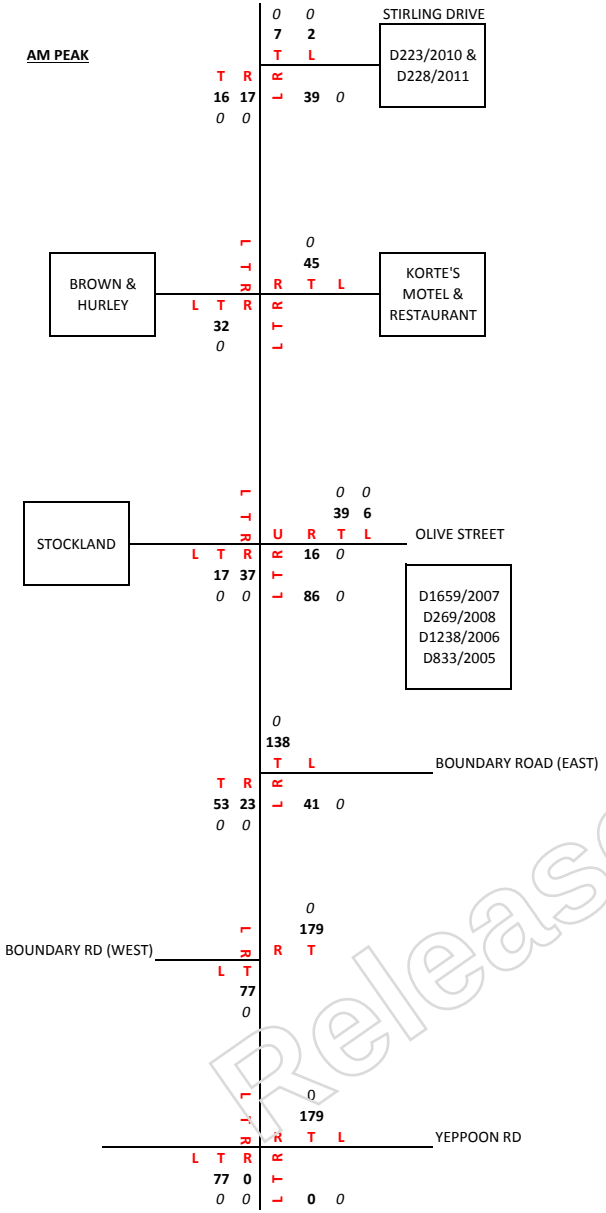
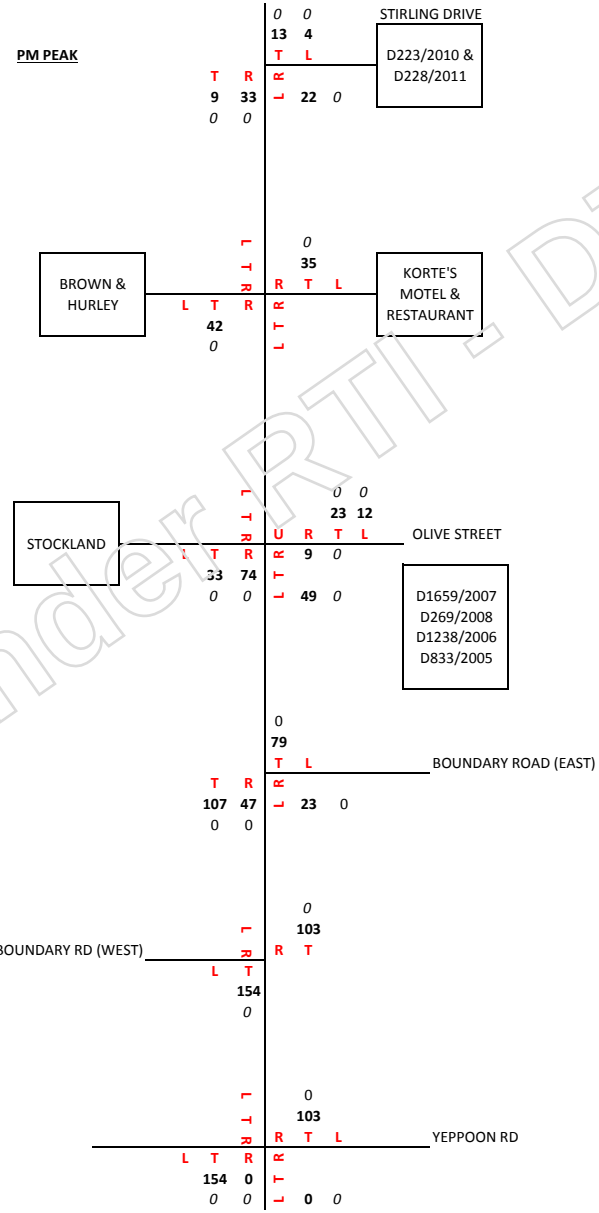
Road Network Volumes 2025

Approved Eastern Developments





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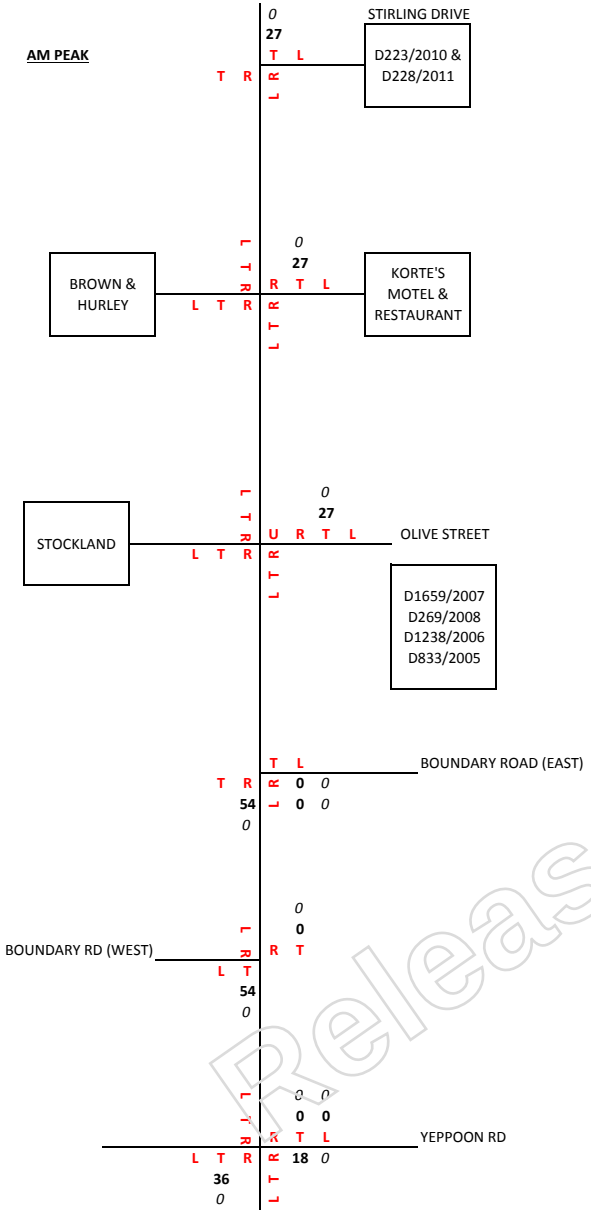
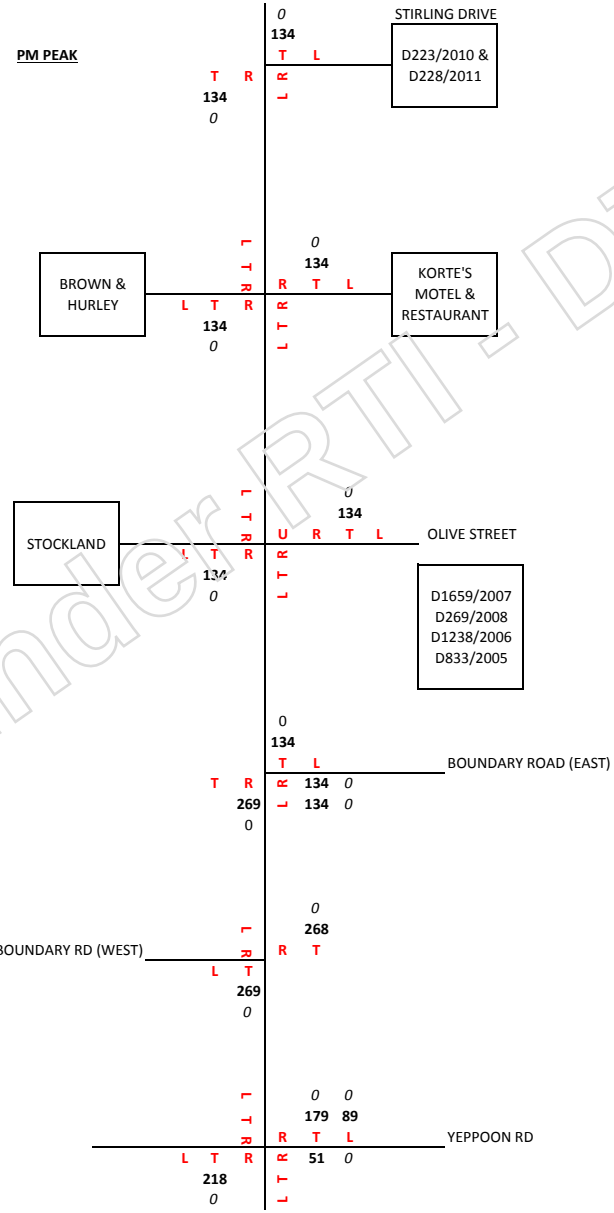
Road Network Volumes

Boundary Shopping Centre Development





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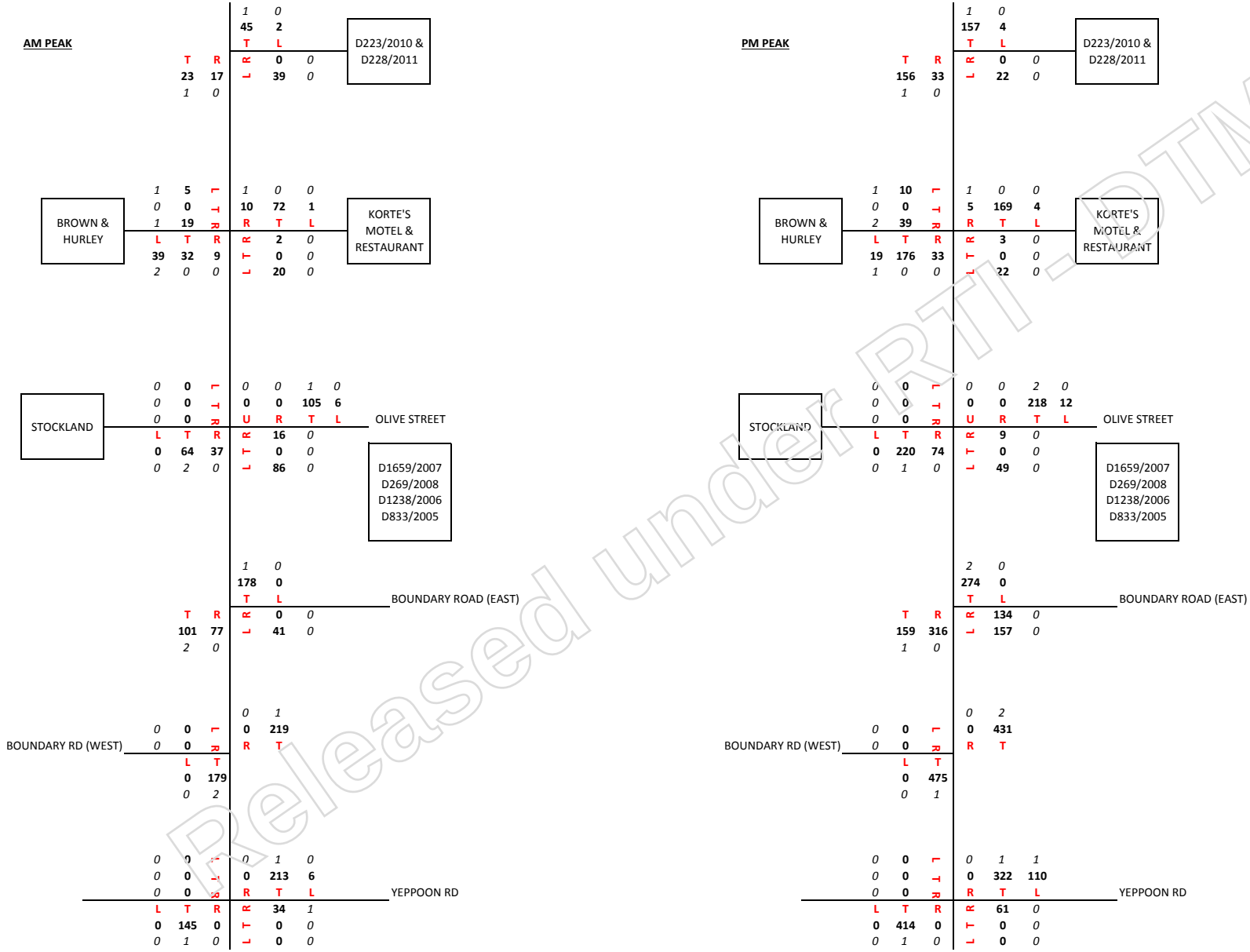
Road Network Volumes

Approved Developments



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APPENDIX E

SIDRA Results

Bruce Highway / Olive Street

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LANE SUMMARY

Bruce Highway / Olive Street
Interim Signalsed Intersection - Stage 1-3
POST DEV - 2015 AM Peak
Signals - Fixed Time Cycle Time = 100 seconds (Optimum Cycle Time - Shortest Queue)

Lane Use and Performance

	Demand Flows L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South: Bruce Highway (South)																
Lane 1	25	0	0	25	0.0	918[1]	0.027	100	14.8	LOS B	0.3	2.3	150	Turn Bay	0.0	0.0
Lane 2	0	167	0	167	21.0	815	0.204	100	16.6	LOS B	4.7	39.0	500	–	0.0	0.0
Lane 3	0	167	0	167	21.0	815	0.204	100	16.6	LOS B	4.7	39.0	500	–	0.0	0.0
Lane 4	0	0	37	37	0.0	142[1]	0.261	100	55.2	LOS E	1.7	12.1	30	Turn Bay	0.0	0.0
Approach	25	333	37	395	17.7		0.261		20.1	LOS C	4.7	39.0				
East: Olive Street (East)																
Lane 1	89	20	18	127	1.6	243	0.523	100	52.9	LOS D	6.0	42.6	500	–	0.0	0.0
Approach	89	20	18	127	1.6		0.523		52.9	LOS D	6.0	42.6				
North: Bruce Highway (North)																
Lane 1	8	461	0	469	6.0	890	0.527	100	20.1	LOS C	16.0	118.0	500	–	0.0	0.0
Lane 2	0	470	0	470	5.9	892	0.527	100	20.0	LOS B	16.1	118.1	500	–	0.0	0.0
Lane 3	0	0	5	5	0.0	188	0.027	100	53.6	LOS D	0.2	1.6	70	Turn Bay	0.0	0.0
Approach	8	931	5	944	5.9		0.527		20.2	LOS C	16.1	118.1				
West: Olive Street (West)																
Lane 1	12	20	86	118	0.0	366[1]	0.323	100	25.4	LOS C	2.9	20.5	500	–	0.0	0.0
Approach	12	20	86	118	0.0		0.323		25.4	LOS C	2.9	20.5				
Intersection				1584	8.1		0.527		23.2	LOS C	16.1	118.1				

Level of Service (LOS) Method: Delay (HCM 2000).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model used.

1 Reduced capacity due to a short lane effect

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Project: C:\Cambray Projects\STO0111\01R\Working\Sidra\13-07-03\Stg 1-3_Bruce Highway-Olive Street.sip
8000396, CAMBRAY CONSULTING, SINGLE

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SIDRA INTERSECTION

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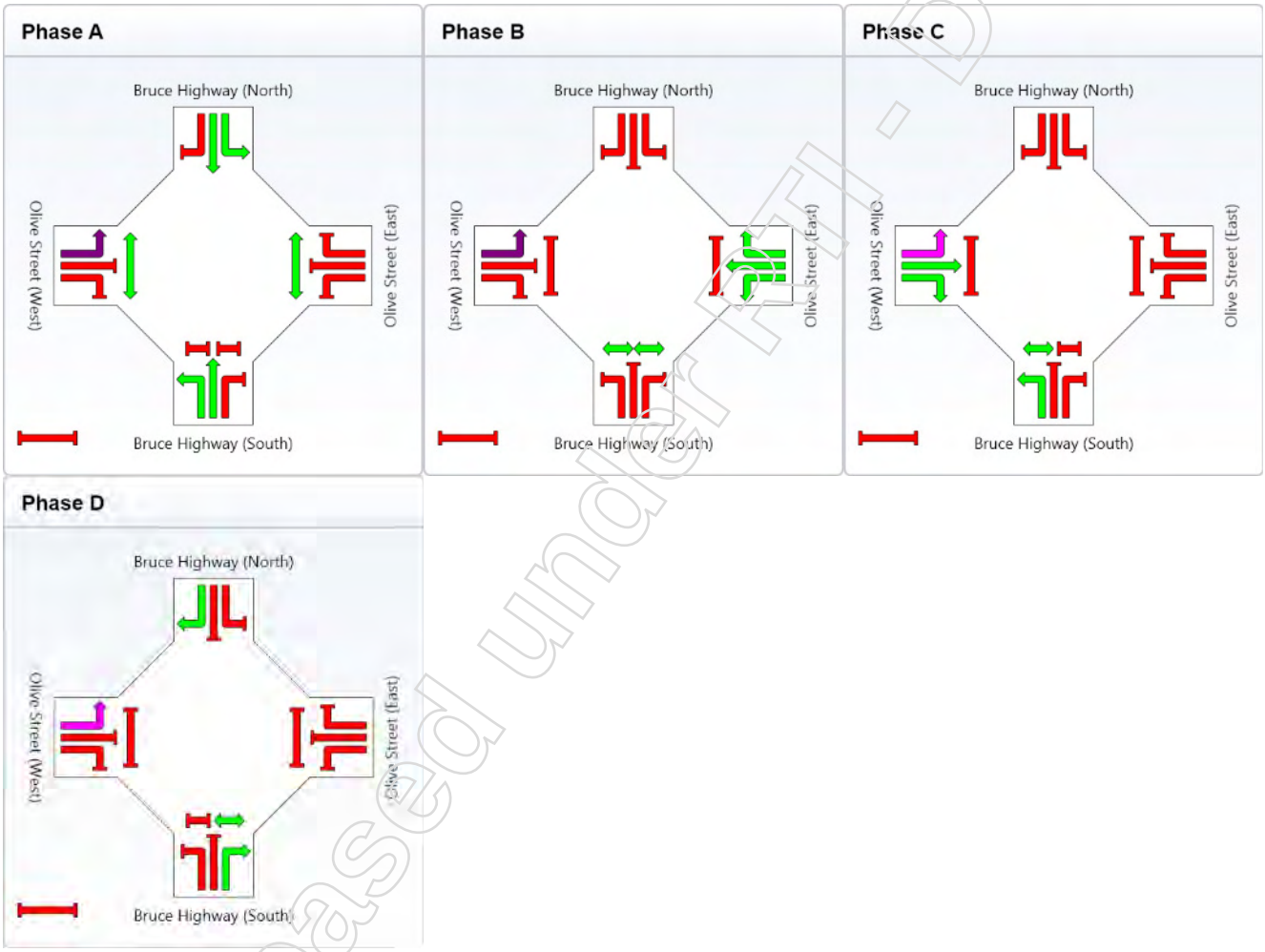
PHASING SUMMARY

Bruce Highway / Olive Street
Interim Signalsed Intersection - Stage 1-3
POST DEV - 2015 AM Peak
Signals - Fixed Time Cycle Time = 100 seconds (Optimum Cycle Time - Shortest Queue)

Phase times determined by the program
Sequence: CAMBRAY 1
Input Sequence: A, B, C, D
Output Sequence: A, B, C, D

Phase Timing Results

Phase	A	B	C	D
Green Time (sec)	47	13	6	10
Yellow Time (sec)	4	4	4	4
All-Red Time (sec)	2	2	2	2
Phase Time (sec)	53	19	12	16
Phase Split	53 %	19 %	12 %	16 %





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LANE SUMMARY

Bruce Highway / Olive Street
Interim Signalsed Intersection - Stage 1-3
POST DEV - 2015 PM Peak
Signals - Fixed Time Cycle Time = 100 seconds (Optimum Cycle Time - Shortest Queue)

Lane Use and Performance

	Demand Flows L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South: Bruce Highway (South)																
Lane 1	91	0	0	91	0.0	956[1]	0.095	100	14.7	LOS B	1.1	7.7	150	Turn Bay	0.0	0.0
Lane 2	0	450	0	450	5.1	858	0.524	100	21.2	LOS C	15.7	114.9	500	–	0.0	0.0
Lane 3	0	450	0	450	5.1	858	0.524	100	21.2	LOS C	15.7	114.9	500	–	0.0	0.0
Lane 4	0	0	75	75	0.0	145[1]	0.517	100	54.0	LOS D	3.5	24.3	30	Turn Bay	0.0	0.0
Approach	91	900	75	1066	4.3		0.524		23.0	LOS C	15.7	114.9				
East: Olive Street (East)																
Lane 1	59	10	12	81	3.7	184	0.441	100	55.8	LOS E	3.9	28.2	500	–	0.0	0.0
Approach	59	10	12	81	3.7		0.441		55.8	LOS E	3.9	28.2				
North: Bruce Highway (North)																
Lane 1	14	280	0	294	8.3	839	0.350	100	19.6	LOS B	9.3	69.7	500	–	0.0	0.0
Lane 2	0	294	0	294	8.7	839	0.350	100	19.2	LOS B	9.3	70.0	500	–	0.0	0.0
Lane 3	0	0	10	10	0.0	225	0.044	100	51.6	LOS D	0.4	3.1	70	Turn Bay	0.0	0.0
Approach	14	574	10	598	8.4		0.350		19.9	LOS B	9.3	70.0				
West: Olive Street (West)																
Lane 1	7	10	61	78	0.0	457[1]	0.171	100	17.1	LOS B	1.0	7.2	500	–	0.0	0.0
Approach	7	10	61	78	0.0		0.171		17.1	LOS B	1.0	7.2				
Intersection				1823	5.4		0.524		23.2	LOS C	15.7	114.9				

Level of Service (LOS) Method: Delay (HCM 2000).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model used.

1 Reduced capacity due to a short lane effect

Processed: Tuesday, 6 August 2013 10:45:31 PM
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SIDRA INTERSECTION

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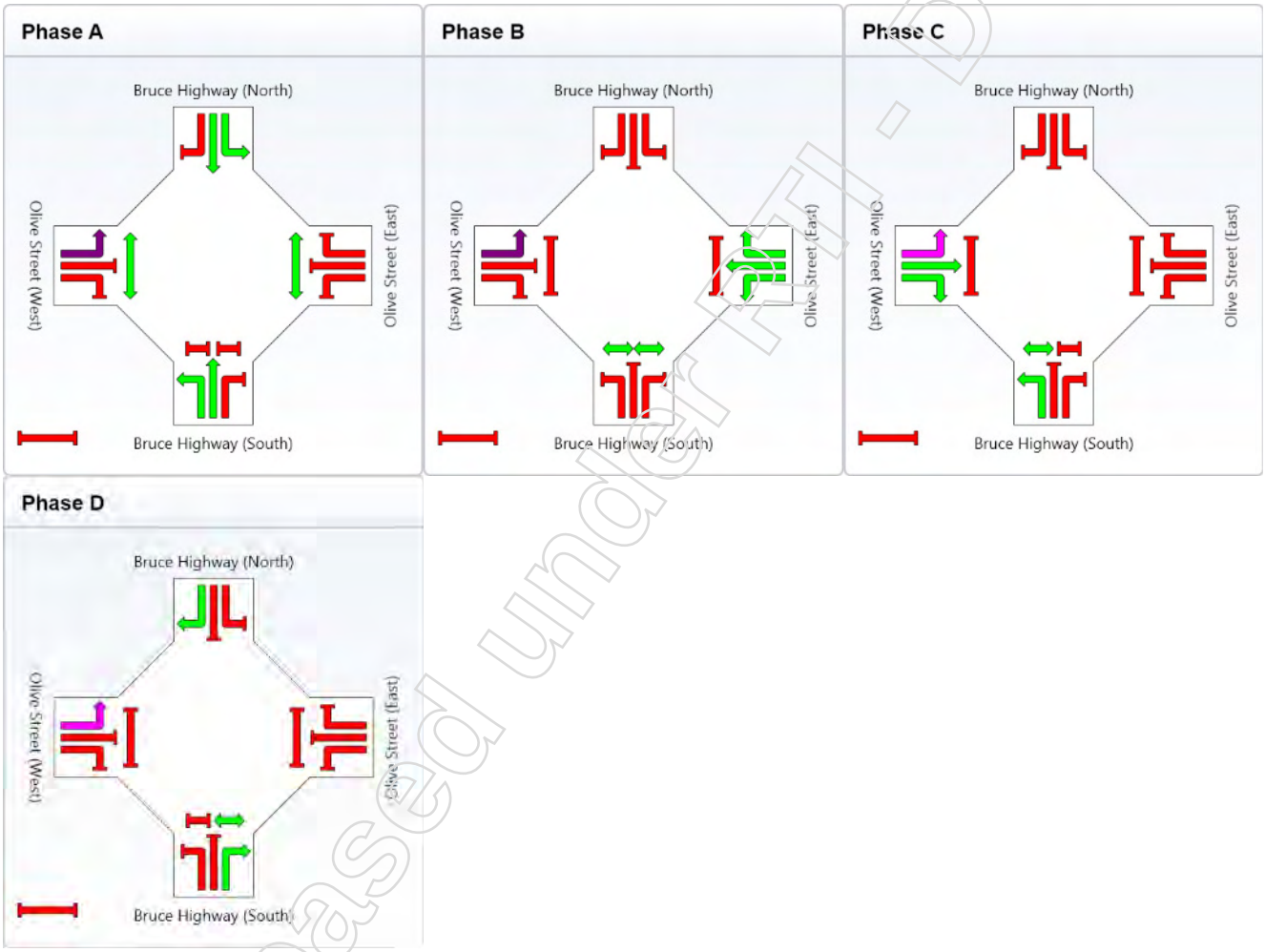
PHASING SUMMARY

Bruce Highway / Olive Street
Interim Signalsed Intersection - Stage 1-3
POST DEV - 2015 PM Peak
Signals - Fixed Time Cycle Time = 100 seconds (Optimum Cycle Time - Shortest Queue)

Phase times determined by the program
Sequence: CAMBRAY 1
Input Sequence: A, B, C, D
Output Sequence: A, B, C, D

Phase Timing Results

Phase	A	B	C	D
Green Time (sec)	45	10	9	12
Yellow Time (sec)	4	4	4	4
All-Red Time (sec)	2	2	2	2
Phase Time (sec)	51	16	15	18
Phase Split	51 %	16 %	15 %	18 %





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LANE SUMMARY

Site: POST 2025 AM PEAK

Bruce Highway / Olive Street
Interim Signalsed Intersection - Stage 1-3
POST DEV - 2025 AM Peak
Signals - Fixed Time Cycle Time = 100 seconds (Optimum Cycle Time - Shortest Queue)

Lane Use and Performance

	Demand Flows L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South: Bruce Highway (South)																
Lane 1	25	0	0	25	0.0	929[1]	0.027	100	14.5	LOS B	0.3	2.2	150	Turn Bay	0.0	0.0
Lane 2	0	181	0	181	21.3	831	0.217	100	16.1	LOS B	5.1	41.9	500	–	0.0	0.0
Lane 3	0	181	0	181	21.3	831	0.217	100	16.1	LOS B	5.1	41.9	500	–	0.0	0.0
Lane 4	0	0	37	37	0.0	142[1]	0.261	100	55.2	LOS E	1.7	12.1	30	Turn Bay	0.0	0.0
Approach	25	361	37	423	18.2		0.261		19.4	LOS B	5.1	41.9				
East: Olive Street (East)																
Lane 1	89	20	18	127	1.6	224	0.566	100	54.2	LOS D	6.1	43.3	500	–	0.0	0.0
Approach	89	20	18	127	1.6		0.566		54.2	LOS D	6.1	43.3				
North: Bruce Highway (North)																
Lane 1	8	504	0	512	6.0	909	0.563	100	20.0	LOS B	17.7	130.1	500	–	0.0	0.0
Lane 2	0	512	0	512	5.9	911	0.563	100	19.8	LOS B	17.7	130.2	500	–	0.0	0.0
Lane 3	0	0	5	5	0.0	188	0.027	100	53.6	LOS D	0.2	1.6	70	Turn Bay	0.0	0.0
Approach	8	1016	5	1029	5.9		0.563		20.1	LOS C	17.7	130.2				
West: Olive Street (West)																
Lane 1	12	20	86	118	0.0	366[1]	0.323	100	25.0	LOS C	2.9	20.1	500	–	0.0	0.0
Approach	12	20	86	118	0.0		0.323		25.0	LOS C	2.9	20.1				
Intersection				1697	8.2		0.566		22.8	LOS C	17.7	130.2				

Level of Service (LOS) Method: Delay (HCM 2000).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model used.

1 Reduced capacity due to a short lane effect

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SIDRA INTERSECTION

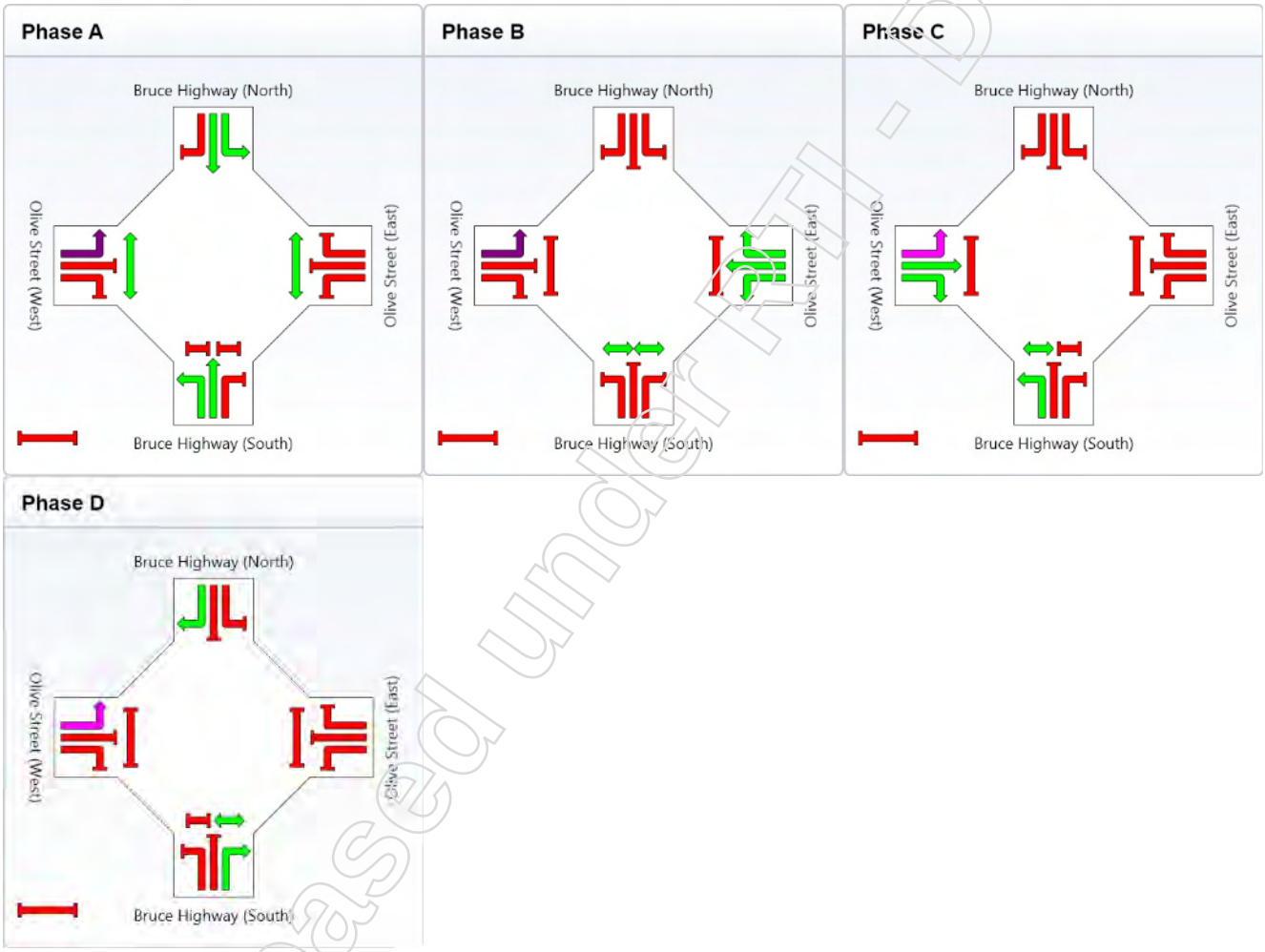
PHASING SUMMARY

Bruce Highway / Olive Street
Interim Signalsed Intersection - Stage 1-3
POST DEV - 2025 AM Peak
Signals - Fixed Time Cycle Time = 100 seconds (Optimum Cycle Time - Shortest Queue)

Phase times determined by the program
Sequence: CAMBRAY 1
Input Sequence: A, B, C, D
Output Sequence: A, B, C, D

Phase Timing Results

Phase	A	B	C	D
Green Time (sec)	48	12	6	10
Yellow Time (sec)	4	4	4	4
All-Red Time (sec)	2	2	2	2
Phase Time (sec)	54	18	12	16
Phase Split	54 %	18 %	12 %	16 %





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LANE SUMMARY

Bruce Highway / Olive Street
Interim Signalsed Intersection - Stage 1-3
POST DEV - 2025 PM Peak
Signals - Fixed Time Cycle Time = 100 seconds (Optimum Cycle Time - Shortest Queue)

Lane Use and Performance

	Demand Flows L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South: Bruce Highway (South)																
Lane 1	91	0	0	91	0.0	977[1]	0.093	100	14.1	LOS B	1.1	7.6	150	Turn Bay	0.0	0.0
Lane 2	0	486	0	486	5.3	895	0.542	100	20.2	LOS C	16.7	122.5	500	–	0.0	0.0
Lane 3	0	486	0	486	5.3	895	0.542	100	20.2	LOS C	16.7	122.5	500	–	0.0	0.0
Lane 4	0	0	75	75	0.0	141[1]	0.533	100	56.6	LOS E	3.6	25.2	30	Turn Bay	0.0	0.0
Approach	91	971	75	1137	4.5		0.542		22.1	LOS C	16.7	122.5				
East: Olive Street (East)																
Lane 1	59	10	12	81	3.7	184	0.441	100	55.8	LOS E	3.9	28.2	500	–	0.0	0.0
Approach	59	10	12	81	3.7		0.441		55.8	LOS E	3.9	28.2				
North: Bruce Highway (North)																
Lane 1	14	299	0	313	8.6	875	0.357	100	18.4	LOS B	9.6	72.4	500	–	0.0	0.0
Lane 2	0	312	0	312	9.0	875	0.357	100	18.0	LOS B	9.6	72.6	500	–	0.0	0.0
Lane 3	0	0	10	10	0.0	188	0.053	100	54.0	LOS D	0.5	3.2	70	Turn Bay	0.0	0.0
Approach	14	611	10	635	8.7		0.357		18.8	LOS B	9.6	72.6				
West: Olive Street (West)																
Lane 1	7	10	61	78	0.0	447[1]	0.175	100	17.1	LOS B	1.1	7.5	500	–	0.0	0.0
Approach	7	10	61	78	0.0		0.175		17.1	LOS B	1.1	7.5				
Intersection				1931	5.6		0.542		22.2	LOS C	16.7	122.5				

Level of Service (LOS) Method: Delay (HCM 2000).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model used.

1 Reduced capacity due to a short lane effect

Processed: Tuesday, 6 August 2013 10:45:32 PM
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SIDRA INTERSECTION

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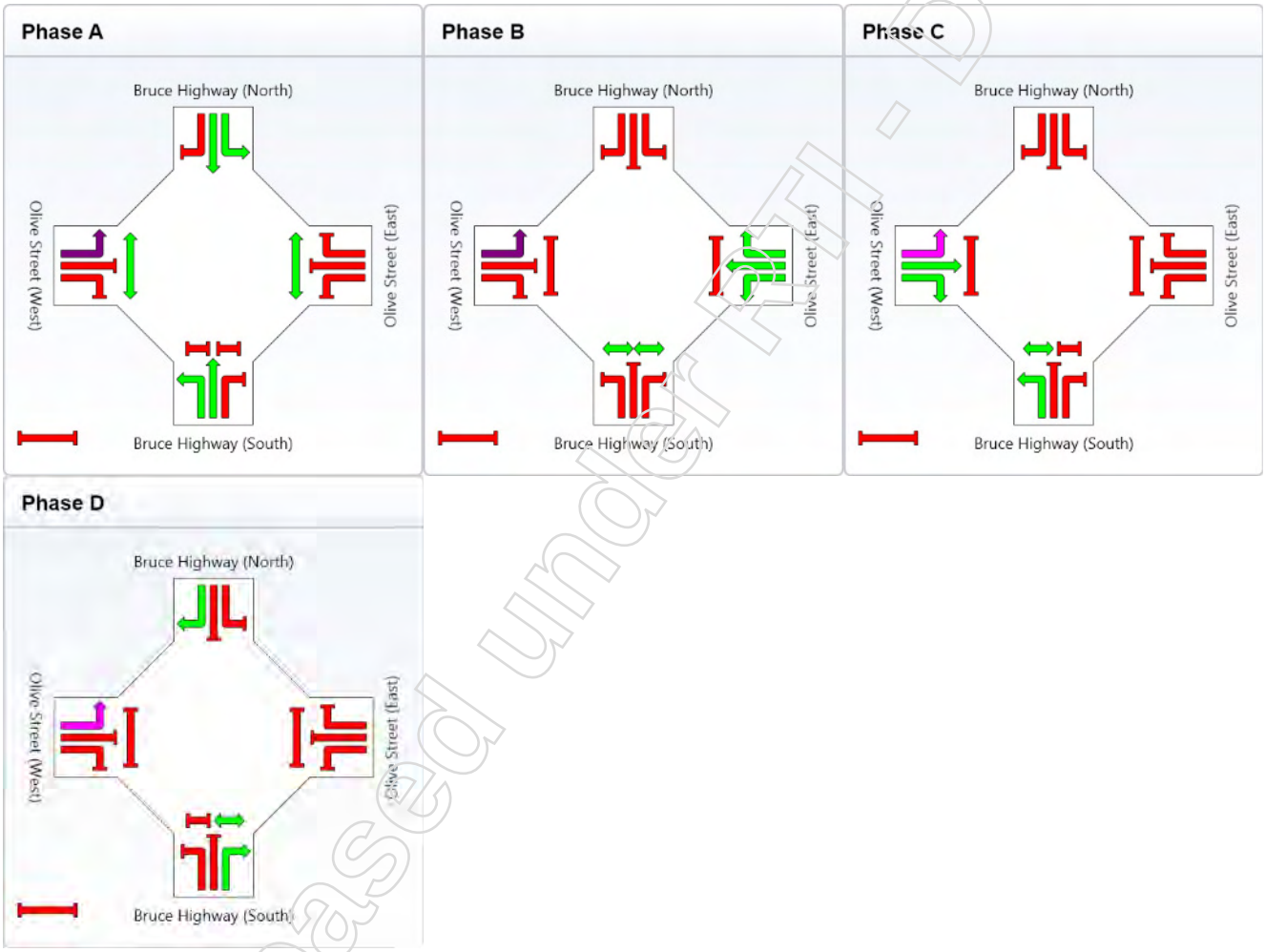
PHASING SUMMARY

Bruce Highway / Olive Street
Interim Signalsed Intersection - Stage 1-3
POST DEV - 2025 PM Peak
Signals - Fixed Time Cycle Time = 100 seconds (Optimum Cycle Time - Shortest Queue)

Phase times determined by the program
Sequence: CAMBRAY 1
Input Sequence: A, B, C, D
Output Sequence: A, B, C, D

Phase Timing Results

Phase	A	B	C	D
Green Time (sec)	47	10	9	10
Yellow Time (sec)	4	4	4	4
All-Red Time (sec)	2	2	2	2
Phase Time (sec)	53	16	15	16
Phase Split	53 %	16 %	15 %	16 %





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APPENDIX F

SIDRA Results

Bruce Highway / Boundary Road (East)

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r_RTI-3295 file1 Release.pdf - Page Number: 308 of 672

LANE SUMMARY

Bruce Highway / Boundary Road (East)
Upgraded Signalised Intersection - Stg 1-3
POST DEV - 2015 AM Peak
Signals - Fixed Time Cycle Time = 85 seconds (Optimum Cycle Time - Shortest Queue)

Lane Use and Performance

	Demand Flows L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South: Bruce Highway																
Lane 1	0	250	0	250	11.4	1122	0.222	100	4.3	LOS A	2.3	17.7	500	–	0.0	0.0
Lane 2	0	250	0	250	11.4	1122	0.222	100	4.3	LOS A	2.3	17.7	500	–	0.0	0.0
Lane 3	0	0	108	108	3.7	151	0.717	100	54.3	LOS D	4.8	34.3	125	Turn Bay	0.0	0.0
Approach	0	499	108	607	10.0		0.717		13.2	LOS B	4.8	34.3				
East: Boundary Road																
Lane 1	102	0	0	102	2.0	457	0.223	100	36.8	LOS D	3.4	24.3	500	–	0.0	0.0
Lane 2	0	0	2	2	0.0	315[1]	0.006	100	34.4	LOS C	0.1	0.4	50	Turn Bay	0.0	0.0
Approach	102	0	2	104	1.9		0.223		36.8	LOS D	3.4	24.3				
North: Bruce Highway																
Lane 1	5	621	0	626	4.6	877	0.714	100	20.0	LOS C	21.0	152.5	500	–	0.0	0.0
Lane 2	0	627	0	627	4.6	878	0.714	100	20.0	LOS B	21.0	152.6	500	–	0.0	0.0
Approach	5	1248	0	1253	4.6		0.714		20.0	LOS C	21.0	152.6				
Intersection				1964	6.2		0.717		18.8	LOS B	21.0	152.6				

Level of Service (LOS) Method: Delay (HCM 2000).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model used.

1 Reduced capacity due to a short lane effect

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Project: C:\Cambray Projects\STO0111\01R\Working\Sidra\13-07-03\Stg 1-3_Bruce Highway-Boundary East.sip
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SIDRA INTERSECTION

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PHASING SUMMARY

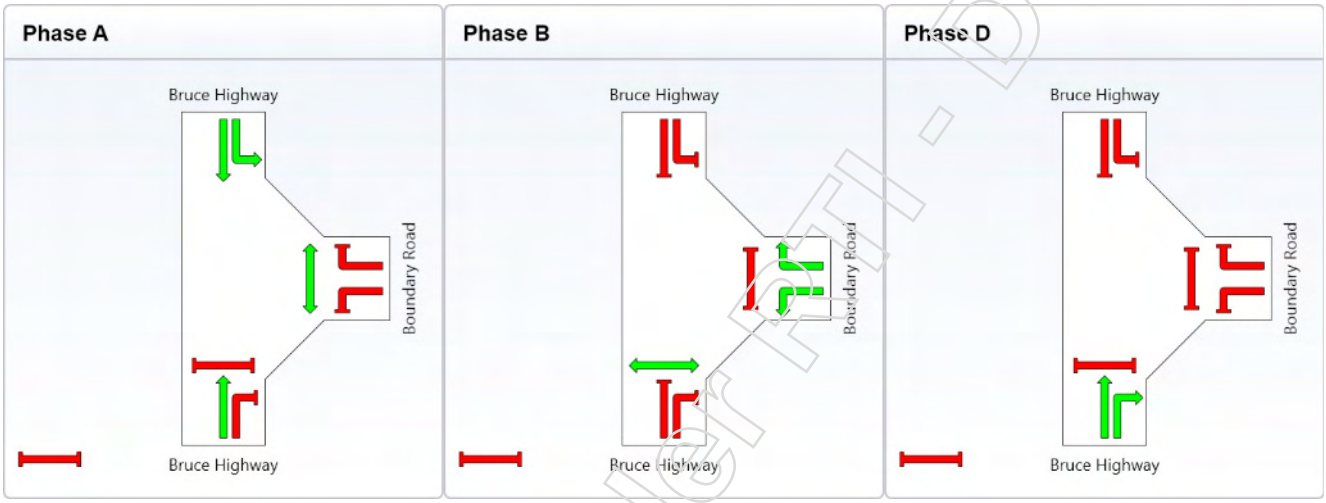
Site: POST 2015 AM PEAK

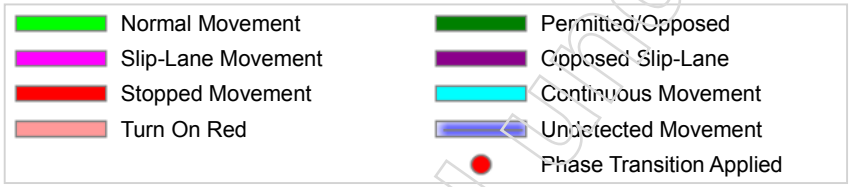
Bruce Highway / Boundary Road (East)
Upgraded Signalised Intersection - Stg 1-3
POST DEV - 2015 AM Peak
Signals - Fixed Time Cycle Time = 85 seconds (Optimum Cycle Time - Shortest Queue)

Phase times determined by the program
Sequence: CAMBRAY
Input Sequence: A, B, D
Output Sequence: A, B, D

Phase Timing Results

Phase	A	B	D
Green Time (sec)	39	21	7
Yellow Time (sec)	4	4	4
All-Red Time (sec)	2	2	2
Phase Time (sec)	45	27	13
Phase Split	53 %	32 %	15 %





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LANE SUMMARY

Bruce Highway / Boundary Road (East)
Upgraded Signalised Intersection - Stg 1-3
POST DEV - 2015 PM Peak
Signals - Fixed Time Cycle Time = 85 seconds (Optimum Cycle Time - Shortest Queue)

Lane Use and Performance

	Demand Flows L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South: Bruce Highway																
Lane 1	0	511	0	511	3.2	1181	0.433	100	5.1	LOS A	6.0	43.1	500	–	0.0	0.0
Lane 2	0	511	0	511	3.2	1181	0.433	100	5.1	LOS A	6.0	43.1	500	–	0.0	0.0
Lane 3	0	0	402	402	0.0	508	0.792	100	43.2	LOS D	16.1	112.7	125	Turn Bay	0.0	0.0
Approach	0	1022	402	1424	2.3		0.792		15.8	LOS B	16.1	112.7				
East: Boundary Road																
Lane 1	203	0	0	203	0.0	464	0.438	100	38.6	LOS D	7.2	50.7	500	–	0.0	0.0
Lane 2	0	0	148	148	0.0	307[1]	0.482	100	37.4	LOS D	5.1	35.7	50	Turn Bay	0.0	0.0
Approach	203	0	148	351	0.0		0.482		38.1	LOS D	7.2	50.7				
North: Bruce Highway																
Lane 1	18	379	0	397	5.3	514	0.772	100	34.4	LOS C	16.3	119.6	500	–	0.0	0.0
Lane 2	0	397	0	397	5.5	515	0.772	100	33.9	LOS C	16.4	119.9	500	–	0.0	0.0
Approach	18	776	0	794	5.4		0.772		34.2	LOS C	16.4	119.9				
Intersection				2569	3.0		0.792		24.5	LOS C	16.4	119.9				

Level of Service (LOS) Method: Delay (HCM 2000).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model used.

1 Reduced capacity due to a short lane effect

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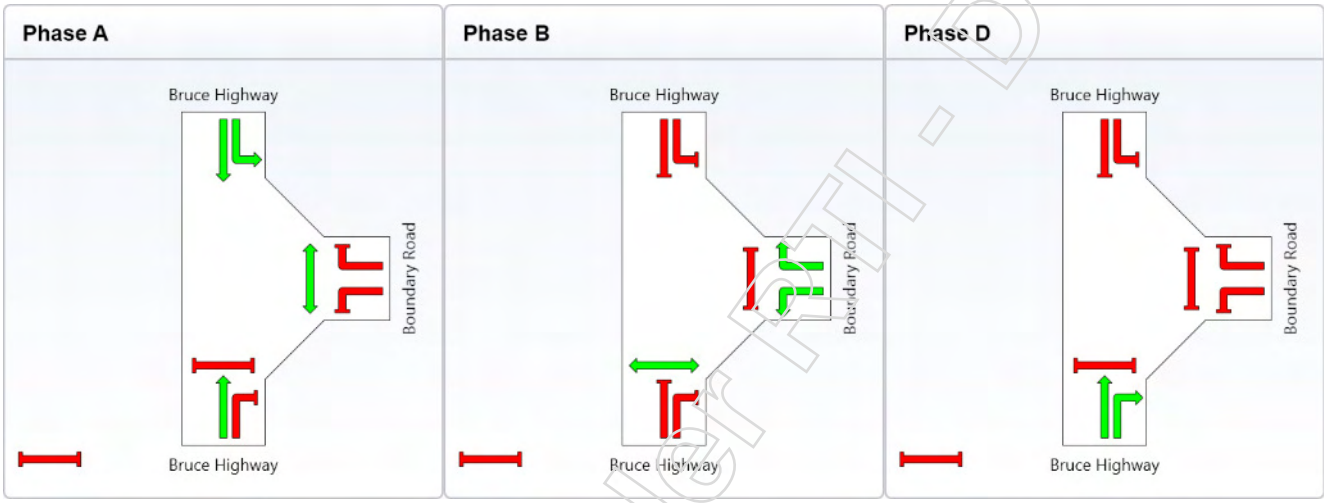
PHASING SUMMARY

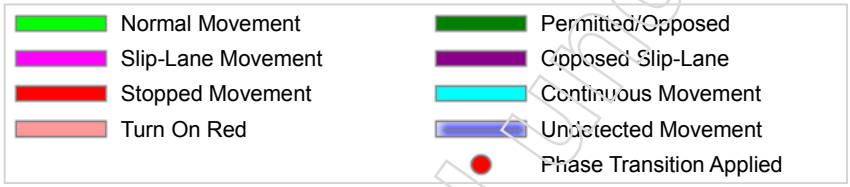
Bruce Highway / Boundary Road (East)
Upgraded Signalised Intersection - Stg 1-3
POST DEV - 2015 PM Peak
Signals - Fixed Time Cycle Time = 85 seconds (Optimum Cycle Time - Shortest Queue)

Phase times determined by the program
Sequence: CAMBRAY
Input Sequence: A, B, D
Output Sequence: A, B, D

Phase Timing Results

Phase	A	B	D
Green Time (sec)	23	21	23
Yellow Time (sec)	4	4	4
All-Red Time (sec)	2	2	2
Phase Time (sec)	29	27	29
Phase Split	34 %	32 %	34 %





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LANE SUMMARY

Site: POST 2025 AM PEAK

Bruce Highway / Boundary Road (East)
Upgraded Signalised Intersection - Stg 1-3
POST DEV - 2025 AM Peak
Signals - Fixed Time Cycle Time = 95 seconds (Optimum Cycle Time - Shortest Queue)

Lane Use and Performance

	Demand Flows L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South: Bruce Highway																
Lane 1	0	269	0	269	11.5	1196	0.224	100	3.1	LOS A	2.0	15.2	500	–	0.0	0.0
Lane 2	0	269	0	269	11.5	1196	0.224	100	3.1	LOS A	2.0	15.2	500	–	0.0	0.0
Lane 3	0	0	108	108	3.7	154	0.702	100	58.7	LOS E	5.2	37.8	125	Turn Bay	0.0	0.0
Approach	0	537	108	645	10.2		0.702		12.4	LOS B	5.2	37.8				
East: Boundary Road																
Lane 1	102	0	0	102	2.0	409	0.249	100	42.3	LOS D	4.0	28.1	500	–	0.0	0.0
Lane 2	0	0	2	2	0.0	279[1]	0.007	100	39.4	LOS D	0.1	0.5	50	Turn Bay	0.0	0.0
Approach	102	0	2	104	1.9		0.249		42.2	LOS D	4.0	28.1				
North: Bruce Highway																
Lane 1	5	673	0	678	4.7	966	0.702	100	19.4	LOS B	24.0	174.7	500	–	0.0	0.0
Lane 2	0	678	0	678	4.7	966	0.702	100	19.3	LOS B	24.0	174.7	500	–	0.0	0.0
Approach	5	1351	0	1356	4.7		0.702		19.3	LOS B	24.0	174.7				
Intersection				2105	6.3		0.702		18.3	LOS B	24.0	174.7				

Level of Service (LOS) Method: Delay (HCM 2000).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model used.

1 Reduced capacity due to a short lane effect

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Project: C:\Cambray Projects\STO0111\01R\Working\Sidra\13-07-03\Stg 1-3_Bruce Highway-Boundary East.sip
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SIDRA INTERSECTION

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PHASING SUMMARY

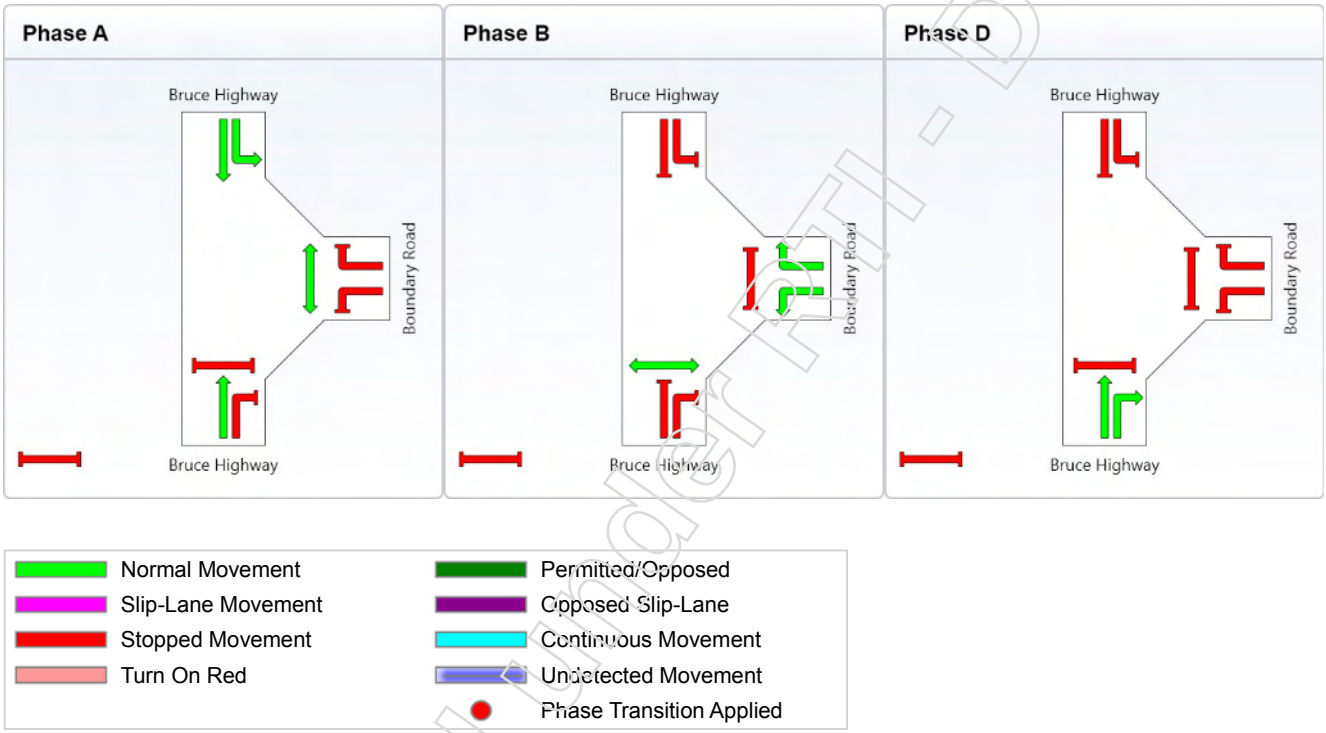
Site: POST 2025 AM PEAK

Bruce Highway / Boundary Road (East)
Upgraded Signalised Intersection - Stg 1-3
POST DEV - 2025 AM Peak
Signals - Fixed Time Cycle Time = 95 seconds (Optimum Cycle Time - Shortest Queue)

Phase times determined by the program
Sequence: CAMBRAY
Input Sequence: A, B, D
Output Sequence: A, B, D

Phase Timing Results

Phase	A	B	D
Green Time (sec)	48	21	8
Yellow Time (sec)	4	4	4
All-Red Time (sec)	2	2	2
Phase Time (sec)	54	27	14
Phase Split	57 %	28 %	15 %



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LANE SUMMARY

Site: POST 2025 PM PEAK

Bruce Highway / Boundary Road (East)
Upgraded Signalised Intersection - Stg 1-3
POST DEV - 2025 PM Peak
Signals - Fixed Time Cycle Time = 90 seconds (Optimum Cycle Time - Shortest Queue)

Lane Use and Performance

	Demand Flows L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South: Bruce Highway																
Lane 1	0	551	0	551	3.3	1222	0.451	100	4.4	LOS A	6.0	43.3	500	–	0.0	0.0
Lane 2	0	551	0	551	3.3	1222	0.451	100	4.4	LOS A	6.0	43.3	500	–	0.0	0.0
Lane 3	0	0	402	402	0.0	521	0.771	100	43.6	LOS D	16.5	115.4	125	Turn Bay	0.0	0.0
Approach	0	1102	402	1504	2.4		0.771		14.9	LOS B	16.5	115.4				
East: Boundary Road																
Lane 1	203	0	0	203	0.0	438	0.464	100	41.5	LOS D	7.8	54.7	500	–	0.0	0.0
Lane 2	0	0	148	148	0.0	288[1]	0.513	100	40.2	LOS D	5.5	38.5	50	Turn Bay	0.0	0.0
Approach	203	0	148	351	0.0		0.513		40.9	LOS D	7.8	54.7				
North: Bruce Highway																
Lane 1	18	402	0	420	5.6	548	0.766	100	34.5	LOS C	17.9	131.4	500	–	0.0	0.0
Lane 2	0	420	0	420	5.8	548	0.766	100	34.1	LOS C	17.9	131.7	500	–	0.0	0.0
Approach	18	822	0	840	5.7		0.766		34.3	LOS C	17.9	131.7				
Intersection				2695	3.1		0.771		24.3	LOS C	17.9	131.7				

Level of Service (LOS) Method: Delay (HCM 2000).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model used.

1 Reduced capacity due to a short lane effect

Processed: Wednesday, 3 July 2013 4:41:43 PM
SIDRA INTERSECTION 5.1.13.2093
Project: C:\Cambray Projects\STO0111\01R\Working\Sidra\13-07-03\Stg 1-3_Bruce Highway-Boundary East.sip
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SIDRA INTERSECTION

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PHASING SUMMARY

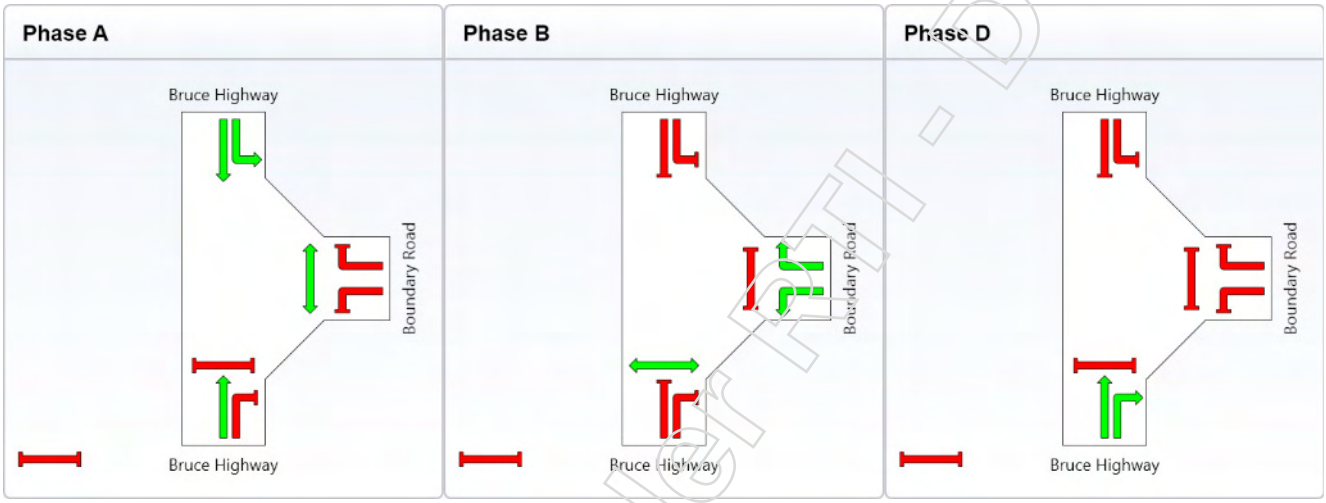
Site: POST 2025 PM PEAK

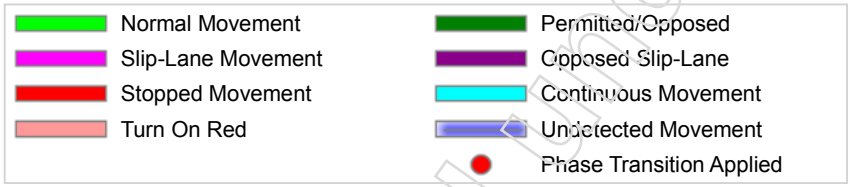
Bruce Highway / Boundary Road (East)
Upgraded Signalised Intersection - Stg 1-3
POST DEV - 2025 PM Peak
Signals - Fixed Time Cycle Time = 90 seconds (Optimum Cycle Time - Shortest Queue)

Phase times determined by the program
Sequence: CAMBRAY
Input Sequence: A, B, D
Output Sequence: A, B, D

Phase Timing Results

Phase	A	B	D
Green Time (sec)	26	21	25
Yellow Time (sec)	4	4	4
All-Red Time (sec)	2	2	2
Phase Time (sec)	32	27	31
Phase Split	36 %	30 %	34 %





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APPENDIX G

SIDRA Results

Bruce Highway / Boundary Road (West)

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r_RTI-3295 file1 Release.pdf - Page Number: 317 of 672

LANE SUMMARY

Bruce Highway / Boundary Road (West)
Proposed Upgraded Configuration - Stage 1-3
POST DEV - 2015 AM Peak
Signals - Fixed Time Cycle Time = 130 seconds (Optimum Cycle Time - Minimum Delay)

Lane Use and Performance

	Demand Flows L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South: Bruce Highway																
Lane 1	201	0	0	201	4.0	669[1]	0.300	100	18.9	LOS B	3.7	26.5	75	Turn Bay	0.0	0.0
Lane 2	0	270	0	270	10.9	1033	0.261	100	10.2	LOS B	5.2	40.1	500	–	0.0	0.0
Lane 3	0	270	0	270	10.9	1033	0.261	100	10.2	LOS B	5.2	40.1	500	–	0.0	0.0
Approach	201	539	0	740	9.1		0.300		12.6	LOS B	5.2	40.1				
North: Bruce Highway																
Lane 1	0	625	0	625	3.8	1434	0.436	100	1.5	LOS A	3.3	23.8	500	–	0.0	0.0
Lane 2	0	625	0	625	3.8	1434	0.436	100	1.5	LOS A	3.3	23.8	500	–	0.0	0.0
Lane 3	0	0	76	76	7.9	247	0.307	100	64.5	LOS E	4.2	31.8	95	Turn Bay	0.0	0.0
Approach	0	1250	76	1326	4.1		0.436		5.1	LOS A	4.2	31.8				
West: Boundary Road																
Lane 1	18	0	0	18	16.7	171[1]	0.105	100	59.7	LOS E	1.0	7.8	50	Turn Bay	0.0	0.0
Lane 2	0	0	47	47	14.9	267	0.176	100	60.4	LOS E	2.6	20.6	500	–	0.0	0.0
Approach	18	0	47	65	15.4		0.176		60.2	LOS E	2.6	20.6				
Intersection				2131	6.1		0.436		9.4	LOS A	5.2	40.1				

Level of Service (LOS) Method: Delay (HCM 2000).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model used.

1 Reduced capacity due to a short lane effect

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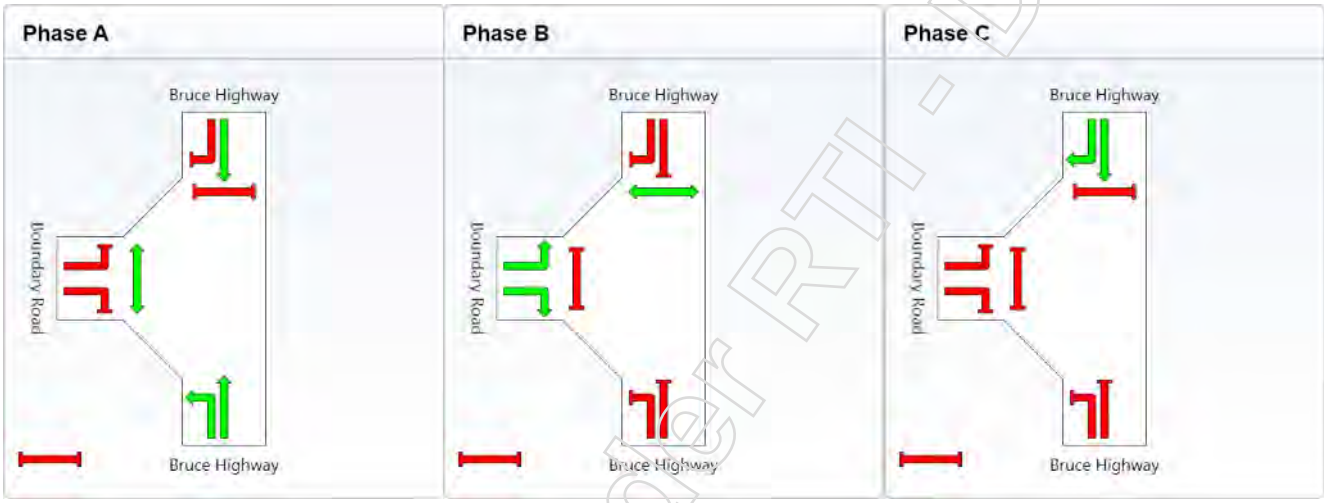
PHASING SUMMARY

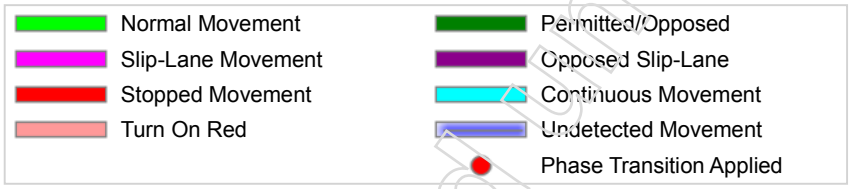
Bruce Highway / Boundary Road (West)
Proposed Upgraded Configuration - Stage 1-3
POST DEV - 2015 AM Peak
Signals - Fixed Time Cycle Time = 130 seconds (Optimum Cycle Time - Minimum Delay)

Phase times determined by the program
Sequence: CAMBRAY
Input Sequence: A, B, C
Output Sequence: A, B, C

Phase Timing Results

Phase	A	B	C
Green Time (sec)	73	21	18
Yellow Time (sec)	4	4	4
All-Red Time (sec)	2	2	2
Phase Time (sec)	79	27	24
Phase Split	61 %	21 %	18 %





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LANE SUMMARY

Site: POST 2015 PM PEAK - UPGRADE

Bruce Highway / Boundary Road (West)
Proposed Upgraded Configuration - Stage 1-3
POST DEV - 2015 PM Peak
Signals - Fixed Time Cycle Time = 110 seconds (Optimum Cycle Time - Minimum Delay)

Lane Use and Performance

	Demand Flows L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South: Bruce Highway																
Lane 1	44	0	0	44	15.9	765[1]	0.058	100	15.6	LOS B	0.5	4.0	75	Turn Bay	0.0	0.0
Lane 2	0	593	0	593	2.5	1145	0.517	100	8.4	LOS A	11.2	80.3	500	–	0.0	0.0
Lane 3	0	593	0	593	2.5	1145	0.517	100	8.4	LOS A	11.2	80.3	500	–	0.0	0.0
Approach	44	1185	0	1229	3.0		0.517		8.6	LOS A	11.2	80.3				
North: Bruce Highway																
Lane 1	0	431	0	431	4.1	1344	0.320	100	1.7	LOS A	2.2	15.6	500	–	0.0	0.0
Lane 2	0	431	0	431	4.1	1344	0.320	100	1.7	LOS A	2.2	15.6	500	–	0.0	0.0
Lane 3	0	0	38	38	31.6	84	0.453	100	69.1	LOS E	2.1	18.9	95	Turn Bay	0.0	0.0
Approach	0	861	38	899	5.2		0.453		4.6	LOS A	2.2	18.9				
West: Boundary Road																
Lane 1	92	0	0	92	9.8	213[1]	0.432	100	51.0	LOS D	4.3	32.6	50	Turn Bay	0.0	0.0
Lane 2	0	0	171	171	5.3	336	0.508	100	52.6	LOS D	8.4	61.4	500	–	0.0	0.0
Approach	92	0	171	263	6.8		0.508		52.0	LOS D	8.4	61.4				
Intersection				2391	4.3		0.517		11.9	LOS B	11.2	80.3				

Level of Service (LOS) Method: Delay (HCM 2000).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model used.

1 Reduced capacity due to a short lane effect

Processed: Wednesday, 3 July 2013 4:51:46 PM
SIDRA INTERSECTION 5.1.13.2093
Project: C:\Cambray Projects\STO0111\01R\Working\Sidra\13-03-04\Stg 1-3_Bruce Highway-Boundary West.sip
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SIDRA INTERSECTION

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PHASING SUMMARY

Bruce Highway / Boundary Road (West)
Proposed Upgraded Configuration - Stage 1-3
POST DEV - 2015 PM Peak
Signals - Fixed Time Cycle Time = 110 seconds (Optimum Cycle Time - Minimum Delay)

Phase times determined by the program
Sequence: CAMBRAY
Input Sequence: A, B, C
Output Sequence: A, B, C

Phase Timing Results

Phase	A	B	C
Green Time (sec)	65	21	6
Yellow Time (sec)	4	4	4
All-Red Time (sec)	2	2	2
Phase Time (sec)	71	27	12
Phase Split	65 %	25 %	11 %



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LANE SUMMARY

Bruce Highway / Boundary Road (West)
Proposed Upgraded Configuration - Stage 1-3
POST DEV - 2025 AM Peak
Signals - Fixed Time Cycle Time = 130 seconds (Optimum Cycle Time - Minimum Delay)

Lane Use and Performance

	Demand Flows L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South: Bruce Highway																
Lane 1	201	0	0	201	4.0	669[1]	0.300	100	18.9	LOS B	3.7	26.5	75	Turn Bay	0.0	0.0
Lane 2	0	287	0	287	11.3	1031	0.278	100	10.3	LOS B	5.7	43.5	500	–	0.0	0.0
Lane 3	0	287	0	287	11.3	1031	0.278	100	10.3	LOS B	5.7	43.5	500	–	0.0	0.0
Approach	201	574	0	775	9.4		0.300		12.5	LOS B	5.7	43.5				
North: Bruce Highway																
Lane 1	0	675	0	675	3.9	1434	0.471	100	1.5	LOS A	3.8	27.3	500	–	0.0	0.0
Lane 2	0	675	0	675	3.9	1434	0.471	100	1.5	LOS A	3.8	27.3	500	–	0.0	0.0
Lane 3	0	0	76	76	7.9	247	0.307	100	64.5	LOS E	4.2	31.8	95	Turn Bay	0.0	0.0
Approach	0	1349	76	1425	4.1		0.471		4.9	LOS A	4.2	31.8				
West: Boundary Road																
Lane 1	18	0	0	18	16.7	171[1]	0.105	100	59.7	LOS E	1.0	7.8	50	Turn Bay	0.0	0.0
Lane 2	0	0	47	47	14.9	267	0.176	100	60.4	LOS E	2.6	20.6	500	–	0.0	0.0
Approach	18	0	47	65	15.4		0.176		60.2	LOS E	2.6	20.6				
Intersection				2265	6.3		0.471		9.1	LOS A	5.7	43.5				

Level of Service (LOS) Method: Delay (HCM 2000).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model used.

1 Reduced capacity due to a short lane effect

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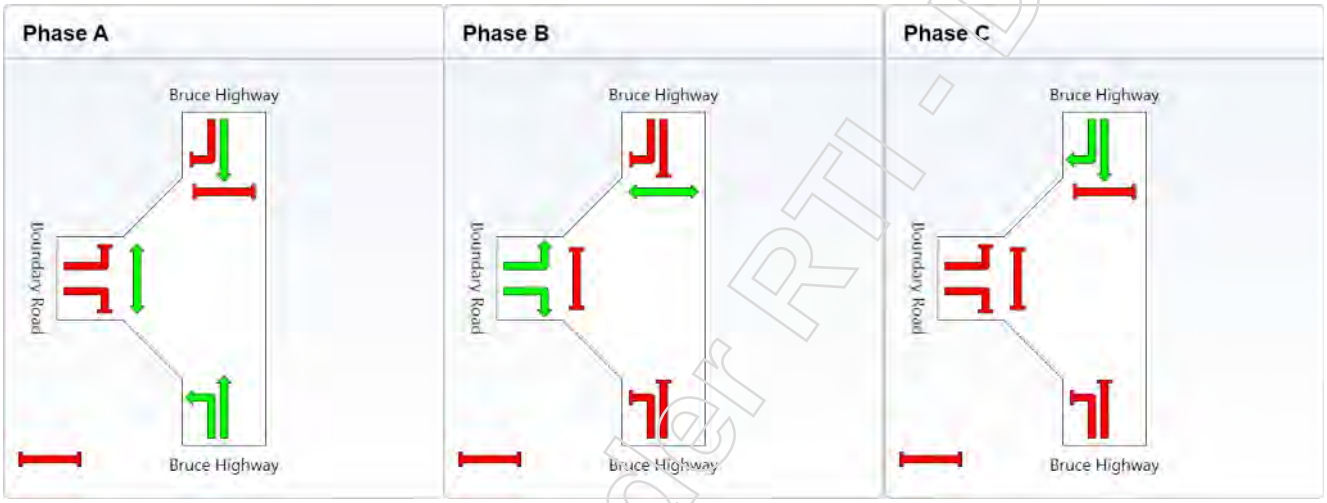
PHASING SUMMARY

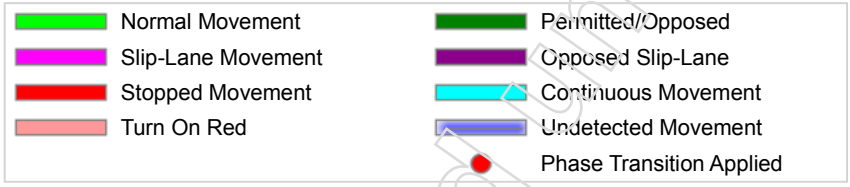
Bruce Highway / Boundary Road (West)
Proposed Upgraded Configuration - Stage 1-3
POST DEV - 2025 AM Peak
Signals - Fixed Time Cycle Time = 130 seconds (Optimum Cycle Time - Minimum Delay)

Phase times determined by the program
Sequence: CAMBRAY
Input Sequence: A, B, C
Output Sequence: A, B, C

Phase Timing Results

Phase	A	B	C
Green Time (sec)	73	21	18
Yellow Time (sec)	4	4	4
All-Red Time (sec)	2	2	2
Phase Time (sec)	79	27	24
Phase Split	61 %	21 %	18 %





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LANE SUMMARY

Site: POST 2025 PM PEAK - UPGRADE

Bruce Highway / Boundary Road (West)
Proposed Upgraded Configuration - Stage 1-3
POST DEV - 2025 PM Peak
Signals - Fixed Time Cycle Time = 115 seconds (Optimum Cycle Time - Minimum Delay)

Lane Use and Performance

	Demand Flows L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South: Bruce Highway																
Lane 1	44	0	0	44	15.9	797[1]	0.055	100	14.9	LOS B	0.5	3.7	75	Turn Bay	0.0	0.0
Lane 2	0	625	0	625	2.6	1179	0.530	100	7.6	LOS A	11.4	81.7	500	–	0.0	0.0
Lane 3	0	625	0	625	2.6	1179	0.530	100	7.6	LOS A	11.4	81.7	500	–	0.0	0.0
Approach	44	1250	0	1294	3.1		0.530		7.9	LOS A	11.4	81.7				
North: Bruce Highway																
Lane 1	0	450	0	450	4.2	1367	0.329	100	1.3	LOS A	1.8	13.0	500	–	0.0	0.0
Lane 2	0	450	0	450	4.2	1367	0.329	100	1.3	LOS A	1.8	13.0	500	–	0.0	0.0
Lane 3	0	0	38	38	31.6	80	0.473	100	72.1	LOS E	2.2	19.9	95	Turn Bay	0.0	0.0
Approach	0	899	38	937	5.3		0.473		4.2	LOS A	2.2	19.9				
West: Boundary Road																
Lane 1	92	0	0	92	9.8	203[1]	0.453	100	53.8	LOS D	4.5	34.4	50	Turn Bay	0.0	0.0
Lane 2	0	0	171	171	5.3	322	0.531	100	55.5	LOS E	8.9	64.9	500	–	0.0	0.0
Approach	92	0	171	263	6.8		0.531		54.9	LOS D	8.9	64.9				
Intersection				2494	4.3		0.531		11.4	LOS B	11.4	81.7				

Level of Service (LOS) Method: Delay (HCM 2000).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model used.

1 Reduced capacity due to a short lane effect

Processed: Wednesday, 3 July 2013 4:51:46 PM
SIDRA INTERSECTION 5.1.13.2093
Project: C:\Cambray Projects\STO0111\01R\Working\Sidra\13-03-04\Stg 1-3_Bruce Highway-Boundary West.sip
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SIDRA INTERSECTION

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PHASING SUMMARY

Bruce Highway / Boundary Road (West)
Proposed Upgraded Configuration - Stage 1-3
POST DEV - 2025 PM Peak
Signals - Fixed Time Cycle Time = 115 seconds (Optimum Cycle Time - Minimum Delay)

Phase times determined by the program
Sequence: CAMBRAY
Input Sequence: A, B, C
Output Sequence: A, B, C

Phase Timing Results

Phase	A	B	C
Green Time (sec)	70	21	6
Yellow Time (sec)	4	4	4
All-Red Time (sec)	2	2	2
Phase Time (sec)	76	27	12
Phase Split	66 %	23 %	10 %



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APPENDIX H

SIDRA Results

Bruce Highway / Yeppoon Road

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LANE SUMMARY

Site: PRE 2013 AM PEAK

Bruce Highway / Yeppoon Road
Existing Configuration - Stage 1-3
PRE DEV - 2013 AM Peak
Signals - Fixed Time Cycle Time = 145 seconds (Optimum Cycle Time - Minimum Delay)

Lane Use and Performance

	Demand Flows L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South: Bruce Highway (South)																
Lane 1	4	0	0	4	0.0	332[1]	0.012	100	28.7	LOS C	0.1	1.0	60	Turn Bay	0.0	0.0
Lane 2	0	176	0	176	6.3	927	0.190	59[6]	21.9	LOS C	6.9	50.5	500	–	0.0	0.0
Lane 3	0	299	0	299	6.3	927	0.322	100	23.6	LOS C	12.6	92.6	500	–	0.0	0.0
Lane 4	0	0	146	146	16.4	194	0.753	100	81.7	LOS F	10.6	83.0	100	Turn Bay	0.0	0.0
Approach	4	475	146	625	8.6		0.753		36.7	LOS D	12.6	92.6				
East: Yeppoon Road																
Lane 1	419	0	0	419	2.1	1848	0.227	100	9.5	X	X	X	500	–	0.0	X
Lane 2	0	3	204	207	6.8	334	0.620	100	68.7	LOS E	13.2	97.4	500	–	0.0	0.0
Approach	419	3	204	626	3.7		0.620		29.1	LOS C	13.2	97.4				
North: Bruce Highway (North)																
Lane 1	162	0	0	162	9.9	1753	0.092	100	9.8	X	X	X	100	Turn Bay	0.0	X
Lane 2	0	356	0	356	4.2	478[1]	0.746	100	26.7	LOS C	15.9	115.4	100	Turn Bay	0.0	18.0
Lane 3	0	701	0	701	4.2	939	0.746	100	31.5	LOS C	39.2	284.2	500	–	0.0	0.0
Lane 4	0	0	1	1	0.0	90[1]	0.011	100	69.1	LOS E	0.1	0.4	25	Turn Bay	0.0	0.0
Approach	162	1057	1	1220	4.9		0.746		27.2	LOS C	39.2	284.2				
West: Cultural Centre Access																
Lane 1	1	3	14	18	5.6	81	0.222	100	83.9	LOS F	1.3	9.6	500	–	0.0	0.0
Approach	1	3	14	18	5.6		0.222		83.9	LOS F	1.3	9.6				
Intersection				2489	5.5		0.753		30.5	LOS C	39.2	284.2				

X: Not applicable for Continuous lane.

Level of Service (LOS) Method: Delay (HCM 2000).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model used.

1 Reduced capacity due to a short lane effect
6 Lane underutilisation due to downstream effects

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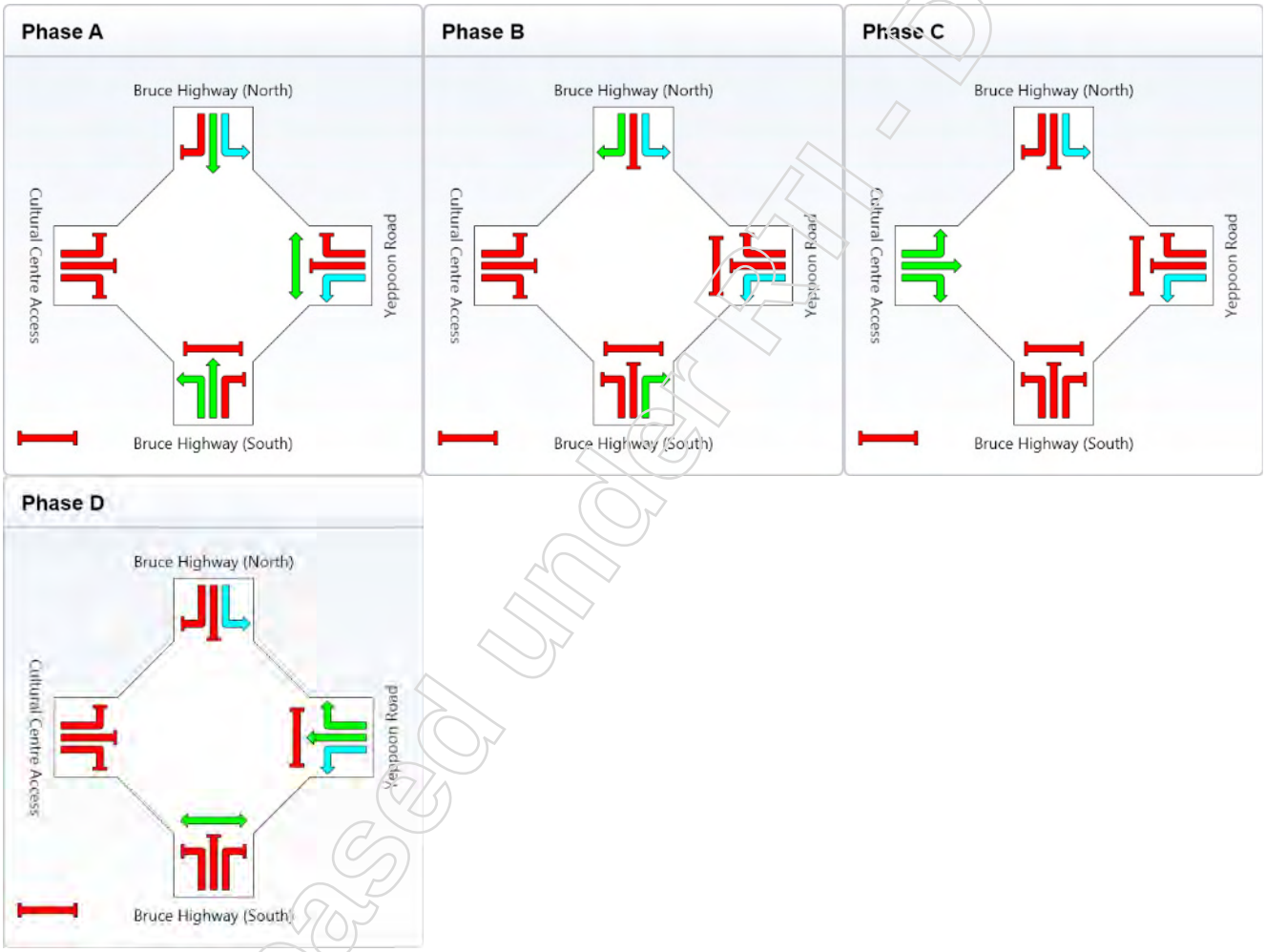
PHASING SUMMARY

Bruce Highway / Yeppoon Road
Existing Configuration - Stage 1-3
PRE DEV - 2013 AM Peak
Signals - Fixed Time Cycle Time = 145 seconds (Optimum Cycle Time - Minimum Delay)

Phase times determined by the program
Sequence: CAMBRAY
Input Sequence: A, B, C, D
Output Sequence: A, B, C, D

Phase Timing Results

Phase	A	B	C	D
Green Time (sec)	71	17	6	27
Yellow Time (sec)	4	4	4	4
All-Red Time (sec)	2	2	2	2
Phase Time (sec)	77	23	12	33
Phase Split	53 %	16 %	8 %	23 %





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LANE SUMMARY

Bruce Highway / Yeppoon Road
Existing Configuration - Stage 1-3
PRE DEV - 2013 PM Peak
Signals - Fixed Time Cycle Time = 135 seconds (Optimum Cycle Time - Minimum Delay)

Lane Use and Performance

	Demand Flows L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South: Bruce Highway (South)																
Lane 1	7	0	0	7	0.0	284[1]	0.025	100	39.2	LOS D	0.3	2.1	60	Turn Bay	0.0	0.0
Lane 2	0	401	0	401	3.1	673	0.597	59[6]	38.7	LOS D	21.6	155.1	500	–	0.0	0.0
Lane 3	0	643	37[0]	680	3.1	671	1.013	100	132.2	LOS F	76.4	548.6	500	–	0.0	13.4
Lane 4	0	0	361	361	1.5	361[1]	1.000[3]	100	63.8[8]	LOS E[8]	23.0[8]	163.2[8]	100	Turn Bay	0.0	50.0
Approach	7	1044	398	1449	2.6		1.013		88.8	LOS F	76.4	548.6				
East: Yeppoon Road																
Lane 1	116	0	0	116	7.8	1778	0.065	100	9.7	X	X	X	500	–	0.0	X
Lane 2	0	4	209	213	4.7	364	0.586	100	62.7	LOS E	12.3	89.7	500	–	0.0	0.0
Approach	116	4	209	329	5.8		0.586		44.0	LOS D	12.3	89.7				
North: Bruce Highway (North)																
Lane 1	315	0	0	315	0.6	1868	0.169	100	9.4	X	X	X	100	Turn Bay	0.0	X
Lane 2	0	279	0	279	5.1	412[1]	0.678	100	35.8	LOS D	13.9	101.6	100	Turn Bay	0.0	6.4
Lane 3	0	450	0	450	5.1	664	0.678	100	40.1	LOS D	25.1	183.5	500	–	0.0	0.0
Lane 4	0	0	2	2	0.0	111[1]	0.018	100	51.1	LOS D	0.1	0.7	25	Turn Bay	0.0	0.0
Approach	315	729	2	1046	3.7		0.678		29.8	LOS C	25.1	183.5				
West: Cultural Centre Access																
Lane 1	1	2	2	5	0.0	92	0.055	100	74.3	LOS E	0.3	2.3	500	–	0.0	0.0
Approach	1	2	2	5	0.0		0.055		74.3	LOS E	0.3	2.3				
Intersection				2829	3.4		1.013		61.7	LOS E	76.4	548.6				

X: Not applicable for Continuous lane.

Level of Service (LOS) Method: Delay (HCM 2000).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model used.

0 Excess flow from back of an adjacent short lane
1 Reduced capacity due to a short lane effect
3 x = 1.00 due to short lane.
6 Lane underutilisation due to downstream effects
8 Delay, queue length and stops for the short lane have been cut down to fit in the queuing space. You may wish to change the short lane to a full lane to investigate the effect on the adjacent lane performance.

Processed: Wednesday, 3 July 2013 4:59:36 PM
SIDRA INTERSECTION 5.1.13.2093
Project: C:\Cambray Projects\STO0111\01R\Working\Sidra\13-07-03\Stg 1-3_Bruce Highway-Yeppoon Rd.sip
8000396, CAMBRAY CONSULTING, SINGLE
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SIDRA INTERSECTION

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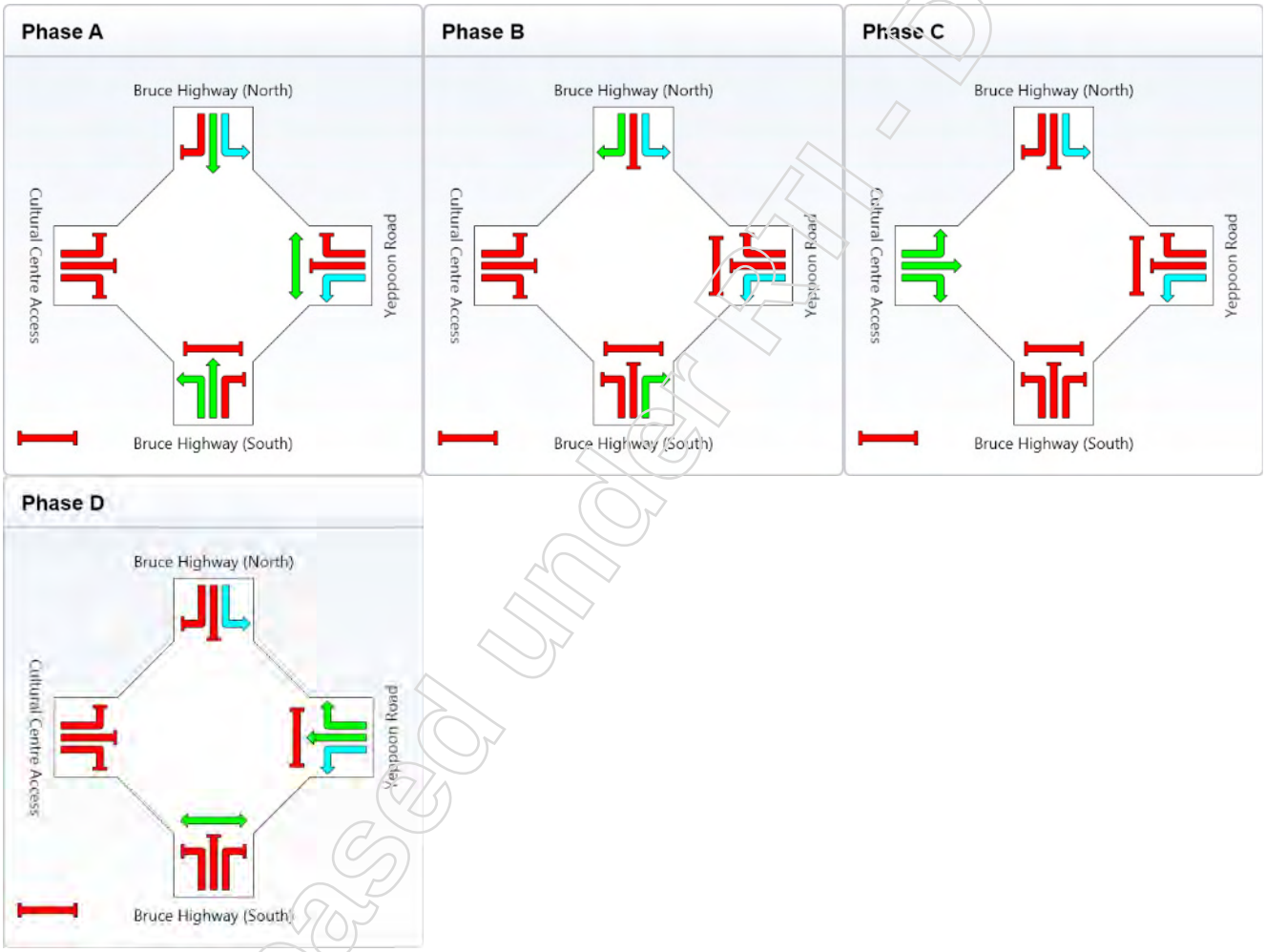
PHASING SUMMARY

Bruce Highway / Yeppoon Road
Existing Configuration - Stage 1-3
PRE DEV - 2013 PM Peak
Signals - Fixed Time Cycle Time = 135 seconds (Optimum Cycle Time - Minimum Delay)

Phase times determined by the program
Sequence: CAMBRAY
Input Sequence: A, B, C, D
Output Sequence: A, B, C, D

Phase Timing Results

Phase	A	B	C	D
Green Time (sec)	47	31	6	27
Yellow Time (sec)	4	4	4	4
All-Red Time (sec)	2	2	2	2
Phase Time (sec)	53	37	12	33
Phase Split	39 %	27 %	9 %	24 %





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LANE SUMMARY

Bruce Highway / Yeppoon Road
Proposed Intersection Upgrade - Stage 1-3
PRE DEV - 2013 AM Peak
Signals - Fixed Time Cycle Time = 115 seconds (Optimum Cycle Time - Minimum Delay)

Lane Use and Performance

	Demand Flows L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South: Bruce Highway (South)																
Lane 1	4	0	0	4	0.0	340[1]	0.012	100	32.0	LOS C	0.1	0.9	60	Turn Bay	0.0	0.0
Lane 2	0	238	0	238	6.3	724	0.328	100	26.8	LOS C	9.3	68.9	500	–	0.0	0.0
Lane 3	0	238	0	238	6.3	724	0.328	100	26.8	LOS C	9.3	68.9	500	–	0.0	0.0
Lane 4	0	0	146	146	16.4	201	0.725	100	66.7	LOS E	8.5	67.6	250	Turn Bay	0.0	0.0
Approach	4	475	146	625	8.6		0.725		36.1	LOS D	9.3	68.9				
East: Yeppoon Road																
Lane 1	419	0	0	419	2.1	1848	0.227	100	9.5	X	X	X	500	–	0.0	X
Lane 2	0	3	204	207	6.8	421	0.492	100	51.0	LOS D	9.5	70.6	500	–	0.0	0.0
Approach	419	3	204	626	3.7		0.492		23.2	LOS C	9.5	70.6				
North: Bruce Highway (North)																
Lane 1	162	0	0	162	9.9	1753	0.092	100	9.8	X	X	X	100	Turn Bay	0.0	X
Lane 2	0	529	0	529	4.2	734	0.720	100	32.4	LOS C	25.2	182.6	500	–	0.0	0.0
Lane 3	0	529	0	529	4.2	734	0.720	100	32.4	LOS C	25.2	182.6	500	–	0.0	0.0
Lane 4	0	0	1	1	0.0	112[1]	0.009	100	56.4	LOS E	0.0	0.3	25	Turn Bay	0.0	0.0
Approach	162	1057	1	1220	4.9		0.720		29.5	LOS C	25.2	182.6				
West: Cultural Centre Access																
Lane 1	1	3	14	18	5.6	102	0.176	100	66.7	LOS E	1.0	7.5	500	–	0.0	0.0
Approach	1	3	14	18	5.6		0.176		66.7	LOS E	1.0	7.5				
Intersection				2489	5.5		0.725		29.8	LOS C	25.2	182.6				

X: Not applicable for Continuous lane.

Level of Service (LOS) Method: Delay (HCM 2000).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model used.

1 Reduced capacity due to a short lane effect

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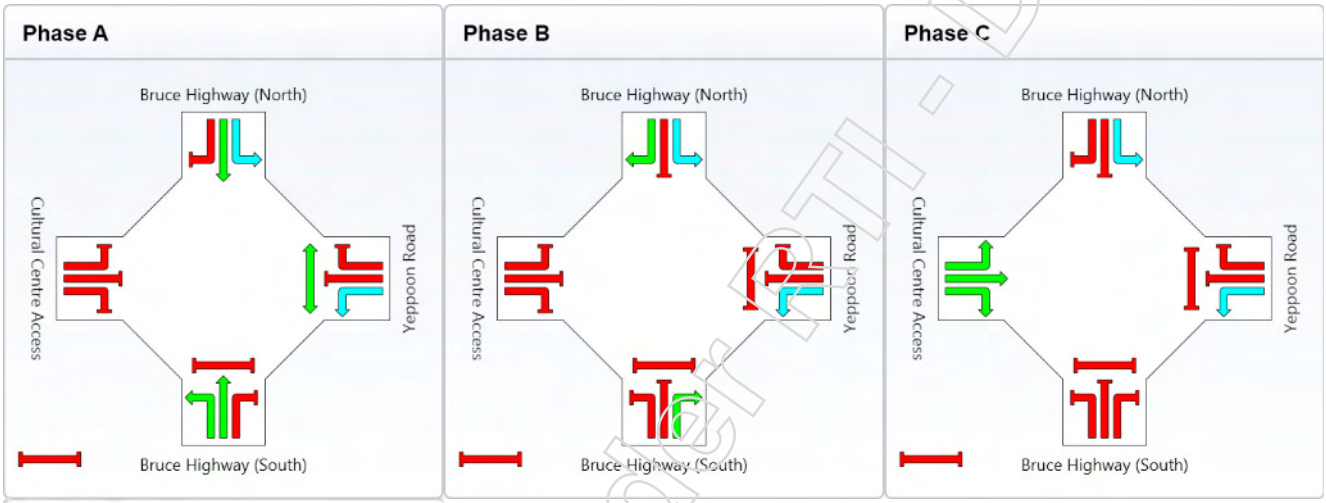
PHASING SUMMARY

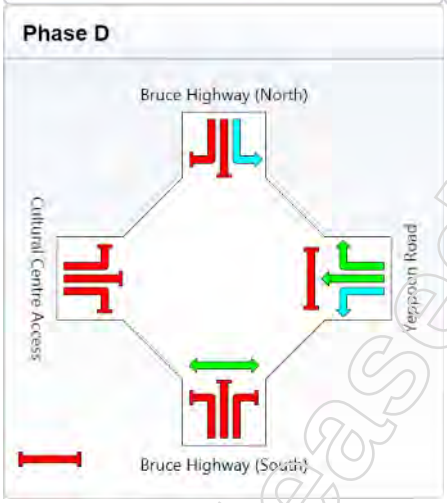
Bruce Highway / Yeppoon Road
Proposed Intersection Upgrade - Stage 1-3
PRE DEV - 2013 AM Peak
Signals - Fixed Time Cycle Time = 115 seconds (Optimum Cycle Time - Minimum Delay)

Phase times determined by the program
Sequence: CAMBRAY
Input Sequence: A, B, C, D
Output Sequence: A, B, C, D

Phase Timing Results

Phase	A	B	C	D
Green Time (sec)	44	14	6	27
Yellow Time (sec)	4	4	4	4
All-Red Time (sec)	2	2	2	2
Phase Time (sec)	50	20	12	33
Phase Split	43 %	17 %	10 %	29 %







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LANE SUMMARY

Bruce Highway / Yeppoon Road
Proposed Intersection Upgrade - Stage 1-3
PRE DEV - 2013 PM Peak
Signals - Fixed Time Cycle Time = 145 seconds (Optimum Cycle Time - Minimum Delay)

Lane Use and Performance

	Demand Flows L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South: Bruce Highway (South)																
Lane 1	7	0	0	7	0.0	264[1]	0.026	100	42.4	LOS D	0.3	2.2	60	Turn Bay	0.0	0.0
Lane 2	0	522	0	522	3.1	653	0.800	100	48.0	LOS D	34.0	243.9	500	–	0.0	0.0
Lane 3	0	522	0	522	3.1	653	0.800	100	48.0	LOS D	34.0	243.9	500	–	0.0	0.0
Lane 4	0	0	398	398	1.5	492	0.810	100	66.5	LOS E	27.6	195.4	250	Turn Bay	0.0	0.0
Approach	7	1044	398	1449	2.6		0.810		53.0	LOS D	34.0	243.9				
East: Yeppoon Road																
Lane 1	116	0	0	116	7.8	1778	0.065	100	9.7	X	X	X	500	–	0.0	X
Lane 2	0	4	209	213	4.7	339	0.629	100	68.6	LOS E	13.6	98.8	500	–	0.0	0.0
Approach	116	4	209	329	5.8		0.629		47.8	LOS D	13.6	98.8				
North: Bruce Highway (North)																
Lane 1	315	0	0	315	0.6	1868	0.169	100	9.4	X	X	X	100	Turn Bay	0.0	X
Lane 2	0	365	0	365	5.1	645	0.566	100	41.9	LOS D	20.9	152.8	500	–	0.0	0.0
Lane 3	0	365	0	365	5.1	645	0.566	100	41.9	LOS D	20.9	152.8	500	–	0.0	0.0
Lane 4	0	0	2	2	0.0	109[1]	0.018	100	49.5	LOS D	0.1	0.7	25	Turn Bay	0.0	0.0
Approach	315	729	2	1046	3.7		0.566		32.1	LOS C	20.9	152.8				
West: Cultural Centre Access																
Lane 1	1	2	2	5	0.0	85	0.059	100	79.9	LOS E	0.4	2.5	500	–	0.0	0.0
Approach	1	2	2	5	0.0		0.059		79.9	LOS E	0.4	2.5				
Intersection				2829	3.4		0.810		44.7	LOS D	34.0	243.9				

X: Not applicable for Continuous lane.

Level of Service (LOS) Method: Delay (HCM 2000).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model used.

1 Reduced capacity due to a short lane effect

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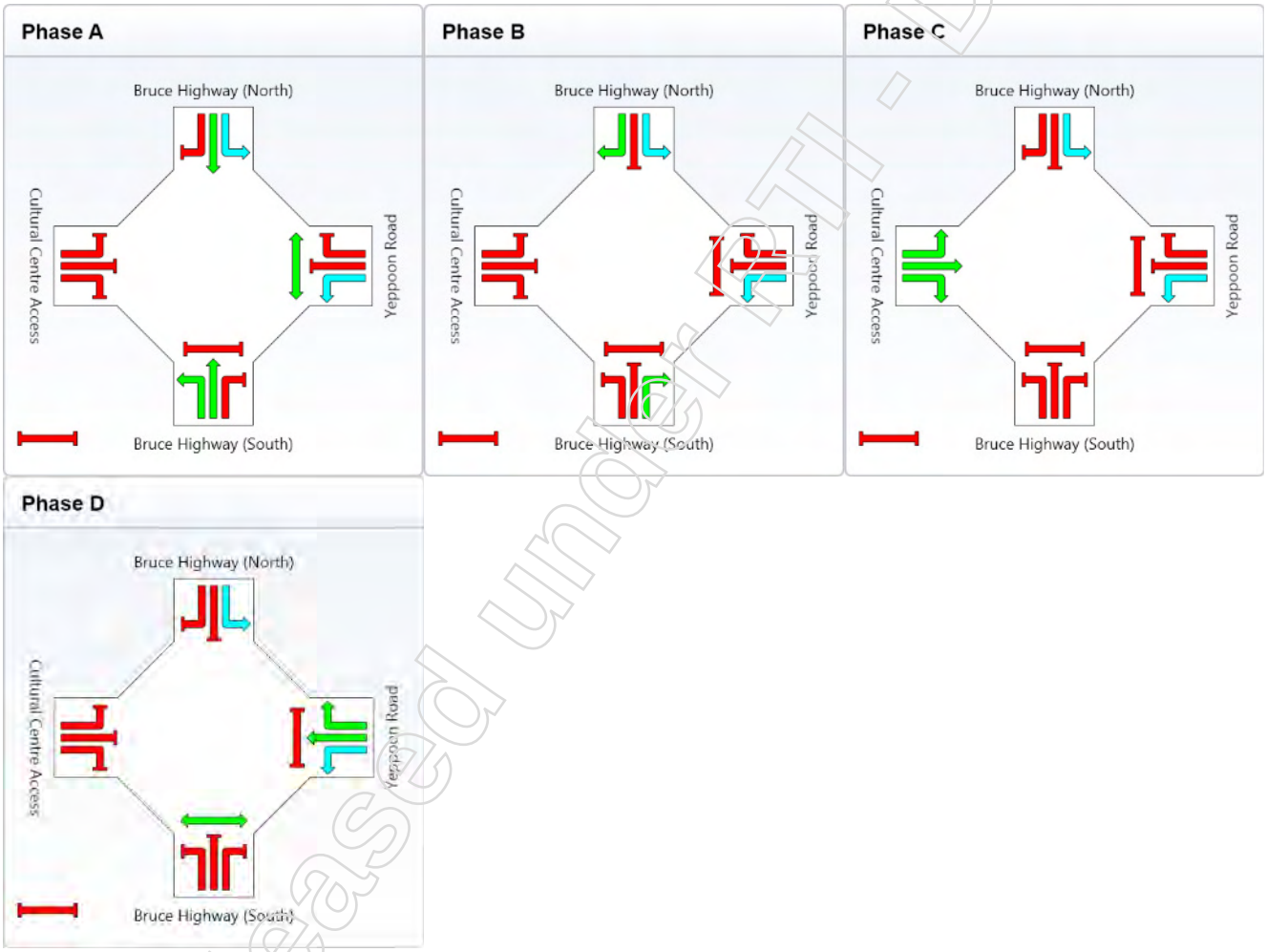
PHASING SUMMARY

Bruce Highway / Yeppoon Road
Proposed Intersection Upgrade - Stage 1-3
PRE DEV - 2013 PM Peak
Signals - Fixed Time Cycle Time = 145 seconds (Optimum Cycle Time - Minimum Delay)

Phase times determined by the program
Sequence: CAMBRAY
Input Sequence: A, B, C, D
Output Sequence: A, B, C, D

Phase Timing Results

Phase	A	B	C	D
Green Time (sec)	49	39	6	27
Yellow Time (sec)	4	4	4	4
All-Red Time (sec)	2	2	2	2
Phase Time (sec)	55	45	12	33
Phase Split	38 %	31 %	8 %	23 %





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LANE SUMMARY

Bruce Highway / Yeppoon Road
Proposed Intersection Upgrade - Stage 1-3
PRE DEV - 2015 AM Peak
Signals - Fixed Time Cycle Time = 130 seconds (Optimum Cycle Time - Minimum Delay)

Lane Use and Performance

	Demand Flows L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South: Bruce Highway (South)																
Lane 1	4	0	0	4	0.0	327[1]	0.012	100	31.6	LOS C	0.1	1.0	60	Turn Bay	0.0	0.0
Lane 2	0	241	0	241	6.4	800	0.301	100	26.3	LOS C	10.0	73.6	500	–	0.0	0.0
Lane 3	0	241	0	241	6.4	800	0.301	100	26.3	LOS C	10.0	73.6	500	–	0.0	0.0
Lane 4	0	0	152	152	16.4	229	0.664	100	69.8	LOS E	9.5	76.0	250	Turn Bay	0.0	0.0
Approach	4	482	152	638	8.8		0.664		36.7	LOS D	10.0	76.0				
East: Yeppoon Road																
Lane 1	437	0	0	437	2.3	1846	0.237	100	9.5	X	X	X	500	–	0.0	X
Lane 2	0	3	211	214	7.0	372	0.576	100	60.1	LOS E	11.8	87.6	500	–	0.0	0.0
Approach	437	3	211	651	3.8		0.576		26.1	LOS C	11.8	87.6				
North: Bruce Highway (North)																
Lane 1	168	0	0	168	10.1	1750	0.096	100	9.8	X	X	X	100	Turn Bay	0.0	X
Lane 2	0	537	0	537	4.2	811	0.662	100	27.8	LOS C	23.4	170.0	500	–	0.0	0.0
Lane 3	0	537	0	537	4.2	811	0.662	100	27.8	LOS C	23.4	170.0	500	–	0.0	0.0
Lane 4	0	0	1	1	0.0	107[1]	0.009	100	60.2	LOS E	0.1	0.4	25	Turn Bay	0.0	0.0
Approach	168	1074	1	1243	5.0		0.662		25.4	LOS C	23.4	170.0				
West: Cultural Centre Access																
Lane 1	1	3	14	18	5.6	90	0.199	100	75.3	LOS E	1.2	8.5	500	–	0.0	0.0
Approach	1	3	14	18	5.6		0.199		75.3	LOS E	1.2	8.5				
Intersection				2550	5.6		0.664		28.8	LOS C	23.4	170.0				

X: Not applicable for Continuous lane.

Level of Service (LOS) Method: Delay (HCM 2000).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model used.

1 Reduced capacity due to a short lane effect

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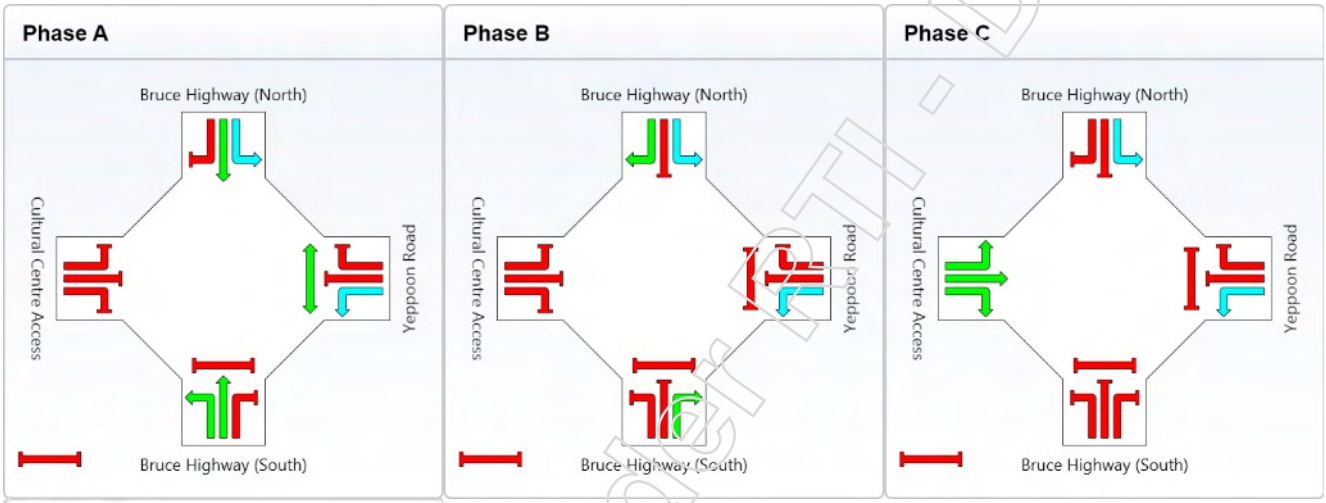
PHASING SUMMARY

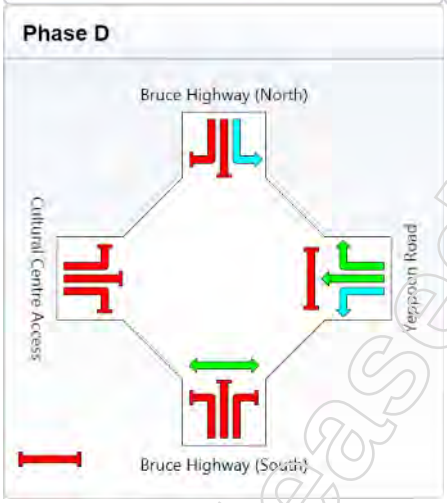
Bruce Highway / Yeppoon Road
Proposed Intersection Upgrade - Stage 1-3
PRE DEV - 2015 AM Peak
Signals - Fixed Time Cycle Time = 130 seconds (Optimum Cycle Time - Minimum Delay)

Phase times determined by the program
Sequence: CAMBRAY
Input Sequence: A, B, C, D
Output Sequence: A, B, C, D

Phase Timing Results

Phase	A	B	C	D
Green Time (sec)	55	18	6	27
Yellow Time (sec)	4	4	4	4
All-Red Time (sec)	2	2	2	2
Phase Time (sec)	61	24	12	33
Phase Split	47 %	18 %	9 %	25 %







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LANE SUMMARY

Bruce Highway / Yeppoon Road
Proposed Intersection Upgrade - Stage 1-3
PRE DEV - 2015 PM Peak
Signals - Fixed Time Cycle Time = 150 seconds (Optimum Cycle Time - Minimum Delay)

Lane Use and Performance

	Demand Flows L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South: Bruce Highway (South)																
Lane 1	7	0	0	7	0.0	257[1]	0.027	100	43.3	LOS D	0.3	2.3	60	Turn Bay	0.0	0.0
Lane 2	0	529	0	529	3.1	657	0.805	100	49.5	LOS D	35.6	255.7	500	–	0.0	0.0
Lane 3	0	529	0	529	3.1	657	0.805	100	49.5	LOS D	35.6	255.7	500	–	0.0	0.0
Lane 4	0	0	414	414	1.4	512	0.809	100	66.8	LOS E	29.3	207.8	250	Turn Bay	0.0	0.0
Approach	7	1057	414	1478	2.6		0.809		54.3	LOS D	35.6	255.7				
East: Yeppoon Road																
Lane 1	121	0	0	121	8.3	1772	0.068	100	9.7	X	X	X	500	–	0.0	X
Lane 2	0	4	215	219	5.0	326	0.671	100	71.9	LOS E	14.7	107.1	500	–	0.0	0.0
Approach	121	4	215	340	6.2		0.671		49.8	LOS D	14.7	107.1				
North: Bruce Highway (North)																
Lane 1	323	0	0	323	0.6	1868	0.173	100	9.4	X	X	X	100	Turn Bay	0.0	X
Lane 2	0	369	0	369	5.2	648	0.569	100	41.1	LOS D	19.7	143.7	500	–	0.0	0.0
Lane 3	0	369	0	369	5.2	648	0.569	100	41.1	LOS D	19.7	143.7	500	–	0.0	0.0
Lane 4	0	0	2	2	0.0	122[1]	0.016	100	49.5	LOS D	0.1	0.6	25	Turn Bay	0.0	0.0
Approach	323	737	2	1062	3.8		0.569		31.5	LOS C	19.7	143.7				
West: Cultural Centre Access																
Lane 1	1	2	2	5	0.0	82	0.061	100	82.7	LOS F	0.4	2.6	500	–	0.0	0.0
Approach	1	2	2	5	0.0		0.061		82.7	LOS F	0.4	2.6				
Intersection				2885	3.5		0.809		45.4	LOS D	35.6	255.7				

X: Not applicable for Continuous lane.

Level of Service (LOS) Method: Delay (HCM 2000).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model used.

1 Reduced capacity due to a short lane effect

Processed: Wednesday, 3 July 2013 5:15:55 PM
SIDRA INTERSECTION 5.1.13.2093
Project: C:\Cambray Projects\STO0111\01R\Working\Sidra\13-07-03\Stg 1-3_Bruce Highway-Yeppoon Rd.sip
8000396, CAMBRAY CONSULTING, SINGLE
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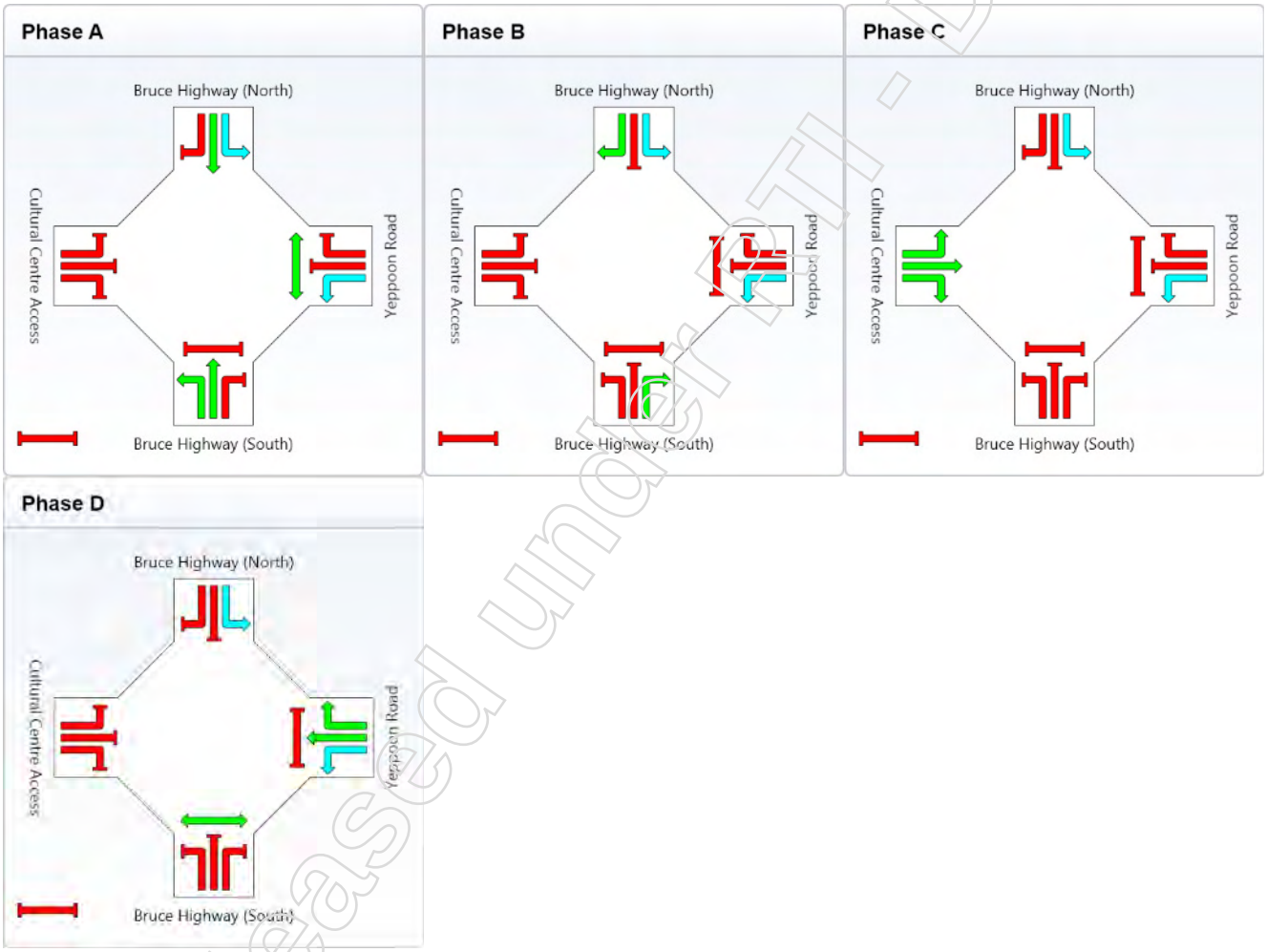
PHASING SUMMARY

Bruce Highway / Yeppoon Road
Proposed Intersection Upgrade - Stage 1-3
PRE DEV - 2015 PM Peak
Signals - Fixed Time Cycle Time = 150 seconds (Optimum Cycle Time - Minimum Delay)

Phase times determined by the program
Sequence: CAMBRAY
Input Sequence: A, B, C, D
Output Sequence: A, B, C, D

Phase Timing Results

Phase	A	B	C	D
Green Time (sec)	51	42	6	27
Yellow Time (sec)	4	4	4	4
All-Red Time (sec)	2	2	2	2
Phase Time (sec)	57	48	12	33
Phase Split	38 %	32 %	8 %	22 %





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LANE SUMMARY

Bruce Highway / Yeppoon Road
Proposed Intersection Upgrade - Stage 1-3
PRE DEV - 2025 AM Peak
Signals - Fixed Time Cycle Time = 135 seconds (Optimum Cycle Time - Minimum Delay)

Lane Use and Performance

	Demand Flows L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South: Bruce Highway (South)																
Lane 1	4	0	0	4	0.0	316[1]	0.013	100	32.5	LOS C	0.1	1.0	60	Turn Bay	0.0	0.0
Lane 2	0	259	0	259	6.6	798	0.324	100	27.7	LOS C	11.2	83.0	500	–	0.0	0.0
Lane 3	0	259	0	259	6.6	798	0.324	100	27.7	LOS C	11.2	83.0	500	–	0.0	0.0
Lane 4	0	0	186	186	16.7	257	0.724	100	71.7	LOS E	12.2	97.8	250	Turn Bay	0.0	0.0
Approach	4	517	186	707	9.2		0.724		39.3	LOS D	12.2	97.8				
East: Yeppoon Road																
Lane 1	532	0	0	532	2.3	1847	0.288	100	9.5	X	X	X	500	–	0.0	X
Lane 2	0	3	250	253	7.1	357	0.708	100	65.0	LOS E	15.4	114.2	500	–	0.0	0.0
Approach	532	3	250	785	3.8		0.708		27.4	LOS C	15.4	114.2				
North: Bruce Highway (North)																
Lane 1	204	0	0	204	10.3	1748	0.117	100	9.8	X	X	X	100	Turn Bay	0.0	X
Lane 2	0	582	0	582	4.3	809	0.719	100	30.0	LOS C	27.8	202.1	500	–	0.0	0.0
Lane 3	0	582	0	582	4.3	809	0.719	100	30.0	LOS C	27.8	202.1	500	–	0.0	0.0
Lane 4	0	0	1	1	0.0	107[1]	0.009	100	59.9	LOS E	0.1	0.4	25	Turn Bay	0.0	0.0
Approach	204	1164	1	1369	5.2		0.719		27.0	LOS C	27.8	202.1				
West: Cultural Centre Access																
Lane 1	1	3	14	18	5.6	87	0.207	100	78.2	LOS E	1.2	8.9	500	–	0.0	0.0
Approach	1	3	14	18	5.6		0.207		78.2	LOS E	1.2	8.9				
Intersection				2879	5.8		0.724		30.4	LOS C	27.8	202.1				

X: Not applicable for Continuous lane.

Level of Service (LOS) Method: Delay (HCM 2000).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model used.

1 Reduced capacity due to a short lane effect

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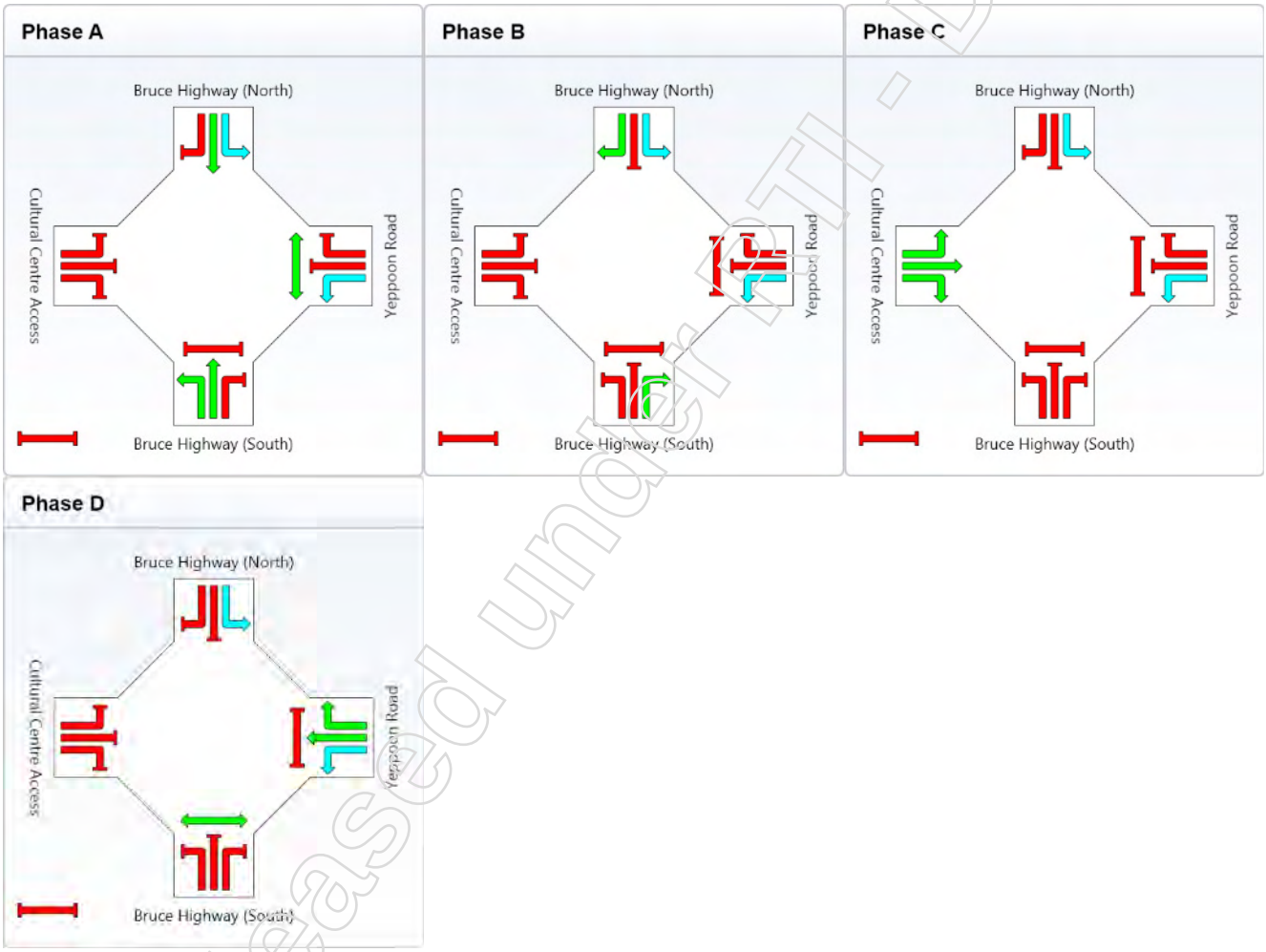
PHASING SUMMARY

Bruce Highway / Yeppoon Road
Proposed Intersection Upgrade - Stage 1-3
PRE DEV - 2025 AM Peak
Signals - Fixed Time Cycle Time = 135 seconds (Optimum Cycle Time - Minimum Delay)

Phase times determined by the program
Sequence: CAMBRAY
Input Sequence: A, B, C, D
Output Sequence: A, B, C, D

Phase Timing Results

Phase	A	B	C	D
Green Time (sec)	57	21	6	27
Yellow Time (sec)	4	4	4	4
All-Red Time (sec)	2	2	2	2
Phase Time (sec)	63	27	12	33
Phase Split	47 %	20 %	9 %	24 %





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LANE SUMMARY

Bruce Highway / Yeppoon Road
Proposed Intersection Upgrade - Stage 1-3
PRE DEV - 2025 PM Peak
Signals - Fixed Time Cycle Time = 150 seconds (Optimum Cycle Time - Minimum Delay)

Lane Use and Performance

	Demand Flows L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South: Bruce Highway (South)																
Lane 1	7	0	0	7	0.0	251[1]	0.028	100	45.5	LOS D	0.3	2.4	60	Turn Bay	0.0	0.0
Lane 2	0	562	0	562	3.2	618	0.910	100	67.9	LOS E	46.0	330.7	500	–	0.0	0.0
Lane 3	0	562	0	562	3.2	618	0.910	100	67.9	LOS E	46.0	330.7	500	–	0.0	0.0
Lane 4	0	0	505	505	1.6	548	0.921	100	84.3	LOS F	43.2	306.6	250	Turn Bay	0.0	23.5
Approach	7	1124	505	1636	2.7		0.921		72.9	LOS E	46.0	330.7				
East: Yeppoon Road																
Lane 1	148	0	0	148	8.1	1774	0.083	100	9.7	X	X	X	500	–	0.0	X
Lane 2	0	4	249	253	5.1	326	0.776	100	75.4	LOS E	17.9	131.1	500	–	0.0	0.0
Approach	148	4	249	401	6.2		0.776		51.2	LOS D	17.9	131.1				
North: Bruce Highway (North)																
Lane 1	369	0	0	369	0.5	1869	0.197	100	9.4	X	X	X	100	Turn Bay	0.0	X
Lane 2	0	391	0	391	5.4	609	0.641	100	45.2	LOS D	22.4	163.9	500	–	0.0	0.0
Lane 3	0	391	0	391	5.4	609	0.641	100	45.2	LOS D	22.4	163.9	500	–	0.0	0.0
Lane 4	0	0	2	2	0.0	127[1]	0.016	100	46.7	LOS D	0.1	0.6	25	Turn Bay	0.0	0.0
Approach	369	781	2	1152	3.8		0.641		33.7	LOS C	22.4	163.9				
West: Cultural Centre Access																
Lane 1	1	2	2	5	0.0	82	0.061	100	82.7	LOS F	0.4	2.6	500	–	0.0	0.0
Approach	1	2	2	5	0.0		0.061		82.7	LOS F	0.4	2.6				
Intersection				3194	3.5		0.921		56.0	LOS E	46.0	330.7				

X: Not applicable for Continuous lane.

Level of Service (LOS) Method: Delay (HCM 2000).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model used.

1 Reduced capacity due to a short lane effect

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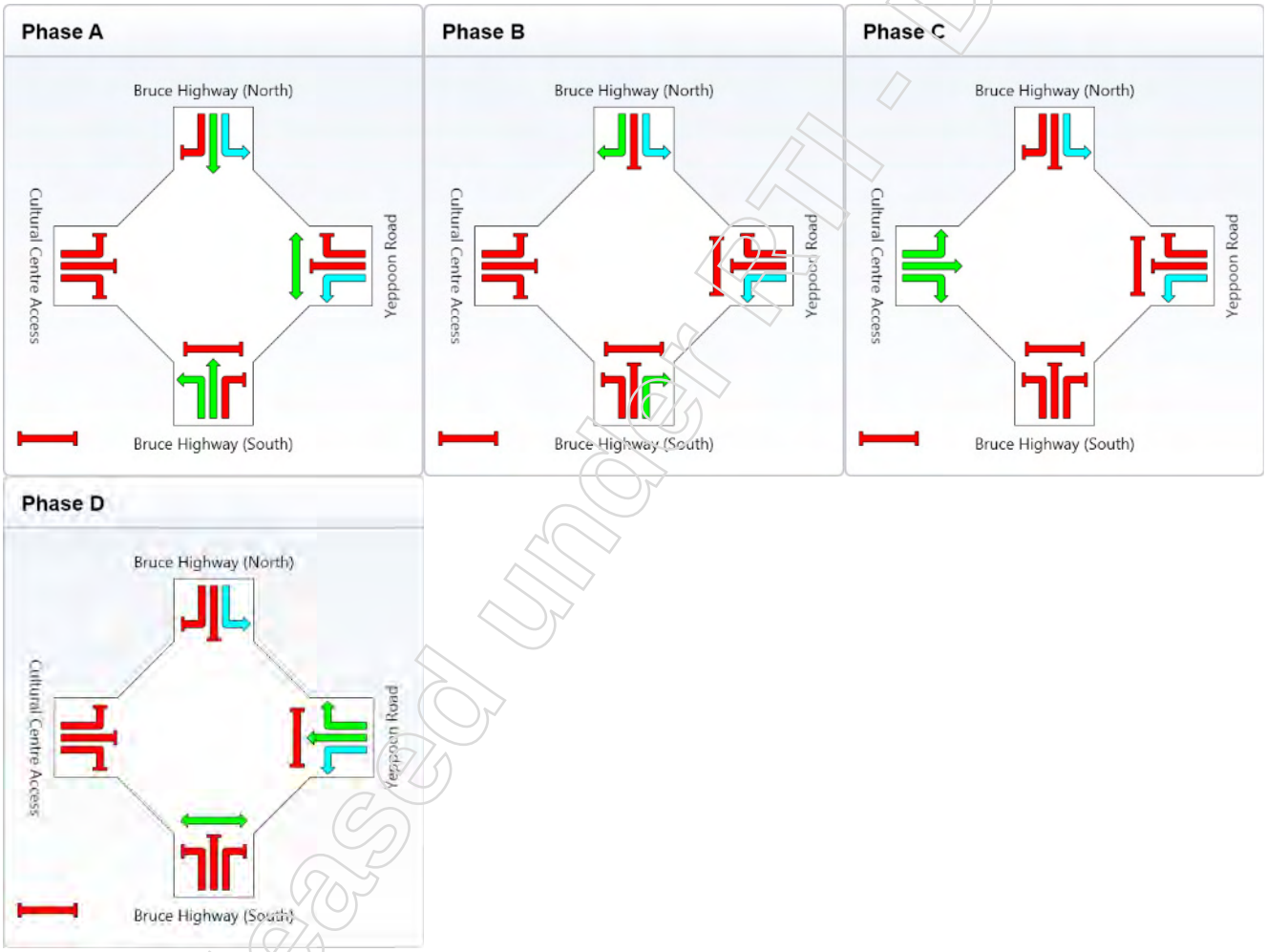
PHASING SUMMARY

Bruce Highway / Yeppoon Road
Proposed Intersection Upgrade - Stage 1-3
PRE DEV - 2025 PM Peak
Signals - Fixed Time Cycle Time = 150 seconds (Optimum Cycle Time - Minimum Delay)

Phase times determined by the program
Sequence: CAMBRAY
Input Sequence: A, B, C, D
Output Sequence: A, B, C, D

Phase Timing Results

Phase	A	B	C	D
Green Time (sec)	48	45	6	27
Yellow Time (sec)	4	4	4	4
All-Red Time (sec)	2	2	2	2
Phase Time (sec)	54	51	12	33
Phase Split	36 %	34 %	8 %	22 %





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LANE SUMMARY

Bruce Highway / Yeppoon Road
Proposed Intersection Upgrade 2 - Stage 1-3
PRE DEV - 2025 AM Peak
Signals - Fixed Time Cycle Time = 125 seconds (Optimum Cycle Time - Minimum Delay)

Lane Use and Performance

	Demand Flows L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South: Bruce Highway (South)																
Lane 1	4	256	0	260	6.5	862	0.302	100	22.9	LOS C	9.9	72.9	500	–	0.0	0.0
Lane 2	0	261	0	261	6.6	862	0.302	100	22.7	LOS C	9.9	73.0	500	–	0.0	0.0
Lane 3	0	0	94	94	16.7	148	0.635	100	73.1	LOS E	5.9	46.9	150	Turn Bay	0.0	0.0
Lane 4	0	0	92	92	16.7	145	0.635	100	73.2	LOS E	5.8	46.2	150	Turn Bay	0.0	0.0
Approach	4	517	186	707	9.2		0.635		36.1	LOS D	9.9	73.0				
East: Yeppoon Road																
Lane 1	532	0	0	532	2.3	1847	0.288	100	9.5	X	X	X	500	–	0.0	X
Lane 2	0	3	250	253	7.1	386	0.655	100	58.4	LOS E	13.7	101.8	500	–	0.0	0.0
Approach	532	3	250	785	3.8		0.655		25.3	LOS C	13.7	101.8				
North: Bruce Highway (North)																
Lane 1	204	0	0	204	10.3	1414[1]	0.144	100	10.1	LOS B	0.5	3.6	100	Turn Bay	0.0	0.0
Lane 2	0	582	0	582	4.3	874	0.666	100	23.4	LOS C	23.1	167.8	500	–	0.0	0.0
Lane 3	0	582	0	582	4.3	874	0.666	100	23.4	LOS C	23.1	167.8	500	–	0.0	0.0
Lane 4	0	0	1	1	0.0	102[1]	0.010	100	65.1	LOS E	0.1	0.4	25	Turn Bay	0.0	0.0
Approach	204	1164	1	1369	5.2		0.666		21.5	LOS C	23.1	167.8				
West: Cultural Centre Access																
Lane 1	1	3	14	18	5.6	94	0.191	100	72.5	LOS E	1.1	8.2	500	–	0.0	0.0
Approach	1	3	14	18	5.6		0.191		72.5	LOS E	1.1	8.2				
Intersection				2879	5.8		0.666		26.4	LOS C	23.1	167.8				

X: Not applicable for Continuous lane.

Level of Service (LOS) Method: Delay (HCM 2000).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model used.

1 Reduced capacity due to a short lane effect

Processed: Wednesday, 3 July 2013 5:15:57 PM
SIDRA INTERSECTION 5.1.13.2093
Project: C:\Cambray Projects\STO0111\01R\Working\Sidra\13-07-03\Stg 1-3_Bruce Highway-Yeppoon Rd.sip
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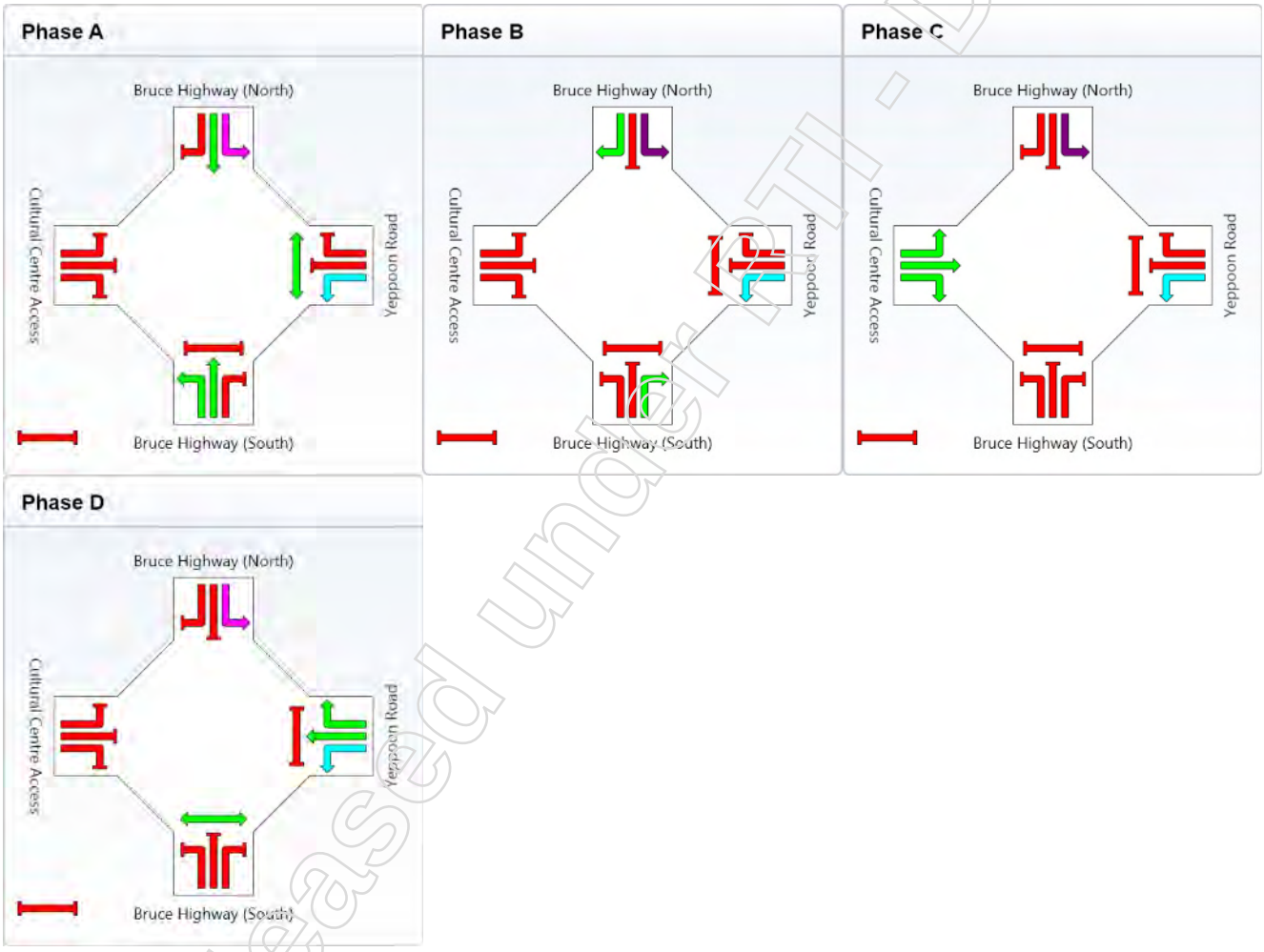
PHASING SUMMARY

Bruce Highway / Yeppoon Road
Proposed Intersection Upgrade 2 - Stage 1-3
PRE DEV - 2025 AM Peak
Signals - Fixed Time Cycle Time = 125 seconds (Optimum Cycle Time - Minimum Delay)

Phase times determined by the program
Sequence: CAMBRAY
Input Sequence: A, B, C, D
Output Sequence: A, B, C, D

Phase Timing Results

Phase	A	B	C	D
Green Time (sec)	57	11	6	27
Yellow Time (sec)	4	4	4	4
All-Red Time (sec)	2	2	2	2
Phase Time (sec)	63	17	12	33
Phase Split	50 %	14 %	10 %	26 %





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LANE SUMMARY

Bruce Highway / Yeppoon Road
Proposed Intersection Upgrade 2 - Stage 1-3
PRE DEV - 2025 PM Peak
Signals - Fixed Time Cycle Time = 130 seconds (Optimum Cycle Time - Minimum Delay)

Lane Use and Performance

	Demand Flows L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South: Bruce Highway (South)																
Lane 1	7	558	0	565	3.2	742	0.762	100	37.3	LOS D	31.0	222.8	500	–	0.0	0.0
Lane 2	0	566	0	566	3.2	742	0.762	100	37.2	LOS D	31.0	222.9	500	–	0.0	0.0
Lane 3	0	0	254	254	1.6	328	0.775	100	68.3	LOS E	16.3	113.4	150	Turn Bay	0.0	0.0
Lane 4	0	0	251	251	1.6	323	0.775	100	68.4	LOS E	16.0	113.8	150	Turn Bay	0.0	0.0
Approach	7	1124	505	1636	2.7		0.775		46.8	LOS D	31.0	222.9				
East: Yeppoon Road																
Lane 1	148	0	0	148	8.1	1774	0.083	100	9.7	X	X	X	500	–	0.0	X
Lane 2	0	4	249	253	5.1	376	0.672	100	61.2	LOS E	14.4	105.4	500	–	0.0	0.0
Approach	148	4	249	401	6.2		0.672		42.2	LOS D	14.4	105.4				
North: Bruce Highway (North)																
Lane 1	369	0	0	369	0.5	1337[1]	0.276	100	10.2	LOS B	1.2	8.7	100	Turn Bay	0.0	0.0
Lane 2	0	391	0	391	5.4	732	0.533	100	30.1	LOS C	16.5	120.5	500	–	0.0	0.0
Lane 3	0	391	0	391	5.4	732	0.533	100	30.1	LOS C	16.5	120.5	500	–	0.0	0.0
Lane 4	0	0	2	2	0.0	114[1]	0.017	100	55.6	LOS E	0.1	0.7	25	Turn Bay	0.0	0.0
Approach	369	781	2	1152	3.8		0.533		23.7	LOS C	16.5	120.5				
West: Cultural Centre Access																
Lane 1	1	2	2	5	0.0	95	0.053	100	71.5	LOS E	0.3	2.2	500	–	0.0	0.0
Approach	1	2	2	5	0.0		0.053		71.5	LOS E	0.3	2.2				
Intersection				3194	3.5		0.775		38.0	LOS D	31.0	222.9				

X: Not applicable for Continuous lane.

Level of Service (LOS) Method: Delay (HCM 2000).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model used.

1 Reduced capacity due to a short lane effect

Processed: Wednesday, 3 July 2013 5:15:57 PM
SIDRA INTERSECTION 5.1.13.2093
Project: C:\Cambray Projects\STO0111\01R\Working\Sidra\13-07-03\Stg 1-3_Bruce Highway-Yeppoon Rd.sip
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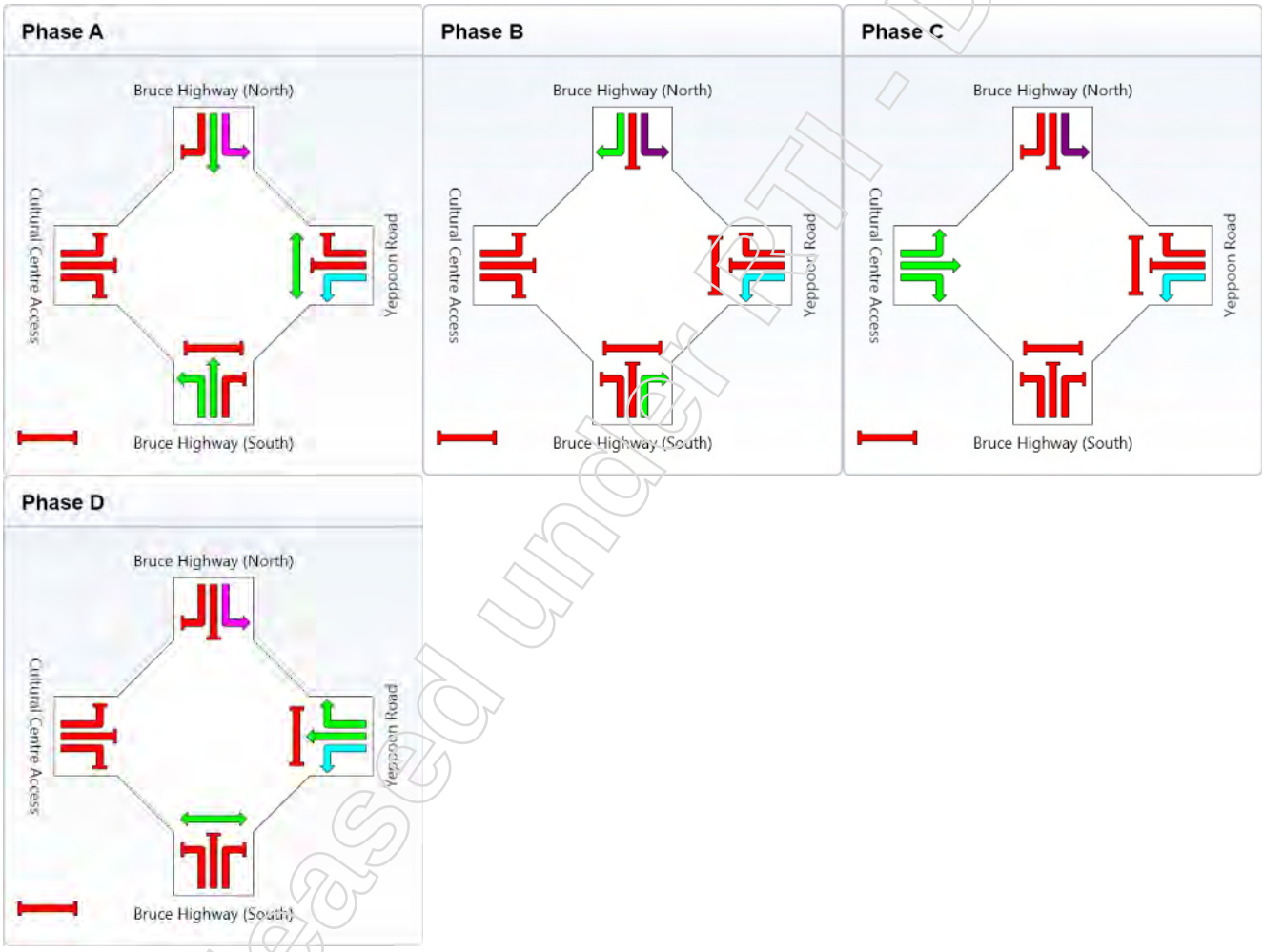
PHASING SUMMARY

Bruce Highway / Yeppoon Road
Proposed Intersection Upgrade 2 - Stage 1-3
PRE DEV - 2025 PM Peak
Signals - Fixed Time Cycle Time = 130 seconds (Optimum Cycle Time - Minimum Delay)

Phase times determined by the program
Sequence: CAMBRAY
Input Sequence: A, B, C, D
Output Sequence: A, B, C, D

Phase Timing Results

Phase	A	B	C	D
Green Time (sec)	50	23	6	27
Yellow Time (sec)	4	4	4	4
All-Red Time (sec)	2	2	2	2
Phase Time (sec)	56	29	12	33
Phase Split	43 %	22 %	9 %	25 %





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LANE SUMMARY

Bruce Highway / Yeppoon Road
Proposed Intersection Upgrade 2 - Stage 1-3
POST DEV - 2015 AM Peak
Signals - Fixed Time Cycle Time = 130 seconds (Optimum Cycle Time - Minimum Delay)

Lane Use and Performance

	Demand Flows L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South: Bruce Highway (South)																
Lane 1	4	247	0	251	6.1	918	0.274	100	21.2	LOS C	9.3	68.4	500	–	0.0	0.0
Lane 2	0	251	0	251	6.2	918	0.274	100	21.0	LOS C	9.3	68.5	500	–	0.0	0.0
Lane 3	0	0	77	77	16.4	129	0.593	100	76.4	LOS E	5.0	39.8	150	Turn Bay	0.0	0.0
Lane 4	0	0	75	75	16.4	127	0.593	100	76.5	LOS E	4.9	39.2	150	Turn Bay	0.0	0.0
Approach	4	498	152	654	8.6		0.593		34.0	LOS C	9.3	68.5				
East: Yeppoon Road																
Lane 1	437	0	0	437	2.3	1846	0.237	100	9.5	X	X	X	500	–	0.0	X
Lane 2	0	3	219	222	6.8	372	0.597	100	60.3	LOS E	12.3	91.4	500	–	0.0	0.0
Approach	437	3	219	659	3.8		0.597		26.6	LOS C	12.3	91.4				
North: Bruce Highway (North)																
Lane 1	181	0	0	181	9.4	1439[1]	0.126	100	10.1	LOS B	0.4	3.1	100	Turn Bay	0.0	0.0
Lane 2	0	574	0	574	3.9	931	0.616	100	20.6	LOS C	21.1	152.6	500	–	0.0	0.0
Lane 3	0	574	0	574	3.9	931	0.616	100	20.6	LOS C	21.1	152.6	500	–	0.0	0.0
Lane 4	0	0	1	1	0.0	96[1]	0.010	100	69.0	LOS E	0.1	0.4	25	Turn Bay	0.0	0.0
Approach	181	1147	1	1329	4.7		0.616		19.2	LOS B	21.1	152.6				
West: Cultural Centre Access																
Lane 1	1	3	14	18	5.6	90	0.199	100	75.3	LOS E	1.2	8.5	500	–	0.0	0.0
Approach	1	3	14	18	5.6		0.199		75.3	LOS E	1.2	8.5				
Intersection				2660	5.4		0.616		25.1	LOS C	21.1	152.6				

X: Not applicable for Continuous lane.

Level of Service (LOS) Method: Delay (HCM 2000).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model used.

1 Reduced capacity due to a short lane effect

Processed: Wednesday, 3 July 2013 5:15:58 PM
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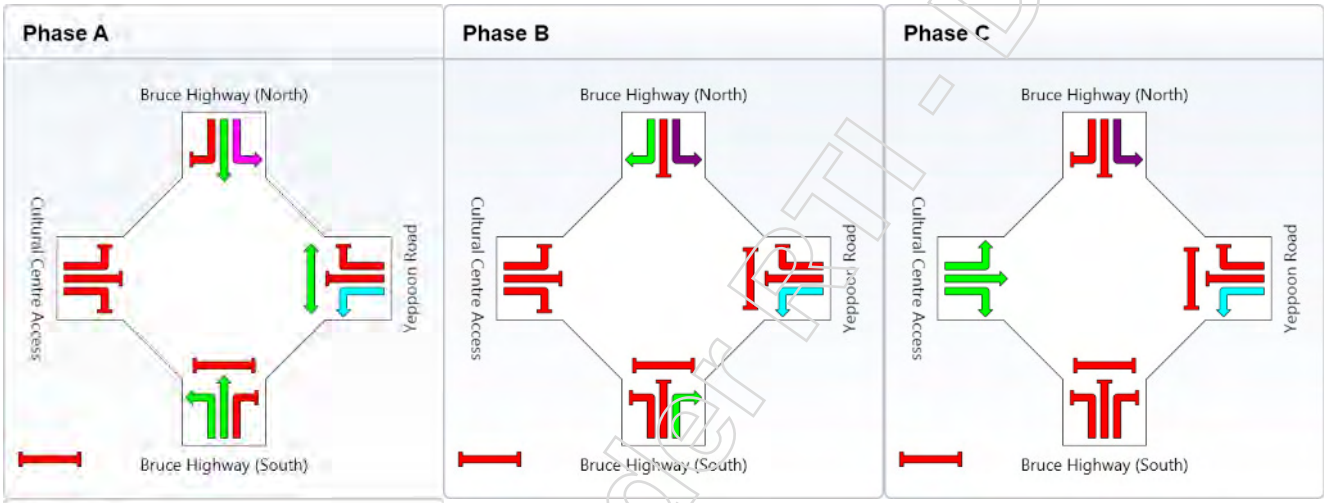
PHASING SUMMARY

Bruce Highway / Yeppoon Road
Proposed Intersection Upgrade 2 - Stage 1-3
POST DEV - 2015 AM Peak
Signals - Fixed Time Cycle Time = 130 seconds (Optimum Cycle Time - Minimum Delay)

Phase times determined by the program
Sequence: CAMBRAY
Input Sequence: A, B, C, D
Output Sequence: A, B, C, D

Phase Timing Results

Phase	A	B	C	D
Green Time (sec)	63	10	6	27
Yellow Time (sec)	4	4	4	4
All-Red Time (sec)	2	2	2	2
Phase Time (sec)	69	16	12	33
Phase Split	53 %	12 %	9 %	25 %





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LANE SUMMARY

Bruce Highway / Yeppoon Road
Proposed Intersection Upgrade 2 - Stage 1-3
POST DEV - 2015 PM Peak
Signals - Fixed Time Cycle Time = 125 seconds (Optimum Cycle Time - Minimum Delay)

Lane Use and Performance

	Demand Flows L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South: Bruce Highway (South)																
Lane 1	7	562	0	569	2.9	758	0.751	100	35.1	LOS D	29.7	213.0	500	–	0.0	0.0
Lane 2	0	569	0	569	2.9	758	0.751	100	35.0	LOS C	29.7	213.1	500	–	0.0	0.0
Lane 3	0	0	209	209	1.4	282	0.739	100	67.2	LOS E	12.8	90.5	150	Turn Bay	0.0	0.0
Lane 4	0	0	205	205	1.4	278	0.739	100	67.3	LOS E	12.6	89.2	150	Turn Bay	0.0	0.0
Approach	7	1131	414	1552	2.5		0.751		43.6	LOS D	29.7	213.1				
East: Yeppoon Road																
Lane 1	121	0	0	121	8.3	1772	0.068	100	9.7	X	X	X	500	–	0.0	X
Lane 2	0	4	232	236	4.7	393	0.601	100	57.5	LOS E	12.5	91.2	500	–	0.0	0.0
Approach	121	4	232	357	5.9		0.601		41.3	LOS D	12.5	91.2				
North: Bruce Highway (North)																
Lane 1	343	0	0	343	0.6	1390[1]	0.247	100	10.0	LOS B	1.0	7.2	100	Turn Bay	0.0	0.0
Lane 2	0	389	0	389	4.9	749	0.519	100	27.9	LOS C	15.4	112.2	500	–	0.0	0.0
Lane 3	0	389	0	389	4.9	749	0.519	100	27.9	LOS C	15.4	112.2	500	–	0.0	0.0
Lane 4	0	0	2	2	0.0	114[1]	0.018	100	56.8	LOS E	0.1	0.7	25	Turn Bay	0.0	0.0
Approach	343	777	2	1122	3.6		0.519		22.5	LOS C	15.4	112.2				
West: Cultural Centre Access																
Lane 1	1	2	2	5	0.0	99	0.051	100	68.7	LOS E	0.3	2.1	500	–	0.0	0.0
Approach	1	2	2	5	0.0		0.051		68.7	LOS E	0.3	2.1				
Intersection				3036	3.3		0.751		35.6	LOS D	29.7	213.1				

X: Not applicable for Continuous lane.

Level of Service (LOS) Method: Delay (HCM 2000).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model used.

1 Reduced capacity due to a short lane effect

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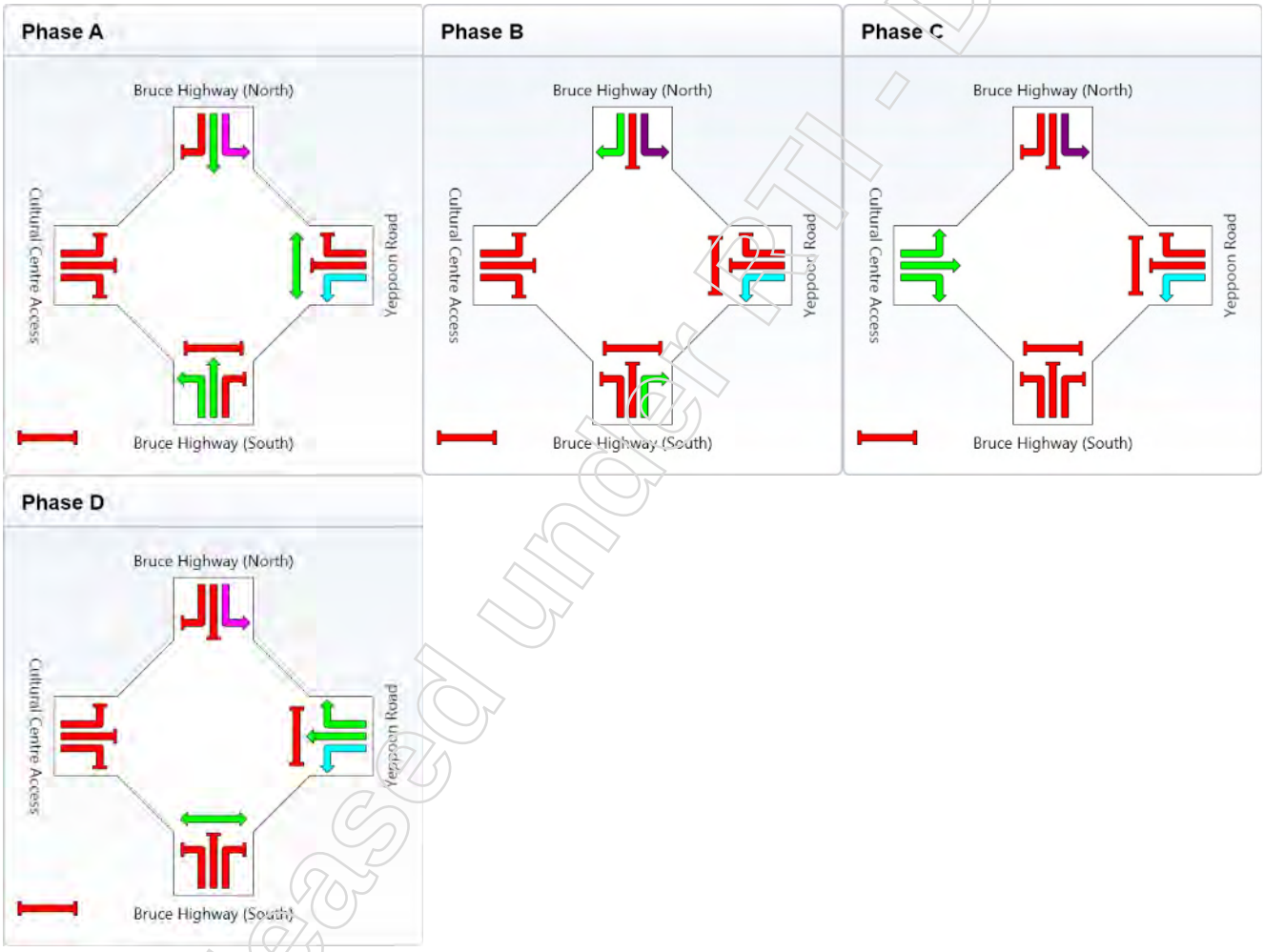
PHASING SUMMARY

Bruce Highway / Yeppoon Road
Proposed Intersection Upgrade 2 - Stage 1-3
POST DEV - 2015 PM Peak
Signals - Fixed Time Cycle Time = 125 seconds (Optimum Cycle Time - Minimum Delay)

Phase times determined by the program
Sequence: CAMBRAY
Input Sequence: A, B, C, D
Output Sequence: A, B, C, D

Phase Timing Results

Phase	A	B	C	D
Green Time (sec)	49	19	6	27
Yellow Time (sec)	4	4	4	4
All-Red Time (sec)	2	2	2	2
Phase Time (sec)	55	25	12	33
Phase Split	44 %	20 %	10 %	26 %





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LANE SUMMARY

Bruce Highway / Yeppoon Road
Proposed Intersection Upgrade 2 - Stage 1-3
POST DEV - 2025 AM Peak
Signals - Fixed Time Cycle Time = 125 seconds (Optimum Cycle Time - Minimum Delay)

Lane Use and Performance

	Demand Flows L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South: Bruce Highway (South)																
Lane 1	4	264	0	268	6.3	878	0.306	100	22.3	LOS C	10.1	74.3	500	–	0.0	0.0
Lane 2	0	269	0	269	6.4	878	0.306	100	22.2	LOS C	10.1	74.4	500	–	0.0	0.0
Lane 3	0	0	94	94	16.7	134	0.699	100	75.4	LOS E	6.0	43.0	150	Turn Bay	0.0	0.0
Lane 4	0	0	92	92	16.7	132	0.699	100	75.5	LOS E	5.9	42.3	150	Turn Bay	0.0	0.0
Approach	4	533	186	723	9.0		0.699		35.9	LOS D	10.1	74.4				
East: Yeppoon Road																
Lane 1	532	0	0	532	2.3	1847	0.288	100	9.5	X	X	X	500	–	0.0	X
Lane 2	0	3	258	261	6.9	387	0.675	100	58.7	LOS E	14.3	105.7	500	–	0.0	0.0
Approach	532	3	258	793	3.8		0.675		25.7	LOS C	14.3	105.7				
North: Bruce Highway (North)																
Lane 1	217	0	0	217	9.7	1426[1]	0.152	100	10.1	LOS B	0.5	3.9	100	Turn Bay	0.0	0.0
Lane 2	0	619	0	619	4.0	891	0.694	100	23.1	LOS C	24.9	180.6	500	–	0.0	0.0
Lane 3	0	619	0	619	4.0	891	0.694	100	23.1	LOS C	24.9	180.6	500	–	0.0	0.0
Lane 4	0	0	1	1	0.0	100[1]	0.010	100	66.3	LOS E	0.1	0.4	25	Turn Bay	0.0	0.0
Approach	217	1237	1	1455	4.9		0.694		21.2	LOS C	24.9	180.6				
West: Cultural Centre Access																
Lane 1	1	3	14	18	5.6	94	0.191	100	72.5	LOS E	1.1	8.2	500	–	0.0	0.0
Approach	1	3	14	18	5.6		0.191		72.5	LOS E	1.1	8.2				
Intersection				2989	5.6		0.699		26.2	LOS C	24.9	180.6				

X: Not applicable for Continuous lane.

Level of Service (LOS) Method: Delay (HCM 2000).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model used.

1 Reduced capacity due to a short lane effect

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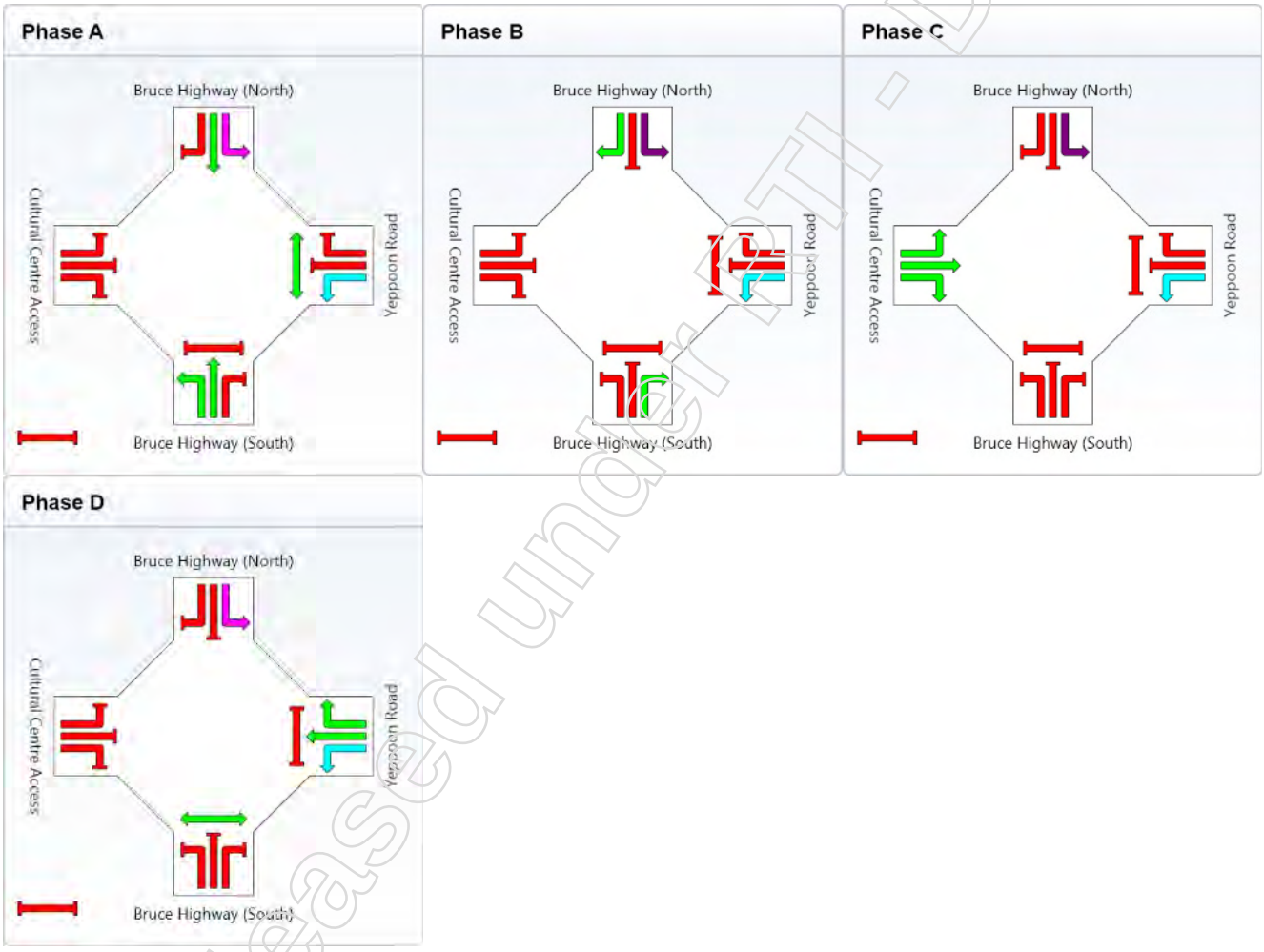
PHASING SUMMARY

Bruce Highway / Yeppoon Road
Proposed Intersection Upgrade 2 - Stage 1-3
POST DEV - 2025 AM Peak
Signals - Fixed Time Cycle Time = 125 seconds (Optimum Cycle Time - Minimum Delay)

Phase times determined by the program
Sequence: CAMBRAY
Input Sequence: A, B, C, D
Output Sequence: A, B, C, D

Phase Timing Results

Phase	A	B	C	D
Green Time (sec)	58	10	6	27
Yellow Time (sec)	4	4	4	4
All-Red Time (sec)	2	2	2	2
Phase Time (sec)	64	16	12	33
Phase Split	51 %	13 %	10 %	26 %





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LANE SUMMARY

Bruce Highway / Yeppoon Road
Proposed Intersection Upgrade 2 - Stage 1-3
POST DEV - 2025 PM Peak
Signals - Fixed Time Cycle Time = 135 seconds (Optimum Cycle Time - Minimum Delay)

Lane Use and Performance

	Demand Flows L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South: Bruce Highway (South)																
Lane 1	7	595	0	602	3.0	773	0.780	100	37.8	LOS D	34.3	246.0	500	–	0.0	0.0
Lane 2	0	603	0	603	3.0	773	0.780	100	37.6	LOS D	34.3	246.1	500	–	0.0	0.0
Lane 3	0	0	254	254	1.6	330	0.771	100	70.0	LOS E	16.8	118.1	150	Turn Bay	0.0	0.0
Lane 4	0	0	251	251	1.6	325	0.771	100	70.1	LOS E	16.5	117.4	150	Turn Bay	0.0	0.0
Approach	7	1198	505	1710	2.6		0.780		47.3	LOS D	34.3	246.1				
East: Yeppoon Road																
Lane 1	148	0	0	148	8.1	1774	0.083	100	9.7	X	X	X	500	–	0.0	X
Lane 2	0	4	266	270	4.8	363	0.743	100	66.0	LOS E	16.7	122.1	500	–	0.0	0.0
Approach	148	4	266	418	6.0		0.743		46.1	LOS D	16.7	122.1				
North: Bruce Highway (North)																
Lane 1	389	0	0	389	0.5	1321[1]	0.294	100	10.2	LOS B	1.4	9.7	100	Turn Bay	0.0	0.0
Lane 2	0	411	0	411	5.1	763	0.538	100	29.5	LOS C	17.5	127.9	500	–	0.0	0.0
Lane 3	0	411	0	411	5.1	763	0.538	100	29.5	LOS C	17.5	127.9	500	–	0.0	0.0
Lane 4	0	0	2	2	0.0	111[1]	0.018	100	57.2	LOS E	0.1	0.7	25	Turn Bay	0.0	0.0
Approach	389	821	2	1212	3.6		0.538		23.3	LOS C	17.5	127.9				
West: Cultural Centre Access																
Lane 1	1	2	2	5	0.0	92	0.055	100	74.3	LOS E	0.3	2.3	500	–	0.0	0.0
Approach	1	2	2	5	0.0		0.055		74.3	LOS E	0.3	2.3				
Intersection				3345	3.4		0.780		38.5	LOS D	34.3	246.1				

X: Not applicable for Continuous lane.

Level of Service (LOS) Method: Delay (HCM 2000).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model used.

1 Reduced capacity due to a short lane effect

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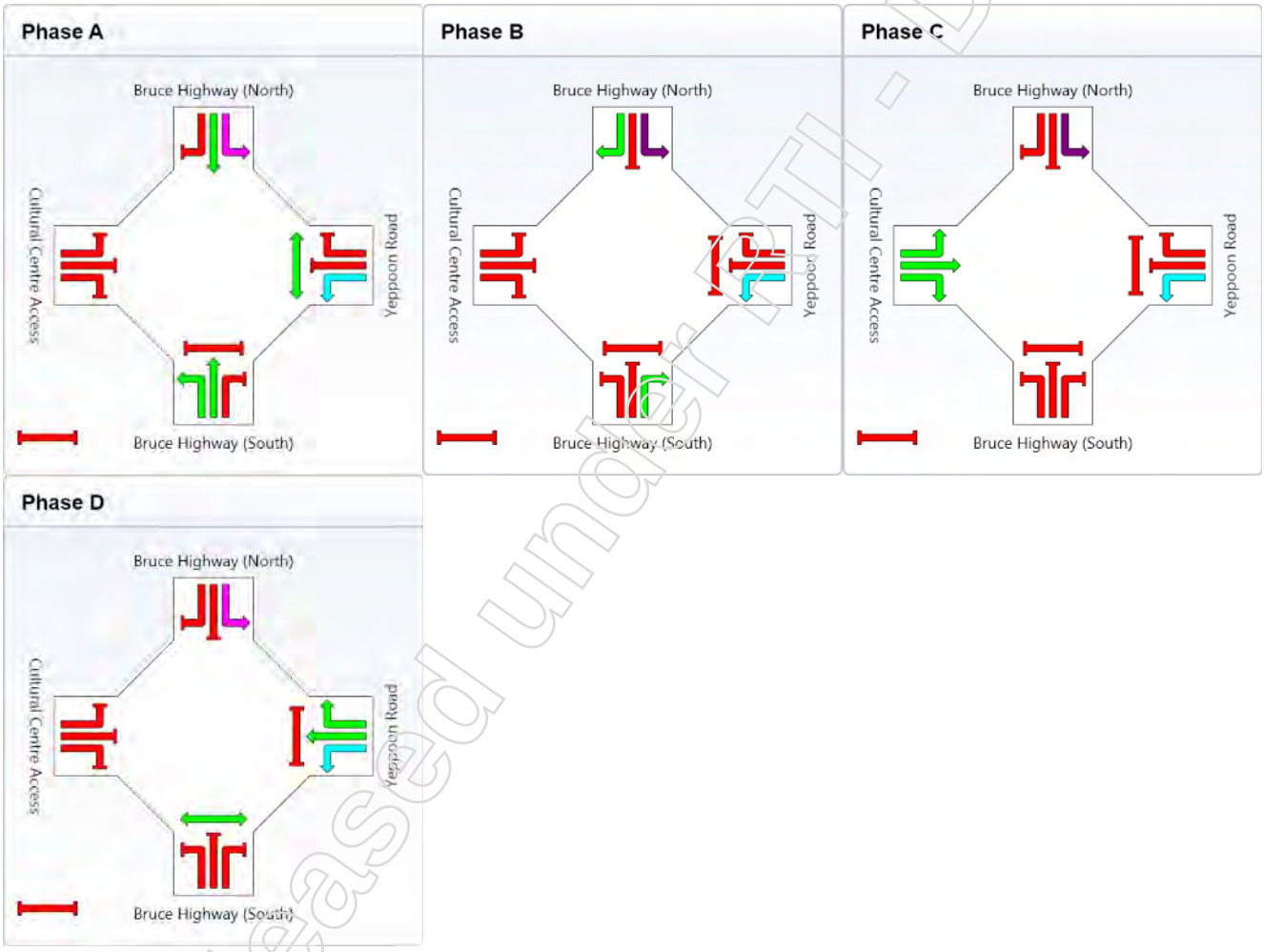
PHASING SUMMARY

Bruce Highway / Yeppoon Road
Proposed Intersection Upgrade 2 - Stage 1-3
POST DEV - 2025 PM Peak
Signals - Fixed Time Cycle Time = 135 seconds (Optimum Cycle Time - Minimum Delay)

Phase times determined by the program
Sequence: CAMBRAY
Input Sequence: A, B, C, D
Output Sequence: A, B, C, D

Phase Timing Results

Phase	A	B	C	D
Green Time (sec)	54	24	6	27
Yellow Time (sec)	4	4	4	4
All-Red Time (sec)	2	2	2	2
Phase Time (sec)	60	30	12	33
Phase Split	44 %	22 %	9 %	24 %





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7 August 2013

Department of Transport and Main Roads
Program Delivery and Operations
Fitzroy Region (Rockhampton Office)
PO Box 5096
Red Hill QLD 4701

For the attention of Mr Byron Jones
cmo.rockhampton@tmr.qld.gov.au

Dear Sir

Proposed Development:	**Preliminary Approval to vary the effect of the planning scheme for a material change of use for a master planned community and a development permit for reconfiguring a lot (five lots into 199 lots, public use land and balance lots)**
Real Property Description:	**Lot 1RP602376, 22SP134380, 23SP134380, 2RP608099, 37RP600698, 38RP600698, 41SP226571, 49SP129857, 5SP238731, 6SP238731**
Street Address:	**Yaamba Road, Parkhurst QLD 4702**
Assessment Manager Ref:	**D/36-2013**
Local Government Area:	**Rockhampton Regional Council**

1.0 Introduction

This letter has been prepared in response to the Request for Additional Information issued by the Department of Transport and Main Roads (TMR) dated 7 May 2013, in relation to the above application. It addresses the traffic-related issues contained therein.

2.0 Response to Issues Raised in TMR's Information Request

The traffic-related issues raised in TMR's Request for Additional Information have been considered and addressed, as described following.

Road Traffic

1. ***Please provide a copy of the Traffic Impact Assessment (TIA) report signed by an RPEQ;***

   Please refer to the revised TIA reports for the development (see **Attachment A** & **Attachment B**) which have been certified by a RPEQ engineer as requested.

2. ***Section 4.2 of the TIA (Stages 1 - 3) refers to Figure 4.2(d) however this figure does not appear in the report, please clarify;***

   Please refer to the attached revised TIA report for the Stage 1-3 ROL application (see **Attachment B**) in which Figure 4.2d has been correctly labelled.

3. ***Section 4.3 of the TIA (Stages 1 - 3) assumes that the full development of stage 1 – 3 (198 Lots) will be completed by 2015 and as such adopts a design horizon of 2025 for the 10 year post-development assessment. TMR has concerns that this development timeframe is overly optimistic which may result in less than a 10 year design horizon for these stages of development. Please provide further justification or evidence supporting the assumption that stages 1 – 3 will be completed by 2015;***

   Even if it is assumed that the construction of Stage 1 does not commence until 2014, this still allows two years (2014 & 2015) for the proposed 198 lots to be developed, which equates to a development rate of approximately 100 lots per year.

   As identified in **Table 3a** below, Rockhampton Regional Council's *Planning Assumptions Report (2011)*, which underpins their adopted infrastructure charges resolution, identifies an overall development rate of approximately 141 lots per year for the Parkhurst area.

   Table 3a: RRC Forecast Development Growth for Parkhurst

PIA locality	PIP projection category	Existing and Projected Dwellings						
		2010 (Existing)	2011	2016	2021	2026	2031 (outside PIA)	Ultimate development
Parkhurst	Single dwelling	409	428	860	1,643	2,310	2,552	3,694
	Semi-attached	6	6	47	138	211	364	364
	Multiple dwelling	0	0	37	215	223	223	223
	Other dwelling	259	259	309	309	181	181	181
	Total Dwellings	674	693	1,253	2,306	2,925	3,320	4,462

   Furthermore it is understood that the forecast development within the Parkhurst area only represents about 47% of the total Rockhampton district land supply (excluding the Livingstone Shire Council area), with a total of 298 lots per annum identified within the *RPS Economics Report* submitted as part of the development application. As such the proposed development rate of 100 lots per annum for the North Parkhurst site would only reflect a total market share of approximately 30%, which is considered reasonable.

   Therefore based on the information provided above, it can be seen that the proposed development timing (completion by 2015) for Stages 1-3 can be considered acceptable.

4. ***Please provide clarification/justification for the 1% per annum compound growth adopted in the analysis as indicated in Section 4.3 of the TIA (Stage 1 – 3);***

   Please refer to Section 5.2 of the revised TIA traffic report for the Preliminary Approval application (see **Attachment A**) and Section 4.3 of the revised TIA report for the Stage 1-3 ROL application (see **Attachment B**) which identify that the adoption of the proposed 1% per annum compound background traffic growth rate in addition to the inclusion of all approved developments that are yet to be constructed equates to combined growth rate of approximately 1.8%-3.5% per annum up to the proposed 10 year design horizon for the development of 2035. This section of the revised report also identifies that the recorded historical 10 year background growth rate for this section of the highway is approximately 1.5% per annum (compound).

   From this information it can clearly be seen that the adoption of the 1% per annum background growth plus the approved development traffic as proposed in the revised TIA reports, is in excess of the historical background growth rates for this section of the highway, and its use can therefore can be considered both conservative and acceptable for use in forecasting the future pre development traffic volumes as part of the analysis of the impacts of the proposed development.

5. ***Section 4.5.1.2 of the TIA (Stage 1 – 3) states that the intersection of the Bruce Highway / Olive St includes the provision of a four lane cross section for the Bruce Highway, which was identified to be required irrespective of the development due to the forecast mid-block volumes exceeding 15,000 vehicles per day. TMR has no committed concept, design or funds for this work and as such, the applicant should not assume that these works will necessarily be in place. Further consideration, analysis and recommendations should be carried out for this intersection on the assumption that TMR are not in a position to upgrade the Bruce Highway within the design horizons currently investigated;***

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The traffic analysis undertaken within the revised TIA reports (see **Attachment A** & **Attachment B**) reiterates that the existing two lane cross section for the Bruce Highway (Yeppoon Road to Olive Street) and the associated Bruce Highway / Olive Street intersection exceeds TMR's desirable level of service (15,000vpd) based on the existing pre development traffic volumes. To resolve these existing deficiencies would require the duplication of the Highway and the upgrade of the Bruce Highway / Olive Street intersection. These works are recommended irrespective of the inclusion of traffic generated by the proposed North Parkhurst development.

Through discussions with TMR officers it is understood that the State acknowledges these existing deficiencies, a fact that is highlighted by the Departments completion of a future road network planning study for Parkhurst and the application for and subsequent attainment of federal government funding to construct the required upgrade works for a portion (Yeppoon Road – Boundary Road East) of the Bruce Highway corridor through Parkhurst.

It should be noted that the 15,000 vpd trigger identified represents the desired level of service for the road, not its ultimate capacity. The capacity of a road network is generally 25% higher than the desired level of service. As demonstrated by the current volumes identified for the existing sections of the Bruce Highway south of Boundary Road East, it is anticipated that volumes in the order of 18,000 – 20,000 vpd can be accommodated by a two lane cross section of road.

Therefore, it would not be unreasonable for TMR to defer the upgrade of this remaining section of the corridor (i.e. Boundary Road East – Olive Street), and based on forecast background growth and the proposed development rates, we do not anticipate the capacity being reached within 5-10 years. This then provides TMR with an additional 5-10 years in which to obtain further federal funding to upgrade the highway to a four lane cross section up to the Olive Street intersection.

However notwithstanding the comments above, and regardless of whether TMR has committed concept, design or funds to undertake the required upgrade works to the Bruce Highway corridor through Parkhurst, it would still be considered unreasonable for the Department to request the applicant to construct these works, which are identified to be existing deficiencies in the state controlled road network.

6. ***Section 4.5.1.2 of the TIA (Stage 1 – 3) states that storage lengths were calculated assuming a two and a half minute delay to vehicles at the level crossing. Please provide further evidence to justify this assumption and explain how this figure was arrived at. In addition, what consideration (if any) has been given to the effect on the signalised intersection if the train lengths increase in the future or if the assumed speed of the trains through the level crossing is lowered;***

A 2min 30sec delay is highly conservative.

It is our understanding that the current train speed on that section of the North Coast line is approximately 80km/h and that the maximum length of trains is 695m. Based on discussions with QR, we understand that this maximum length of train was unlikely to increase due to current weight and length restrictions for trains using the line (in particular in regards to movements over the rail bridge in Rockhampton).Using this information calculations were then undertaken to estimate the likely delay times.

If the train speed were 60km/h, it would take approximately 42 seconds for the train to pass the crossing. Additional time (20 sec) is then assumed both before and after the train to cater for the boom gates lowering and rising clear of the train movements.

As a consequence we expect an 85 second delay (1min 25sec) to vehicles during the train phase.

Therefore in summary, from the information provided above it can be seen that the assumption of a delay time of approximately two and a half minutes to vehicles at the level crossing is conservative and therefore should be more than adequate to establish the effect on road traffic movements at the adjacent intersection due to a train movement.

7. ***The proposed intersection layout indicated in Figure 4.5.1.2a does not adequately cater for what is anticipated to be a significant pedestrian demand from the estate to the existing Parkhurst School on Mason Avenue on the eastern side of the Bruce Highway. It is suggested the provision of an additional pedestrian crossing at the signals on the Olive St (East) leg or the relocation of the pedestrian crossing from the Bruce Highway (North) leg to the Bruce Highway (South) leg may resolve this issue. Your further consideration and advice as to how this matter will be addressed is sought;***

Please refer to Section 5.4.1.2 of the revised TIA report (Preliminary Approval) (**Attachment A**) and Section 4.5.1.2 of the revised TIA report for the Stage 1-3 ROL application (**Attachment B**) which detail the revised analysis undertaken for the proposed Bruce Highway / Olive Street signalised intersection, incorporating both the relocation of the pedestrian crossing from the northern to the southern leg of the Bruce Highway and the provision of a pedestrian crossing at the signals on the eastern (Olive Street) approach.

As identified by this analysis, the proposed interim and ultimate intersection configurations (including the relocation of the pedestrian crossing across the highway and the additional pedestrian crossing on the eastern approach to the signals) are expected to operate within acceptable limits for all analysed post development traffic scenarios, and as such are considered acceptable to cater for the expected post development traffic flows at the Bruce Highway / Olive Street intersection as a result of the proposed North Parkhurst development.

8. ***Section 4.5.1.3 of the TIA (Stage 1 – 3) includes analysis of an upgraded intersection at Bruce Highway / Boundary Road (East) rather than the existing intersection form. Similarly to item 5 above, TMR has no committed concept, design or funds for this work and as such, the applicant should not assume that these works will necessarily be in place. Further consideration, analysis and recommendations should be carried out for this intersection on the assumption that TMR are not in a position to upgrade the Bruce Highway / Boundary Road (East) within the design horizons currently investigated;***

The traffic analysis undertaken within the revised TIA reports (see **Attachment A** & **Attachment B**) reiterates that the provision of a four lane cross section for the Bruce Highway (Yeppoon Road to Olive Street) and associated works at the Bruce Highway / Boundary Road (East) intersection are a requirement of the pre development traffic volumes on the Bruce Highway corridor. As these works are therefore necessary irrespective of the inclusion of traffic generated by the proposed North Parkhurst development, they can be considered an existing deficiency of the state-controlled network.

Through discussions with TMR officers it is understood that this view regarding the networks existing deficiencies is agreed, a fact that is highlighted by the Departments completion of a future road network planning study for Parkhurst and the application for and subsequent attainment of federal government funding to construct the required upgrade works for a portion (Yeppoon Road – Boundary Road East) of the Bruce Highway corridor through Parkhurst.

As the Bruce Highway / Boundary Road (East) intersection falls within the abovementioned section of the highway which has obtained federal funding, it has been assumed that TMR would now be in a position to undertake all upgrade works recommended to rectify the identified existing network deficiencies at this intersection within the design horizons currently investigated.

Furthermore, irrespective of the above, and regardless of whether TMR has committed concept, design or funds for the required upgrade works to its network, it would be unreasonable for the Department to request the applicant to construct these works which are required to existing deficiencies.

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9. ***Section 4.5.1.4 of the TIA (Stage 1 – 3) indicates that the analysis added another lane to the Boundary Road approach to simulate left turning vehicles propping next to right turning vehicles. With respect, this is not considered appropriate at unsignalised intersections for sight visibility reasons. Further explanation is provided in the department's "Road Planning and Design Manual" (RPDM) section 13.3.1.3 and Figure 13.6;***

   It is noted that this additional lane was included in the analysis of the intersection in the previous version of the report to simulate the effect of left turning vehicles propping next to right turning vehicles at the intersection, which although not deemed appropriate by TMR is currently occurring at the intersection as a result of the large exit lane width available on the Boundary Road (West) approach.

   Regardless of this matter it is noted that the provision of this "additional lane" does not significantly impact on the overall operation of the intersection and as such has been removed from the analysis within the revised report. As such please refer to the appropriate sections of both revised TIA reports, which now more accurately reflect TMR's view on the existing lane configurations on the western leg/approach to the Bruce Highway / Boundary Road (West) intersection.

10. ***Section 4.5.1.4 of the TIA (Stage 1 – 3) includes analysis of an upgraded intersection at Bruce Highway / Boundary Road (West) rather than the existing intersection form. Similarly to items 5 and 8 above, TMR has no committed concept, design or funds for this work and as such, the applicant should not assume that these works will necessarily be in place. Further consideration, analysis and recommendations should be carried out for this intersection on the assumption that TMR are not in a position to upgrade the Bruce Highway / Boundary Road (West) within the design horizons currently investigated;***

    The traffic analysis undertaken within the revised TIA reports (see **Attachment A** & **Attachment B**) reiterates that the provision of a four lane cross section for the Bruce Highway (Yeppoon Road to Olive Street) and associated works at the Bruce Highway / Boundary Road (West) intersection are a requirement of the pre development traffic volumes on the Bruce Highway corridor. As these works are therefore necessary irrespective of the inclusion of traffic generated by the proposed North Parkhurst development, they can be considered an existing deficiency of the state-controlled network.

    Through discussions with TMR officers it is understood that this view regarding the networks existing deficiencies is agreed, a fact that is highlighted by the Departments completion of a future road network planning study for Parkhurst and the application for and subsequent attainment of federal government funding to construct the required upgrade works for a portion (Yeppoon Road – Boundary Road East) of the Bruce Highway corridor through Parkhurst.

    As the Bruce Highway / Boundary Road (West) intersection falls within the abovementioned section of the highway which has obtained federal funding, it has been assumed that TMR would now be in a position to undertake all upgrade works recommended to rectify the identified existing network deficiencies at this intersection within the design horizons currently investigated.

    Furthermore, irrespective of the above, and regardless of whether TMR has committed concept, design or funds for the required upgrade works to its network, it would be unreasonable for the Department to request the applicant to construct these works which are required to existing deficiencies.

11. ***TMR has no committed concept, design or funding for the upgrade of this section of the Bruce Highway. The applicant is requested to provide a mitigation strategy to address the developments impacts on the state-controlled network.***

    The traffic analysis undertaken within the revised TIA reports (see **Attachment A** & **Attachment B**) reiterates that the existing two lane cross section for the Bruce Highway (Yeppoon Road to Olive Street) exceeds TMR's desirable level of service (15,000vpd) based on the existing pre development traffic volumes. To resolve these existing deficiencies would require the duplication of the Highway. These works are recommended irrespective of the inclusion of traffic generated by the proposed North Parkhurst development.

    Through discussions with TMR officers it is understood that the State acknowledges these existing deficiencies, a fact that is highlighted by the Departments completion of a future road network planning study for Parkhurst and the application for and subsequent attainment of federal government funding to construct the required upgrade works for a portion (Yeppoon Road – Boundary Road East) of the Bruce Highway corridor through Parkhurst.

    It should be noted that the 15,000 vpd trigger identified represents the desired level of service for the road, not its ultimate capacity. The capacity of a road network is generally 25% higher than the desired level of service. As demonstrated by the current volumes identified for the existing sections of the Bruce Highway south of Boundary Road East, it is anticipated that volumes in the order of 18,000 – 20,000 vpd can be accommodated by a two lane cross section of road.

    Therefore, it would not be unreasonable for TMR to defer the upgrade of this remaining section of the corridor (i.e. Boundary Road East – Olive Street), and based on forecast background growth and the proposed development rates, we do not anticipate the capacity being reached within 5-10 years. This then provides TMR with an additional 5-10 years in which to obtain further federal funding to upgrade the highway to a four lane cross section up to the Olive Street intersection.

    However notwithstanding the comments above, and regardless of whether TMR has committed concept, design or funds to undertake the required upgrade works to the Bruce Highway corridor through Parkhurst, it would still be considered unreasonable for the Department to request the applicant to construct these works, which are identified to be existing deficiencies in the state controlled road network.

We trust the above information is of assistance, and adequately addresses the traffic-related raised by TMR in the Request for Additional Information dated 9 March 2011, regarding this application.

If you have any queries regarding the comments above please do not hesitate to contact me on NR

NR

Yours faithfully

NR

BEng (Civil) | CPEng | MIEAust |NPER
Senior Transport Engineer
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ATTACHMENT A

Revised Traffic Impact Assessment Report

Preliminary Approval Application

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CAMBRAY consulting
Traffic Engineering and Transport Planning



Proposed Master Planned Community
Stockland North Parkhurst

Traffic Impact Assessment (Application for Preliminary Approval)

Report Revision B (responding to information requests)

Prepared for Stockland
8 August 2013

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1.0 Introduction

Cambray Consulting was engaged to assist Stockland with developing a master plan for the planned residential site located in North Parkhurst, QLD. As part of this assessment a Traffic Impact Assessment report (dated 5 March 2013) was completed and lodged with Council as part of the development application for the proposed development.

Requests for additional information were then received from both Rockhampton Regional Council and the Department of Transport and Main Roads (TMR) in relation to the proposed development, which have led to minor amendments to the internal site layout and the methodology of the traffic impact assessment for the site and the inclusion of additional analysis regarding the impact of the development on key local government controlled intersections.

This updated report has therefore been prepared in response to requests for additional information, addressing the traffic-related issues identified and assessing the revised site layout. This assessment involved:

- Establishment of access strategy for the proposed development;
- Operation of the proposed at grade rail crossing;
- Internal road hierarchy and cross sections;
- Staging of the road network including trigger volumes; and
- Investigation into traffic impacts of the development including attributable external roadworks / contributions;

1.1 Limits of Report

This report takes into account the particular instructions and requirements of our client. Cambray Consulting has taken care in the preparation of this report, however it neither accepts liability nor responsibility whatsoever in respect of:

- Any use of this report by any third party;
- Any third party whose interests may be affected by any decision made regarding the contents of this report; and/or
- Any conclusion drawn resulting from omission or lack of full disclosure by our client, our client's consultants, or any other parties.

1.2 Safety In Design

Within the scope of our design activities, we have identified safety in design issues and potential hazards, whenever reasonably practicable within our field of expertise. Due to our limited and upfront role on this project, it is not considered reasonably practicable to identify all potential hazards which may occur throughout the life of a project, including during detailed design and construction activities. It is strongly recommended that safety in design issues be reviewed during all ensuing design and construction stages of the project.

1.3 RPEQ Certification

I, NR confirm that I have prepared and/or reviewed the contents of this document.

NR

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2.0 Site Location

The proposed development site is located as shown in **Figure 2a** below, and is bounded by the Bruce Highway and the North Coast Rail line the East, William Palfrey Drive to the South, land identified for future rural residential uses to the West and Ramsay Creek to the North.

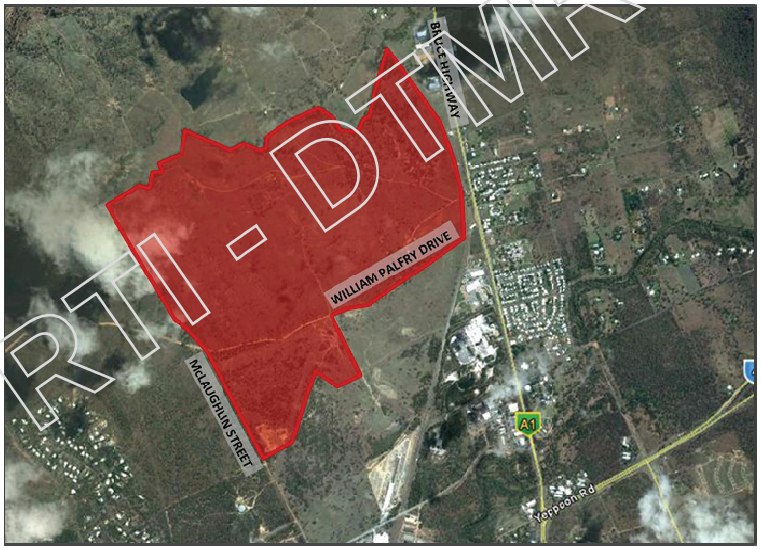

Figure 2a: Site Location

The subject site comprises five (5) lots, all of which are under the ownership of Stockland having a combined area of 276.72ha:

- Lot 1 on RP602376;
- Lot 5 on SP238731;
- Lot 37 on RP600698;
- Lot 37 on RP600698; and
- Lot 2 on RP608099.

The following lots have been included in the application to secure site access provisions from the Bruce Highway (Yaamba Road) and to facilitate continued access over railway corridor:

- Lot 22 on SP134380 (*held by the State of Qld*);
- Lot 23 on SP134380 (*held by the State of Qld*);
- Lot 49 on SP129857 (*held by the State of Qld*); and
- Lot 41 on SP226571 (private ownership)

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3.0 Planning Context

The proposed development site has been identified for several years as an area for future residential development growth, by both Council and Main Roads. This can be seen by its inclusion in such planning documents as

- Council's Parkhurst and Yeppoon Road Corridor Structure Plan (GHD 2007);
- Rockhampton Traffic Study (Arup 2008);
- RRC Priority Infrastructure Plan Planning Assumptions Report (GHD 2011), and
- TMR's draft Parkhurst Forward Planning Traffic Analysis Study (2010).

All of these planning documents envisaged a large residential development (i.e. > 2,000 lots) with the primary access from the Bruce Highway and secondary access via McLaughlin Street and the Alexandra Street corridor. Common to each study was a Urban Arterial Road providing connectivity between the Bruce Highway and the planned residential catchments to the west of the Highway. Several of these planning documents identify this proposed Urban Arterial Road joining the Bruce Highway at Olive Street, creating a fourth (western) leg to the existing intersection. This intersection requires signalisation and would incorporate an at-grade crossing of the adjacent rail corridor..

These planning documents are discussed in further detail below. The intent of Stockland is to develop the land in a manner that is consistent with these planning studies

3.1 Parkhurst & Yeppoon Road Corridor Structure Plan (2007)

This was a land use planning study commissioned by the former Rockhampton City Council. The study identifies the extent of land required to service the possible future growth (both residential and commercial) within the local Parkhurst area.

Figure 3.1a below is an extract from this study which shows the land uses identified on the subject site. A full size copy of the plan is included as **Appendix A**.

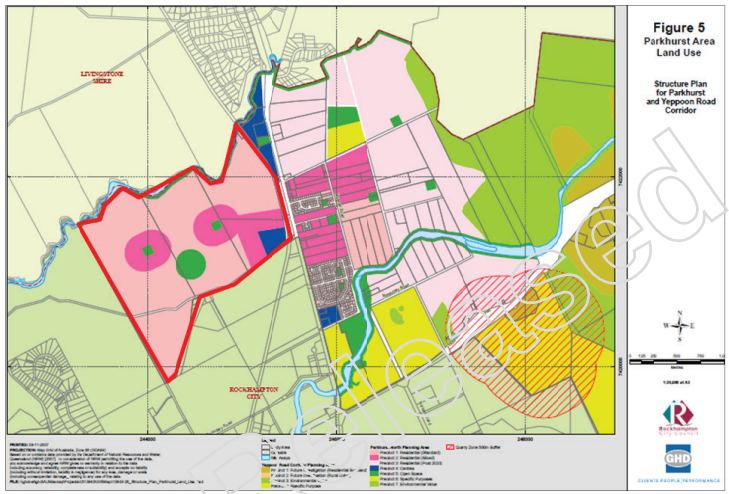

Figure 3.1a – Extract from Parkhurst & Yeppoon Road Corridor Structure Plan (2007)

As can be seen in the figure above the majority of the Stockland site was identified for future residential uses and was assumed to yield approximately 2,650 dwellings. It is also noted that a Neighbourhood Centre was identified within the site, being located on the south-eastern corner of site.

Figure 3.1b below is an extract of the road hierarchy plan that was included in this Council study. Again a full size copy of this figure is included as **Appendix B**.

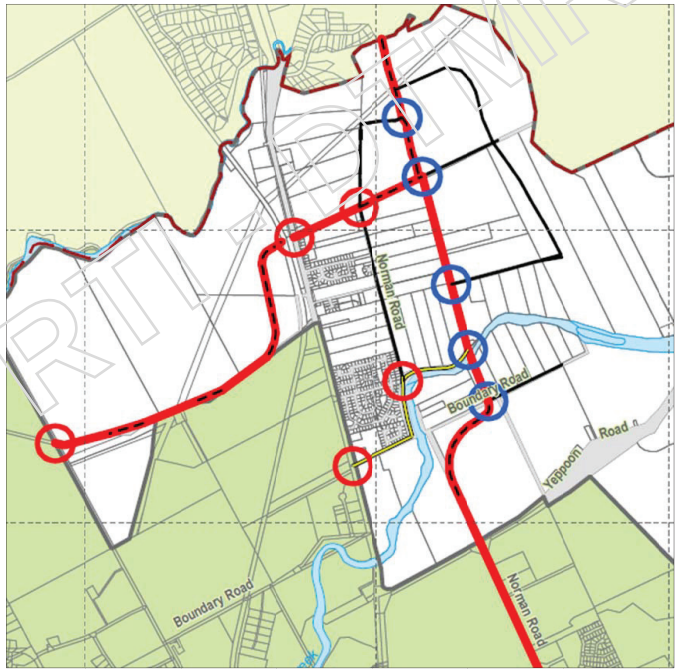

Figure 3.1b – Proposed Road Hierarchy -Parkhurst & Yeppoon Road Corridor Structure Plan (2007)

The figure above indicating the proposed road hierarchy identifies the proposed Urban Arterial Road utilising a section of the current alignment of William Palfrey Road before deviating to intersect the Bruce Highway at the current Olive Street intersection location.

The technical document that accompanied the planning study identified that an *"Urban Arterial Road needs to be established to service this area providing connection to Yaamba Road (Bruce Highway)"* and that "alternate access to/from this development is via McLaughlin St and Alexandra St". This suggests an expected provision of two (2) points of access to the development site at the ultimate build-out scenario. The report also identified a distribution split for traffic from west of the highway (i.e. the subject site) of 80% to/from the Bruce Highway and 20% to/from the Alexandra St corridor.

Rockhampton City Council subsequently resolved to adopt this structure plan for the Parkhurst and Yeppoon Road corridor at its meeting held on 3rd December 2008.

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3.2 Rockhampton Traffic Study 2008

The Rockhampton Traffic Study (RTS) (2008) was commissioned by Council to identify and evaluate a future Road Network Strategy for the Rockhampton area. Underpinning the study was the development of a strategic transport model which divided Rockhampton into several development zones, with forecast population and employment figures assigned to each zone for 2011, 2016 and 2021.

Initially a 2011 "do minimum" scenario was developed based on the existing road network and all the road projects that Council and Main Roads had identified to be complete prior to 2011.

Future year scenarios (2016 and 2021) were then carried out based on two scenarios of population growth; 1) the City Plan Scenario, which was based on PIFU High Series forecasts and has development in line with the land zoning of the previous Rockhampton City Plan , and 2) the Parkhurst Accelerated Growth (PAG) Scenario, which was based on growth in the Parkhurst area significantly greater than that identified in the City Plan.

The inclusion of the PAG scenario was requested during the study after Council became aware of the potential development of two large land parcels in Parkhurst. The scale of these developments was significant and an alternative land use scenario was prepared to establish the impacts of such accelerated development in the Parkhurst area on the surrounding road network. The two parcels identified were:

- A major parcel of land near the intersection of Belmont Road and William Palfrey Road – known as Edenbrook; and
- A major landholding in Parkhurst between Edenbrook and the North Coast Rail Line extending up to the previous City Boundary (Ramsay Creek) and straddling William Palfrey Road – which is the subject site for the proposed Stockland Master Planned Community.

Various road projects were then modelled to mitigate the impacts of this future development with the output from the study being a list of recommended road network projects required to accommodate the proposed development scenarios, including the expected timeframes for the works and approximate cost estimates.

Whilst we do not have access to the traffic model which underpins the study, the report included information on future population and lot yields for each development area, as well as providing forecast traffic volumes on the various links within the local road network.

Working backwards from these forecast volumes and lot yield assumptions the traffic distribution for the Stockland North Parkhurst site adopted in the RTS was estimated to be 70% to/from the Bruce Highway and 30% to/from the Alexandra Street corridor.

It is noted that this distribution differs from that previously identified in Council's *Parkhurst and Yeppoon Road Corridor Structure Plan 2007* (80% to/from Bruce Highway and 20% to/from Alexandra Street corridor). The RTS involved the development of a detailed traffic model in EMME/2 adopting a traditional 4-step methodology. This model assigns traffic to the road network based on sophisticated algorithms. As a consequence, the distributions identified in the RTS are expected to provide a more accurate representation of the future traffic conditions and will be adopted for the purpose of this report

The report also made several assumptions regarding the additional road network required to accommodate the PAG scenario. The additional network was identified based on previous planning applications and discussions with Council and included the provision of two (2) points of access for the proposed Stockland site, including:

- The realignment of William Palfrey Road and connection to the Bruce Highway at Olive Street; and
- A new road link connecting Alexandra Street to William Palfrey Road (realignment of McLaughlin Street).

The model also assumes that there is a major urban arterial road through the site providing connectivity between McLaughlin Street and the Bruce Highway. The traffic report identifies a number of road projects to ensure that the road network continues to operate within the desirable level of service under the PAG scenario. **Figure 3.2a** shows the key road projects within close proximity to the subject site.

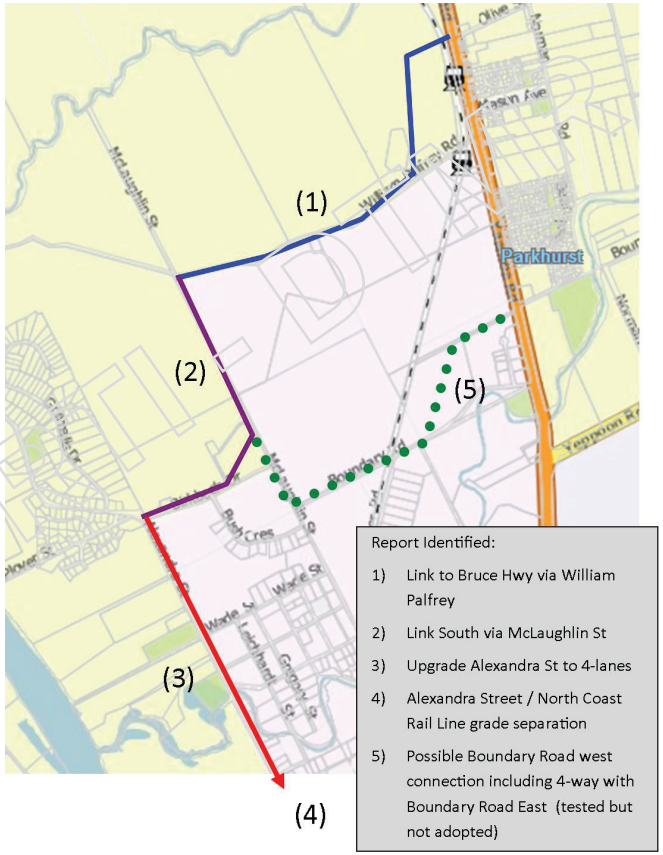

Figure 3.2a – Road Projects included in Transport Model

3.3 Planning Assumptions Report 2011

The Planning Assumptions Report (PAR) contains the planning assumptions and growth projections underpinning Council's Priority Infrastructure Plan (PIP) prepared by Rockhampton Regional Council and approved by the Minister for the Department of Local Government and Planning.

The PAR documented the methodology and the assumptions used to prepare the Planning Assumptions Model (PAM) including dwelling, population, floor space (GFA) and employment planning assumptions, as well as the timing of development and development sequence. This information was then used to establish the Priority Infrastructure Area (PIA) for each of the identified development areas within the Rockhampton Regional Council Local Government Area. This information was then used as the basis for the preparation of Council's *Adopted Infrastructure Charges Resolution 2011*.

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As part of this process the future development in the Parkhurst area was identified, with an extract from the PAR shown in **Figure 3.3a** below, with a full size copy included as **Appendix C**.

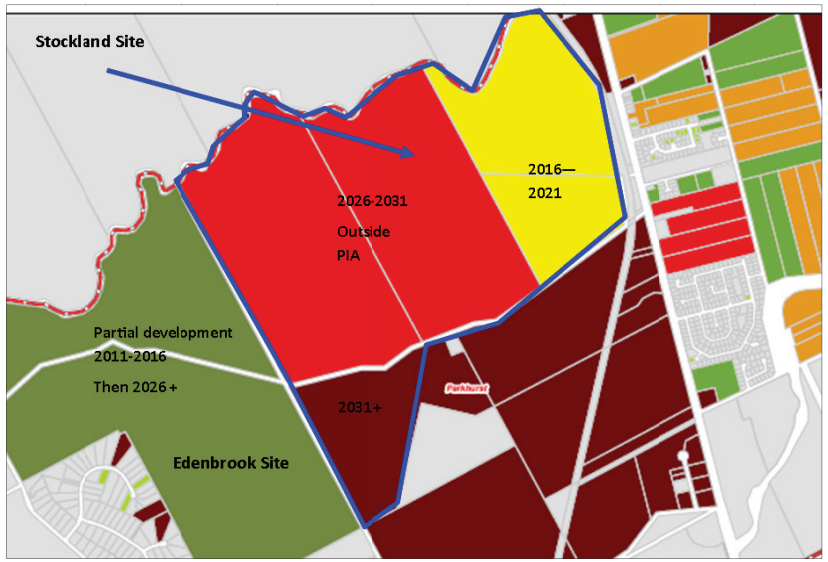

Figure 3.3a – Extract from Council's Planning Assumptions Report

As seen above, the eastern portion of the proposed development site has been identified for residential uses and is included in the PIP (<2026). Whilst the balance of the subject site is also identified for residential uses, it is not included in the current PIP due to the anticipated timing of development (>2026).

3.4 Adopted Infrastructure Charges Resolution No. 2 (2012)

The purpose of Council's Infrastructure Charges Resolution is to identify truck infrastructure required to mitigate the impacts of planned development. The planned development includes all land uses which have been identified in the PIP and fall within the Priority Infrastructure Area (PIA).

In the Parkhurst growth area, all of Edenbrook and the eastern portion of the subject site are included in the PIA. It is also understood that Council's intent for this eastern portion of the site was for development to occur with sole access via an intersection off the Bruce Highway.

Figure 3.4a shows the trunk infrastructure identified by Council to support this development, with a full size copy included as **Appendix D**.

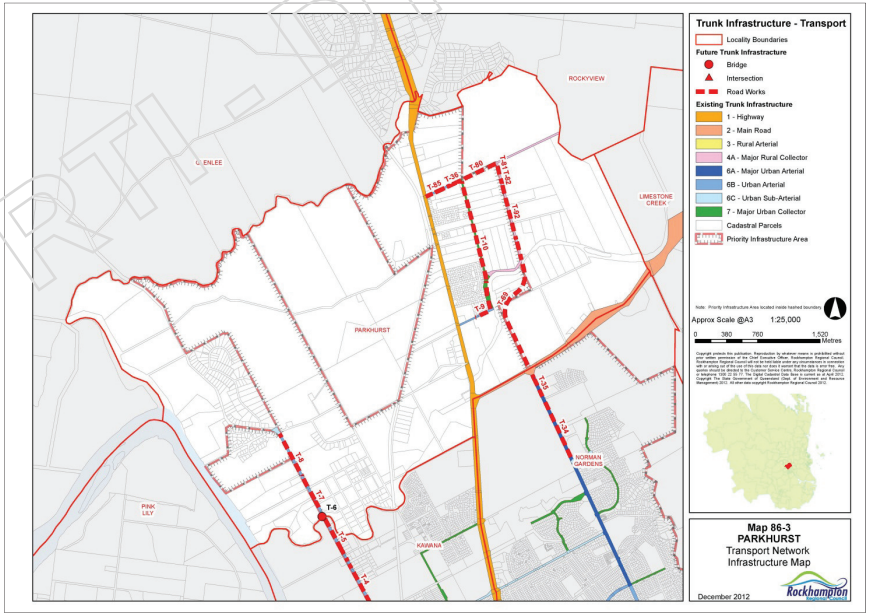

Figure 3.4a – Trunk Infrastructure

Council have committed to funding the above-mentioned works by collecting contributions from only those developments that are included within the PIP.

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3.5 Transport Main Roads Planning Intent "Bruce Highway"

It is our understanding that DTMR's ultimate planning intent for this road corridor is to upgrade the highway from a two-lane undivided road to a four-lane divided road as well as implement an access management strategy to minimise the number of intersections on the Highway and provide defined access and egress points for traffic associated with development on both sides of the Highway. From discussions with TMR they have identified 15,000 vehicles as representing their deficiency capacity and hence the notional trigger volume for four lanes.

This planning is in response to both the current and anticipated development in the Parkhurst area which includes not only the proposed North Parkhurst site, but land to the north and on the eastern side of the Bruce Hwy.

From a review of TMR's preliminary future road network planning layouts and spread sheet model, it is our understanding that the current planning intent for the Bruce Highway through Parkhurst includes:

Olive Street / North Parkhurst Access / Bruce Highway Intersection (Traffic Signals)

Main Roads has identified in its planning that the current intersection of Olive Street with the Bruce Highway as the access location for the North Parkhurst land parcel. This access has been shown as an upgrade of the current intersection to traffic signals with a fourth western leg constructed to provide access to the North Parkhurst site.

Boundary Road East (Traffic Signals)

It is our understanding that as part of a recently approved development application the existing intersection of Boundary Road East with the Bruce Highway was conditioned to be upgraded to traffic signals.

Closure of William Palfrey Road

With the addition of a connection to the land on the west of the highway via the proposed fourth leg at the Olive Street intersection it has been identified that the existing connection to the west (i.e. William Palfrey Road) will be closed under TMR's ultimate planning intent for the Bruce Highway corridor through Parkhurst.

4.0 Proposed Masterplan

As detailed in Section 3 of this report, the proposed development site has been identified for several years as an area for future residential development growth, by both Council and Main Roads. Stockland plans to develop the subject site as a master planned residential community, generally consistent with the future planning intents of both Council and TMR.

The application seeks preliminary approval to ultimately create a 2,000+ lot residential and mixed use development aimed at providing a benchmark for master planned communities within Rockhampton. For the purpose of the traffic assessment we have assumed a maximum development yield equivalent to 2,350 detached residential dwellings. The plan of development for the proposed master planned community prepared by RPS can be seen in **Appendix E**.

4.1 Access Strategy

The development will be serviced by two (2) major access points:

- the principal access will be via the Bruce Highway at the existing Olive Street intersection; and
- the secondary access will be via the Alexandra Street / McLaughlin Street corridor.

Consistent with the transport planning intent of both Council and TMR, the masterplan makes allowance for a future Urban Arterial Road which would provide connectivity between the Bruce Highway and the existing/planned residential catchments to the west (e.g. Edenbrook). This Urban Arterial Road is proposed to connect to the Bruce Highway at Olive Street, creating a fourth western leg of a new signalised intersection which would also incorporate an at-grade crossing of the adjacent North Coast rail line.

The rail crossing would essentially be a relocation of the existing rail crossing on William Palfrey Road, which would ultimately be closed as part of the planned residential development. This would also include re-diverting the traffic that currently utilises the existing at grade crossing to the new crossing and providing an alternative connection for this traffic to William Palfrey Road.

This access strategy is consistent with both TMR's planning intent for the Bruce Highway corridor and the local government road network identified in Council planning studies. In addition it is understood that as part of the construction of the initial stage of the development access for the construction vehicles will be sought via William Palfrey Road, utilising both the current rail crossing and intersection with the Bruce Highway.

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4.2 Rail Crossing

The proposed development site is bounded by the North Coast Rail Line along its eastern edge. Queensland Rail identifies the North Coast Line as *"the principle freight and passenger line within the Queensland Rail network, running the length of coastal Queensland between Brisbane in the south and Cairns in the north".*

The relevant section of the North Coast Line runs parallel to the Bruce Highway throughout the Parkhurst corridor and is primarily used by containerised freight services, high speed tilt trains, single commodity trains and cattle trains. The line also travels throughout the city of Rockhampton and has several at grade crossings with various levels of treatment (lights, boom gates etc.) at the interface with both Council and state controlled roads, as shown in **Figure 4.2a** below.

NORTH COAST LINE

403	639.342	Stanley Street	Public Level	Signs	X S	Open	LGA
403	639.574	Derby Street	Public Level	Signs	X S	Open	LGA
403	639.805	William Street	Public Level	Signs	X S	Open	LGA
403	640.040	Denham Street	Public Level	Signs	X S	Open	LGA
403	640.270	Fitzroy Street	Public Level	Half Boomgates		Open	MRD
403	640.499	Archer Street	Public Level	Signs	X S	Open	LGA
403	640.730	Cambridge Street	Public Level	Signs	X S	Open	LGA
403	640.963	Albert Street (Bruce Highway)	Public Level	Half Boomgates		Open	MRD
403	641.205	North Street	Public Level	Signs	X S	Open	LGA
403	641.441	Bolsover Street	Public Level	Half Boomgates		Open	LGA
831	641.998	Glenmore Road	Public Level	Half Boomgates		Open	LGA
831	643.246	Main Street	Public Level	Half Boomgates		Open	LGA
831	643.588	Taylor Street Pedestrian Access	Pedestrian			Open	LGA
831	644.161	Richardson Road	Public Level	Half Boomgates		Open	LGA
831	645.060	Farm Street	Public Level	Half Boomgates		Open	LGA
831	647.960	Boundary Road	Public Level	Flashing Lights		Open	LGA
832	649.855	William Palfrey Road	Public Level	Flashing Lights		Open	LGA

Figure 4.2a: Existing Rail Crossings of North Coast Line in Rockhampton and Current Treatments

Discussions with officers from Queensland Rail has identified that the section of line in the vicinity of the proposed development carries in the order of two (2) trains (one in either direction) in both the AM and PM peak periods, that train speeds are approximately 60-80km/h and that the largest freight services are approximately 650m in length.

Due to the location of the proposed development in relation to the current alignment of the North Coast rail line, the site generated traffic is required to cross the rail line at some point when travelling south regardless of the proposed access location for the development, whether this be at:

- the existing at-grade crossing at William Palfrey Road; or
- the existing at-grade crossing at Boundary Road West;
- the existing at-grade crossing at Farm Street; or
- the proposed at-grade crossing on the new western leg of Olive Street.

Consideration was given to the provision of a grade separated crossing of the rail line as part of the proposed development, however due to a number of issues including the cost of this infrastructure, the requirement for an additional intersection on the Highway, construction and land ownership hurdles and the departure from both Council's and TMR's ultimate planning intent for the local road network this option was not deemed to be viable.

As such the following access strategy is proposed:

i. A four-way signalised intersection on the Bruce Highway at Olive Street; and
ii. An at-grade crossing of the rail corridor on the proposed western fourth leg of this intersection.

The operation of the proposed four-way signalised intersection on the Bruce Highway is discussed in detail in section 5 of this report. The detail that follows addresses the proposed configuration and operation of the at-grade crossing. Specifically the co-ordination of the traffic signals with the rail signals.

It is also important to note that no additional rail crossings are proposed as part of the proposed access strategy. To clarify, the existing rail crossing on William Palfrey Road is proposed to be relocated to align with the proposed access to the planned residential development. This includes diverting the traffic that currently utilises the existing at grade crossing to the new crossing which then provides an alternative connection for this traffic to William Palfrey Road.

The provision of this alternate access via Olive Street (West) will also alleviate any future requirement for the adjacent intersection of William Palfrey Road with the Bruce Highway to be upgraded to accommodate the use of traffic travelling to/from the west. This is deemed to be desirable as constraints anticipated to be imposed by the adjacent properties (in particular the access/egress locations for the existing shop/service station opposite William Palfrey) are expected to impact on the ability for traffic signals to effectively be provided at this location. Furthermore it is noted that the provision of a signalised access at William Palfrey Road would not be in line with TMR's current planning intent for the Bruce Highway corridor.

The relocation of the existing at-grade crossing from William Palfrey Road is expected to improve the safety for traffic in the area to the benefit of the community, as the current crossing has minimal safety treatments, with only flashing signals provided (as seen in **Figure 4.2b** and **Figure 4.2c** below), whilst the relocated crossing is proposed to provide full active protection (e.g. flashing signals, boom gate barriers, advance warning signs, gated pedestrian enclosures etc.) as well as providing an opportunity for the use of new technology or approaches to the treatment of level crossings.



Figure 4.2b: Existing At-Grade Crossing at William Palfrey Road



Figure 4.2c: Existing At-Grade Crossing at William Palfrey Road

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In addition to the active protection at the relocated crossing, measures are proposed to manage the impact of vehicle queuing from the proposed traffic signals at Bruce Highway / Olive Street. They include:

- Implementation of a "Keep Clear" zone on the development road approach to the proposed Olive Street signalised intersection to minimise the occurrence of vehicles queuing on the crossing;
- The co-ordination of the rail crossing with the proposed traffic signals on the Bruce Highway, including:
  - A special "clearance phase", as shown in **Figure 4.2d** below, which is to be called at the proposed Olive Street signals when a train is on the approach to the crossing. This clearance phase will provide "green time" to the development road approach to the intersection to allow the vehicles queued between the rail corridor and the Highway to clear. This is expected to limit the potential for queuing across the rail corridor; and
  - As the train passes through the crossing, a second phase, as shown in **Figure 4.2e** below, is run which continues to hold traffic back from entering the development road and therefore the crossing (i.e. no left-turn or right turn movements from the Highway into the site will be allowed) and gives priority to the through movements on the Bruce Highway.

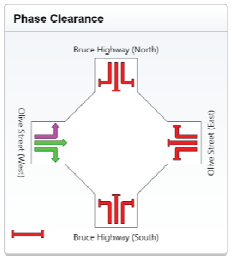

Figure 4.2d: Proposed Clearance Phase at Access Intersection

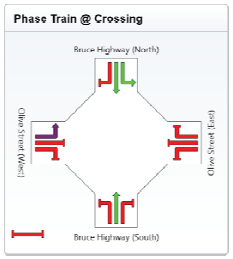

Figure 4.2e: Proposed Train Phase at Access Intersection

This proposed co-ordination of the crossing control measures and the traffic signals at Olive Street with train movements is expected to ensure that appropriate stop measures, including boom gates and red lights for certain traffic movements, are triggered to stop conflicts between trains and vehicular traffic.

In addition, the design of the signalised intersection at Olive Street is proposed to include adequate storage length in the proposed auxiliary turn lanes on the Bruce Highway approaches to accommodate the queuing that will occur if a train arrives coincident with the AM or PM road peak. This is expected to ensure that vehicle queues formed in these auxiliary lanes during a train crossing of the development access road will not impede the through vehicle movements and therefor the operational efficiency of the Bruce Highway. Refer to section 5 of this report for further detail on the geometry of the Bruce Highway / Olive Street traffic signals.

The analysis in Section 5 of this report shows that the proposed signalised intersection at Olive Street operates below capacity. As a consequence during each cycle, the traffic signals will accommodate all vehicles that are expected to arrive during the cycle. Because the signals operate with spare capacity, the traffic signals have the capacity to accommodate additional vehicle demand.

When a train crosses Olive Street, a train phase is called (refer Figure 4.2e above).

This phase prevents traffic crossing the rail corridor (i.e. entering or leaving the proposed development). The result being that queue of vehicles will develop. After the train has passed the traffic signals will revert back to the standard phasing. The spare capacity within the traffic signals is then used to dissipate the queue that has been generated as a result of the train.

For example, during the 2025 AM peak hour with full build out we expect in the order of 1000 vehicles will depart the site via the Bruce Hwy. The traffic signals are proposed to run on a 140 second cycle time. Therefore each cycle we would expect in the order of 39-40 vehicles would depart the site to the Bruce Hwy. The traffic signals have capacity to accommodate 46 vehicles per cycle, and as a consequence the traffic signals have the capacity to accommodate an additional 7 vehicles per cycle.

We expect motorists leaving the site will be delayed for approximately 25 seconds due to the train. This assumes a 700m long train travelling at 60km/hr with 20 seconds grace period before and after. During this time 23 vehicles will be stopped.

Once the traffic signals revert back to the standard phasing, this additional demand (23 vehicles) will require just over 3 cycles (spare capacity = 7 veh / cycle) to dissipate. This is just under 8 minutes.

Therefore, should a train arrive during the AM peak hour, we expect the queue to dissipate (i.e. normal traffic conditions) within 10 minutes.

The detailed working for a train arriving during the AM peak hour period are shown in **Figures 4.2f-l** over page.

In summary, the combination of the proposed active protection measures at the relocated crossing, and the co-ordination of the rail crossing signals with the adjacent signalised access intersection on the Bruce Highway to both restrict vehicular traffic from conflicting with train movements and manage vehicle queues is expected to provide a functional rail crossing which allows access to the proposed development consistent with the planning intent of both Council and TMR.

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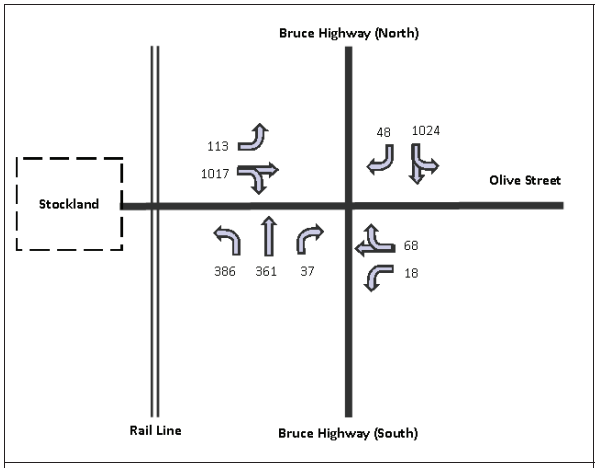

Figure 4.2f 2025 AM Peak Hour (Vehicles per Hour)

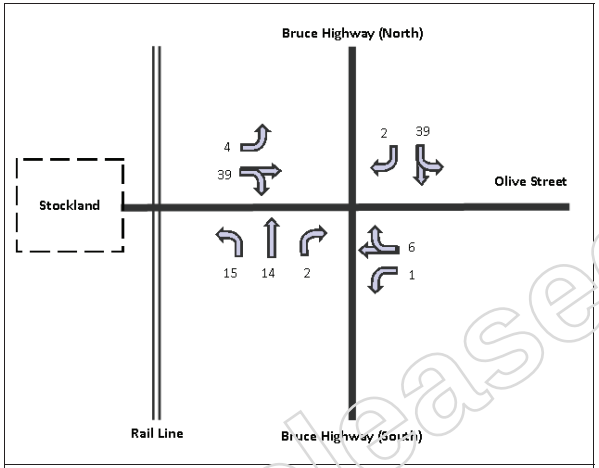

Figure 4.2g Figure 2025 AM Peak Hour (Vehicles per Cycle – 140sec cycle)

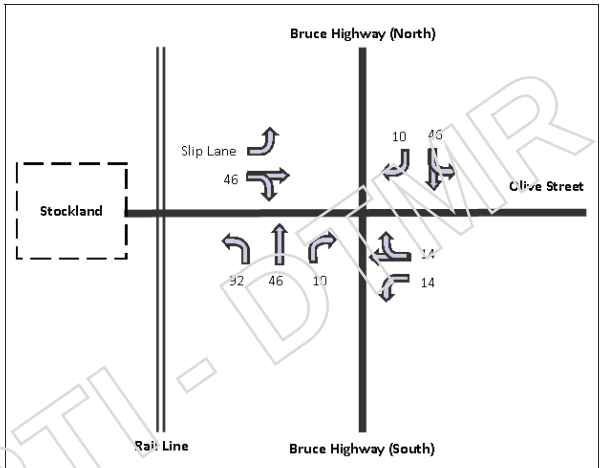

Figure 4.2h Green Time Per Cycle (seconds)

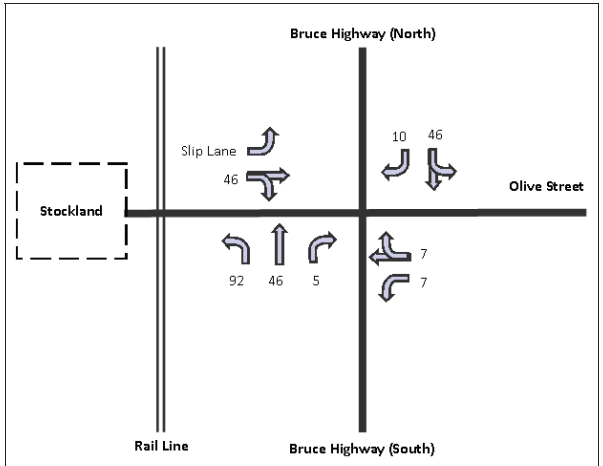

Figure 4.2i Capacity Per Cycle (Vehicle)

Note: assumes 2 seconds per vehicle/lane

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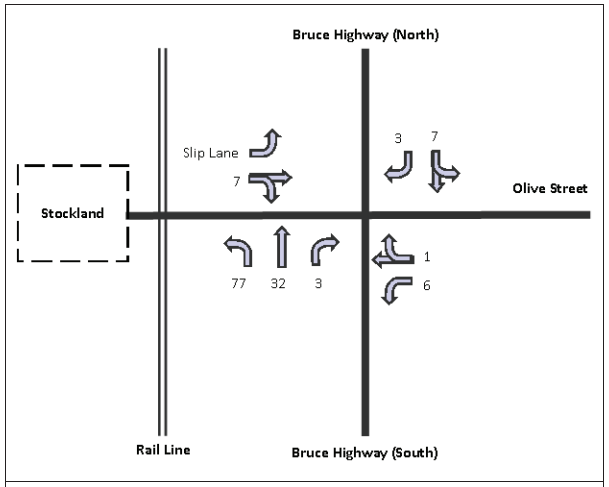

Figure 4.2j Spare Capacity Per Cycle (Vehicles)

(Figure 4.2i—Figure 4.2g)

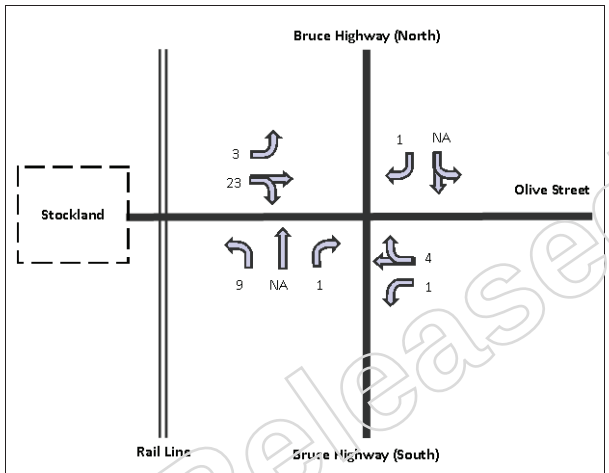

Figure 4.2k Additional Demand During Train Phase

(This assumes the train will delay motorists by 85 seconds)

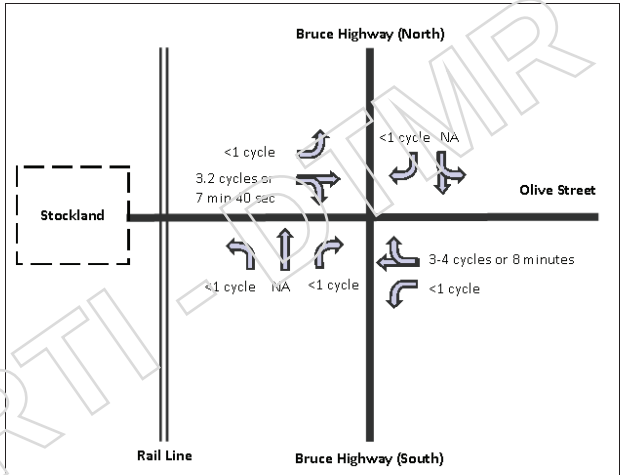

Figure 4.2l Time to dissipate the additional queue following train (i.e. normal traffic conditions)

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4.3 Internal Road Hierarchy

The internal road network has been developed generally in accordance with Rockhampton City Council's Planning Policy No. 13 *Road Hierarchy* and seeks to achieve a safe, efficient and convenient road system. A copy of the proposed road hierarchy plan has been included as **Appendix F**.

A copy of the proposed cross sections is included in **Appendix G.** These cross sections are generally consistent with the dimensional requirements specified in the Capricorn Municipal Development Guidelines (CMDG), however we note that some minor amendments are proposed to address site specific aspects (e.g. roads adjacent to the esplanade and roads split by drainage corridors).

The sections that follow provide detail on the proposed road hierarchy and cross-sections and further justification for any proposed departure from Council's guidelines or policies.

4.3.1 Urban Arterial

Consistent with the transport planning intent of both Council and TMR, the overall masterplan for the site makes allowance for a future Arterial Road through the site to provide connectivity between the Bruce Highway and the existing/planned residential catchments to the west (e.g. Edenbrook).

As shown in the proposed Road Hierarchy plan for the development (refer to **Appendix F**) the eastern section of this connection, between the internal signalised intersection and the access intersection with the Highway at Olive Street, has been identified as an Urban Arterial Road.

It is noted that there isn't a standard cross section for an Urban Arterial within the CMDG, and that Council requires the applicant to provide a cross-section. The proposed cross section for the Urban Arterial in **Appendix G** recommends a four-lane configuration within a 32.5m road reserve, including the provision of 2m on-road bicycle lanes, a 5m centre median and footpaths in both verges. The provision of such a cross section for the Urban Arterial Road is considered to be appropriate to cater for the expected traffic volumes for this section of the internal road network.

Furthermore this section of Urban Arterial Road forms part of the identified connection between the Alexandra Street and Bruce Highway corridors and is intended to service a catchment which extends well beyond the subject site, and as such is trunk infrastructure.

4.3.2 Urban Sub Arterial

The proposed Road Hierarchy plan also identifies the section of road from the southern connection of the internal traffic signals to the intersection with McLaughlin Street, including a portion of the current alignment of William Palfrey Road, as an Urban Sub Arterial.

The proposed cross section for Urban Sub Arterial roads (as shown in **Appendix G**) recommends a two-lane configuration within a 25.5m road reserve, including the provision 5.5m carriageways, 2m shoulders/on-road bicycle lanes, a 5m centre median and 4.75m verges including footpaths. It is noted that whilst the proposed 25.5m road reserve is narrower than the width specified in the CMDG (30m), the remainder of the individual elements of the cross section (carriageway, verge and median widths) meet or exceed the minimum requirements of the CMDG. As a consequence it is considered that the provision of such a cross section for the Urban Sub Arterial Roads appropriate to cater for the expected traffic volumes for this section of the internal road network.

In addition, this section of Urban Sub Arterial Road also forms part of the identified connection between the Alexandra Street and Bruce Highway corridors and is intended to service a catchment which extends well beyond the subject site, and as such is trunk infrastructure.

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4.3.3 Major Urban Collector

As shown on the Road Hierarchy Plan (refer to **Appendix F**) it is proposed that two different types of Major Urban Collector Roads are included within the internal road network for the proposed master planned community.

The first (Major Urban Collector Type 1) is a no-access roadway and is proposed to be located at the start and end of the main, northern east-west roadway within the site. The proposed cross section (as shown in **Appendix G**) identifies a two-lane configuration within a 20.5m road reserve, with provision of a 10m carriageway, including 3.5m traffic lanes and 1.5m shoulders/on-road bicycle lane and 5.25m verges with pathways on both sides of the reserve.

It is noted that all of the individual elements of the proposed cross section meet or exceed the minimum requirements specified for a Major Urban Collector in the CMDG. As such it is therefore considered that the proposed cross section for the non-access Major Urban Collector (Type 1) is acceptable from a traffic perspective.

The second Major Urban Collector identified in the Road Hierarchy Plan incorporates a carriageway split by the main drainage channel which runs through the northern section the site. This portion of the road network is expected to operate as two separate one-way roadways separated by a large centre median (the drainage channel). Several connections be between the two directions of travel are also proposed, mainly adjacent to the intersections with the main north-south minor collector roads.

The proposed cross section for the Major Urban Collector Type 2 (as shown in **Appendix G**) identifies a two-lane configuration within a varying road reserve, with provision of a 5m pavement, incorporating 3.5m traffic lanes and 1.5m shoulders/on-road bicycle lane with an additional 5.25m verge with pathways on both sides of the central drainage corridor. The cross section also identifies the possibility for an optional parking bay to be included on the inside of the roadway, adjacent to the drainage channel. It is again noted that all of the individual elements of the proposed cross section meet or exceed the minimum requirements specified for a Major Urban Collector in the CMDG.

Furthermore, by splitting the carriageway into two separate directions of travel it is anticipated that the traffic volumes for each carriageway will be below the 3,000 vehicles per day threshold for restricted lot access. To this end we believe it is appropriate for the section of road within this master planned community identified as Major Urban Collector (Type 2) to have direct property access.

4.3.4 Minor Urban Collector

Similarly to Major Urban Collectors, the proposed Road Hierarchy plan also identifies two types of Minor Urban Collector Roads within the internal road network of the proposed master planned community.

The first (Minor Urban Collector Type 1) is the main minor collector street utilised in the road network, with the proposed cross section (as shown in **Appendix G**) identifying a two-lane configuration within a 18m road reserve, with provision of a 7.5m carriageway and 5.25m verges with a pathways on one side of the reserve.

It is noted that all of the individual elements of the proposed cross section meet or exceed the minimum requirements specified for a Minor Urban Collector in the CMDG, and as such it is therefore considered acceptable from a traffic perspective.

The proposed Road Hierarchy plan identifies that the Minor Urban Collector (Type 2) is proposed to be utilised for the section of road between the Mixed Use parcel and parkland to the south of the Urban Arterial access road to the development. The proposed cross section for the Type 2 Minor Urban Collector includes the provision of a 7.5m pavement in line with a standard Minor Collector (and CMDG specifications) but also proposes 2.5m parking lanes along both sides of the carriageway. It is also proposed that the standard 18m road reserve width is retained, and that smaller verge widths be provided outside the parking lanes, as additional verge width can be accommodated within the adjacent parkland and within the assumed building setback of the mixed use parcel. This is considered acceptable and therefore the proposed cross section for the Minor Urban Collector (Type 2) is deemed appropriate from a traffic perspective.

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4.3.5 Access Street

The proposed cross section for the Access Streets within the network (as shown in **Appendix G**) includes a two-lane configuration within a 15m road reserve, with provision of a 7m carriageway and 4m verges. It is noted that whilst the proposed 15m road reserve and 7.0m carriageway are slightly less than the minimum widths specified in the CMDG (16m and 7.5m respectively) they are generally in accordance with the design standards of several other local governments.

Furthermore, the provision of a 7.0m carriageway is in excess of the 5.5m width identified in RRC's City Plan and considered more sufficient to cater for the movement of vehicles in both directions past a parked car. It is therefore considered that the proposed cross section for the Access Streets is acceptable from a traffic perspective.

4.3.6 Access Place

The proposed cross section for the Access Place within the network (as shown in **Appendix G**) includes a two-lane configuration within a 14m road reserve, with provision of a 5.5m carriageway and 4.25m verges. It is noted that whilst the proposed 14m road reserve is slightly less than the minimum width specified in the CMDG (16m) all of the individual elements of the cross section (carriageway and verge widths) meet or exceed the minimum requirements of the CMDG. As such it is therefore considered that the proposed cross section for the Access Streets is acceptable from a traffic perspective.

4.3.7 Esplanade Road

The proposed Road Hierarchy Plan (refer to **Appendix F**) identifies an Esplanade Road along the northern edge of the site, adjacent to the Ramsay Creek corridor. The proposed cross section for the Esplanade Road is identified in **Appendix G** and includes a two-lane configuration, with road element widths generally consistent with an Access Street, which would be the applicable cross section for the expected traffic volumes on these sections of the internal network.

The only variation from the proposed cross section of an Access Street is the provision of a smaller verge on the side of the road reserve abutting the proposed parkland adjacent to Ramsay Creek. This reduced verge width is considered acceptable as the width provided (2m) is considered sufficient to cater for the provision of services and the remainder of the verge width could easily be accommodated within the adjacent parkland. Therefore it is considered that the proposed cross section for the Esplanade Road is acceptable from a traffic perspective.

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4.3.8 Proposed Bus Route and Bus Stop Facilities

The proposed road hierarchy also incorporates bus routes within the site to provide access for residents to public passenger transport. As shown in **Figure 4.3.2a** below it is proposed that the bus route through the site will includes the use of the identified Urban Arterial, Urban Sub Arterial and both Major and Minor Urban Collector roads.

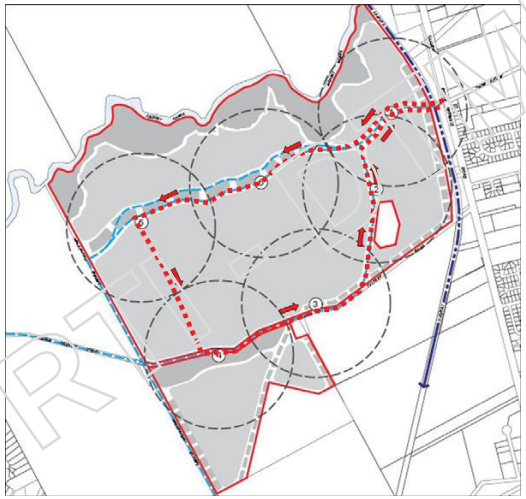

Figure 4.3.2a – Proposed Internal Bus Route

The second plan includedin **Appendix F** shows the above mentioned bus route superimposed over the road hierarchy plan.

Figure 4.3.2a above also identifies indicative bus stop locations throughout the site, whilst the exact locations of the bus stops are to be confirmed, and will be established during the detailed design phase of the project, it can readily be seen that the proposed development will meet the requirement to provide 90% of residents with easy access to public transport facilities (i.e. < 400m walk). Furthermore, it is proposed that bus stops facilities in line with Translink's Regular Stop standards (as shown in **Figure 4.3.2b** below), will be provided at the appropriate locations within the development.

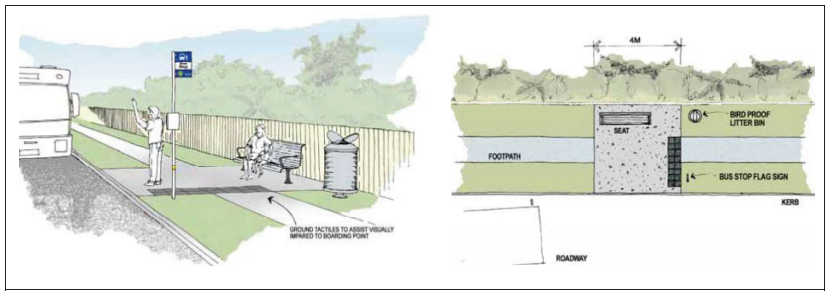

Figure 4.3.2b – Translink Regular Stop

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4.3.9 Compliance with Reconfiguring a Lot Code

The proposed road hierarchy and cross sections will comply with following acceptable solutions of Council's *Reconfiguring A Lot Code*:

- ✓ The driving distance from any allotment to a major street is no more than 700 metres (**A31.1**)
- ✓ No more than three (3) turning movements at intersections or junctions are required in order to travel from any home to the most convenient major street. (**A31.2**)
- ✓ All clusters of more than 100 allotments are provided with at least two (2) alternative accesses to a major road. (**A31.3**)
- ✓ At least 90% of all allotments are located within 400m radial distance from an existing, approved or proposed (as a part of the subdivision) major urban collector road. (**A 32**)

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4.4 Development Staging & Trigger Volumes

As previously mentioned the applicant intends staging the development from east to west, with the internal road network of the development being delivered as required in line with this approach. Access to the development under the early stages will be via the Bruce Highway only and it will not be until the later stages of the development that the western part of the site will be developed and connection provided to McLaughlin Street. As such the transport infrastructure within the site is proposed to be delivered based on trigger volumes of internal traffic.

As part of the first stage of the development traffic signals are required at the Bruce Highway / Olive Street intersection. The geometry of this intersection is shown diagrammatically in **Figure 4.4a**.

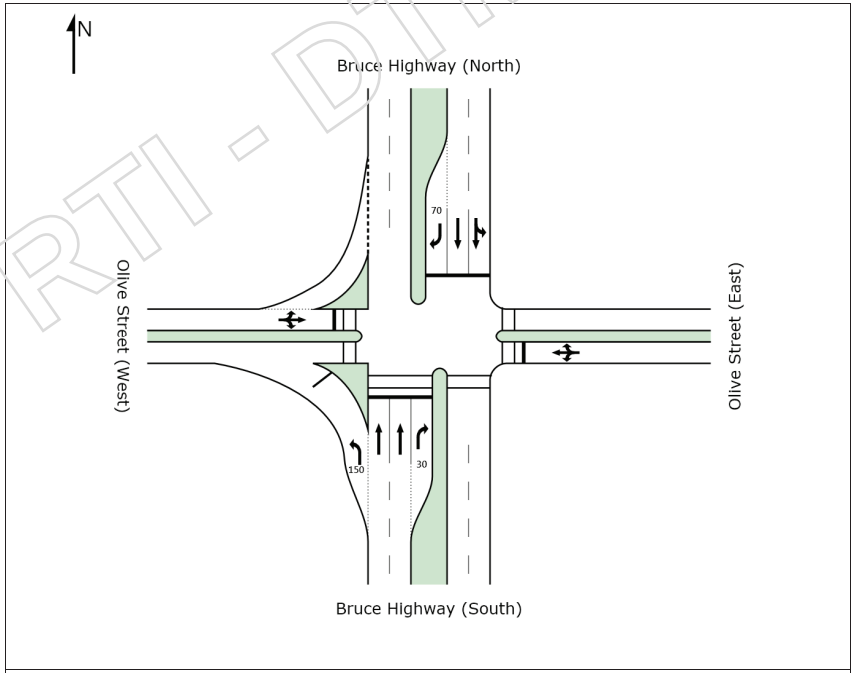

Figure 4.4a: Proposed Interim Four-Way Signalised Intersection Configuration - Bruce Highway / Olive Street Intersection
****NOTE : Values shown on auxiliary lanes indicate storage length only.**

The intersection geometry is expected to operate within the acceptable limit of operation (i.e. 90% degree of saturation) until such time as site generated traffic exceeds 11,475 vehicles per day, or approximately 1,275 detached residential dwellings. It is at this point that the intersection may need to be upgraded to the ultimate configuration **(Trigger 1).**

Initially the urban arterial road will be constructed as a two lane road providing connectivity to the Bruce Highway only. The extent of construction will be limited to that necessary to provide access to the applicable stage of the development.

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Under the ultimate planning intent the north-eastern section of the Urban Arterial Road will have a four lane cross section. However, this will not be required until such time as traffic volumes exceeds 13,000 vehicles per day which approximates 1,450 detached dwellings **(Trigger 2).**

The ultimate geometry for the Bruce Hwy / Olive Street traffic signals has been designed to operate within the acceptable limit of operation (i.e. 90% DOS) for site generate traffic up to approximately 17,100 vehicles per day. This is equivalent to 1,900 lots. Once this trigger has been reached a second point of access to the site is required to accommodate the balance of the development. The second access will be achieved by extending the urban arterial road through to McLaughlin Street **(Trigger 3).**

4.4.1 Trigger 1 – 1,275 dwellings

Traffic signals are proposed at the intersection of the Bruce Highway and Olive Street. The interim geometry shown in **Figure 4.4a** above is expected to reach the acceptable limit of operation (i.e. 90% DOS) when site generated traffic reaches 11,475 vehicles per day, which equates to approximately 1,275 dwellings.

This will be trigger for the construction of the ultimate intersection which is shown diagrammatically in **Figure 4.4.1a** below. For further information regarding the traffic analysis completed to determine this trigger volume please refer to **Section 5.4.1.2** of this report.

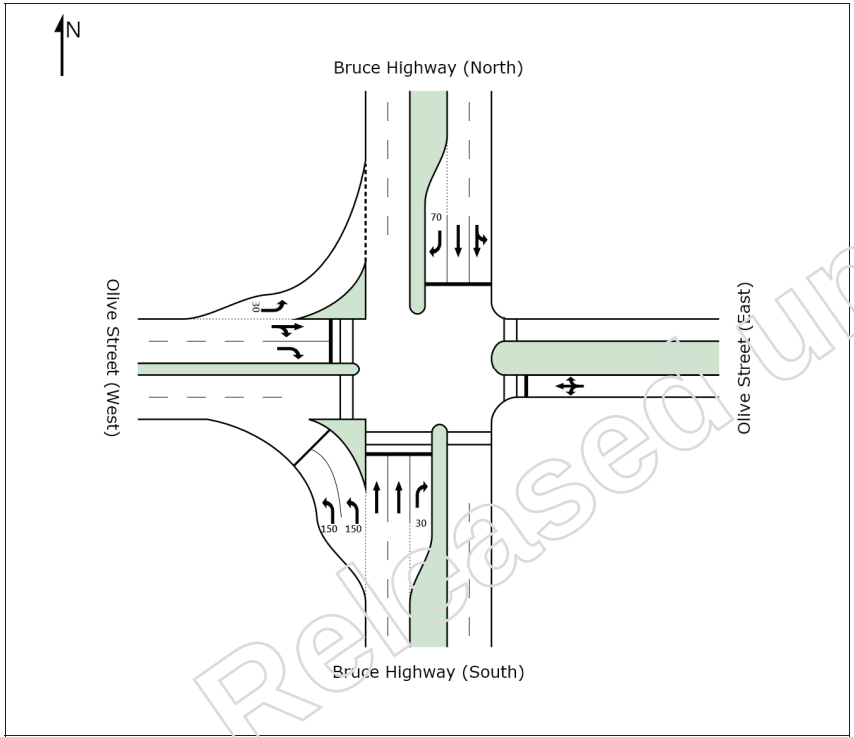

Figure 4.4.1a: Proposed Ultimate Four-Way Signalised Intersection Configuration - Bruce Highway / Olive Street Intersection
****NOTE : Values shown on auxiliary lanes indicate storage length only.**

4.4.2 Trigger 2 – 1,450 dwellings

Under the ultimate planning intent the north-eastern section of the Urban Arterial Road will have a four lane cross section. However, this will not be required until such time as traffic volumes exceed 13,000 vehicles per day or approximately 1,450 detached dwellings.

The trigger volume of 13,000 vehicles per day was identified as the desirable level of service for a two lane urban arterial roads in the *Rockhampton Traffic Study 2008* report.

4.4.3 Trigger 3 – 1,900 dwellings

The ultimate geometry for the Bruce Hwy / Olive Street traffic signals is expected to operate within the acceptable limit of operation (i.e. 90% DOS) for site generate traffic of approximately 17,100 vehicles per day. This analysis is included in Section 5 of this report. This approximates 1,900 detached dwellings, at which time the urban arterial road through to McLaughlin Street will be constructed.

4.4.4 Delivery of other Parts of the Transport Infrastructure

With the exception of the urban arterial road, there are no trigger volumes which will mandate the delivery of the internal road network. The internal roads will be delivered as necessary to provide access to the relevant stage of the development.

Whilst the current infrastructure charges policy does not recognise the urban arterial or McLaughlin Street as trunk infrastructure they are intended to service a catchment which extends well beyond the subject site. As a consequence, we believe it should be classified as trunk infrastructure and any physical works carried out by the Applicant on these parts of the road network should be creditable against the infrastructure charges paid.

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5.0 Traffic Impact Assessment

5.1 Development Traffic Generation and Distribution

To ensure that the proposed development is in accordance with the overall development yield identified in the PAG development scenario in the *Rockhampton Traffic Study (2008)*, this application seeks preliminary approval for up to 2,350 lots.

The development is also proposed to include approximately 4,500m^2 GFA of non-residential uses including up to 3,500m^2 GFA of retail tenancies. However for the purposes of assessment it has been assumed that the catchments for the non-residential uses will be wholly contained internally within the development, which is considered acceptable for a residential development of this size. As such the traffic generated by the proposed non-residential uses have not been considered when investigating the impact of the proposed development on the external road network.

Using the standard traffic generation rates for residential lots identified in the RTA's *Guide to Traffic Generating Developments* and the proposed development yield, an estimate of the traffic volumes forecast to be generated by the development was established, as summarised in **Table 5.1a** below.

Table 5.1a: Proposed Master Planned Community Ultimate Development Traffic Generation

Use	Yield	Daily Traffic Generation Rate	Daily Traffic Generation	Peak Hour Traffic Generation Rate	Peak Hour Traffic Generation
Standard Residential Lots	2,350 lots	9 trips / lot	21,150 trips	0.85 trips / lot	1,998 trips
		TOTAL	**21,150 trips**	**TOTAL**	**1,998 trips**

The proposed plan of development identifies a connection between McLaughlin Street and the Bruce Highway, via the internal Urban Arterial Road. As such the development is proposed to have two connection points to the external road network, and subsequently it has been assumed that 70% of traffic generated by the development will access the Bruce Highway, whilst the remaining 30% will travel via McLaughlin Street.

These traffic distribution assumptions are believed to be generally consistent with those adopted in the traffic model which underpinned the 2008 *Rockhampton Traffic Study*. A full summary of the traffic distribution assumptions adopted for the analysis of the proposed development can be seen in **Table 5.1b** over page.

Table 5.1b: Estimated Development Traffic Distribution

Assumed Traffic Distributions	
AM Peak	PM Peak
Stockland North Parkhurst Development	
Arrival / Departure Split ▪ 30% Incoming to Development; ▪ 70% Outgoing from Development. ***External Network Distribution*** ▪ 70% to/from the Bruce Highway; of which • 10% to/from Bruce Highway (North); and • 90% to/from Bruce Highway (South). ▪ 30% to/from the McLaughlin Street.	***Arrival / Departure Split*** ▪ 60% Incoming to Development; ▪ 40% Outgoing from Development. ***External Network Distribution*** ▪ 70% to/from the Bruce Highway; of which • 10% to/from Bruce Highway (North); and • 90% to/from Bruce Highway (South). ▪ 30% to/from the McLaughlin Street.
255 Lots from Adjacent Edenbrook Development (Approved)	
Arrival / Departure Split ▪ 30% Incoming to Development; ▪ 70% Outgoing from Development. ***External Network Distribution*** ▪ 100% to/from the Bruce Highway; of which • 10% to/from Bruce Highway (North); and • 90% to/from Bruce Highway (South).	***Arrival / Departure Split*** ▪ 60% Incoming to Development; ▪ 40% Outgoing from Development. ***External Network Distribution*** ▪ 100% to/from the Bruce Highway; of which • 10% to/from Bruce Highway (North); and • 90% to/from Bruce Highway (South).

It is also important to note that the proposed east-west arterial road will also provide connectivity to other residential land uses along the Alexandra Street corridor (e.g. Edenbrook). Therefore as part of the analysis of the proposed access intersection with the Bruce Highway we have conservatively assumed that 30% or 255 of the approved lots within the adjacent Edenbrook development will access the Bruce Highway at this location.

Figure 5.1a and **Figure 5.1b** below show the assumed development volumes at the proposed access intersection with the Bruce Highway for the both the AM and PM peak hours based on the assumptions above. It is noted that at the request of Council a volume of 50 vph has been assigned to the through movements between Olive Street East and West during the AM peak hour to represent the expected traffic movements between the proposed development and the Parkhurst State School on the eastern side of the Highway.

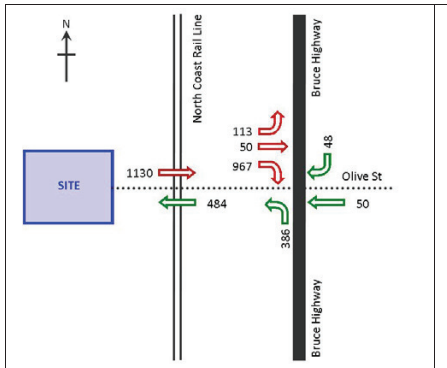

Figure 5.1a: Development Traffic Volumes (AM Peak)

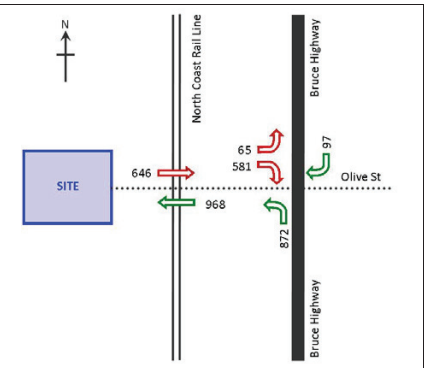

Figure 5.1a: Development Traffic Volumes (PM Peak)

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The peak hour development traffic volumes identified for the proposed access intersection above were then distributed along Bruce Highway corridor through Parkhurst, with the volumes at the each of the relevant intersections including Olive Street, Boundary Road (East), Boundary Road (West) and Yeppoon Road summarised in **Figure 5.1c** below.

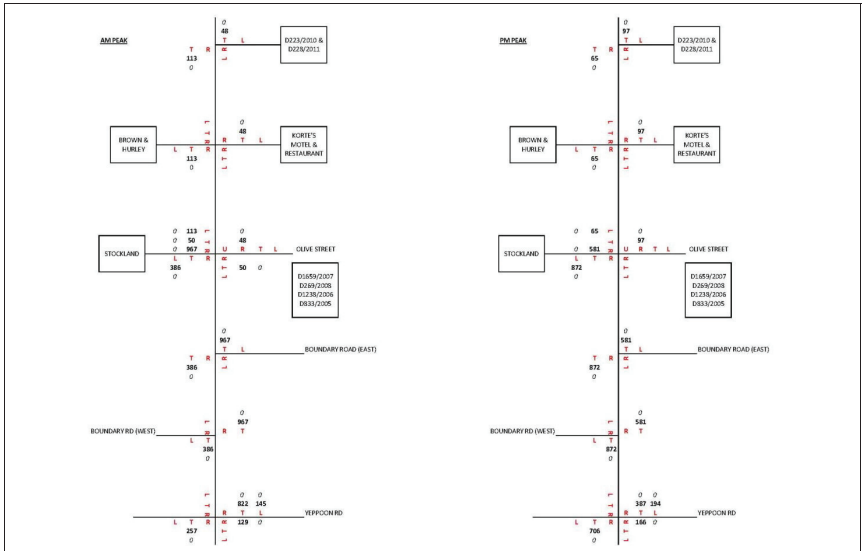

Figure 5.1c: Stockland North Parkhurst - Development Traffic Volumes (Bruce Highway Corridor)

5.2 Pre Development Traffic

To establish the background traffic volumes on the surrounding road network, the latest intersection count data for the relevant intersections along the Bruce Highway corridor were obtained from the Department of Transport and Main Roads (TMR). These included the intersections of the Bruce Highway with Olive Street, Boundary Road (East), Boundary Road (West) and Yeppoon Road. This data was collected via manual turning counts at the intersections which were undertaken throughout 2012, with the raw data for each intersection included as **Appendix H**.

For the purpose of the analysis it has been assumed that full build-out of the proposed master planned community would occur by 2025, resulting in a 10 year design horizon for the development of 2035. It is noted that whilst this assumption regarding the timing of the development has been made, the timing of the key milestone dates identified above will ultimately be determined by the physical sales rate and construction of the proposed lots, and as such may be beyond those assumed for the purpose of this analysis.

Notwithstanding the above, due to the variable nature of traffic networks and the possibility of changes to the forecast traffic characteristics as a result of a number of external factors, it is considered impractical to try and forecast traffic conditions past 2035 as the longer period the current data is extrapolated (especially for periods over 20 years) the less likely that the resultant traffic volumes will be an accurate representation of the future network volumes.

To establish the expected future background traffic volumes at the proposed access intersection location a growth rate of 1% p.a. (compound) was conservatively applied to the through movements on the Bruce Highway. The resultant background traffic volumes along the Parkhurst Bruce Highway corridor can be seen in **Appendix I**.

In addition to the background traffic volumes on the Bruce Highway, the traffic volumes expected to be generated by developments already approved in the Parkhurst corridor were also considered at the request of both Rockhampton Regional Council and TMR. These developments included Korte's Motel and Restaurant development, the proposed 1 into 5 ROL application over the Brown and Hurley site, several residential developments on the eastern side of the Bruce Highway (D223/2010, D228/2011, D1659/2007, D269/2008, D1238/2006 and D833/2005) and the retail development (shopping centre) on the corner of Boundary Road East and the Highway.

The traffic generation and distribution from these additional developments were based on the *Traffic Impact Assessment* reports submitted for each application. Where such reports were unavailable the traffic distributions adopted were in accordance with those identified in TMR's future planning network spreadsheet models. The traffic calculations for each of the existing approved developments for both the assumed 2025 and 2035[1] road networks can be seen in **Appendix J** with the forecast development volumes at the relevant intersections along the Parkhurst Bruce Highway corridor also included.

It is noted that the inclusion of additional traffic from the approved developments identified above **in addition** to the application of the proposed 1% p.a. compound growth rate for the through movements on the highway is expected to exceed the historical growth rate (1.5% p.a. compound) identified for this section of the highway by TMR, as shown in **Table 5.2a** below.

Table 5.2a: Adopted Background Traffic Growth Rate

Scenario	Traffic Volumes (vph)		Growth Rate	
	AM Peak	PM Peak	AM Peak	PM Peak
2012 Bruce Highway / Olive Street Count Volumes	942 (120)	920 (94)		
Forecast 2025 Pre Development Volumes	1,364 (139)	1,476 (106)	2.71%	3.48%
Forecast 2025 Pre Development Volumes	1,414 (153)	1,584 (117)	1.78%	2.39%

Note: Volumes calculated for midblock section south of Olive Street based on recorded and forecast Bruce Highway / Olive Street intersection volumes. All growth rates identified are compound growth rates per annum.

The pre development volumes were then calculated by combining the forecast background traffic volumes with the volumes generated by the approved developments previously identified. The resultant 2025 and 2035 AM and PM peak pre development traffic volumes for the road network are summarised in **Figure 5.2a** and **Figure 5.2b** below.

[1] The 2035 road network assumes the connection of the two sections of Norman Road has been completed (in 2031 as per Council's Infrastructure Charges Resolution Ver2), thus leading to a redistribution of the development traffic for the approved developments east of the Bruce Highway.

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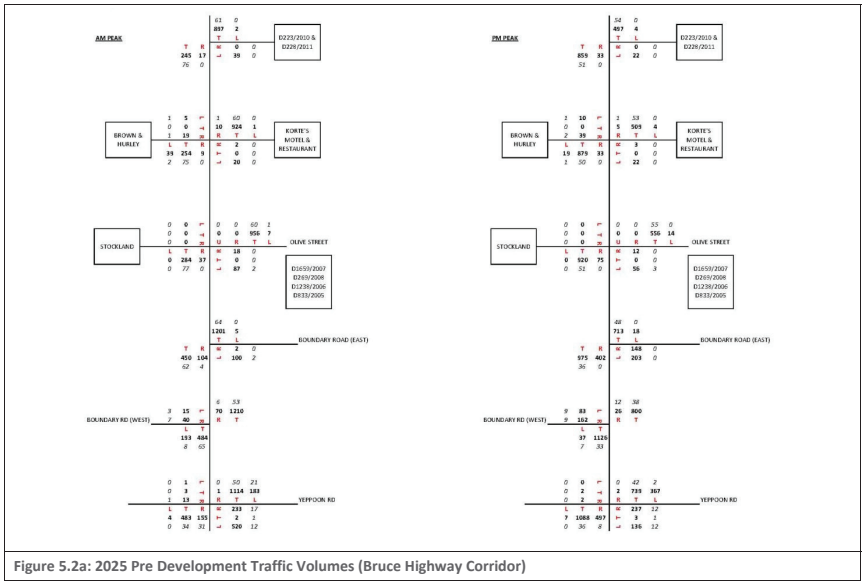

Figure 5.2a: 2025 Pre Development Traffic Volumes (Bruce Highway Corridor)

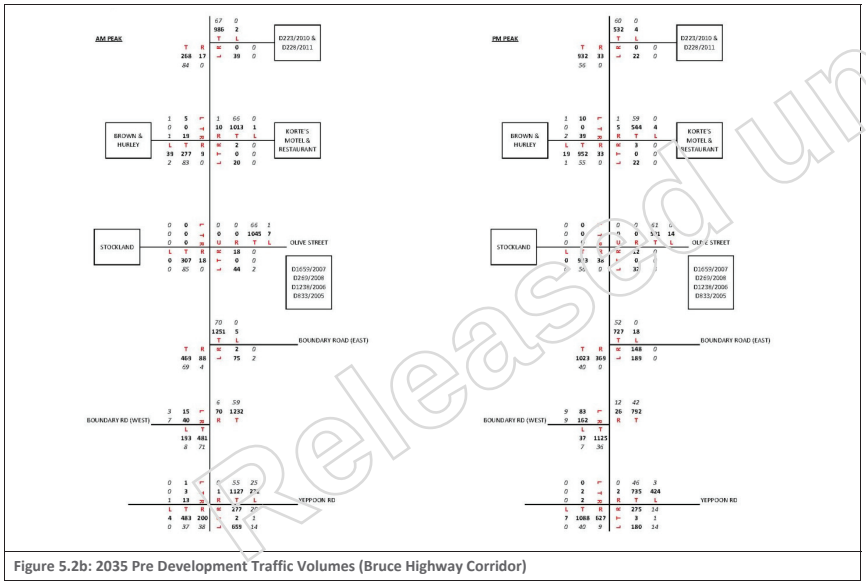

Figure 5.2b: 2035 Pre Development Traffic Volumes (Bruce Highway Corridor)

5.3 Post Development Traffic

Using the volumes predicted to be generated by the proposed development, those by the already approved developments in the surrounding area and the forecast background traffic volumes, the post development traffic conditions at the relevant intersections along the Bruce Highway corridor through Parkhurst were analysed.

This analysis was completed for both the identified AM and PM peak periods, at the year of completion (2025) and the ten year design horizon (2035). The resultant 2025 and 2035 peak hour post development traffic volumes for the road network are summarised in **Figure 5.3a** and **Figure 5.3b** below.

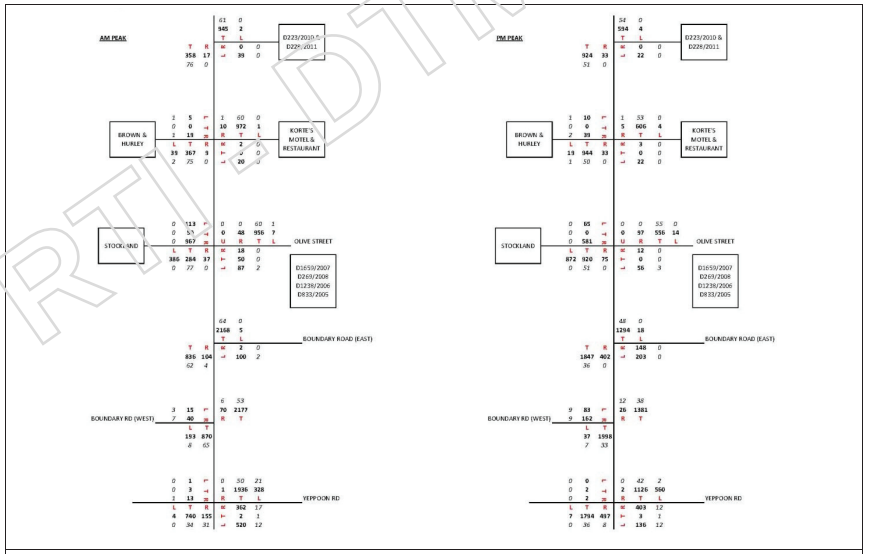

Figure 5.3a: 2025 Post Development Traffic Volumes (Bruce Highway Corridor)

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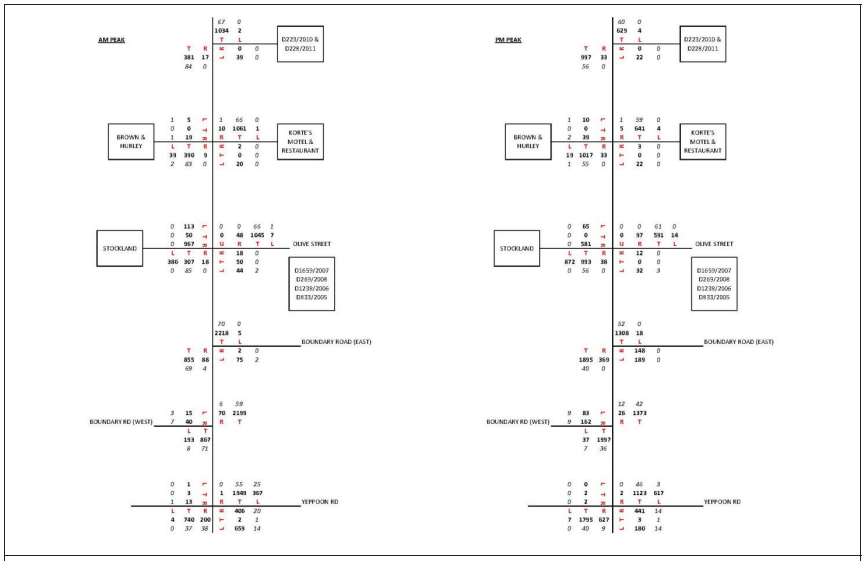

Figure 5.3b: 2035 Post Development Traffic Volumes (Bruce Highway Corridor)

5.4 Traffic Impact Assessment

As previously mentioned analysis has been completed to determine the impact of the proposed master planned community on both the state and local government controlled external road networks. The investigation into the operation of the state controlled road network will focus on the relevant section of the Parkhurst Bruce Highway corridor, including the major intersections, whilst the assessment of the impact on the local government controlled network will focus on the Alexandra Street corridor.

5.4.1 State Controlled Road Network Analysis

An investigation into the impacts of the proposed development on the state controlled road network has been completed, with analysis being undertaken on the relevant section of the Bruce Highway (Yeppoon Road to Olive Street) including mid-block volumes and the operation of the major intersections of:

- Olive Street (Interim and Ultimate configurations);
- Boundary Road (East);
- Boundary Road (West); and
- Yeppoon Road.

These analyses are discussed in further detail in the following sections.

5.4.1.1 Midblock Volumes – Capacity of Current Cross Section

TMR has previously advised that the desired maximum daily flow and hence trigger volume for an upgrade from two lanes to four is 15,000 vehicles per day. Whilst Annual Average Daily Traffic (AADT) segment volumes for the relevant sections of the highway are currently available, these do not include the additional traffic generated by the approved developments in the area and as such do not provide an accurate representation of the expected pre-development traffic volumes.

The mid-block volumes have been derived from the pre-development intersection volumes. This was achieved by extracting the approach and departure volumes. **Figure 5.4.1.1a** below identifies the intersection volumes and corresponding mid-block volumes for the forecast 2013 pre development traffic scenario.

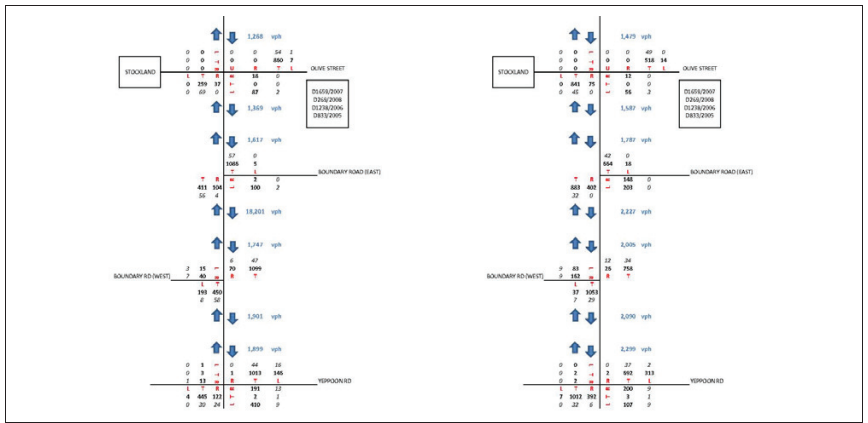

Figure 5.4.1.1a: 2013 Forecast Peak Hour Mid-Block Traffic Volumes (Bruce Highway Corridor)

Section 5.2 of TMR's *Road Planning and Design Manual* describes the generally accepted method of applying a factor of ten (10) for urban arterial roads to calculated peak hour volumes from daily traffic volumes, and vice versa. By

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applying this factor of ten to the peak hour mid-block values shown above the expected daily volumes were estimated, as shown in **Figure 5.4.1.1b** below.

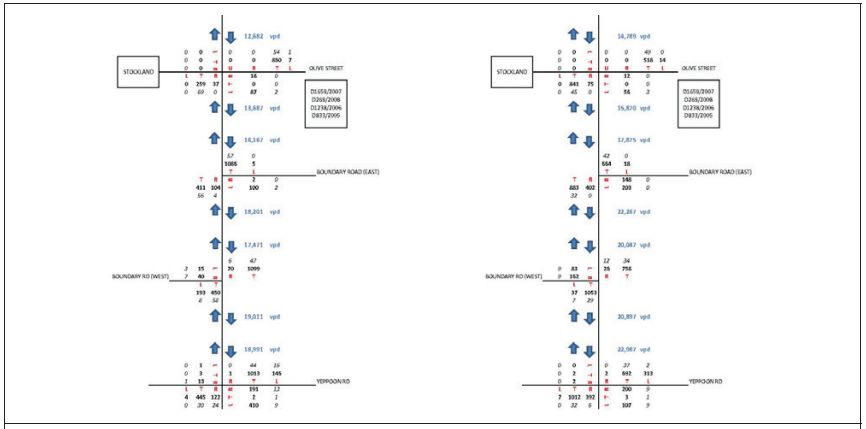

Figure 5.4.1.1b: 2013 Forecast Daily Mid-Block Traffic Volumes (Bruce Highway Corridor)

From the values identified in the figure above it can be seen that the expected pre development daily mid-block volumes on each relevant section of the Bruce Highway between Yeppoon Road and Olive Street exceed the TMR trigger volume of 15,000 vehicles per day. These values also therefore validate both DTMR's future intent for this road corridor and current planning studies, as well as the recommendation from the 2008 *Rockhampton Traffic Study* (prepared by Arup) that the initial section of the Highway (Yeppoon Road to Boundary Road (East) required duplication by 2011.

As such it is expected that an upgrade of the Highway from two to four lanes, including the provision of additional through lanes at existing intersections, will be required regardless of the construction of the proposed North Parkhurst development.

5.4.1.2 Bruce Highway / Olive Street

The analysis of the intersections was then completed using SIDRA 5.1 software, adopting a proposed four-way signalised intersection for the Bruce Highway / Olive Street intersection in accordance with the future planning intent of both TMR and Council.

As previously mentioned, an interim intersection configuration has been proposed to accommodate the traffic generated by the initial stages of the development, and an upgrade trigger of 1,275 lots identified as the limit of operation for the proposed interim configuration. As such traffic analysis has been completed to confirm this proposed upgrade trigger, with the assumptions and results of the analysis described below.

For the purpose of analysis the majority of the traffic assumptions listed in **Table 5.1a** and **Table 5.1b** were adopted, however as is anticipated that a connection to the west (i.e. McLaughlin Street) would not be provided as part of the works for the initial 1,000 lots, it has been assumed that 100% of the traffic from these lots would access the external road network via the proposed signals at the Bruce Highway / Olive Street intersection.

In addition, the identified design horizon for the overall development (2035) has been conservatively been adopted for the analysis of the interim configuration for the initial 1,275 lots to verify the proposed intersection upgrade trigger. The interim intersection configuration adopted for the analysis of the proposed Bruce Highway / Olive Street intersection upgrade trigger (1,275 lots) can be seen in **Figure 5.4.1.2a** below.

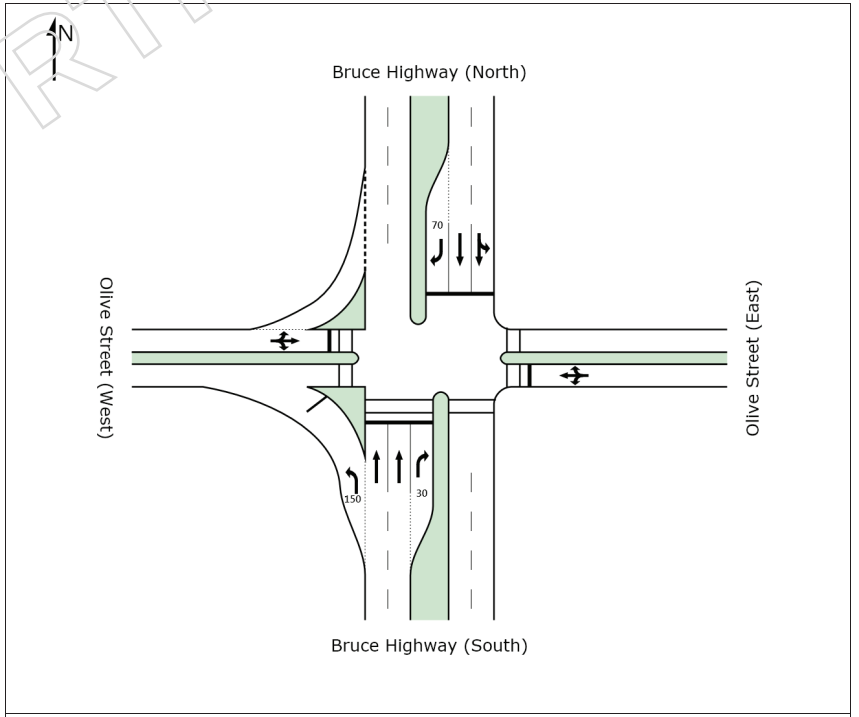

Figure 5.4.1.2a: Proposed Interim Four-Way Signalised Intersection Configuration - Bruce Highway/Olive Street Intersection
****NOTE : Values shown on auxiliary lanes indicate storage length only.**

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The interim intersection configuration identified above includes the provision of a four lane cross section for the Highway which in Section 5.4.1.1 was identified to be required regardless of the development due to the forecast pre development mid-block volumes exceeding 15,000 vehicles per day which triggers the need for TMR to four-lane the Bruce Highway between Yeppoon Road and Olive Street, which would include the southern approach to this intersection.

It is also noted that the required storage lengths of the auxiliary lanes for the left turn into the site from the south and the right turn from the north have been sized to accommodate the expected queue lengths developed during a train passing over the proposed level crossing on the new access road into the site. These storage lengths have been calculated assuming a two and a half minute delay to vehicles at the level crossing.

A four (4) phase signal configuration with pedestrian crossings on the southern (staged), eastern and western approaches was adopted for the purpose of the intersection analysis. The modelled phasing is shown in **Figure 5.4.1.2b** below.

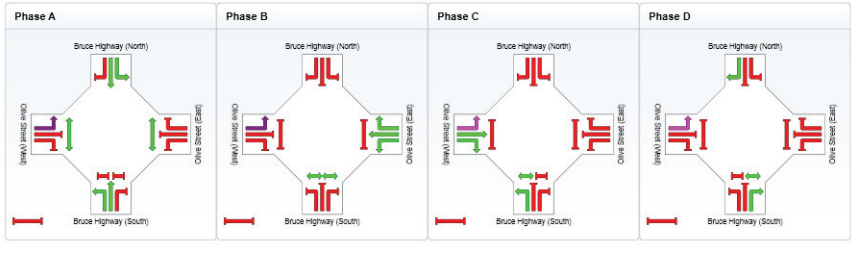

Figure 5.4.1.2b: Adopted Signal Phasing – Bruce Highway / Olive Street Intersection

The results of the analyses detailing the predicted operation of the proposed interim configuration of the Bruce Highway / Olive Street intersection for the adopted design horizons have been included within **Appendix K**, with a summary of the results provided in **Table 5.4.1.2a** below.

Table 5.4.1.2a: Summary of SIDRA Analysis Results – Bruce Highway / Olive Street Intersection – Interim Configuration Post Development Scenarios – Proposed Signalised Intersection Configuration

Intersection	Intersection Control	Year	Peak Hour	DOS %
Interim (1,275 Lots) Bruce Highway / Olive Street	Four-way Signalised	2035	AM	89.3
			PM	67.4

From the results above it can be seen that the proposed interim four-way signalised intersection configuration of the Bruce Highway / Olive Street intersection is expected to operate satisfactorily up to the proposed intersection trigger (1,275 lots) with all calculated values for intersection Degree of Saturation (DOS) for the assumed post development scenarios within the acceptable limits of operation (90%) for signalised intersections.

Once the identified development trigger (1,275 lots) has been reached[2], it is proposed that the intersection will be upgraded to the identified ultimate intersection configuration. This ultimate intersection configuration includes an additional entry and exit lane on the western approach leg to the intersection, as well as an additional signalised left turn lane into the site from the southern Bruce Highway approach.

[2] Note – Development trigger may be extended beyond 1,275 lots if subsequent traffic analysis identifies the interim intersection configuration will operate within acceptable limits of operation for a signalised intersection.

The ultimate configuration for the Bruce Highway / Olive Street intersection adopted during the analysis of the post development traffic conditions for the development can be seen in **Figure 5.4.1.2c** below.

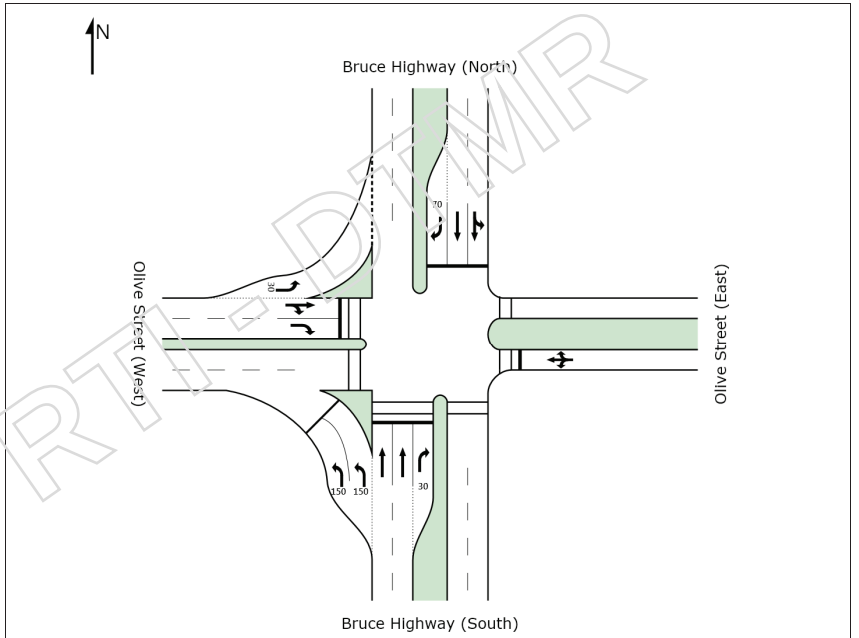

Figure 5.4.1.2c: Proposed Four-Way Signalised Intersection Configuration - Bruce Highway / Olive Street Intersection
****NOTE : Values shown on auxiliary lanes indicate storage length only.**

Again a four (4) phase signal configuration with pedestrian crossings on the southern (staged), eastern and western approaches was adopted in the analysis with a summary of the phasing used shown in **Figure 5.4.1.2d** below.

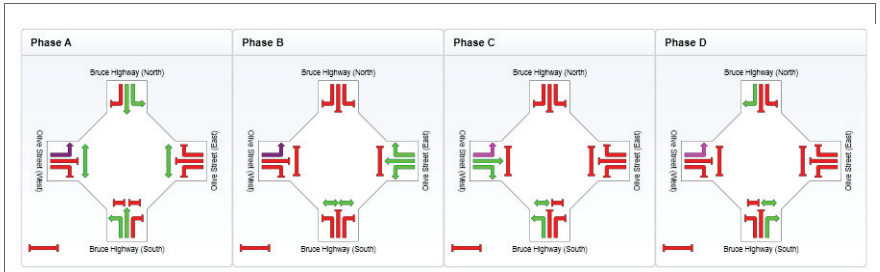

Figure 5.4.1.2d: Adopted Signal Phasing – Bruce Highway / Olive Street Intersection

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The results of the analyses detailing the predicted operation of the proposed Bruce Highway / Olive Street intersection for the forecast post development traffic conditions are attached as **Appendix K.** A summary of these results is provided in **Table 5.4.1.2b** over page.

Table 5.4.1.2b: Summary of SIDRA Analysis Results – Bruce Highway / Olive Street Intersection – Ultimate Configuration Post Development Scenarios – Proposed Signalised Intersection Configuration

Intersection	Intersection Control	Year	Peak Hour	DOS %
Bruce Highway / Olive Street	Four-Way Signalised	2025	AM	**83.2**
			PM	**74.9**
		2035	AM	**84.8**
			PM	**78.7**

From the results above it can be seen that the proposed ultimate configuration of the four-way signalised intersection of the Bruce Highway / Olive Street intersection is expected to operate satisfactorily for all post development scenarios, with all calculated values for intersection Degree of Saturation (DOS) below the acceptable limit of operation (90%) for signalised intersections.

5.4.1.3 Bruce Highway / Boundary Road (East)

Following consultation with TMR the signalised configuration of the Boundary Road (East) / Bruce Highway intersection conditioned as part of a recently approved shopping centre development (on Boundary Road East) was identified, as shown in **Figure 5.4.1.3a** below.

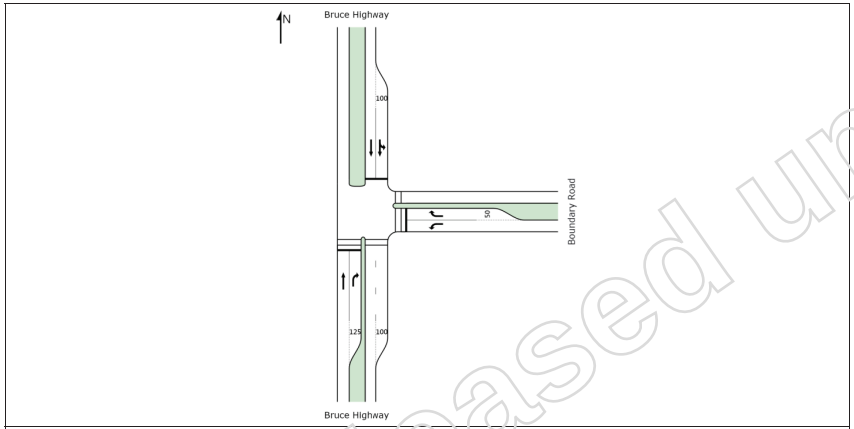

Figure 5.4.1.3a: Approved Signalised Intersection Configuration - Bruce Highway / Boundary Road (East) Intersection

It is noted that the geometry indicated in this approved intersection configuration only provides one through lane for northbound traffic and a short secondary through lane for southbound traffic. Therefore to align with the previously identified requirement for a four lane cross section of the Highway on both approaches to the intersection, an alternative, upgraded intersection configuration to address this existing deficiency has been proposed as shown in **Figure 5.4.1.3c** below.

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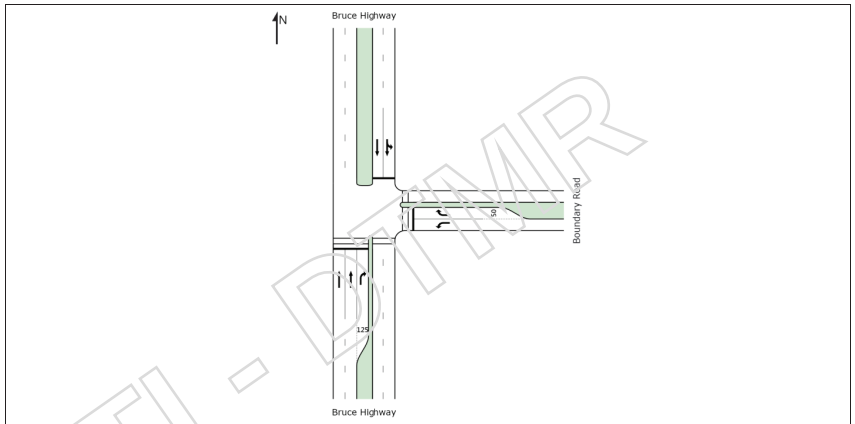

Figure 5.4.1.3c: Upgraded Intersection Configuration - Bruce Highway / Boundary Road (East) Intersection

A three (3) phase signal configuration with pedestrian crossings on the southern and eastern approaches was adopted for the purpose of the intersection analysis. A generalised summary of the adopted signal phasing is shown in **Figure 5.4.1.3b** below.

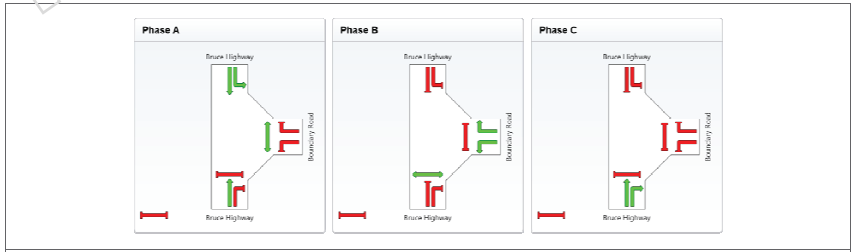

Figure 5.4.1.3b: Adopted Signal Phasing – Bruce Highway / Boundary Road (East) Intersection

The results of the analyses detailing the predicted operation of the proposed upgraded configuration of the Bruce Highway / Boundary Road (East) intersection for the forecast post development traffic conditions are attached as **Appendix L.** A summary of these results is provided in **Table 5.4.1.3b** below.

Table 5.4.1.3b: Summary of SIDRA Analysis Results – Bruce Highway / Boundary Road (East) Intersection Post Development Scenarios – Proposed Upgraded Signalised Intersection Configuration

Intersection	Intersection Control	Year	Peak Hour	DOS %
Bruce Highway / Boundary Road (East)	Three-Way Signalised	2025	AM	**85.0**
			PM	**84.8**
		2035	AM	**84.8**
			PM	**83.1**

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From the results above it can be seen that the proposed upgrade to the signalised intersection configuration of the Bruce Highway / Boundary Road (East) intersection is expected to operate satisfactorily for all post development scenarios, with all calculated values for intersection Degree of Saturation (DOS) below the acceptable limit of operation (90%) for signalised intersections.

5.4.1.4 Bruce Highway / Boundary Road (West)

The existing priority controlled geometry of the Bruce Highway / Boundary Road West intersection is shown in **Figure 5.4.1.4a** below.

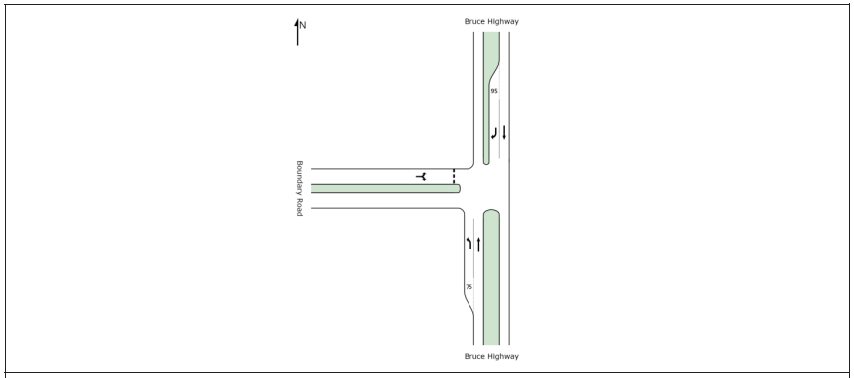

Figure 5.4.1.4a: Existing Intersection Configuration - Bruce Highway / Boundary Road (West) Intersection

It is noted that the current geometry of the intersection, as identified above, is based on the existing two-lane alignment of the Bruce Highway. However as established in Section 5.4.1.1 the Bruce Highway requires duplication to provide a four lane cross section and as such the requirement to provide these additional through lanes on both Bruce Highway approaches to the intersection can be considered an existing deficiency of the road network.

The geometry that will be required to address the identified existing deficiencies is shown in **Figure 5.4.1.4b** below. This alternative configuration includes additional through lanes in both directions, as well as including pedestrian crossings on both the northern and western approaches which whilst included are not expected to cater for large volume of pedestrian traffic.

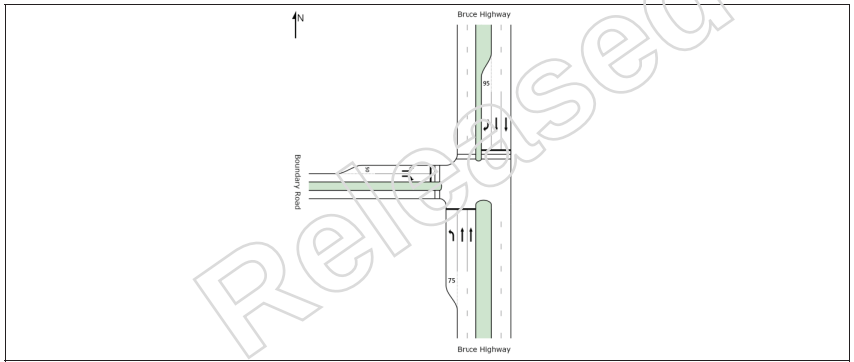

Figure 5.4.1.4b: Upgraded Intersection Configuration - Bruce Highway / Boundary Road (West) Intersection

A three (3) phase signal configuration with pedestrian crossings on the northern and western approaches was adopted for the purpose of the intersection analysis. A generalised summary of the adopted signal phasing is shown in **Figure 5.4.1.4c** below.

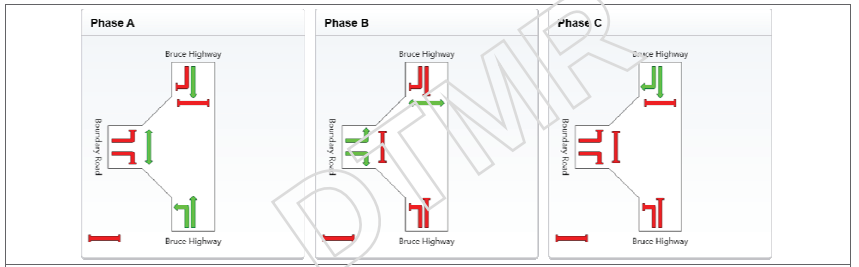

Figure 5.4.1.4c: Adopted Signal Phasing – Bruce Highway / Boundary Road (West) Proposed Signalised Intersection

The results of the analyses detailing the predicted operation of the proposed upgraded configuration of the Bruce Highway / Boundary Road (West) intersection for the forecast post development traffic conditions are attached as **Appendix M,** with a summary provided in **Table 5.4.1.4b** below.

Table 5.4.1.4b: Summary of SIDRA Analysis Results – Bruce Highway / Boundary Road (West) Intersection Post Development Scenarios – Proposed Upgraded Intersection Configuration

Intersection	Intersection Control	Year	Peak Hour	DOS %
Bruce Highway / Boundary Road (West)	Three-Way Signalised	2025	AM	**76.1**
			PM	**74.4**
		2035	AM	**74.7**
			PM	**74.6**

From the results above it can be seen that once the existing deficiencies of the intersection have been rectified the proposed upgraded Bruce Highway / Boundary Road (West) intersection (three way signalised) is expected to operate satisfactorily during the analysed post development scenarios, with all calculated values for intersection Degree of Saturation (DOS) within the acceptable limits of operation (90%) for signalised intersections.

5.4.1.5 Bruce Highway / Yeppoon Road

Initial analysis was completed to assess the future operation of the existing signalised intersection configuration of the Bruce Highway / Yeppoon Road intersection. A diagram of the configuration adopted for this analysis is in **Figure 5.4.1.5a** below.

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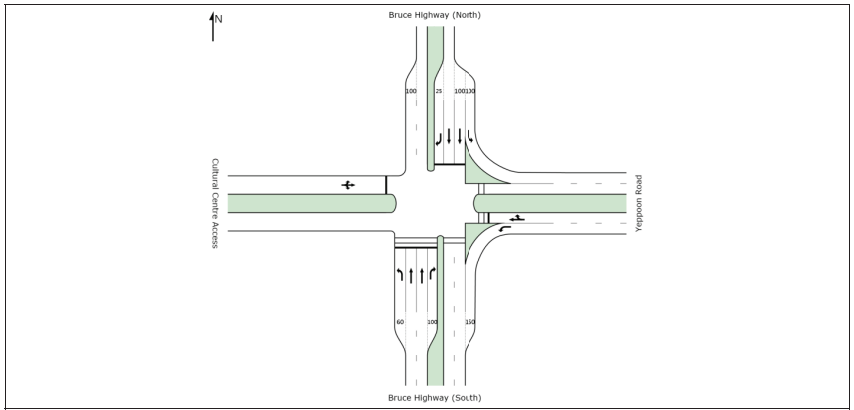

Figure 5.4.1.5a: Existing Intersection Configuration - Bruce Highway / Yeppoon Road (West) Intersection

A four (4) phase signal configuration with pedestrian crossings on the southern and eastern approaches was adopted for the purpose of the intersection analysis. A generalised summary of the adopted signal phasing is shown in **Figure 5.4.1.5b** below.

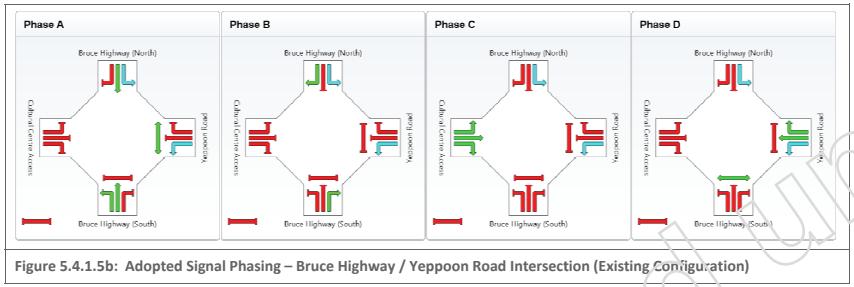

Figure 5.4.1.5b: Adopted Signal Phasing – Bruce Highway / Yeppoon Road Intersection (Existing Configuration)

The results of the analysis detailing the predicted operation of the existing Bruce Highway / Yeppoon Road intersection for the forecast pre development traffic conditions are attached as **Appendix N**, with a summary of these results provided in **Table 5.4.1.5a** over page.

Table 5.4.1.5a: Summary of SIDRA Analysis Results – Bruce Highway / Yeppoon Road Intersection
Pre Development Scenarios – Existing Signalised Intersection Configuration

Intersection	Intersection Control	Year	Peak Hour	DOS %
Bruce Highway / Yeppoon Road	Four-Way Signalised	2013	AM	75.3
			PM	101.3

The results above indicate that the current intersection configuration of the Bruce Highway / Yeppoon Road intersection is not expected to operate satisfactorily during the 2013 PM pre development scenario (including assumed traffic volumes from approved developments), with the calculated value for intersection Degree of Saturation (DOS) outside the acceptable limits of operation (90%) for signalised intersections.

A detailed investigation of the calculated results for the 2013 PM peak analysis indicates that the failure mechanism for the current intersection configuration is the right turn lane and adjacent through lanes on the southern approach to the intersection. Furthermore the results indicate an underutilisation of the outside or westernmost through lane on the southern approach, which can be attributed to the provision of a short (100m) auxiliary through lane downstream of this movement. The results further reinforce the need for the provision of a four lane cross section of the highway north of Yeppoon Road as identified earlier, and also demonstrate that the current configuration of the Bruce Highway / Yeppoon Road intersection will need to be upgraded regardless of the addition of traffic from the proposed Stockland North Parkhurst development.

An upgraded intersection configuration, including the provision of the full four through lane cross section on the northern approach, as shown in **Figure 5.4.1.5c** below, was then analysed. This alternative configuration also incorporated an increase in the current length of the right turn pocket on the southern approach from 100m to 250m, and adopted that same signal phasing as the existing configuration analysis shown above.

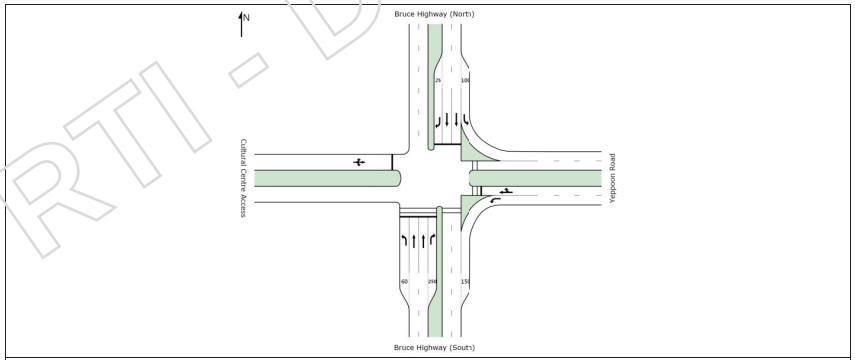

Figure 5.4.1.5c: Upgraded Intersection Configuration - Bruce Highway / Yeppoon Road Intersection

The results of the analyses detailing the predicted operation of the proposed upgraded Bruce Highway / Yeppoon Road intersection for the forecast pre development traffic conditions are attached as **Appendix N.** A summary of these results is provided in **Table 5.4.1.5b** below.

Table 5.4.1.5b: Summary of SIDRA Analysis Results – Bruce Highway / Yeppoon Road Intersection
Pre Development Scenarios – Proposed Upgraded Signalised Intersection Configuration

Intersection	Intersection Control	Year	Peak Hour	DOS %
Bruce Highway / Yeppoon Road	Four-Way Signalised	2013	AM	72.5
			PM	81.0
		2025	AM	72.4
			PM	92.1
		2035	AM	81.1
			PM	102.2

From the results above it can be seen that the proposed upgraded Bruce Highway / Yeppoon Road intersection including the provision of the required four through lane cross section is not expected to operate satisfactorily during the analysed pre development scenarios, with the calculated values of intersection Degree of Saturation (DOS) for both the 2025 and 2035 PM peak period outside the acceptable limits of operation (90%) for signalised intersections.

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A second iteration of an upgraded intersection layout was then developed to improve the operational performance of the intersection under the forecast pre development traffic conditions. This second iteration of the layout included the provision of two right turn pockets on the southern approach, which in turn led to the formation of a combined through and left lane on this approach and the modification of the left turn lane on the northern approach from a continuous lane with designated downstream lane to a standard priority controlled slip lane. A diagram of the analysed intersection configuration is shown in **Figure 5.4.1.5d** below

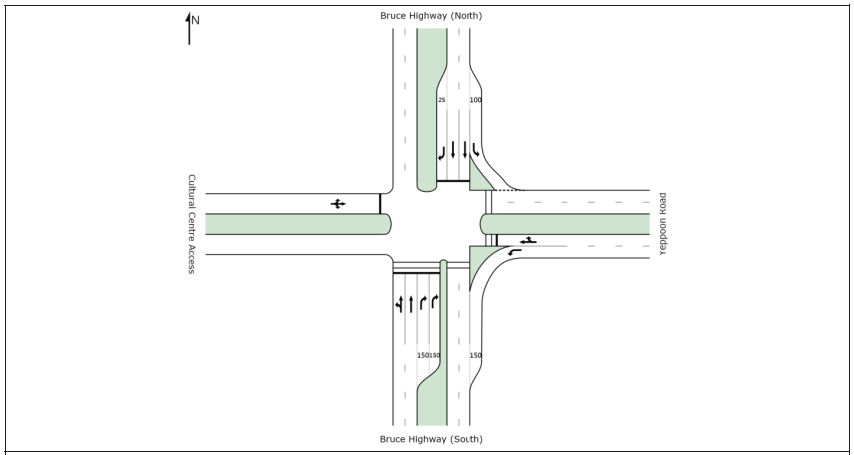

Figure 5.4.1.5d: Upgraded (Second Iteration) Intersection Configuration - Bruce Highway / Yeppoon Road Intersection

These alterations to the intersection configuration also led to minor modifications to the movement restrictions during each phase of the signal cycle, primarily concerning the left turn from the northern approach, as shown in the signal phasing summary shown in **Figure 5.4.1.5e** below.

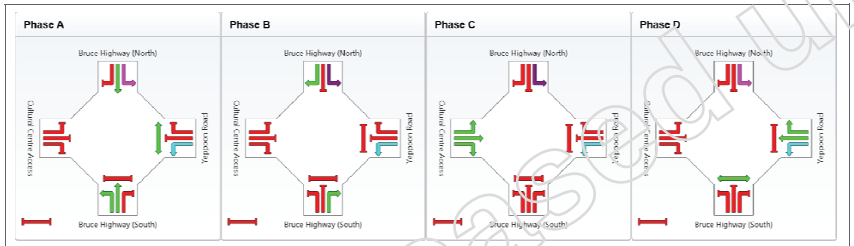

Figure 5.4.1.5e: Adopted Signal Phasing (Second Upgrade Iteration) - Bruce Highway / Yeppoon Road Intersection

The results of the analysis detailing the predicted operation of the second iteration of proposed upgrades to the Bruce Highway / Yeppoon Road intersection for the forecast pre development traffic conditions are attached as **Appendix N.** A summary of these results is provided in **Table 5.4.1.5c** below.

Table 5.4.1.5c: Summary of SIDRA Analysis Results – Bruce Highway / Yeppoon Road Intersection
Pre Development Scenarios – Proposed Upgraded (Second Iteration) Signalised Intersection Configuration

Intersection	Intersection Control	Year	Peak Hour	DOS %
Bruce Highway / Yeppoon Road	Four-Way Signalised	2025	AM	66.6
			PM	77.5
		2035	AM	75.6
			PM	81.2

From the results above it can be seen that the proposed upgraded Bruce Highway / Yeppoon Road intersection is expected to operate satisfactorily during the analysed pre development scenarios, with all calculated values for intersection Degree of Saturation (DOS) within the acceptable limits of operation (90%) for signalised intersections.

The results also demonstrate that the proposed upgraded layout (second iteration) identified above could be considered to represent the minimum infrastructure provision requirements at the intersection to cater for the pre development traffic from 2025 onwards, and that the provision of these upgrades will be required regardless development of the Stockland North Parkhurst site.

The operation of the proposed upgraded configuration of the Bruce Highway / Yeppoon Road intersection was then analysed for the forecast post development scenarios. The results of this analysis are attached as **Appendix N** and summary of these results is provided in **Table 5.4.1.5d** below.

Table 5.4.1.5d: Summary of SIDRA Analysis Results – Bruce Highway / Yeppoon Road Intersection
Post Development Scenarios – Proposed Upgraded (Second Iteration) Signalised Intersection Configuration

Intersection	Intersection Control	Year	Peak Hour	DOS %
Bruce Highway / Yeppoon Road	Four-Way Signalised	2025	AM	98.6
			PM	105.7
		2035	AM	104.3
			PM	114.7

From the results above it can be seen that the geometry shown in **Figure 5.4.1.5d** is not expected to operate satisfactorily during the analysed post development scenarios, with the calculated values for intersection Degree of Saturation (DOS) outside the acceptable limits of operation (90%) for signalised intersections.

Therefore a final upgrade to the intersection has been proposed to improve the intersection operation under the forecast post development traffic conditions. As shown in **Figure 5.4.1.5f** below, this proposed upgrade provides an additional auxiliary through lane on the northern approach to the intersection and the corresponding downstream auxiliary through lane. In addition a second short right turn lane has been provided on the eastern approach to the intersection and the left turn provision on this approach has been modified from a single continuous lane to a double signalised left turn (including one short turn pocket).

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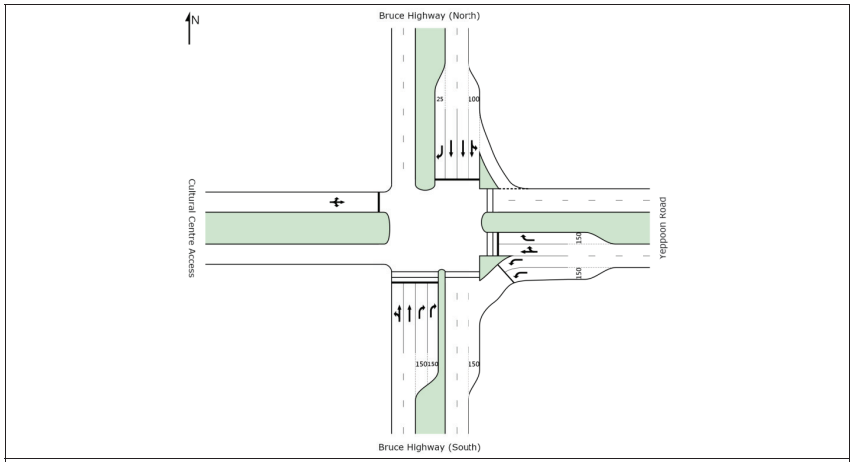

Figure 5.4.1.5f: Upgraded (Final) Intersection Configuration - Bruce Highway / Yeppoon Road Intersection

The upgrades identified above have also led to a modification to the proposed signal phasing for the intersection. As part of the analysis different signal phasings were adopted for the AM and PM peak periods as shown in **Figure 5.4.1.5g** and **Figure 5.4.1.5h** below. It is also noted that the pedestrian crossing on the southern approach to the intersection has been staged across several phases to optimise the operation of the intersection.

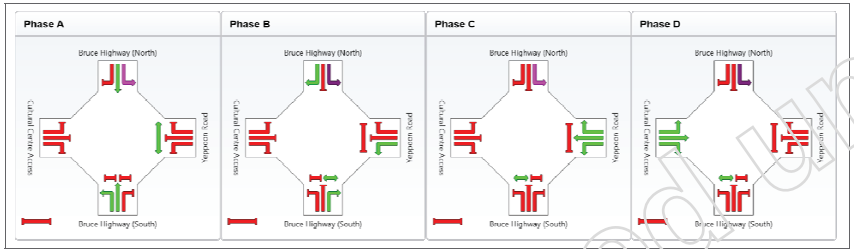

Figure 5.4.1.5g: Adopted AM Peak Signal Phasing (Final Upgrade) – Bruce Highway / Yeppoon Road Intersection

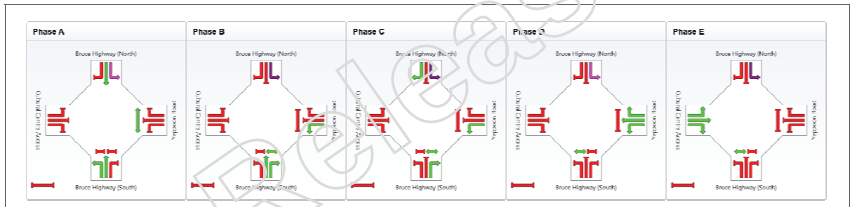

Figure 5.4.1.5h: Adopted PM Peak Signal Phasing (Final Upgrade) – Bruce Highway / Yeppoon Road Intersection

The results of the analysis detailing the predicted operation of the proposed upgraded Bruce Highway / Yeppoon Road intersection for the forecast post development traffic conditions are attached as **Appendix N.** A summary of these results is provided in **Table 5.4.1.5e** below.

Table 5.4.1.5e: Summary of SIDRA Analysis Results – Bruce Highway / Yeppoon Road Intersection
Post Development Scenarios – Proposed Upgraded (Final) Signalised Intersection Configuration

Intersection	Intersection Control	Year	Peak Hour	DOS %
Bruce Highway / Yeppoon Road	Four-Way Signalised	2025	AM	78.9
			PM	83.9
		2035	AM	82.5
			PM	86.9

From the results above it can be seen that the proposed upgraded Bruce Highway / Yeppoon Road intersection is expected to operate satisfactorily during the analysed post development scenarios, with all calculated values for intersection Degree of Saturation (DOS) within the acceptable limits of operation (90%) for signalised intersections.

5.4.2 Local Government Controlled Road Network Analysis

An investigation into the impacts of the proposed development on the local government controlled road network has also been completed, with analysis being undertaken on several key intersections on both the existing external and proposed internal road networks, in accordance with the request from Rockhampton Regional Council. These key intersections include:

- William Palfrey Road / McLaughlin Street;
- Alexandra Road / Belmont Road / Birkbeck Drive; and
- Proposed internal signalised intersection at junction of Access Arterial (Olive Street), the East-West Sub Arterial and Southern Sub Arterial (William Palfrey Realignment).

To assist with the assessment of the intersections identified above and to inform the internal road hierarchy of the development, a full internal road network model has been constructed assuming the full build-out scenario of both Edenbrook and the proposed North Parkhurst site. Further information regarding the completed analysis for each intersection can be seen in the following sections and a diagram summarising the calculated daily traffic volumes on the identified higher order road links within the site has been included for reference as **Appendix O**.

5.4.2.1 William Palfrey Road / McLaughlin Street

Using the road link volumes forecast using the internal road network model, the expected daily traffic volumes at the proposed William Palfrey Road / McLaughlin Street intersection were identified as shown in **Figure 5.4.2.1a** below. It is noted that this intersection is also assumed to be the access point for the Edenbrook development to the external road network via McLaughlin Street, and as such the assumed traffic volumes generated by this development have also been included within the analysis.

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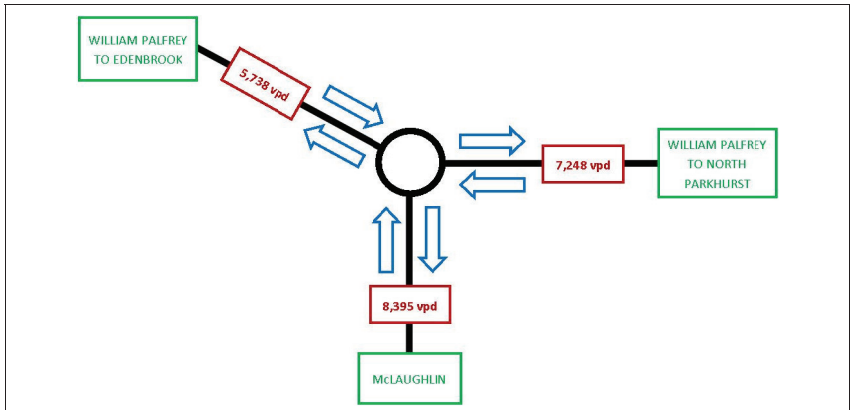

Figure 5.4.2.1a: Forecast Daily Traffic Volumes – William Palfrey Road / McLaughlin Street Intersection

Adopting the development traffic distribution assumptions as previously identified in **Table 5.1b**, the forecast daily traffic volumes were used to establish an estimate of the likely hourly volumes at the intersection, with the resultant AM and PM peak volumes summarised in **Figure 5.4.2.1b** and **Figure 5.4.2.1c** below. It is also noted that a heavy vehicle percentage of 2% has been adopted for the purpose of the analysis.

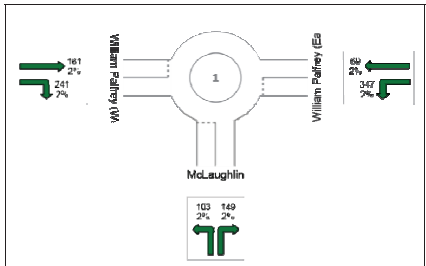

Figure 5.4.2.1b: Forecast AM Peak Traffic Volumes – William Palfrey Road / McLaughlin Street Intersection

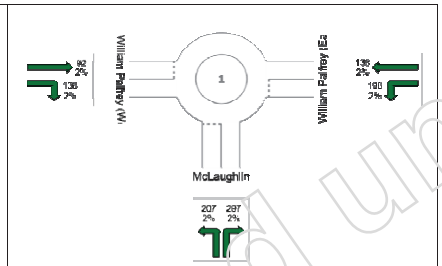

Figure 5.4.2.1c: Forecast PM Peak Traffic Volumes – William Palfrey Road / McLaughlin Street Intersection

These forecast peak hour volumes shown above were then used to complete the analysis for the intersection. Due to the higher order road approaches to the intersection and the fact that the intersection will serve as an access point to two residential developments, a roundabout has been proposed for the configuration of the roundabout, with the geometry adopted for the analysis consistent with that required to accommodate 19m Articulated vehicle movements (if required).

It is also noted that due to the assumed timings of both the proposed development and the adjacent Edenbrook development, it is not expected that traffic from North Parkhurst would utilise this intersection until the later stages of the project, and therefore it has been assumed this intersection (at least the relevant parts) would have been constructed as part of the external works required for the Edenbrook development. A diagram indicating the proposed configuration of the intersection adopted for the analysis is in **Figure 5.4.2.1d** below.

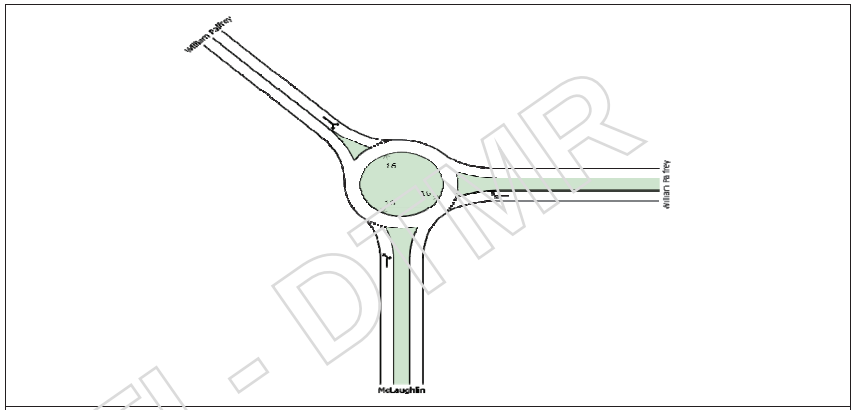

Figure 5.4.2.1d: Proposed Intersection Configuration – William Palfrey Road / McLaughlin Street

The results of the analysis detailing the predicted operation of the proposed William Palfrey Road / McLaughlin Street intersection for the forecast full build-out traffic conditions are attached as **Appendix P.** A summary of these results is provided in **Table 5.4.2.1a** below.

Table 5.4.2.1a: Summary of SIDRA Analysis Results – William Palfrey Road / McLaughlin Street Intersection Post Development Scenarios – Full Build-out Proposed Roundabout Intersection Configuration

Intersection	Intersection Control	Scenario	Peak Hour	DOS %
William Palfrey Road / McLaughlin Street	Three-Way Roundabout	Full Build-out	AM	**36.6**
			PM	**39.0**

From the results above it can be seen that the proposed roundabout configuration of the William Palfrey Road / McLaughlin Street intersection is expected to operate satisfactorily for both the AM and PM peaks assuming the full build-out development scenario, with all calculated values for intersection Degree of Saturation (DOS) well within the acceptable limits of operation (85%) for roundabouts.

As such it can be considered that the proposed roundabout configuration of the William Palfrey Road / McLaughlin Street intersection is adequate to cater for the expected traffic volumes associated with the full build-out of the proposed North Parkhurst development.

5.4.2.2 Proposed Internal Signals

As part of the internal road network it has been identified that the intersection of the arterial access road (Olive Street West), the main east-west collector and the realignment of William Palfrey Road is to be controlled by a signalised intersection, with the proposed location of the signals shown in **Figure 5.2.4.2a** below.

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Figure 5.4.2.2a: Proposed Location of Internal Signalised Intersection

Using the road link volumes forecast within the internal road network model, the expected daily traffic volumes at the proposed internal signals were identified as shown in **Figure 5.4.2.2b** below.

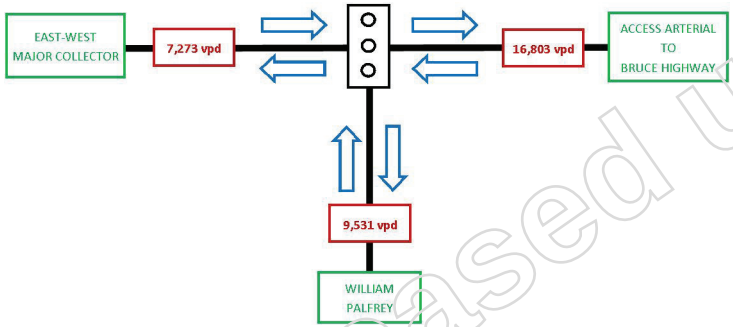

Figure 5.4.2.2b: Forecast Daily Traffic Volumes – Internal Signals

Adopting the development traffic distribution assumptions as previously identified in **Table 5.1b**, the forecast daily traffic volumes were used to establish an estimate of the likely hourly volumes at the intersection, with the resultant AM and PM peak volumes summarised in **Figure 5.4.2.2c** and **Figure 5.4.2.2d** below. It is also noted that a heavy vehicle percentage of 2% was again adopted for the purpose of the analysis.

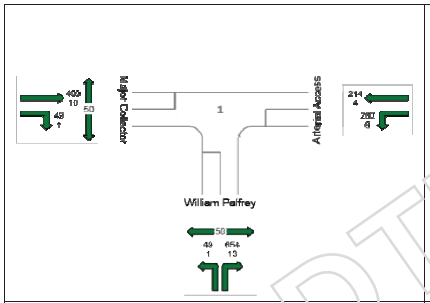

Figure 5.4.2.2c: Forecast AM Peak Traffic Volumes – Internal Signals

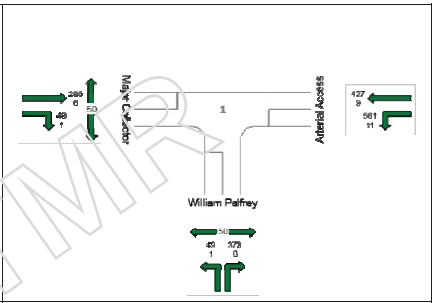

Figure 5.4.2.2d: Forecast PM Peak Traffic Volumes – Internal Signals

These forecast peak hour volumes as shown above were then used to complete the analysis for the intersection, with a diagram of the proposed configuration of the intersection shown in **Figure 5.4.2.2e** below.

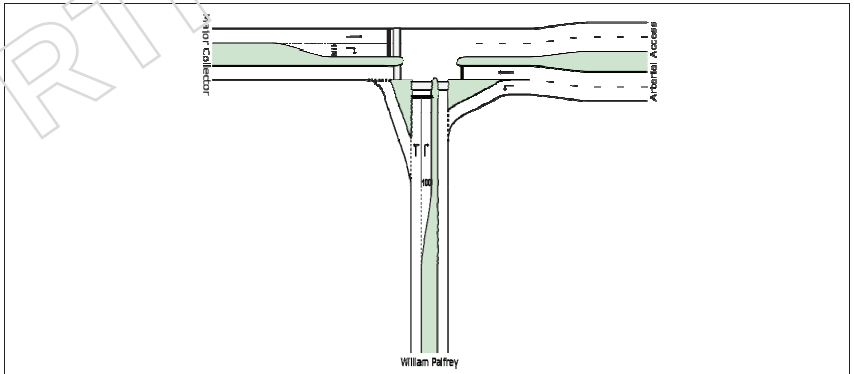

Figure 5.4.2.2e: Proposed Intersection Configuration – Internal Signals

A standard three (3) phase signal configuration with pedestrian crossings on the southern and western approaches was adopted for the purpose of the intersection analysis. A generalised summary of the adopted signal phasing is shown in **Figure 5.4.2.2f** below.

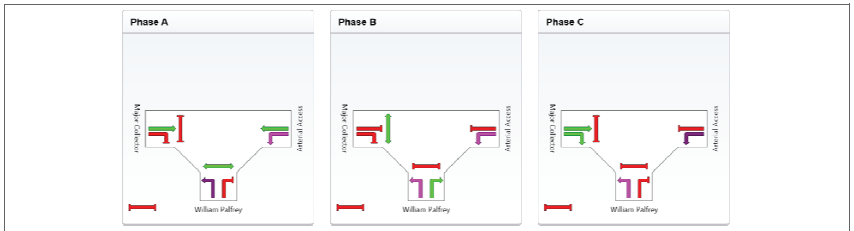

Figure 5.4.2.2f: Adopted Signal Phasing – Proposed Internal Signals

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The results of the analysis detailing the predicted operation of the proposed internal signals for the forecast full build-out traffic conditions are attached as **Appendix R.** A summary of these results is provided in **Table 5.4.2.2a** below.

Table 5.4.2.2a: Summary of SIDRA Analysis Results – Proposed Internal Signals
Post Development Scenarios – Full Build-out Proposed Internal Signals

Intersection	Intersection Control	Scenario	Peak Hour	DOS %
Internal Signals	Signalised Three Way	Full Build-out	AM	**66.5**
			PM	**67.2**

From the results above it can be seen that the proposed configuration of the internal signalised intersection is expected to operate satisfactorily for both the AM and PM peaks assuming the full build-out development scenario, with all calculated values for intersection Degree of Saturation (DOS) within the acceptable limits of operation (90%) for signalised intersections.

As such it can be considered that the proposed configuration of the internal signals is adequate to cater for the expected traffic volumes associated with the full build-out of the proposed North Parkhurst development.

5.4.2.3 Alexandra Road / Belmont Road / Birkbeck Drive

The final intersection that Council has been requested to be analysed is the existing intersection of Alexandra Road, Belmont Road and Birkbeck Drive. As this is an existing intersection that currently forms part of the Council controlled road network, the investigation will include analysis of both the forecast pre development and post development traffic conditions to determine the impacts of the proposed North Parkhurst on the operation of the intersection, as described in the following sections.

5.4.2.3.1 *Pre Development Traffic Conditions*

To determine the background traffic at the Alexandra Road / Belmont Road / Birkbeck Drive intersection a manual traffic count was undertaken on 28 May 2013, with the raw count data included as **Appendix S**. From the count data the AM peak was established as 7:30-8:30am and a PM peak from 4:30-5:30pm. The recorded turning movement volumes at the intersection for these peak periods are summarised in **Figure 5.4.2.3a** and **Figure 5.4.2.3b** below.

It is also noted that due to the fact that the Belmont Road – Alexandra Road corridor does not provide a direct through connection to the north, and is essentially a closed catchment, it is not expected that any background traffic growth will occur, and that the only increases in traffic volumes will be as a direct result of future developments. As such the current volumes at the intersection are considered appropriate to forecast the future background traffic volumes under the full build-out scenario for the North Parkhurst development.

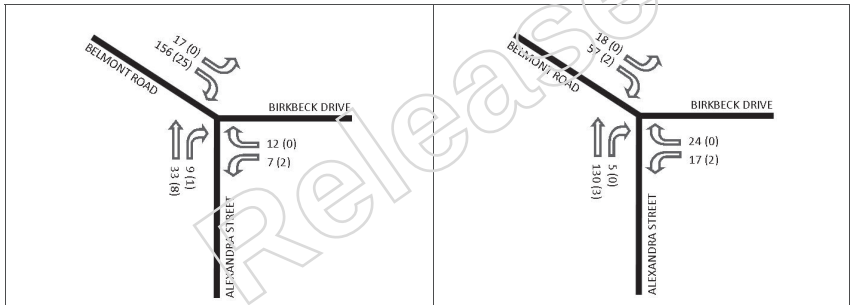

Figure 5.4.2.3a: AM Peak Background Volume (2013)

Figure 5.4.2.3B: PM Peak Background Volume (2013)

Then to establish the pre development traffic volumes at the intersection, the expected traffic volumes from the approved development in the area was added to the current volumes recorded at the intersection. From discussions with Council the approved development in the area was identified to be Edenbrook and Stages 5-8 of Riverside Estate (noting that traffic from Stages 1-4 are assumed to be included in current volumes).

It is understood that Stages 5-8 of Riverside Estate will yield 84 standard residential lots, and using a standard generation rate, a 100% distribution to/from Alexandra Road to the south and the standard AM and PM inbound/outbound traffic splits identified in **Table 5.1b** above, the peak hour traffic volumes at the Alexandra Road / Belmont Road / Birkbeck Drive intersection generated by Stages 5-8 were forecast, as shown in **Figure 5.4.2.3c** below.

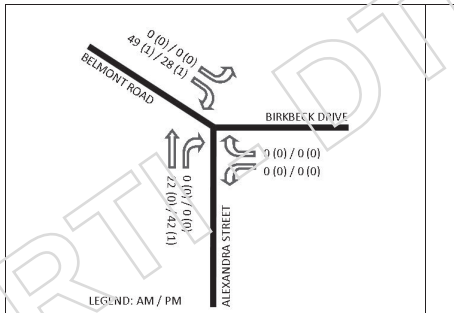

Figure 5.4.2.3c: Forecast Peak Hour Development Volumes (Stages 5-8 Riverside Estate)
Alexandra Road / Belmont Road / Birkbeck Drive

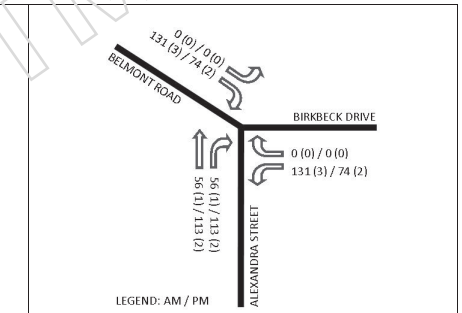

Figure 5.4.2.3d: Forecast Peak Hour Development Volumes (Edenbrook)
Alexandra Road / Belmont Road / Birkbeck Drive

Similarly the traffic volumes generated at the Alexandra Road / Belmont Road / Birkbeck Drive intersection by the approved Edenbrook development were also forecast, as shown in **Figure 5.4.2.3d** above. These volumes were calculated by applying the general development traffic distributions identified within the Arup *Traffic Impact Study* (February 2009), with approximately 25% of the traffic from the Edenbrook development assumed to utilised both the Belmont Road and Birkbeck Drive approaches to the intersection. It is also noted that a heavy vehicle percentage of 2% has been adopted for each of the development traffic volumes identified in the analysis.

As identified above, the pre development traffic volumes were established by adding the calculated approved development traffic volumes to those recorded during the background traffic count, with the resultant pre development AM and PM peak volumes summarised in **Figure 5.4.2.3e** and **Figure 5.4.2.3f** below

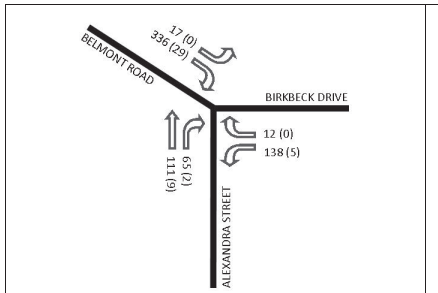

Figure 5.4.2.3e: Pre Development Volumes (AM Peak)
Alexandra Road / Belmont Road / Birkbeck Drive

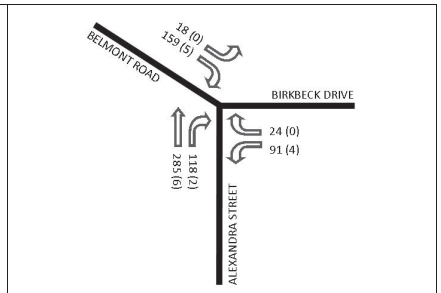

Figure 5.4.2.3f: Pre Development Volumes (PM Peak)
Alexandra Road / Belmont Road / Birkbeck Drive

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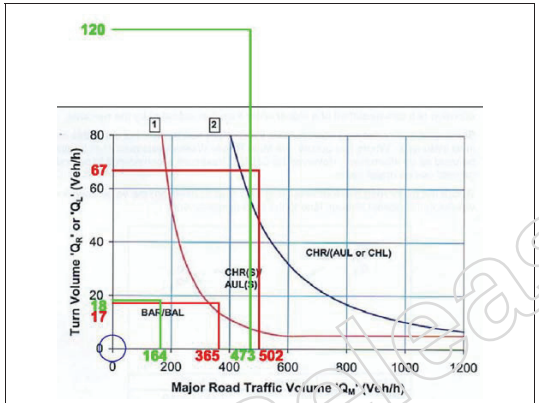
As shown in **Figure 5.4.2.3g** below, the existing configuration of the intersection operates as a three way priority controlled junction with the Alexandra Street – Belmont Road legs maintaining priority as the major legs of the intersection, with the Birkbeck Drive approach giving way. All approaches to the intersection currently operate as two way two lane roads and it is noted that neither of the priority approaches provide designated auxiliary turn lanes for movements into Birkbeck Drive.



Figure 5.4.2.3g: Existing Intersection Configuration
Alexandra Street / Belmont Road / Birkbeck Drive

As such, a turn warrants assessment has been undertaken for the forecast pre development traffic volumes at the Alexandra Street / Belmont Road / Birkbeck Drive intersection, with the resultant graph shown in **Figure 5.4.2.3h** below.



LEGEND: **AM** / **PM**

Figure 5.4.2.3h: Turn Warrants Assessment (Austroads) – Pre Development
Alexandra Street / Belmont Road / Birkbeck Drive

Based on the figure above it can be seen that the current configuration of the Alexandra Street / Belmont Road / Birkbeck Drive intersection should be upgraded to provide a full CHR treatment for the right turn into Birkbeck Drive from Alexandra Street and an AUL(s) treatment for the left turn into Birkbeck Drive from Belmont Drive, to cater for the expected pre development traffic volumes at the intersection.

It is noted that as this upgrade/provision of auxiliary lanes has been identified to be required for the forecast pre development traffic volumes at the intersection, it can be concluded that these upgrades will be required regardless of the inclusion of the traffic from the North Parkhurst site, and as such cannot reasonably be attributed to the proposed development.

5.4.2.3.2 Development Traffic Volumes

Based on the assumption that 30% of the overall North Parkhurst development would access the Alexandra Street corridor via its intersection with Birkbeck Drive, and using the traffic distribution assumptions previously identified in **Table 5.1b**, the expected peak hour development traffic volumes at the Alexandra Street / Belmont Road / Birkbeck Drive intersection were calculated, as shown in **Figure 5.4.2.3i** and **Figure 5.4.2.3j** below.

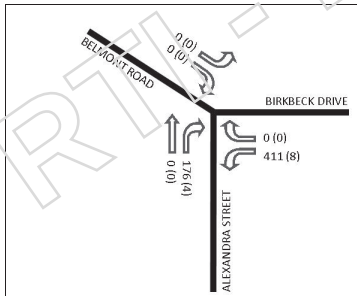


Figure 5.4.2.3i: AM Peak Hour Development Volumes (North Parkhurst)
Alexandra Road / Belmont Road / Birkbeck Drive

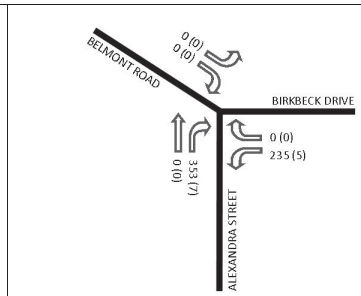


Figure 5.4.2.3j: PM Peak Hour Development Volumes (North Parkhurst)
Alexandra Road / Belmont Road / Birkbeck Drive

5.4.2.3.3 Post Development Traffic Conditions

Using the volumes predicted to be generated by the proposed North Parkhurst development and the forecast pre development traffic volumes, the post development traffic conditions at the Alexandra Street / Belmont Road / Birkbeck Drive intersection was analysed. The analysis was completed using SIDRA 5.1 software and was undertaken for both the AM and PM peak periods for the full build-out design scenario for the development. The resultant AM and PM peak post development traffic volumes at the intersection are summarised in **Figure 5.4.2.3k** and **Figure 5.4.2.3l** below.

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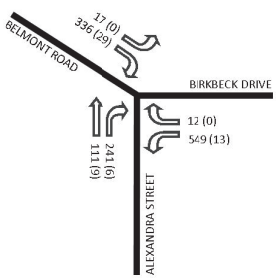

Figure 5.4.2.3k: Post Development Volumes (AM Peak) Alexandra Road / Belmont Road / Birkbeck Drive

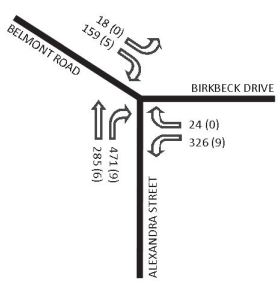

Figure 5.4.2.3l: Post Development Volumes (PM Peak) Alexandra Road / Belmont Road / Birkbeck Drive

As identified above, the upgrade of the current intersection configuration to provide designated auxiliary lanes for both the right and left turns into Birkbeck Drive are required to accommodate the pre development traffic volumes. As such it has been assumed that these upgrade works have been completed prior to the inclusion of traffic from North Parkhurst, with a diagram indicating the proposed configuration of the intersection adopted for the analysis is in **Figure 5.4.2.1m** below.

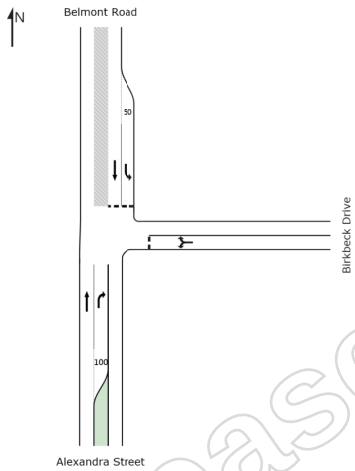

Figure 5.4.2.1m: Proposed Upgraded Intersection Configuration – Alexandra Street / Belmont Road / Birkbeck Drive

The results of the analysis detailing the predicted operation of the upgraded Alexandra Street / Belmont Road / Birkbeck Drive intersection for the forecast full build-out (post development) traffic conditions are attached as **Appendix T.** A summary of these results is provided in **Table 5.4.2.3a** below.

Table 5.4.2.3a: Summary of SIDRA Analysis Results – Alexandra Street / Belmont Road / Birkbeck Drive Post Development Scenarios – Full Build-out

Intersection	Intersection Control	Scenario	Peak Hour	DOS %
Alexandra Street / Belmont Road / Birkbeck Drive	Three-Way Priority Controlled	Full Build-out	AM	**33.3**
			PM	**28.7**

From the results above it can be seen that the proposed upgraded configuration of the Alexandra Street / Belmont Road / Birkbeck Drive intersection is expected to operate satisfactorily for both the AM and PM peaks assuming the full build-out development scenario, with all calculated values for intersection Degree of Saturation (DOS) within the acceptable limits of operation (80%) for priority controlled intersections. As such it can be considered that the proposed upgraded configuration of the intersection (upgrade works to be completed by others) is adequate to cater for the expected traffic volumes associated with the full build-out of the proposed North Parkhurst development.

5.4.2.4 Balance of Local Government Road Network

In addition to the investigation into the impacts of the proposed development on the key intersections listed above, a high level assessment of the expected traffic impacts of the North Parkhurst site on the balance of the Council controlled road network was also completed, as described below.

Section 5.1 of this report describes how the proposed development of both the North Parkhurst and adjacent Edenbrook sites is consistent with the development scenario identified in the Parkhurst Accelerated Growth (PAG) scenario assessed in the *Rockhampton Traffic Study 2008 (RTS)*. Furthermore it demonstrated that the assumed ultimate development yield (2,350 lots) and the traffic distribution assumptions (70% to Bruce Highway / 30% to Alexandra Street) adopted as part of this analysis were generally consistent with those identified within the traffic network model which underpinned the RTS.

Therefore to simplify the analysis of the impacts of the proposed development on the local government road network and to avoid the duplication of the assessment already completed during the RTS (2008), it is proposed that the additional road network upgrade works attributed to the PAG scenario (above those identified in the City Plan scenario within the RTS) be adopted as the transport infrastructure requirements of the North Parkhurst and Edenbrook developments combined.

Furthermore, Council's *Adopted Infrastructure Charges Resolution No. 2 (2012)* subsequently detailed the transport infrastructure that has been attributed to the future development parcels identified within the designated Priority Infrastructure Area (PIA). Whilst the whole Edenbrook site was shown to be within the boundaries of the PIA only the easternmost portion of the North Parkhurst site was included, the yield of which is understood to be approximately 500 lots.

As the transport infrastructure works identified in the resolution are understood to be solely provided by the infrastructure charges applied to future development located within the PIA, it can reasonably be assumed the only contribution of the North Parkhurst site to the delivery of the transport infrastructure listed in Council's *Adopted Infrastructure Charges Resolution No. 2 (2012)* would be via the relevant transport infrastructure charges collected from the portion of the development (approximately 500 lots) within the PIA.

Using the information above, the conclusion can therefore be drawn that the transport infrastructure requirements of the portion of the North Parkhurst site outside the PIA would equate to the infrastructure upgrade works identified within the analysis of the PAG scenario in the *Rockhampton Traffic Study*, but not listed in Council's *Adopted Infrastructure Charges Resolution No. 2 (2012).*

Furthermore it is understood that the one of these items, the construction of the Alexandra Street extension to William Palfrey Road (McLaughlin Street realignment), has been conditioned on the adjacent Edenbrook development as part of a previous Infrastructre Agreement. As such its construction should not be attributable to the proposed Stockland North Parkhurst development.

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In addition, the proposed plan of development identifies William Palfrey Road as a high order Urban Arterial Road / Urban Sub Arterial Road. Once connected to the west via McLaughlin Street, this road will connect the Alexandra Street and Bruce Highway corridors, providing a direct east-west connection for development west of the highway.

As this connection will service a catchment which extends well beyond the North Parkhurst site it can reasonable be considered that the upgrade of William Palfrey Road to the identified Urban Arterial Road / Urban Sub Arterial Road standard should be classified as trunk infrastructure works. As a consequence, any physical works carried out by Stockland to deliver the arterial road should be creditable against the infrastructure charges paid by the applicant.



6.0 Conclusion and Recommendations

The proposed development site has been identified for several years as an area for future residential development growth, by both Council and Main Roads. This can be seen by its inclusion in such planning documents as

- Council's Parkhurst and Yeppoon Road Corridor Structure Plan (GHD 2007);
- Rockhampton Traffic Study (Arup 2008);
- RRC Priority Infrastructure Plan Planning Assumptions Report (GHD 2011), and
- TMR's draft Parkhurst Forward Planning Traffic Analysis Study (2010).

All of these planning documents envisaged a large residential development (i.e. > 2,000 lots) with the primary access from the Bruce Highway and secondary access via McLaughlin Street and the Alexandra Street corridor. Common to each study was an Urban Arterial Road providing connectivity between the Bruce Highway and the planned residential catchments to the west of the Highway. Several of these planning documents identify this proposed Urban Arterial Road joining the Bruce Highway at Olive Street, creating a fourth (western) leg to the existing intersection. It was also identified that this intersection would require signalisation and would incorporate an at-grade crossing of the adjacent rail corridor on the proposed development access road approach to the intersection.

The masterplan that has been submitted as part of the application for preliminary approval is consistent with the above planning intent.

6.1 Rail Crossing, Internal Road Network and Staging

A series of meetings have been held with Queensland Rail and other stakeholders wherein an assessment of the proposed at grade rail crossing has been carried out. This report provides detail on the proposed co-ordination of the traffic signals at the proposed Olive Street intersection with the rail signals at the relocated at grade crossing to enable the proposed rail crossing to operate in a safe and efficient manner.

The internal road network has been developed generally in accordance with Rockhampton City Council's Planning Policy No. 13 *Road Hierarchy* and the Capricorn Municipal Development Guidelines (CMDG). The road layout seeks to achieve a safe, efficient and convenient road system. Some minor amendments are proposed to the standard cross sections to address site specific aspects (e.g. roads adjacent to the esplanade and roads split by drainage corridors). We are also seeking to activate the major collector streets by providing direct property access which aligns with current industry standards.

The applicant intends staging the development from east to west. Access to the development under the early stages will be via the Bruce Highway only. This will require the construction of traffic signals at the Bruce Highway / Olive Street intersection and a part of the urban arterial road (2 lanes initially). It will not be until the later stages of the development that the western part of the site will be developed and connection provided to McLaughlin Street. The transport infrastructure will be delivered based on trigger volumes. This report provides detail on the trigger volumes and staging which can be summarised as follows:

	Stage 1	Trigger 1	Trigger 2	Trigger 3
Number detached dwellings	**1**	**1,275**	**1,450**	**1,900**
Interim Traffic Signals Bruce Hwy / Olive Street. Construct at-grade rail crossing 2-lane	✓			
Upgrade Bruce Hwy / Olive Street traffic signals to ultimate geometry. Duplicate the at grade crossing of the rail corridor (i.e. 4-lanes)		✓		
Upgrade the north-eastern part of the Urban Arterial to 4-lanes			✓	
Provide a secondary point of access to the site via McLaughlin Street. This will be achieved by constructing the balance of the Urban Arterial / Urban Sub Arterial Road (William Palfrey Road).				✓

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6.2 Traffic Impact

Analysis was completed to determine the impact of the proposed master planned community on both the state and local government controlled external road networks. The investigation into the operation of the state controlled road network focused on the impact on the relevant section of the Parkhurst Bruce Highway corridor, including the major intersections, whilst the assessment of the impact on the local government controlled network focused on the impact on the Alexandra Street corridor, as well as a number of key intersections identified by Council.

An investigation into the impacts of the proposed development on the relevant section of the Bruce Highway (Yeppoon Road to Olive Street) including an assessment of the expected mid-block volumes and the operation of the major intersections of Olive Street, Boundary Road (East), Boundary Road (West) and Yeppoon Road. For the purpose of this analysis it has been assumed that full build-out of proposed master planned community development would occur by 2025, with a 10 year design horizon for the development of 2035.

From the analysis in to the mid-block volumes on the each relevant section of the Bruce Highway between Yeppoon Road and Olive Street it was identified that expected pre development daily volumes exceeded the TMR specified trigger volume of 15,000 vehicles per day in 2013. As such it is considered that the requirement to upgrade of the Highway from two to four lanes, including the provision of additional through lanes at existing intersections is an existing deficiency and would be required regardless of the development of the proposed Stockland North Parkhurst site. Therefore it would be unreasonable to attribute the upgrade of the Bruce Highway (Yeppoon Road to Olive Street) from two lanes to four to the proposed Stockland North Parkhurst development.

Analysis of the Bruce Highway / Olive Street intersection identified that the ultimate intersection configuration required the provision of a four lane cross section for the Highway which was identified to be required regardless of the development due to the forecast pre development mid-block volumes exceeding 15,000 vehicles per day. This existing deficiency triggers the need for TMR to four-lane the Bruce Highway between Yeppoon Road and Olive Street, which would include the southern approach to this intersection.

As a consequence, it is considered unreasonable to attribute the full upgrade of the Bruce Highway / Olive Street intersection (as shown in the figure above) to the Stockland North Parkhurst development.

Analysis of the Bruce Highway / Boundary Road (East) intersection identified that the ultimate intersection configuration requires the provision of a four lane cross section for the Highway which was identified to be required regardless of the development due to the forecast pre development mid-block volumes exceeding 15,000 vehicles per da. This exising deficiency triggers the need for DTMR to four-lane the Bruce Highway between Yeppoon Road and Olive Street, which would include the both the northern and southern approaches to the Bruce Highway / Boundary Road (East) intersection.

Analysis of the Bruce Highway / Boundary Road (West) intersection identified that the ultimate intersection configuration requires signalisation of the existing intersection and the provision of a four lane cross section for the Highway, which as identified in Section 5.4.1.1 is needed regardless of the development due to the forecast pre development mid-block volumes exceeding 15,000 vehicles per day. This existing deficiency triggers the requirement for TMR to four-lane the Bruce Highway between Yeppoon Road and Olive Street, which would include the both the northern and southern approaches to the Bruce Highway / Boundary Road (West) intersection.

Analysis of the Bruce Highway / Yeppoon Road intersection identified that major upgrades from the existing intersection configuration would have been required before the assumed year of completion (2025) for the proposed development regardless of the addition of traffic generated by the Stockland site. Therefore it is considered unreasonable to attribute the full upgrade of the Bruce Highway / Yeppoon Road intersection to the proposed Stockland North Parkhurst development.

Notwithstanding this, it is acknowledged that the inclusion of traffic from the proposed development site will require additional upgrades over and above those required to address deficiencies unrelated to Stockland. As such, a contribution towards the cost of the upgrade of the intersection based on the provision of attributable infrastructure is deemed appropriate.

The investigation into the impacts of the proposed development on the relevant local government controlled road network included an assessment of several key intersections on both the existing external (Alexandra Street / Belmont Road / Birkbeck Drive) and proposed internal road networks (William Palfrey Road / McLaughlin Street and the proposed internal signals), in accordance with the request from Rockhampton Regional Council, as well a high level assessment of the expected traffic impacts of the North Parkhurst site on the balance of the Council controlled road network.

The analysis of the Alexandra Street / Belmont Road / Birkbeck Drive intersection identified that upgrade works including the provision of a CHR right turn treatment on the Alexandra Street approach, and an AUL(s) left turn treatment on the Belmont Road approach was required to accommodate the forecast pre development traffic volumes. It was then demonstrated that once upgraded, the intersection would be adequate to cater for the expected post development traffic conditions for the full build-out of the North Parkhurst site. As the need to upgrade the intersection was identified to be required regardless of the addition of traffic from the North Parkhurst site, it can be considered an existing deficiency in the road network and cannot be reasonable be attributed to the proposed development.

The analysis of the William Palfrey / McLaughlin Street intersection identified that the proposed roundabout configuration of the William Palfrey Road / McLaughlin Street intersection was expected to operate satisfactorily for both the AM and PM peaks assuming the full build-out development scenario, and as such is adequate to cater for the expected traffic volumes associated with the full build-out of the proposed North Parkhurst development. It was also noted that due to the assumed timings of both the proposed development and the adjacent Edenbrook development, that it is not expected that traffic from North Parkhurst would utilise this intersection until the later stages of the project, and therefore it has been assumed this intersection (or at least the relevant parts) would have been constructed as part of the external works required for the Edenbrook development.

Similarly the analysis of the proposed internal signalised intersection identified that the proposed configuration was expected to operate within acceptable limits for both the AM and PM peaks assuming the full build-out development scenario, and as such it can be considered that the proposed configuration of the internal signals is adequate to cater for the anticipated traffic volumes associated with the full build-out of the proposed North Parkhurst development.

In addition to the investigation into the impacts of the proposed development on the key intersections listed above, a high level assessment of the expected traffic impacts of the North Parkhurst site on the balance of the Council controlled road network was also completed.

Section 5.1 of this report describes how the proposed development of both the North Parkhurst and adjacent Edenbrook sites is consistent with the development scenario identified in the Parkhurst Accelerated Growth (PAG) scenario assessed in the *Rockhampton Traffic Study 2008 (RTS)*. Furthermore it demonstrated that the assumed ultimate development yield (2,350 lots) and the traffic distribution assumptions (70% to Bruce Highway / 30% to Alexandra Street) adopted as part of this analysis were generally consistent with those identified within the traffic network model which underpinned the RTS.

Therefore to simplify the analysis of the impacts of the proposed development on the local government road network and to avoid the duplication of the assessment already completed during the RTS (2008), it is proposed that the additional road network upgrade works attributed to the PAG scenario (above those identified in the City Plan scenario within the RTS) be adopted as the transport infrastructure requirements of the North Parkhurst and Edenbrook developments combined.

Furthermore, Council's *Adopted Infrastructure Charges Resolution No. 2 (2012)* subsequently detailed the transport infrastructure that has been attributed to the future development parcels identified within the designated Priority Infrastructure Area (PIA). Whilst the whole Edenbrook site was shown to be within the boundaries of the PIA only the easternmost portion of the North Parkhurst site was included, the yield of which is understood to be approximately 500 lots.

As the transport infrastructure works identified in the resolution are understood to be solely provided by the infrastructure charges applied to future development located within the PIA, it can reasonably be assumed the only contribution of the North Parkhurst site to the delivery of the transport infrastructure listed in Council's *Adopted*

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Infrastructure Charges Resolution No. 2 (2012) would be via the relevant transport infrastructure charges collected from the portion of the development (approximately 500 lots) within the PIA.

Using the information above, the conclusion can therefore be drawn that the transport infrastructure requirements of the portion of the North Parkhurst site outside the PIA would equate to the infrastructure upgrade works identified within the analysis of the PAG scenario in the *Rockhampton Traffic Study*, but not listed in Council's *Adopted Infrastructure Charges Resolution No. 2 (2012).*

Furthermore it is understood that the one of these items, the construction of the Alexandra Street extension to William Palfrey Road (McLaughlin Street realignment), has been conditioned on the adjacent Edenbrook development as part of a previous Infrastructre Agreement. As such its construction should not be attributable to the proposed Stockland North Parkhurst development.

In addition, the proposed plan of development identifies William Palfrey Road as a high order Urban Arterial Road / Urban Sub Arterial Road. Once connected to the west via McLaughlin Street, this road will connect the Alexandra Street and Bruce Highway corridors, providing a direct east-west connection for development west of the highway.

As this connection will service a catchment which extends well beyond the North Parkhurst site it can reasonable be considered that the upgrade of William Palfrey Road to the identified Urban Arterial Road / Urban Sub Arterial Road standard should be classified as trunk infrastructure works. As a consequence, any physical works carried out by Stockland to deliver the arterial road should be creditable against the infrastructure charges paid by the applicant.

We therefore consider that the proposal is satisfactory from a traffic operations perspective, and recommend that the development application be approved from a traffic engineering viewpoint.

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Comments on Cambray Consulting Pty. Ltd.'s Response dated 16 July 2013 to TMR's Information Request dated 5 May 2013.

By Chris Murphy on 30 July 2013

Note: The numbering convention used below aligns with the numbering used in TMR's Information Request dated 5 May 2013.

1. Response satisfactory. RPEQ signed reports provided;
2. Response satisfactory. Figure correctly labelled;
3. Response satisfactory. Additional clarification provided. Supported by RRC's Planning Assumptions Report (2011), which underpins their Infrastructure Charges Schemes;
4. Response satisfactory. Explanation provided that the adoption of a 1% pa growth rate with the addition of traffic generation from other approved developments equates to a combined growth rate of 1.8% - 3.5%. This equivalent rate of 1.8% - 3.5 % is higher than the historic growth rate of 1.5% on this section of the Bruce Highway;
5. **Response NOT satisfactory.** Item 5 of TMR's Information Request (IR) identifies that Cambray Consulting's Traffic Impact Assessment (TIA) report relies upon the assumption that TMR would have fully planned, designed, funded and completed construction of this section of the Bruce Highway to 4 lanes. The IR asked for details of how the applicant intended to mitigate the impacts of the proposed development if TMR were unable to secure funding and complete the 4 lane construction works within the required timeframe. With respect, Cambray Consulting Pty. Ltd., through their response to the IR, has failed to clarify how the development impacts will be mitigated if TMR are unable to complete the 4 laning works. Cambray have simply suggested that it is unreasonable for TMR to request the applicant to construct these works, which are identified to be existing deficiencies in the State-controlled Road network. This response is unhelpful, as at no stage has TMR identified that the applicant will be asked to complete these works. The IR was seeking clarification as to how the development impacts will be mitigated and to date, no credible response has been provided to this question;
6. Response satisfactory. Further explanation of how train movement result in 2.5 minutes (conservatively) delay at signals;
7. Response satisfactory. Additional pedestrian connection provided on the eastern side of Bruce Highway across the Olive Street approach;
8. **Response NOT satisfactory.** Item 8 of TMR's Information Request (IR) identifies that Cambray Consulting's Traffic Impact Assessment (TIA) report relies upon the assumption that TMR would have fully planned, designed, funded and completed construction of this section of the Bruce Highway to 4 lanes. The IR asked for details of how the applicant intended to mitigate the impacts of the proposed development if TMR were unable to secure funding and complete the 4 lane construction works within the required timeframe. With respect, Cambray Consulting Pty. Ltd., through their response to the IR, has failed to clarify how the development impacts will be mitigated if TMR are unable to complete the 4 laning works. Cambray have simply suggested that this is an existing deficiency on the SCR network and that it is unreasonable for

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TMR to request the applicant to construct these works. This response is unhelpful, as at no stage has TMR identified that the applicant will be asked to complete these works. The IR was seeking clarification as to how the development impacts will be mitigated and to date, no credible response has been provided to this question;

9. Response satisfactory. Additional left turn lane removed from analysis;

10. **Response NOT satisfactory.** Item 10 of TMR's Information Request (IR) identifies that Cambray Consulting's Traffic Impact Assessment (TIA) report relies upon the assumption that TMR would have fully planned, designed, funded and completed construction of this section of the Bruce Highway to 4 lanes. The IR asked for details of how the applicant intended to mitigate the impacts of the proposed development if TMR were unable to secure funding and complete the 4 lane construction works within the required timeframe. With respect, Cambray Consulting Pty. Ltd., through their response to the IR, has failed to clarify how the development impacts will be mitigated if TMR are unable to complete the 4 laning works. Cambray have simply suggested that this is an existing deficiency on the SCR network and that it is unreasonable for TMR to request the applicant to construct these works. This response is unhelpful, as at no stage has TMR identified that the applicant will be asked to complete these works. The IR was seeking clarification as to how the development impacts will be mitigated and to date, no credible response has been provided to this question;

11. **Response NOT satisfactory.** As per items 5, 8 and 10, the applicant has not provided a satisfactory response that is not dependant on TMR rectifying existing deficiencies on the SCR network.

Summary

Generally speaking the items in TMR's Information Request have been satisfactorily addressed in the applicant's response and in the two (2) updated Cambray Consulting Pty. Ltd.'s Traffic Impact Assessment (TIA) reports dated 4 July 2013. However, four (4) items have not been satisfactorily addressed as identified above. The crux of this issue is that Cambray have identified that the Bruce Highway requires upgrading within the 10 year design horizon regardless of whether or not the current development application proceeds. This may be the case however, without certain funding, TMR cannot possibly commit to providing the infrastructure upgrades required to enable the proposed DA to proceed.

In light of the fact that TMR officers have been given a verbal direction to ignore planning that has not been signed off at a sufficient level and fully consulted, designed and funded, it is my view that (for consistency sake) this same approach should be applied to this DA. Without the certainty of government funding and a committed project, which I understand TMR does not currently have, I am unsure how TMR could consider approving the current application without the applicant being required to fund the solution.

It is recommended that we discuss this matter with Chris Hewitt and the applicant before TMR making its Referral Agency Response.

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Rockhampton Office
232 Bolsover St, Rockhampton
Gracemere Office
1 Ranger St, Gracemere
Mount Morgan Office
32 Hall St, Mount Morgan
Yeppoon Office
25 Normanby St, Yeppoon

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11 November 2013

Department of Transport and Main Roads
PO Box 5096
Red Hill Rockhampton Qld 4701

cmo.rockhampton@tmr.qld.gov.au

Attention: Chris Hewitt and Byron Jones

RE: STOCKLAND RESIDENTIAL DEVELOPMENT – TRAFFIC ACCESS

Council is finalising the assessment of a development application made by Stockland for a master planned community at North Parkhurst. During the assessment, concerns were identified by Council's consulting traffic engineer regarding the acceptability of long term access to the Bruce Highway via an at grade level crossing (Olive Street/Bruce Highway intersection).

The concerns relate to the safety of vehicular, pedestrian and cyclist movements between the site and the Bruce Highway. The Stockland development does not comprise significant attractors in terms of commercial, education or employment generators. It is therefore evident that significant movements will occur at this intersection, particularly during peak hours, as the resident population migrates from this residential node to other activity nodes within the city.

It is acknowledge that Queensland Rail has given in principle approval for the rail crossing and the Department of Transport and Main Roads has echoed this in its recent concurrence agency response. Whilst Council will not purport to usurp the role of a concurrence agency, nor contradict conditions imposed by a concurrence agency, Council feels an obligation to advise you of the concerns which have been identified by its consulting traffic engineer.

Most notable of these concerns is the fact that the level crossing approved by Queensland Rail and the Department of Transport and Main Roads does not constitute satisfactory long term planning, particularly when Olive Street will clearly be a key bus route for both public and school bus services. It is noted that an ALCAM assessment including Olive Street as a bus route resulted in a high risk score.

It was felt that Council could not just ignore this information and that it should be forwarded to you for your consideration. Please note that, if you consider it necessary, Council is interested in working with the department to investigate future grade separated crossing locations and alternative access options in the vicinity of the development site, particularly in association with the proposed Rockhampton Ring Road.

Should you require further details or clarification regarding the above, please do not hesitate to contact the undersigned on 4939 9941.

Yours faithfully,

NR

Erin McCabe
ACTING OPERATIONS MANAGER
DEVELOPMENT ASSESSMENT

cc. QR - GPO Box 1429, BRISBANE, QLD 4000
NR qr.com.au – QR
Not Relevant @qr.com.au – QR

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Attachment A

Amended Proposal Plans

Prepared by, RPS

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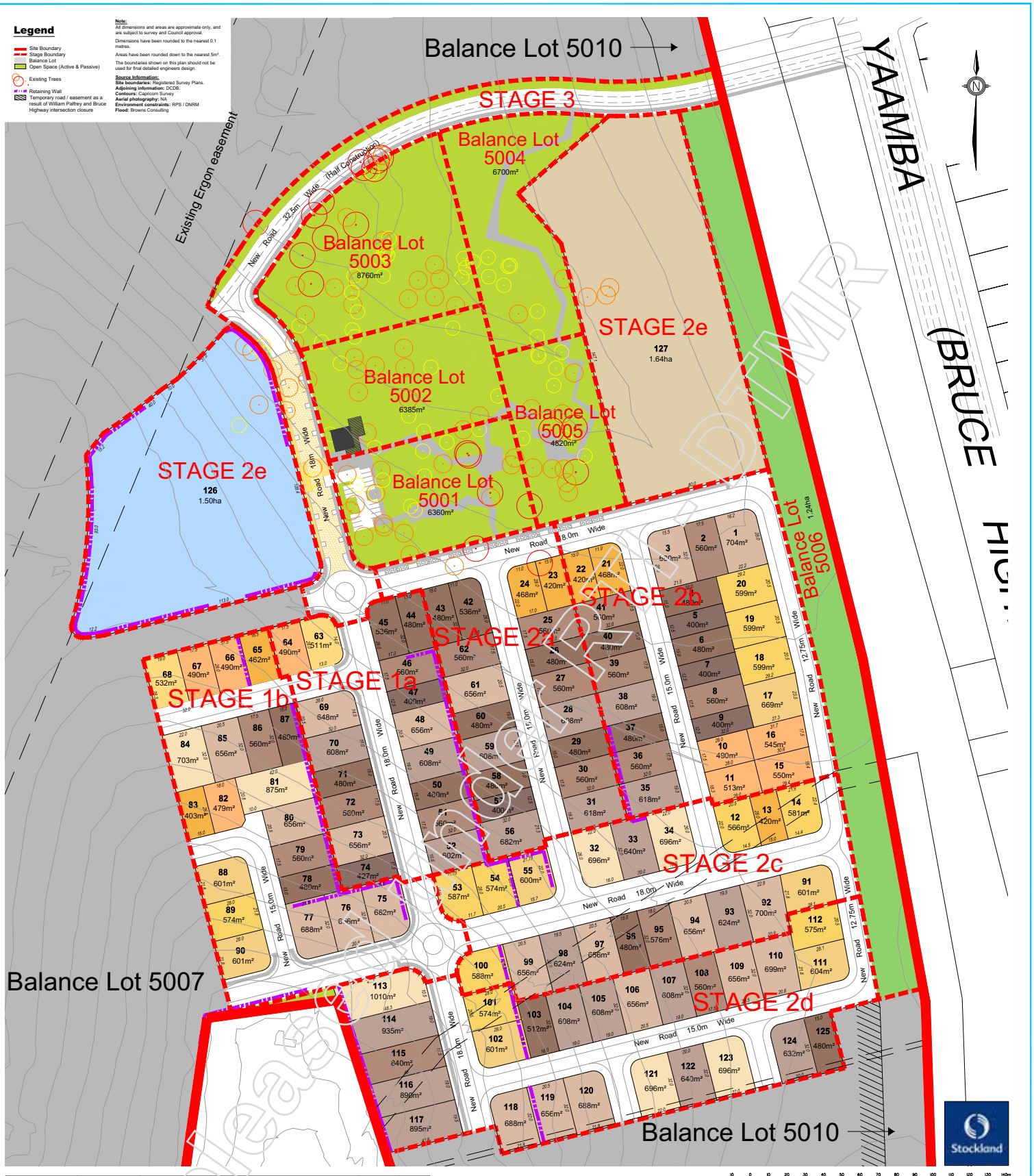

ALLOTMENT TYPE	DIMENSIONS		STAGE									
28m Deep Lots	Typical Lot	Area	1A	1B	2A	2B	2C	2D	2E	OVERALL	TOTAL %
Courtyard Allotment	15.0 x 28m	420m²	—	2	2	2	1	—	—	7	5.5%
Premium Courtyard Allotment	17.5 x 28m	490m²	1	3	—	4	—	—	—	8	6.3%
Traditional Allotment	19.0 x 28m	532m²	1	1	—	—	—	—	—	2	1.6%
Premium Traditional Allotment	20.5 x 28m	574m²	—	1	—	3	5	2	—	11	8.7%
Lifestyle Allotment	22.0 x 28m	616m²	—	2	—	1	2	2	—	7	5.5%
Sub Total			2	9	2	10	8	4	—	35	27.6%
32m Deep Lots	Typical Lot	Area									
Premium Villa	12.5 x 32m	400m²	2	—	1	3	—	—	—	6	4.7%
Courtyard Allotment	15.0 x 32m	480m²	4	2	6	4	1	2	—	19	15.0%
Premium Courtyard Allotment	17.5 x 32m	560m²	3	2	4	5	1	2	—	17	13.4%
Traditional Allotment	19.0 x 32m	608m²	3	—	4	2	3	8	—	20	15.7%
Premium Traditional Allotment	20.5 x 32m	656m²	3	5	1	2	4	6	—	21	16.5%
Lifestyle Allotment	22.0 x 32m	704m²	—	2	—	—	2	3	—	7	5.5%
Sub Total			15	11	16	16	11	21	—	90	70.9%
Super Lot		1.643 ha	—	—	—	—	—	—	1	1	0.8%
Mixed Use		1.5 ha	—	—	—	—	—	—	1	1	0.8%
Total Dwellings			17	20	18	26	19	25	1	127	100.0%

	STAGE													OVERALL	TOTAL %
	1A	1B	2A	2B	2C	2D	3	5001	5002	5003	5004	5005	5006		
Total Precinct Area	1.24 ha	1.76 ha	1.37 ha	2.03 ha	2.04 ha	1.71 ha	0.98 ha	0.63 ha	0.63 ha	0.87 ha	0.67 ha	0.48 ha	1.24 ha	15.65 ha	100.0%
Total Saleable Area	0.92 ha	1.16 ha	0.96 ha	1.39 ha	1.15 ha	1.68 ha	—	—	—	—	—	—	—	7.26 ha	46.4%
Open Space															
Active & Passive Open Space	—	—	—	—	—	0.02 ha	—	0.63 ha	0.63 ha	0.87 ha	0.67 ha	0.48 ha	—	3.30 ha	72.7%
Linear Open Space	—	—	—	—	—	—	—	—	—	—	—	—	1.24 ha	1.24 ha	27.3%
Total Open Space	—	—	—	—	—	0.02 ha	—	0.63 ha	0.63 ha	0.87 ha	0.67 ha	0.48 ha	1.24 ha	4.54 ha	100.0%
Road Type															
Total Length of New Road	179 m	340 m	250 m	416 m	324 m	412 m	180 m	—	—	—	—	—	—	2101 m	
3.5m Wide New Driveway	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
12.75m Wide New Road	—	—	—	153 m	50 m	50 m	—	—	—	—	—	—	—	253 m	
15m Wide New Road	34 m	180 m	149 m	115 m	64 m	276 m	—	—	—	—	—	—	—	818 m	
18m Wide New Road	145 m	160 m	101 m	148 m	210 m	86 m	180 m	—	—	—	—	—	—	1030 m	
25.5m Wide New Road	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
32.5m Wide New Road (Half Constructed)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	

REVISION

Level Datum	Date	24 OCTOBER 2013	
Origin	Comp By.	BDC/MJB/FK	
	DWG Name.	109116-90e ROL	
	Local Authority	ROCKHAMPTON REGIONAL COUNCIL	
Scale 1:1000	Sheet A1	Locality	ROCKHAMPTON
		Job Reference	109116

CLIENT
STOCKLAND

PROPOSED SUBDIVISION
STAGES 1-3
ALLOTMENT LAYOUT

PROJECT
ELLIDA

Plan Ref **109116-90** Rev **E**

RPS Australia East Pty Ltd
ACN 140 292 762
ABN 44 140 292 762
Urban Design
Suite 1, Ground Floor,
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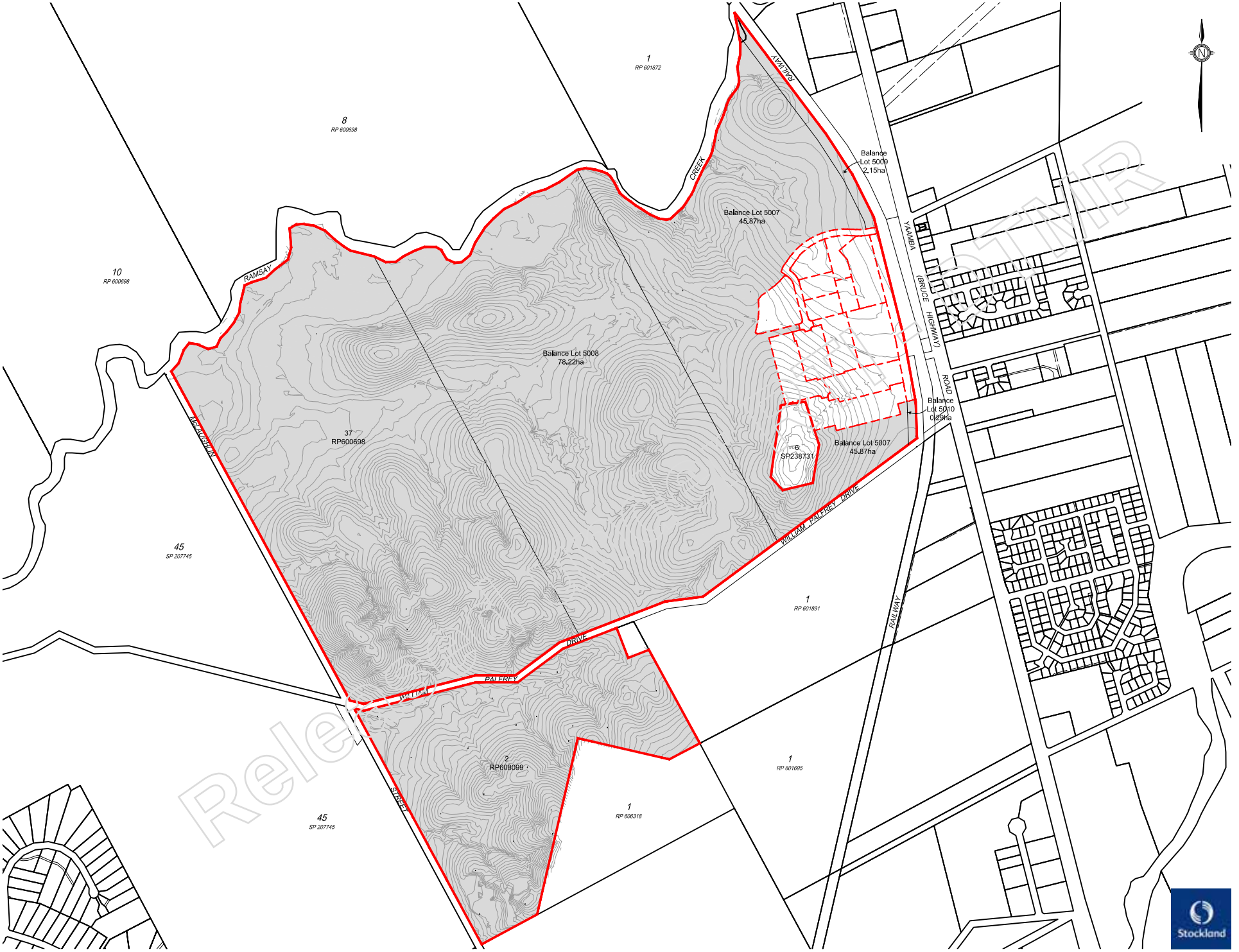

REVISION

Note:
All dimensions and areas are approximate only, and are subject to survey and Council approval.

Dimensions have been rounded to the nearest 0.1 metres.

Areas have been rounded down to the nearest 5m².

The boundaries shown on this plan should not be used for final detailed engineers design.

Source Information:
Site boundaries: Registered Survey Plans.
Adjoining information: DCDB.
Contours: Capricorn Survey
Aerial photography: NA
Environment constraints: RPS / DNRM
Flood: Browns Consulting

CLIENT
STOCKLAND

PROJECT
ELLIDA

BALANCE LOT PLAN

Level Datum	
Origin	
Date	29 JULY 2013
Comp By.	BDC/MJB
DWG Name.	109116-86d Balance Lot Plan.dwg
Local Authority	ROCKHAMPTON REGIONAL COUNCIL
Locality	ROCKHAMPTON
Job Reference	109116
Scale	*1:5000*
Sheet	*A1*
Plan Ref	***109116-86***
Rev	***D***

RPS Australia East Pty Ltd
ACN 140 292 762
ABN 44 140 292 762
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Appendix E

Traffic Impact Assessment

Prepared by, Cambray Counsulting

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CAMBRAY consulting
Traffic Engineering and Transport Planning



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Proposed Master Planned Community
Stockland North Parkhurst

Traffic Impact Assessment
Application for Preliminary Approval - Report Revision C

Prepared for Stockland

31 August 2013

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1.0 Introduction

Cambray Consulting was engaged to assist Stockland with developing a master plan for the planned residential site located in North Parkhurst, QLD. As part of this assessment a Traffic Impact Assessment report (dated 5 March 2013) was completed and lodged with Council as part of the development application for the proposed development.

Requests for additional information were then received from both Rockhampton Regional Council and the Department of Transport and Main Roads (TMR) in relation to the proposed development, which have led to minor amendments to the internal site layout and the methodology of the traffic impact assessment for the site and the inclusion of additional analysis regarding the impact of the development on key local government controlled intersections.

This updated report has therefore been prepared in response to requests for additional information, addressing the traffic-related issues identified and assessing the revised site layout. This assessment involved:

- Establishment of access strategy for the proposed development;
- Operation of the proposed at grade rail crossing;
- Internal road hierarchy and cross sections;
- Staging of the road network including trigger volumes; and
- Investigation into traffic impacts of the development including attributable external roadworks / contributions;

1.1 Limits of Report

This report takes into account the particular instructions and requirements of our client. Cambray Consulting has taken care in the preparation of this report, however it neither accepts liability nor responsibility whatsoever in respect of:

- Any use of this report by any third party;
- Any third party whose interests may be affected by any decision made regarding the contents of this report; and/or
- Any conclusion drawn resulting from omission or lack of full disclosure by our client, our client's consultants, or any other parties.

1.2 Safety In Design

Within the scope of our design activities, we have identified safety in design issues and potential hazards, whenever reasonably practicable within our field of expertise. Due to our limited and upfront role on this project, it is not considered reasonably practicable to identify all potential hazards which may occur throughout the life of a project, including during detailed design and construction activities. It is strongly recommended that safety in design issues be reviewed during all ensuing design and construction stages of the project.

1.3 RPEQ Certification

I, NR confirm that I have prepared and/or reviewed the contents of this document.

NR

BEng (Civil) | NR CPEng | MIEAust |NPER
Senior Transport Engineer
Cambray Consulting Pty Ltd

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2.0 Site Location

The proposed development site is located as shown in **Figure 2a** below, and is bounded by the Bruce Highway and the North Coast Rail line the East, William Palfrey Drive to the South, land identified for future rural residential uses to the West and Ramsay Creek to the North.



Figure 2a: Site Location

The subject site comprises five (5) lots, all of which are under the ownership of Stockland having a combined area of 276.72ha:

- Lot 1 on RP602376;
- Lot 5 on SP238731;
- Lot 37 on RP600698;
- Lot 37 on RP600698; and
- Lot 2 on RP608099.

The following lots have been included in the application to secure site access provisions from the Bruce Highway (Yaamba Road) and to facilitate continued access over railway corridor:

- Lot 22 on SP134380 (*held by the State of Qld*);
- Lot 23 on SP134380 (*held by the State of Qld*);
- Lot 49 on SP129857 (*held by the State of Qld*); and
- Lot 41 on SP226571 (private ownership)

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3.0 Planning Context

The proposed development site has been identified for several years as an area for future residential development growth, by both Council and Main Roads. This can be seen by its inclusion in such planning documents as

- Council's Parkhurst and Yeppoon Road Corridor Structure Plan (GHD 2007);
- Rockhampton Traffic Study (Arup 2008);
- RRC Priority Infrastructure Plan Planning Assumptions Report (GHD 2011), and
- TMR's draft Parkhurst Forward Planning Traffic Analysis Study (2010).

All of these planning documents envisaged a large residential development (i.e. > 2,000 lots) with the primary access from the Bruce Highway and secondary access via McLaughlin Street and the Alexandra Street corridor. Common to each study was a Urban Arterial Road providing connectivity between the Bruce Highway and the planned residential catchments to the west of the Highway. Several of these planning documents identify this proposed Urban Arterial Road joining the Bruce Highway at Olive Street, creating a fourth (western) leg to the existing intersection. This intersection requires signalisation and would incorporate an at-grade crossing of the adjacent rail corridor..

These planning documents are discussed in further detail below. The intent of Stockland is to develop the land in a manner that is consistent with these planning studies

3.1 Parkhurst & Yeppoon Road Corridor Structure Plan (2007)

This was a land use planning study commissioned by the former Rockhampton City Council. The study identifies the extent of land required to service the possible future growth (both residential and commercial) within the local Parkhurst area.

Figure 3.1a below is an extract from this study which shows the land uses identified on the subject site. A full size copy of the plan is included as **Appendix A**.

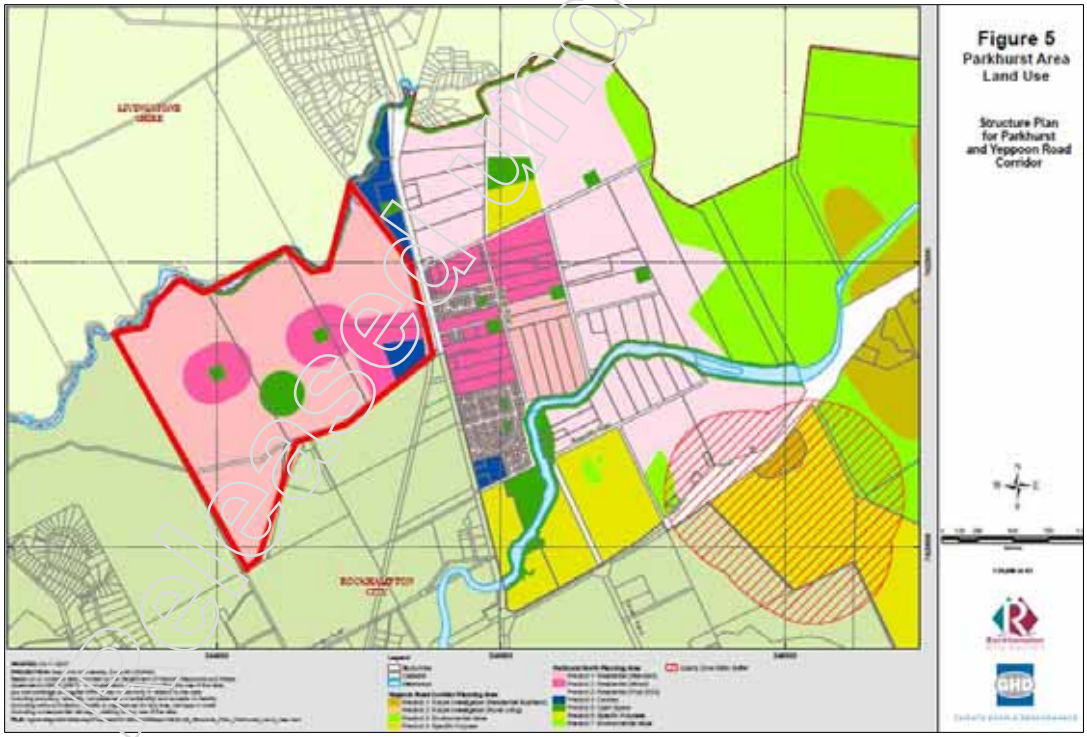

Figure 3.1a – Extract from Parkhurst & Yeppoon Road Corridor Structure Plan (2007)

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As can be seen in the figure above the majority of the Stockland site was identified for future residential uses and was assumed to yield approximately 2,650 dwellings. It is also noted that a Neighbourhood Centre was identified within the site, being located on the south-eastern corner of site.

Figure 3.1b below is an extract of the road hierarchy plan that was included in this Council study. Again a full size copy of this figure is included as **Appendix B**.

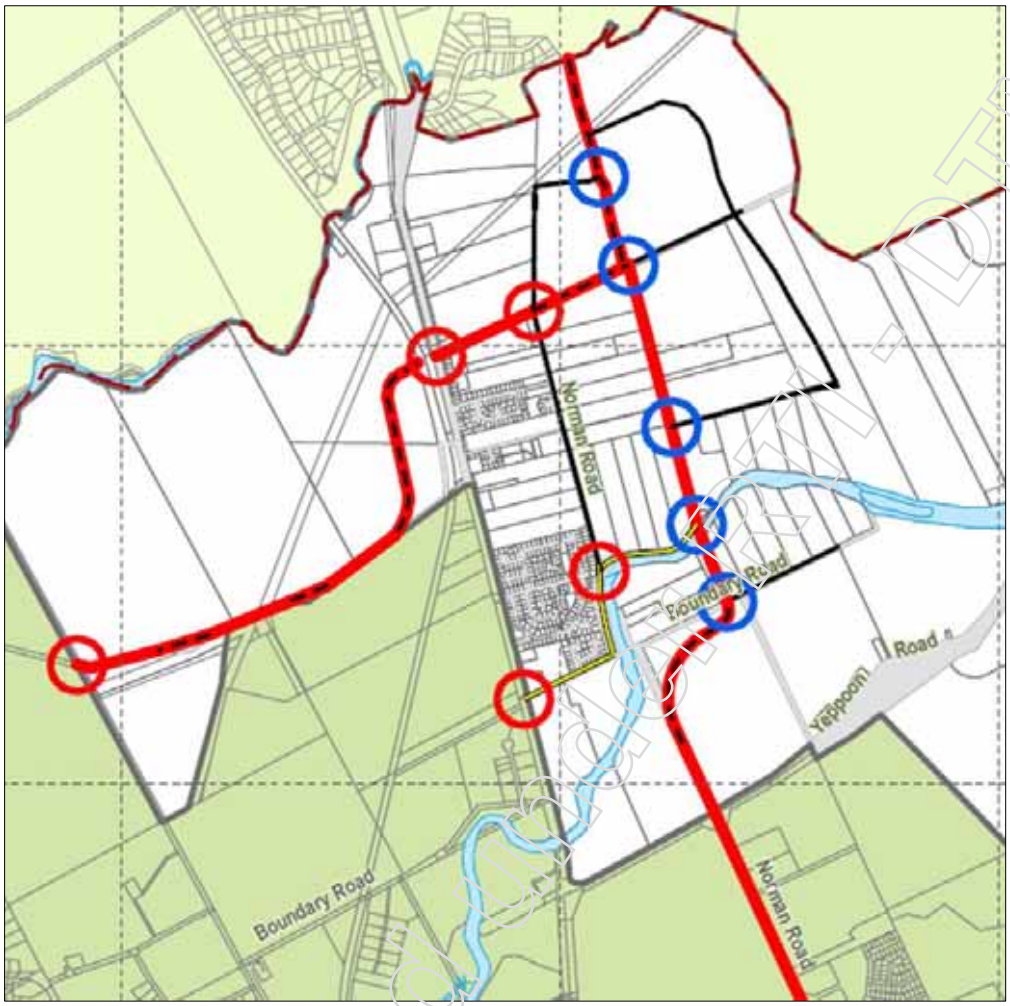

Figure 3.1b – Proposed Road Hierarchy -Parkhurst & Yeppoon Road Corridor Structure Plan (2007)

The figure above indicating the proposed road hierarchy identifies the proposed Urban Arterial Road utilising a section of the current alignment of William Palfrey Road before deviating to intersect the Bruce Highway at the current Olive Street intersection location.

The technical document that accompanied the planning study identified that an *"Urban Arterial Road needs to be established to service this area providing connection to Yaamba Road (Bruce Highway)"* and that "alternate access to/from this development is via McLaughlin St and Alexandra St". This suggests an expected provision of two (2) points of access to the development site at the ultimate build-out scenario. The report also identified a distribution split for traffic from west of the highway (i.e. the subject site) of 80% to/from the Bruce Highway and 20% to/from the Alexandra St corridor.

Rockhampton City Council subsequently resolved to adopt this structure plan for the Parkhurst and Yeppoon Road corridor at its meeting held on 3rd December 2008.

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3.2 Rockhampton Traffic Study 2008

The Rockhampton Traffic Study (RTS) (2008) was commissioned by Council to identify and evaluate a future Road Network Strategy for the Rockhampton area. Underpinning the study was the development of a strategic transport model which divided Rockhampton into several development zones, with forecast population and employment figures assigned to each zone for 2011, 2016 and 2021.

Initially a 2011 "do minimum" scenario was developed based on the existing road network and all the road projects that Council and Main Roads had identified to be complete prior to 2011.

Future year scenarios (2016 and 2021) were then carried out based on two scenarios of population growth; 1) the City Plan Scenario, which was based on PIFU High Series forecasts and has development in line with the land zoning of the previous Rockhampton City Plan , and 2) the Parkhurst Accelerated Growth (PAG) Scenario, which was based on growth in the Parkhurst area significantly greater than that identified in the City Plan.

The inclusion of the PAG scenario was requested during the study after Council became aware of the potential development of two large land parcels in Parkhurst. The scale of these developments was significant and an alternative land use scenario was prepared to establish the impacts of such accelerated development in the Parkhurst area on the surrounding road network. The two parcels identified were:

- A major parcel of land near the intersection of Belmont Road and William Palfrey Road – known as Edenbrook; and
- A major landholding in Parkhurst between Edenbrook and the North Coast Rail Line extending up to the previous City Boundary (Ramsay Creek) and straddling William Palfrey Road – which is the subject site for the proposed Stockland Master Planned Community.

Various road projects were then modelled to mitigate the impacts of this future development with the output from the study being a list of recommended road network projects required to accommodate the proposed development scenarios, including the expected timeframes for the works and approximate cost estimates.

Whilst we do not have access to the traffic model which underpins the study, the report included information on future population and lot yields for each development area, as well as providing forecast traffic volumes on the various links within the local road network.

Working backwards from these forecast volumes and lot yield assumptions the traffic distribution for the Stockland North Parkhurst site adopted in the RTS was estimated to be 70% to/from the Bruce Highway and 30% to/from the Alexandra Street corridor.

It is noted that this distribution differs from that previously identified in Council's *Parkhurst and Yeppoon Road Corridor Structure Plan 2007* (80% to/from Bruce Highway and 20% to/from Alexandra Street corridor). The RTS involved the development of a detailed traffic model in EMME/2 adopting a traditional 4-step methodology. This model assigns traffic to the road network based on sophisticated algorithms. As a consequence, the distributions identified in the RTS are expected to provide a more accurate representation of the future traffic conditions and will be adopted for the purpose of this report

The report also made several assumptions regarding the additional road network required to accommodate the PAG scenario. The additional network was identified based on previous planning applications and discussions with Council and included the provision of two (2) points of access for the proposed Stockland site, including:

- The realignment of William Palfrey Road and connection to the Bruce Highway at Olive Street; and
- A new road link connecting Alexandra Street to William Palfrey Road (realignment of McLaughlin Street).

The model also assumes that there is a major urban arterial road through the site providing connectivity between McLaughlin Street and the Bruce Highway. The traffic report identifies a number of road projects to ensure that the road network continues to operate within the desirable level of service under the PAG scenario. **Figure 3.2a** shows the key road projects within close proximity to the subject site.

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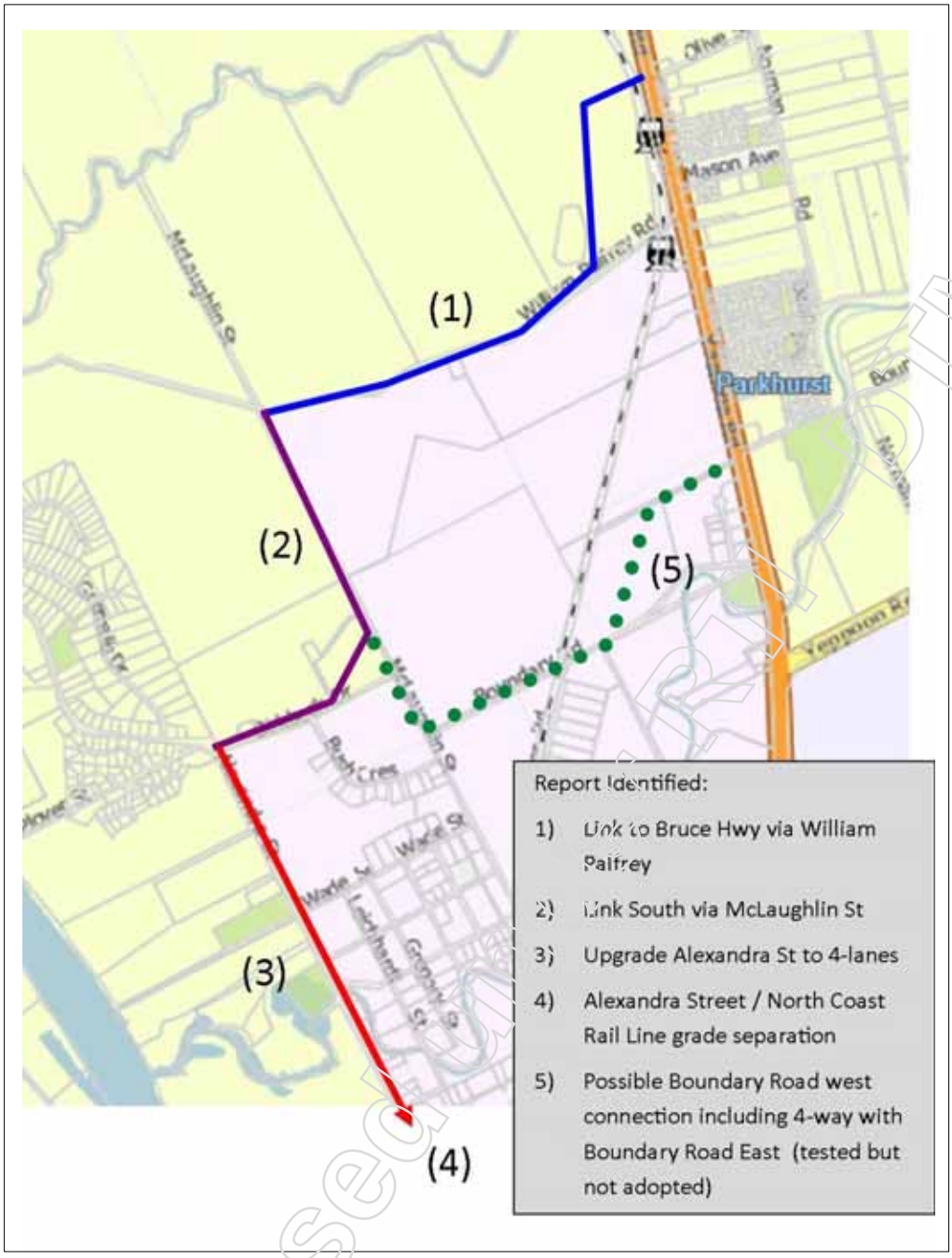

Figure 3.2a – Road Projects included in Transport Model

3.3 Planning Assumptions Report 2011

The Planning Assumptions Report (PAR) contains the planning assumptions and growth projections underpinning Council's Priority Infrastructure Plan (PIP) prepared by Rockhampton Regional Council and approved by the Minister for the Department of Local Government and Planning.

The PAR documented the methodology and the assumptions used to prepare the Planning Assumptions Model (PAM) including dwelling, population, floor space (GFA) and employment planning assumptions, as well as the timing of development and development sequence. This information was then used to establish the Priority Infrastructure Area (PIA) for each of the identified development areas within the Rockhampton Regional Council Local Government Area. This information was then used as the basis for the preparation of Council's *Adopted Infrastructure Charges Resolution 2011*.

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As part of this process the future development in the Parkhurst area was identified, with an extract from the PAR shown in **Figure 3.3a** below, with a full size copy included as **Appendix C**.

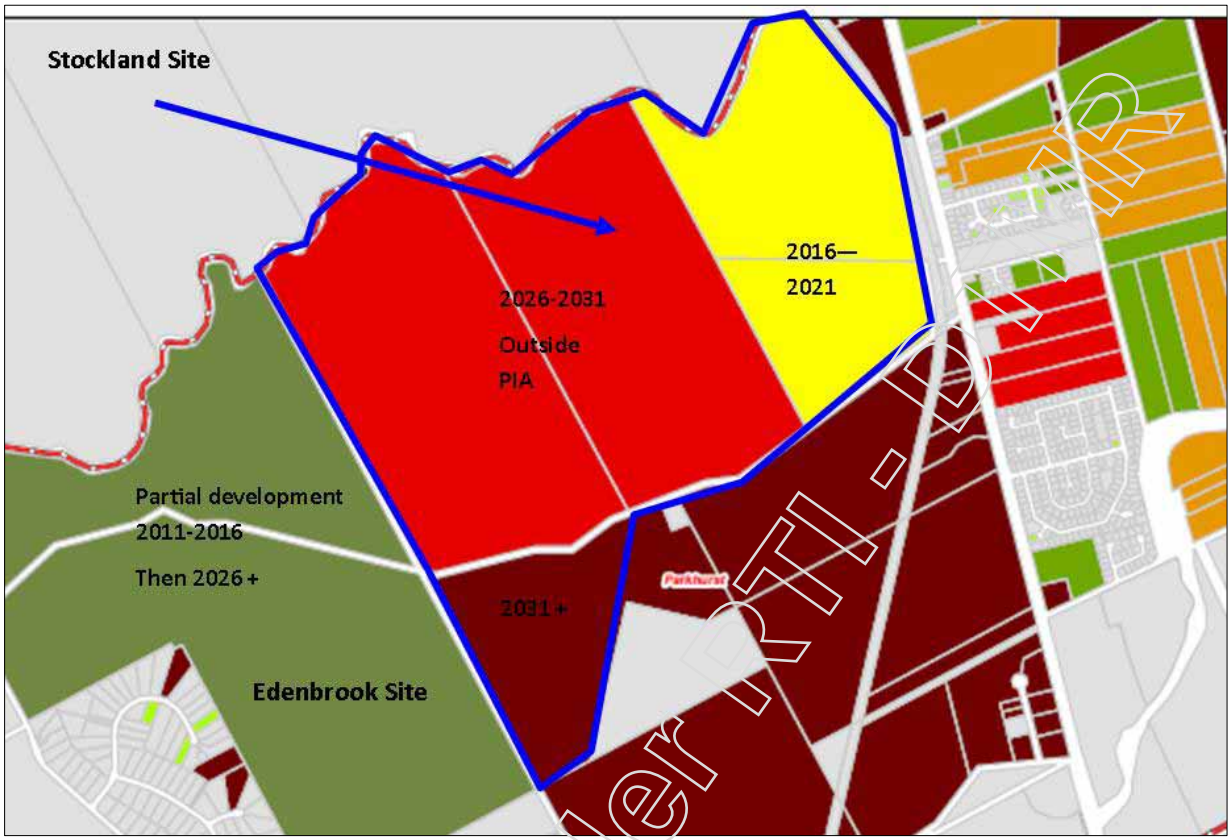

Figure 3.3a – Extract from Council's Planning Assumptions Report

As seen above, the eastern portion of the proposed development site has been identified for residential uses and is included in the PIP (<2026). Whilst the balance of the subject site is also identified for residential uses, it is not included in the current PIP due to the anticipated timing of development (>2026).

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3.4 Adopted Infrastructure Charges Resolution No. 2 (2012)

The purpose of Council's Infrastructure Charges Resolution is to identify truck infrastructure required to mitigate the impacts of planned development. The planned development includes all land uses which have been identified in the PIP and fall within the Priority Infrastructure Area (PIA).

In the Parkhurst growth area, all of Edenbrook and the eastern portion of the subject site are included in the PIA. It is also understood that Council's intent for this eastern portion of the site was for development to occur with sole access via an intersection off the Bruce Highway.

Figure 3.4a shows the trunk infrastructure identified by Council to support this development, with a full size copy included as **Appendix D**.

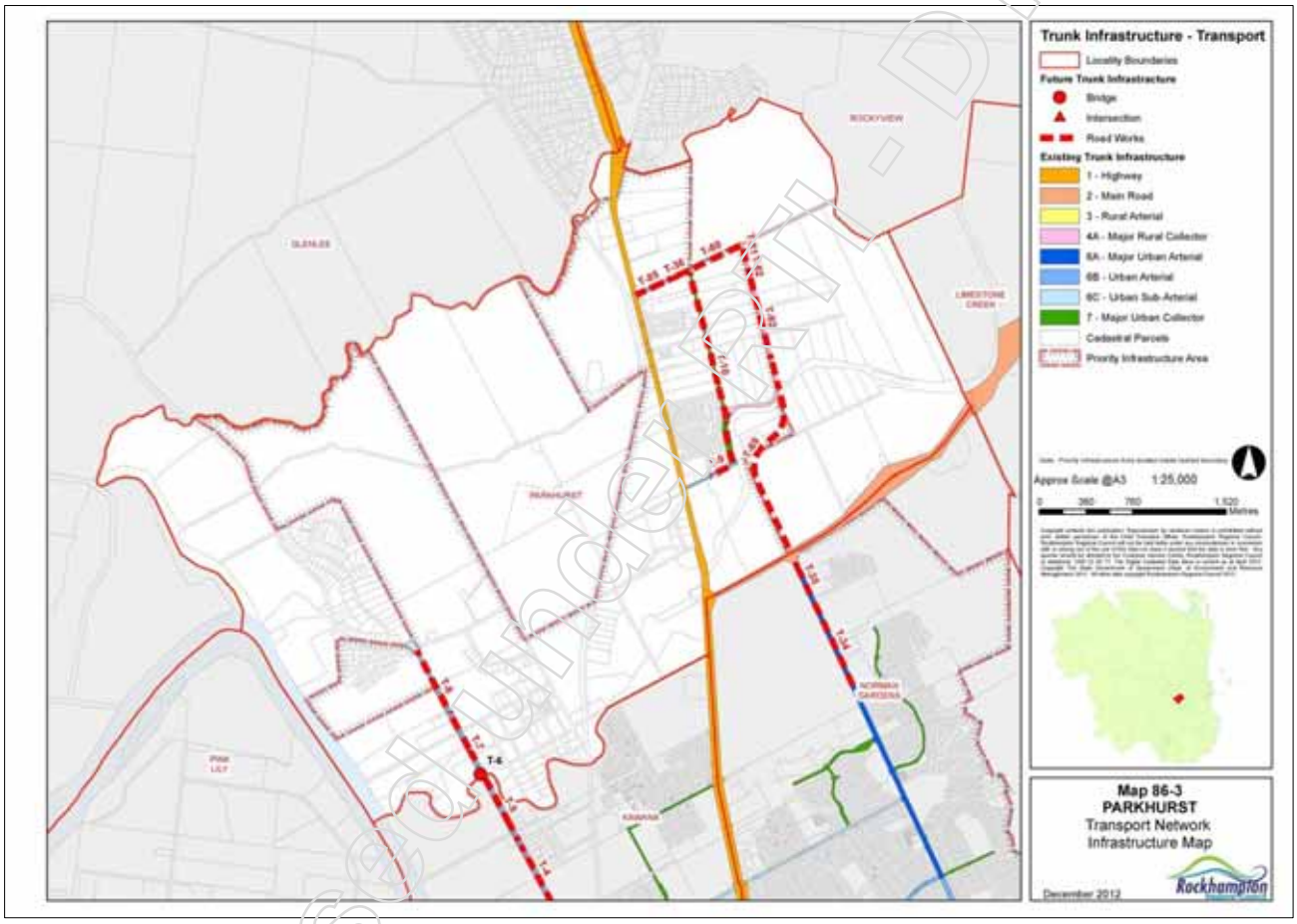

Figure 3.4a – Trunk Infrastructure

Council have committed to funding the above-mentioned works by collecting contributions from only those developments that are included within the PIP.

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3.5 Transport Main Roads Planning Intent "Bruce Highway"

It is our understanding that DTMR's ultimate planning intent for this road corridor is to upgrade the highway from a two-lane undivided road to a four-lane divided road as well as implement an access management strategy to minimise the number of intersections on the Highway and provide defined access and egress points for traffic associated with development on both sides of the Highway. From discussions with TMR they have identified 15,000 vehicles as representing their deficiency capacity and hence the notional trigger volume for four lanes.

This planning is in response to both the current and anticipated development in the Parkhurst area which includes not only the proposed North Parkhurst site, but land to the north and on the eastern side of the Bruce Hwy.

From a review of TMR's preliminary future road network planning layouts and spread sheet model, it is our understanding that the current planning intent for the Bruce Highway through Parkhurst includes:

Olive Street / North Parkhurst Access / Bruce Highway Intersection (Traffic Signals)

Main Roads has identified in its planning that the current intersection of Olive Street with the Bruce Highway as the access location for the North Parkhurst land parcel. This access has been shown as an upgrade of the current intersection to traffic signals with a fourth western leg constructed to provide access to the North Parkhurst site.

Boundary Road East (Traffic Signals)

It is our understanding that as part of a recently approved development application the existing intersection of Boundary Road East with the Bruce Highway was conditioned to be upgraded to traffic signals.

Closure of William Palfrey Road

With the addition of a connection to the land on the west of the highway via the proposed fourth leg at the Olive Street intersection it has been identified that the existing connection to the west (i.e. William Palfrey Road) will be closed under TMR's ultimate planning intent for the Bruce Highway corridor through Parkhurst.

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4.0 Proposed Masterplan

As detailed in Section 3 of this report, the proposed development site has been identified for several years as an area for future residential development growth, by both Council and Main Roads. Stockland plans to develop the subject site as a master planned residential community, generally consistent with the future planning intents of both Council and TMR.

The application seeks preliminary approval to ultimately create a 2,000+ lot residential and mixed use development aimed at providing a benchmark for master planned communities within Rockhampton. For the purpose of the traffic assessment we have assumed a maximum development yield equivalent to 2,350 detached residential dwellings. The plan of development for the proposed master planned community prepared by RPS can be seen in **Appendix E**.

4.1 Access Strategy

The development will be serviced by two (2) major access points:

- the principal access will be via the Bruce Highway at the existing Olive Street intersection; and
- the secondary access will be via the Alexandra Street / McLaughlin Street corridor.

Consistent with the transport planning intent of both Council and TMR, the masterplan makes allowance for a future Urban Arterial Road which would provide connectivity between the Bruce Highway and the existing/planned residential catchments to the west (e.g. Edenbrook). This Urban Arterial Road is proposed to connect to the Bruce Highway at Olive Street, creating a fourth western leg of a new signalised intersection which would also incorporate an at-grade crossing of the adjacent North Coast rail line.

The rail crossing would essentially be a relocation of the existing rail crossing on William Palfrey Road, which would ultimately be closed as part of the planned residential development. This would also include re-diverting the traffic that currently utilises the existing at grade crossing to the new crossing and providing an alternative connection for this traffic to William Palfrey Road.

This access strategy is consistent with both TMR's planning intent for the Bruce Highway corridor and the local government road network identified in Council planning studies. In addition it is understood that as part of the construction of the initial stage of the development access for the construction vehicles will be sought via William Palfrey Road, utilising both the current rail crossing and intersection with the Bruce Highway.

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4.2 Rail Crossing

The proposed development site is bounded by the North Coast Rail Line along its eastern edge. Queensland Rail identifies the North Coast Line as *"the principle freight and passenger line within the Queensland Rail network, running the length of coastal Queensland between Brisbane in the south and Cairns in the north".*

The relevant section of the North Coast Line runs parallel to the Bruce Highway throughout the Parkhurst corridor and is primarily used by containerised freight services, high speed tilt trains, single commodity trains and cattle trains. The line also travels throughout the city of Rockhampton and has several at grade crossings with various levels of treatment (lights, boom gates etc.) at the interface with both Council and state controlled roads, as shown in **Figure 4.2a** below.

NORTH COAST LINE

403	639.342	Stanley Street	Public Level	Signs	X S	Open	LGA
403	639.574	Derby Street	Public Level	Signs	X S	Open	LGA
403	639.805	William Street	Public Level	Signs	X S	Open	LGA
403	640.040	Denham Street	Public Level	Signs	X S	Open	LGA
403	640.270	Fitzroy Street	Public Level	Half Boomgates		Open	MRD
403	640.499	Archer Street	Public Level	Signs	X S	Open	LGA
403	640.730	Cambridge Street	Public Level	Signs	X S	Open	LGA
403	640.963	Albert Street (Bruce Highway)	Public Level	Half Boomgates		Open	MRD
403	641.205	North Street	Public Level	Signs	X S	Open	LGA
403	641.441	Bolsover Street	Public Level	Half Boomgates		Open	LGA
831	641.998	Glenmore Road	Public Level	Half Boomgates		Open	LGA
831	643.246	Main Street	Public Level	Half Boomgates		Open	LGA
831	643.588	Taylor Street Pedestrian Access	Pedestrian			Open	LGA
831	644.161	Richardson Road	Public Level	Half Boomgates		Open	LGA
831	645.060	Farm Street	Public Level	Half Boomgates		Open	LGA
831	647.960	Boundary Road	Public Level	Flashing Lights		Open	LGA
832	649.855	William Palfrey Road	Public Level	Flashing Lights		Open	LGA

Figure 4.2a: Existing Rail Crossings of North Coast Line in Rockhampton and Current Treatments

Discussions with officers from Queensland Rail has identified that the section of line in the vicinity of the proposed development carries in the order of two (2) trains (one in either direction) in both the AM and PM peak periods, that train speeds are approximately 60-80km/h and that the largest freight services are approximately 650m in length.

Due to the location of the proposed development in relation to the current alignment of the North Coast rail line, the site generated traffic is required to cross the rail line at some point when travelling south regardless of the proposed access location for the development, whether this be at:

- the existing at-grade crossing at William Palfrey Road; or
- the existing at-grade crossing at Boundary Road West;
- the existing at-grade crossing at Farm Street; or
- the proposed at-grade crossing on the new western leg of Olive Street.

Consideration was given to the provision of a grade separated crossing of the rail line as part of the proposed development, however due to a number of issues including the cost of this infrastructure, the requirement for an additional intersection on the Highway, construction and land ownership hurdles and the departure from both Council's and TMR's ultimate planning intent for the local road network this option was not deemed to be viable.

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As such the following access strategy is proposed:

i. A four-way signalised intersection on the Bruce Highway at Olive Street; and
ii. An at-grade crossing of the rail corridor on the proposed western fourth leg of this intersection.

The operation of the proposed four-way signalised intersection on the Bruce Highway is discussed in detail in section 5 of this report. The detail that follows addresses the proposed configuration and operation of the at-grade crossing. Specifically the co-ordination of the traffic signals with the rail signals.

It is also important to note that no additional rail crossings are proposed as part of the proposed access strategy. To clarify, the existing rail crossing on William Palfrey Road is proposed to be relocated to align with the proposed access to the planned residential development. This includes diverting the traffic that currently utilises the existing at grade crossing to the new crossing which then provides an alternative connection for this traffic to William Palfrey Road.

The provision of this alternate access via Olive Street (West) will also alleviate any future requirement for the adjacent intersection of William Palfrey Road with the Bruce Highway to be upgraded to accommodate the use of traffic travelling to/from the west. This is deemed to be desirable as constraints anticipated to be imposed by the adjacent properties (in particular the access/egress locations for the existing shop/service station opposite William Palfrey) are expected to impact on the ability for traffic signals to effectively be provided at this location. Furthermore it is noted that the provision of a signalised access at William Palfrey Road would not be in line with TMR's current planning intent for the Bruce Highway corridor.

The relocation of the existing at-grade crossing from William Palfrey Road is expected to improve the safety for traffic in the area to the benefit of the community, as the current crossing has minimal safety treatments, with only flashing signals provided (as seen in **Figure 4.2b** and **Figure 4.2c** below), whilst the relocated crossing is proposed to provide full active protection (e.g. flashing signals, boom gate barriers, advance warning signs, gated pedestrian enclosures etc.) as well as providing an opportunity for the use of new technology or approaches to the treatment of level crossings.



Figure 4.2b: Existing At-Grade Crossing at William Palfrey Rd



Figure 4.2c: Existing At-Grade Crossing at William Palfrey Rd

In addition to the active protection at the relocated crossing, measures are proposed to manage the impact of vehicle queuing from the proposed traffic signals at Bruce Highway / Olive Street. They include:

- Implementation of a "Keep Clear" zone on the development road approach to the proposed Olive Street signalised intersection to minimise the occurrence of vehicles queuing on the crossing;
- The co-ordination of the rail crossing with the proposed traffic signals on the Bruce Highway, including:
  - A special "clearance phase", as shown in **Figure 4.2d** below, which is to be called at the proposed Olive Street signals when a train is on the approach to the crossing. This clearance phase will provide "green time" to the development road approach to the intersection to allow the vehicles queued between the

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rail corridor and the Highway to clear. This is expected to limit the potential for queuing across the rail corridor; and

- As the train passes through the crossing, a second phase, as shown in **Figure 4.2e** below, is run which continues to hold traffic back from entering the development road and therefore the crossing (i.e. no left-turn or right turn movements from the Highway into the site will be allowed) and gives priority to the through movements on the Bruce Highway.

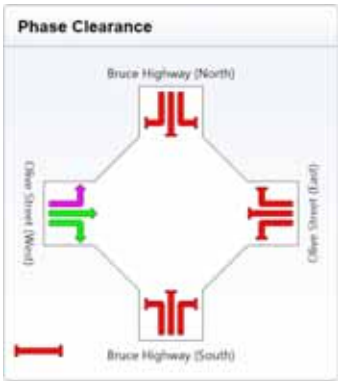

Figure 4.2d: Proposed Clearance Phase at Access Intersection

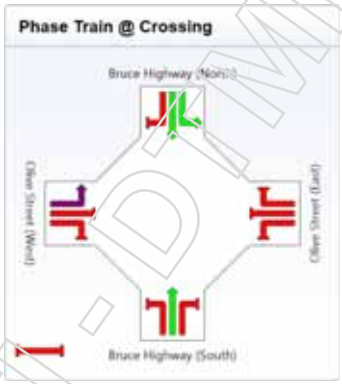

Figure 4.2e: Proposed Train Phase at Access Intersection

This proposed co-ordination of the crossing control measures and the traffic signals at Olive Street with train movements is expected to ensure that appropriate stop measures, including boom gates and red lights for certain traffic movements, are triggered to stop conflicts between trains and vehicular traffic.

In addition, the design of the signalised intersection at Olive Street is proposed to include adequate storage length in the proposed auxiliary turn lanes on the Bruce Highway approaches to accommodate the queuing that will occur if a train arrives coincident with the AM or PM road peak. This is expected to ensure that vehicle queues formed in these auxiliary lanes during a train crossing of the development access road will not impede the through vehicle movements and therefor the operational efficiency of the Bruce Highway. Refer to section 5 of this report for further detail on the geometry of the Bruce Highway / Olive Street traffic signals.

The analysis in Section 5 of this report shows that the proposed signalised intersection at Olive Street operates below capacity. As a consequence during each cycle, the traffic signals will accommodate all vehicles that are expected to arrive during the cycle. Because the signals operate with spare capacity, the traffic signals have the capacity to accommodate additional vehicle demand.

When a train crosses Olive Street, a train phase is called (refer **Figure 4.2e** above). This phase prevents traffic crossing the rail corridor (i.e. entering or leaving the proposed development). The result being that queue of vehicles will develop. After the train has passed the traffic signals will revert back to the standard phasing. The spare capacity within the traffic signals is then used to dissipate the queue that has been generated as a result of the train.

For example, during the 2025 AM peak hour with full build out we expect in the order of 1042 vehicles will depart the site southbound via the Bruce Highway. The traffic signals are proposed to run on a 140 second cycle time. Therefore each cycle we would expect in the order of 41 vehicles would depart the site to the Bruce Highway southbound. The traffic signals have capacity to accommodate 47 vehicles per cycle, and as a consequence the traffic signals have the capacity to accommodate an additional 6 vehicles per cycle.

We expect motorists leaving the site will be delayed for approximately 85 seconds due to the train. This assumes a 700m long train travelling at 60km/hr with 20 seconds grace period before and after. During this time 25 vehicles will be stopped. Once the traffic signals revert back to the standard phasing, this additional demand (25 vehicles) will require just over 4 cycles (spare capacity = 6 veh / cycle) to dissipate, which is just under 10 minutes. Therefore, should a train arrive during the AM peak hour, we expect the queue to dissipate (i.e. normal traffic conditions) within 10

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minutes. The detailed working for a train arriving during the AM peak hour period are shown in **Figure 4.2f** to **Figure 4.2l** below.

In summary, the combination of the proposed active protection measures at the relocated crossing, and the co-ordination of the rail crossing signals with the adjacent signalised access intersection on the Bruce Highway to both restrict vehicular traffic from conflicting with train movements and manage vehicle queues is expected to provide a functional rail crossing which allows access to the proposed development consistent with the planning intent of both Council and TMR.

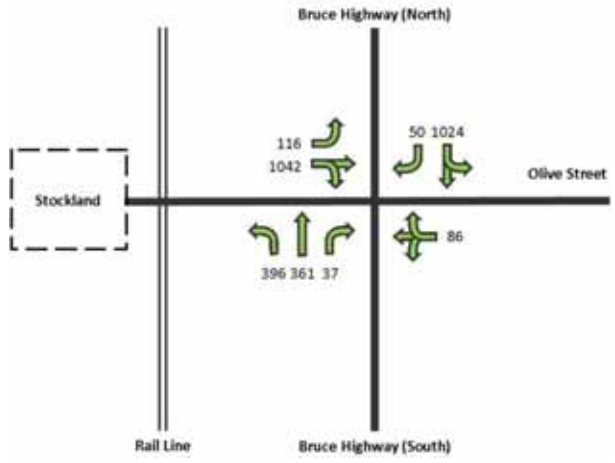

Figure 4.2f: 2025 AM Peak Volumes (veh / hr)

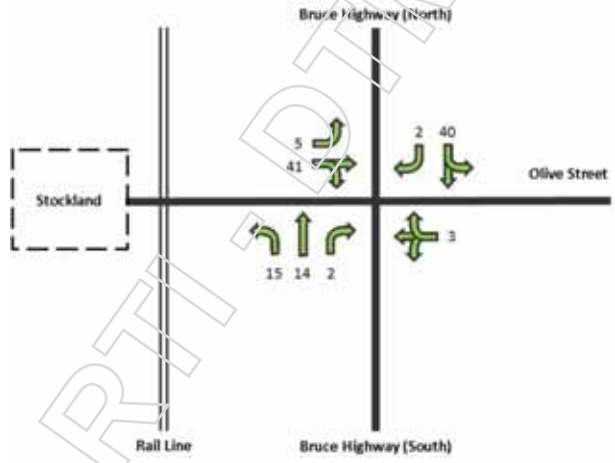

Figure 4.2g: 2025 AM Peak Hour (veh / 140 sec cycle)

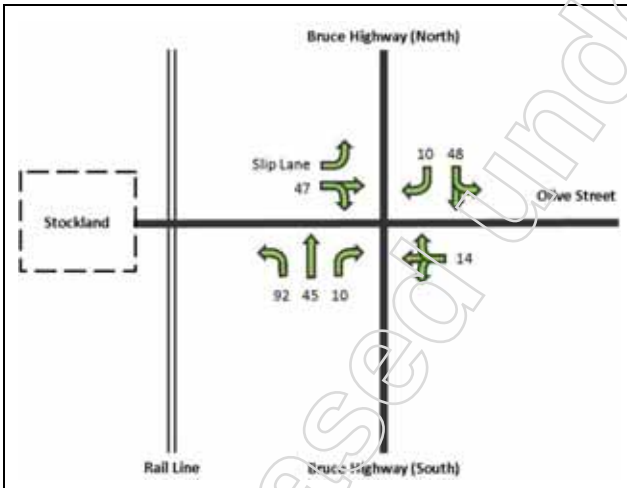

Figure 4.2h: Movement Green Time Per Cycle (sec)

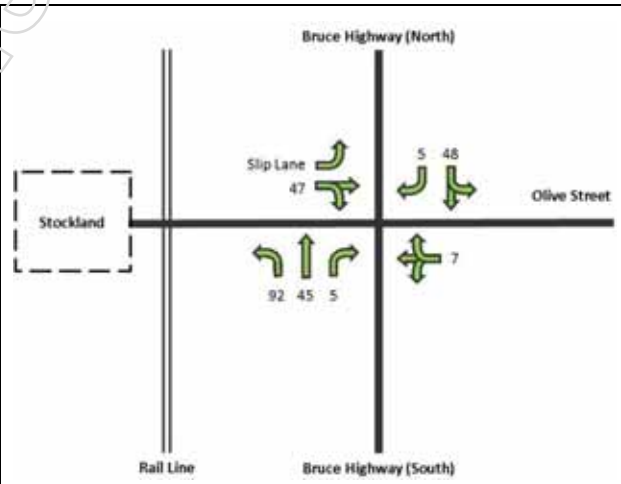

Figure 4.2i: Capacity Per Cycle (veh / cycle)
Note: Assumes 2 seconds per vehicle/lane

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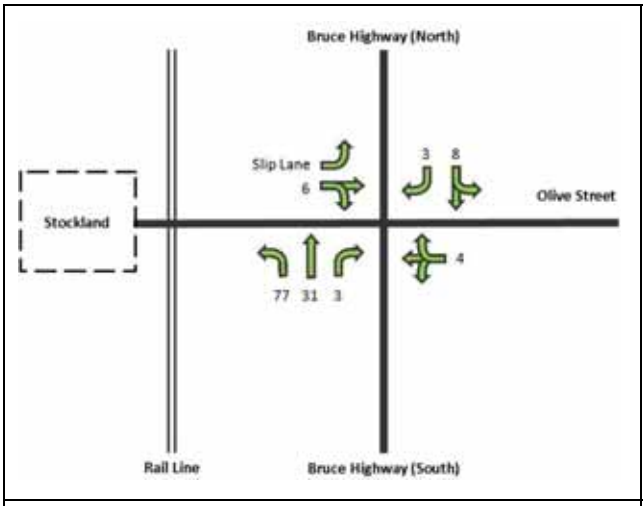

Figure 4.2j: Spare Capacity Per Cycle (veh / cycle)

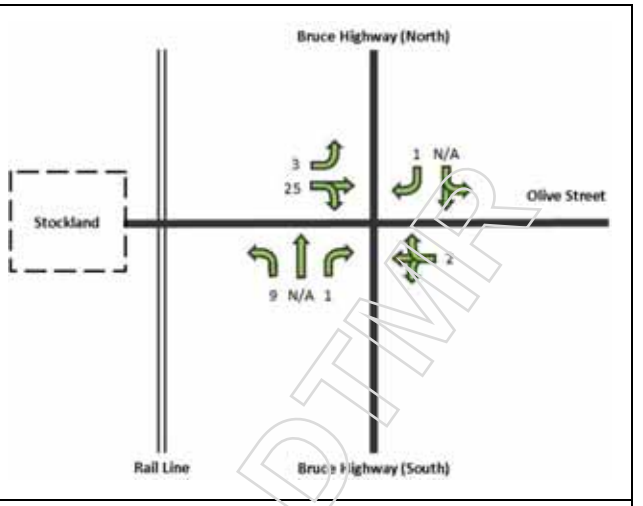

Figure 4.2k: Additional Demand During Train Phase (85 sec)

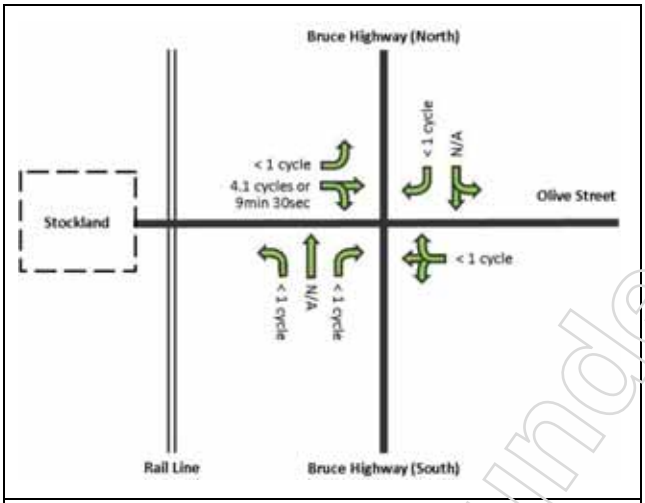

Figure 4.2l: Time to Dissipate Queue Following Train

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4.3 Internal Road Hierarchy

The internal road network has been developed generally in accordance with Rockhampton City Council's Planning Policy No. 13 *Road Hierarchy* and seeks to achieve a safe, efficient and convenient road system. A copy of the proposed road hierarchy plan has been included as **Appendix F**.

A copy of the proposed cross sections is included in **Appendix G.** These cross sections are generally consistent with the dimensional requirements specified in the Capricorn Municipal Development Guidelines (CMDG), however we note that some minor amendments are proposed to address site specific aspects (e.g. roads adjacent to the esplanade and roads split by drainage corridors).

The sections that follow provide detail on the proposed road hierarchy and cross-sections and further justification for any proposed departure from Council's guidelines or policies.

4.3.1 Urban Arterial

Consistent with the transport planning intent of both Council and TMR, the overall masterplan for the site makes allowance for a future Arterial Road through the site to provide connectivity between the Bruce Highway and the existing/planned residential catchments to the west (e.g. Edenbrook).

As shown in the proposed Road Hierarchy plan for the development (refer to **Appendix F**) the eastern section of this connection, between the internal signalised intersection and the access intersection with the Highway at Olive Street, has been identified as an Urban Arterial Road.

It is noted that there isn't a standard cross section for an Urban Arterial within the CMDG, and that Council requires the applicant to provide a cross-section. The proposed cross section for the Urban Arterial in **Appendix G** recommends a four-lane configuration within a 32.5m road reserve, including the provision of 2m on-road bicycle lanes, a 5m centre median and footpaths in both verges. The provision of such a cross section for the Urban Arterial Road is considered to be appropriate to cater for the expected traffic volumes for this section of the internal road network.

Furthermore this section of Urban Arterial Road forms part of the identified connection between the Alexandra Street and Bruce Highway corridors and is intended to service a catchment which extends well beyond the subject site, and as such is trunk infrastructure.

4.3.2 Urban Sub Arterial

The proposed Road Hierarchy plan also identifies the section of road from the southern connection of the internal traffic signals to the intersection with McLaughlin Street, including a portion of the current alignment of William Palfrey Road, as an Urban Sub Arterial.

Appendix G identifies two different cross sections for the Urban Sub Arterial roads throughout the site, one which is predominantly used on the existing William Palfrey Road alignment and another which includes provision for the current Ergon electrical easement within its dividing centre median.

The first cross section recommends a two-lane configuration within a 25.5m road reserve, including the provision 5.5m carriageways, 2m shoulders/on-road bicycle lanes, a 5m centre median and 4.75m verges including footpaths. It is noted that whilst the proposed 25.5m road reserve is narrower than the width specified in the CMDG (30m), the remainder of the individual elements of the cross section (carriageway, verge and median widths) meet or exceed the minimum requirements of the CMDG. As a consequence it is considered that the provision of such a cross section for the Urban Sub Arterial Roads appropriate to cater for the expected traffic volumes for this section of the internal road network.

The overall road reserve width is then increased to 45.5m to incorporate the 15m Ergon easement and adjacent 5m buffer zones within the now 25m central median. It is noted however that all other elements of the Urban Sub Arterial cross section are maintained, including the provision 5.5m carriageways, 2m shoulders/on-road bicycle lanes, a 5m centre median and 4.75m verges including footpaths.

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In addition, the section of roadway identified as Urban Sub Arterial also forms part of the identified connection between the Alexandra Street and Bruce Highway corridors and is intended to service a catchment which extends well beyond the subject site, and as such is considered trunk infrastructure.

4.3.3 Major Urban Collector

As shown on the Road Hierarchy Plan (refer to **Appendix F**) it is proposed that two different types of Major Urban Collector Roads are included within the internal road network for the proposed master planned community.

The first (Major Urban Collector Type 1) is a no-access roadway and is proposed to be located at the start and end of the main, northern east-west roadway within the site. The proposed cross section (as shown in **Appendix G**) identifies a two-lane configuration within a 20.5m road reserve, with provision of a 10m carriageway, including 3.5m traffic lanes and 1.5m shoulders/on-road bicycle lane and 5.25m verges with pathways on both sides of the reserve.

It is noted that all of the individual elements of the proposed cross section meet or exceed the minimum requirements specified for a Major Urban Collector in the CMDG. As such it is therefore considered that the proposed cross section for the non-access Major Urban Collector (Type 1) is acceptable from a traffic perspective.

The second Major Urban Collector identified in the Road Hierarchy Plan incorporates a carriageway split by the main drainage channel which runs through the northern section the site. This portion of the road network is expected to operate as two separate one-way roadways separated by a large centre median (the drainage channel). Several connections be between the two directions of travel are also proposed, mainly adjacent to the intersections with the main north-south minor collector roads.

The proposed cross section for the Major Urban Collector Type 2 (as shown in **Appendix G**) identifies a two-lane configuration within a varying road reserve, with provision of a 5m pavement, incorporating 3.5m traffic lanes and 1.5m shoulders/on-road bicycle lane with an additional 5.25m verge with pathways on both sides of the central drainage corridor. The cross section also identifies the possibility for an optional parking bay to be included on the inside of the roadway, adjacent to the drainage channel. It is again noted that all of the individual elements of the proposed cross section meet or exceed the minimum requirements specified for a Major Urban Collector in the CMDG.

Furthermore, by splitting the carriageway into two separate directions of travel it is anticipated that the traffic volumes for each carriageway will be below the 3,000 vehicles per day threshold for restricted lot access. To this end we believe it is appropriate for the section of road within this master planned community identified as Major Urban Collector (Type 2) to have direct property access.

4.3.4 Minor Urban Collector

Similarly to Major Urban Collectors, the proposed Road Hierarchy plan also identifies two types of Minor Urban Collector Roads within the internal road network of the proposed master planned community.

The first (Minor Urban Collector Type 1) is the main minor collector street utilised in the road network, with the proposed cross section (as shown in **Appendix G**) identifying a two-lane configuration within a 18m road reserve, with provision of a 7.5m carriageway and 5.25m verges with a pathways on one side of the reserve.

It is noted that all of the individual elements of the proposed cross section meet or exceed the minimum requirements specified for a Minor Urban Collector in the CMDG, and as such it is therefore considered acceptable from a traffic perspective.

The proposed Road Hierarchy plan identifies that the Minor Urban Collector (Type 2) is proposed to be utilised for the section of road between the Mixed Use parcel and parkland to the south of the Urban Arterial access road to the development. The proposed cross section for the Type 2 Minor Urban Collector includes the provision of a 7.5m pavement in line with a standard Minor Collector (and CMDG specifications) but also proposes 2.5m parking lanes along both sides of the carriageway. It is also proposed that the standard 18m road reserve width is retained, and that smaller verge widths be provided outside the parking lanes, as additional verge width can be accommodated within the adjacent parkland and within the assumed building setback of the mixed use parcel. This is considered acceptable

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and therefore the proposed cross section for the Minor Urban Collector (Type 2) is deemed appropriate from a traffic perspective.

4.3.5 Access Street

The proposed cross section for the Access Streets within the network (as shown in **Appendix G**) includes a two-lane configuration within a 15m road reserve, with provision of a 7m carriageway and 4m verges. It is noted that whilst the proposed 15m road reserve and 7.0m carriageway are slightly less than the minimum widths specified in the CMDG (16m and 7.5m respectively) they are generally in accordance with the design standards of several other local governments.

Furthermore, the provision of a 7.0m carriageway is in excess of the 5.5m width identified in RRC's City Plan and considered more sufficient to cater for the movement of vehicles in both directions past a parked car. It is therefore considered that the proposed cross section for the Access Streets is acceptable from a traffic perspective.

4.3.6 Access Place

The proposed cross section for the Access Place within the network (as shown in **Appendix G**) includes a two-lane configuration within a 14m road reserve, with provision of a 5.5m carriageway and 4.25m verges. It is noted that whilst the proposed 14m road reserve is slightly less than the minimum width specified in the CMDG (16m) all of the individual elements of the cross section (carriageway and verge widths) meet or exceed the minimum requirements of the CMDG. As such it is therefore considered that the proposed cross section for the Access Streets is acceptable from a traffic perspective.

4.3.7 Esplanade Road

The proposed Road Hierarchy Plan (refer to **Appendix F**) identifies an Esplanade Road along the northern edge of the site, adjacent to the Ramsay Creek corridor. The proposed cross section for the Esplanade Road is identified in **Appendix G** and includes a two-lane configuration, with road element widths generally consistent with an Access Street, which would be the applicable cross section for the expected traffic volumes on these sections of the internal network.

The only variation from the proposed cross section of an Access Street is the provision of a smaller verge on the side of the road reserve abutting the proposed parkland adjacent to Ramsay Creek. This reduced verge width is considered acceptable as the width provided (2m) is considered sufficient to cater for the provision of services and the remainder of the verge width could easily be accommodated within the adjacent parkland. Therefore it is considered that the proposed cross section for the Esplanade Road is acceptable from a traffic perspective.

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4.3.8 Proposed Bus Route and Bus Stop Facilities

The proposed road hierarchy also incorporates bus routes within the site to provide access for residents to public passenger transport. As shown in **Figure 4.3.2a** below it is proposed that the bus route through the site will includes the use of the identified Urban Arterial, Urban Sub Arterial and both Major and Minor Urban Collector roads.

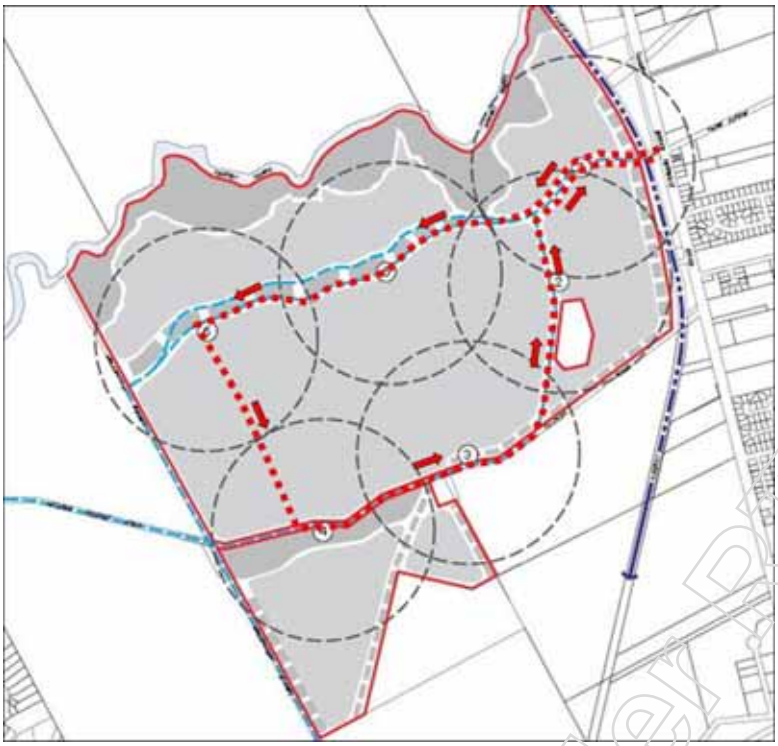

Figure 4.3.2a – Proposed Internal Bus Route

The second plan includedin **Appendix F** shows the above mentioned bus route superimposed over the road hierarchy plan.

Figure 4.3.2a above also identifies indicative bus stop locations throughout the site, whilst the exact locations of the bus stops are to be confirmed, and will be established during the detailed design phase of the project, it can readily be seen that the proposed development will meet the requirement to provide 90% of residents with easy access to public transport facilities (i.e. < 400m walk). Furthermore, it is proposed that bus stops facilities in line with Translink's Regular Stop standards (as shown in **Figure 4.3.2b** below), will be provided at the appropriate locations within the development.

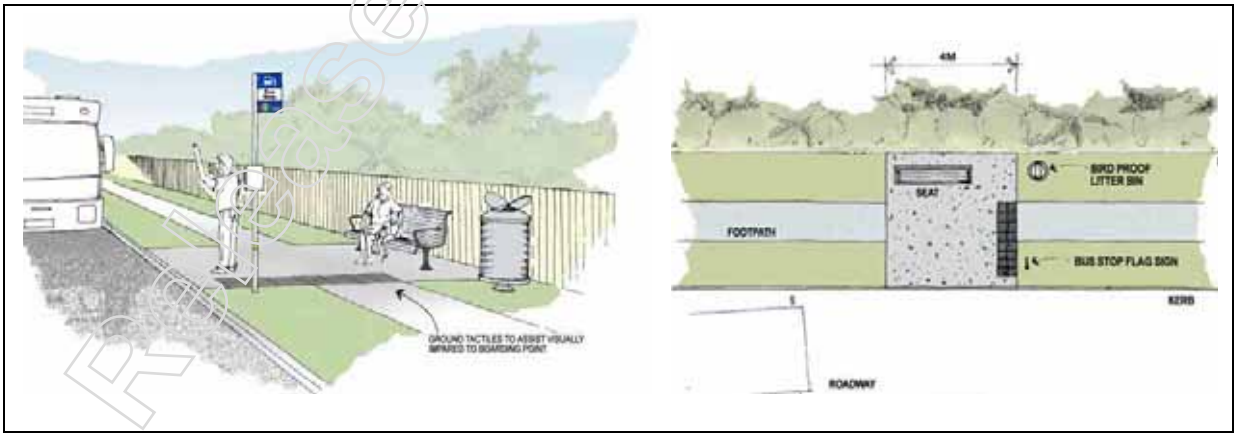

Figure 4.3.2b – Translink Regular Stop

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4.3.9 Compliance with Reconfiguring a Lot Code

The proposed road hierarchy and cross sections will comply with following acceptable solutions of Council's *Reconfiguring A Lot Code*:

- ✓ The driving distance from any allotment to a major street is no more than 700 metres (**A31.1**)
- ✓ No more than three (3) turning movements at intersections or junctions are required in order to travel from any home to the most convenient major street. (**A31.2**)
- ✓ All clusters of more than 100 allotments are provided with at least two (2) alternative accesses to a major road. (**A31.3**)
- ✓ At least 90% of all allotments are located within 400m radial distance from an existing, approved or proposed (as a part of the subdivision) major urban collector road. (**A 32**)

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4.4 Development Staging & Trigger Volumes

As previously mentioned the applicant intends staging the development from east to west, with the internal road network of the development being delivered as required in line with this approach. Access to the development under the early stages will be via the Bruce Highway only and it will not be until the later stages of the development that the western part of the site will be developed and connection provided to McLaughlin Street. As such the transport infrastructure within the site is proposed to be delivered based on trigger volumes of internal traffic.

As part of the first stage of the development traffic signals are required at the Bruce Highway / Olive Street intersection. The geometry of this intersection is shown diagrammatically in **Figure 4.4a**.

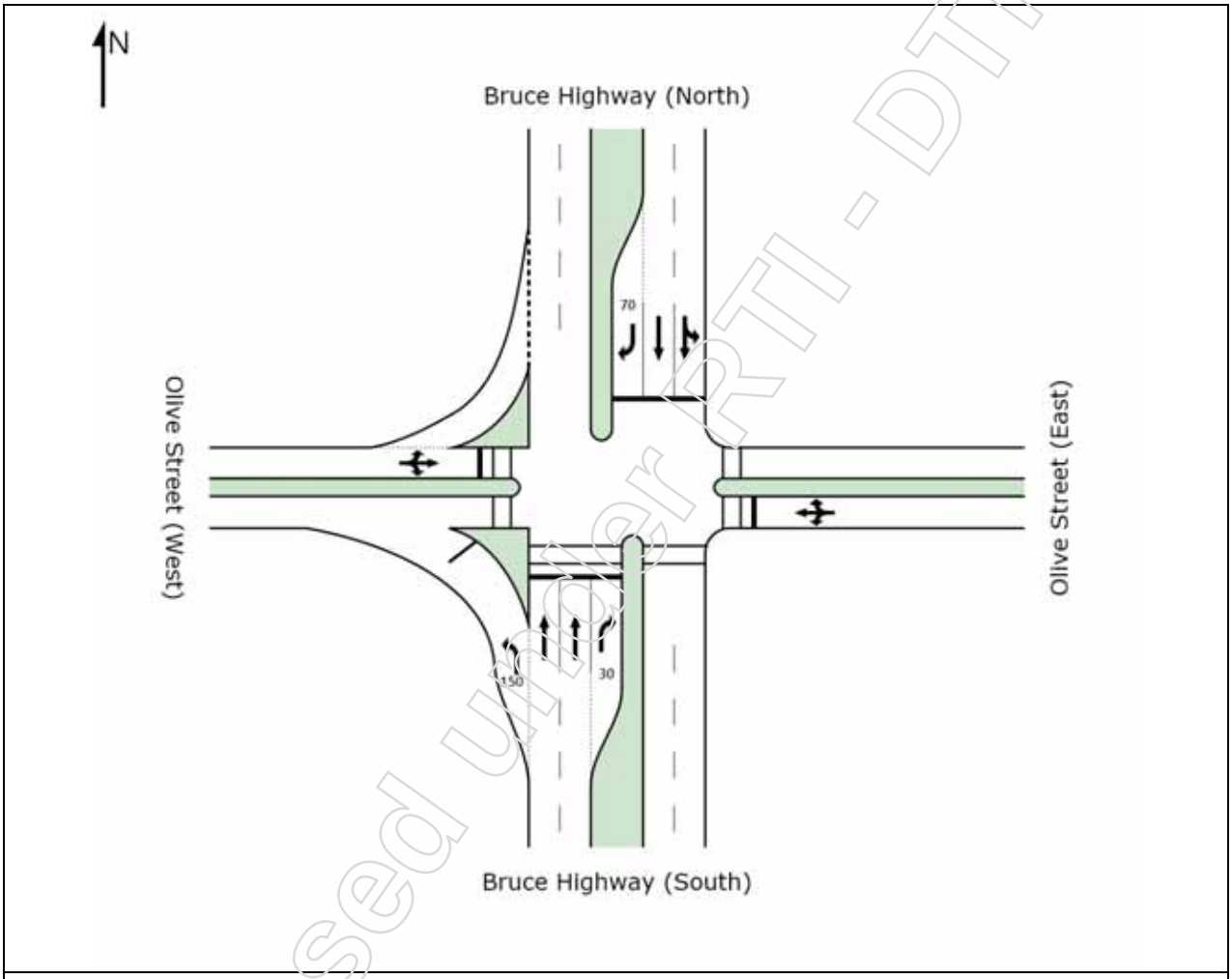

Figure 4.4a: Proposed Interim Four-Way Signalised Intersection Configuration - Bruce Highway / Olive Street Intersection
****NOTE : Values shown on auxiliary lanes indicate storage length only.**

The intersection geometry is expected to operate within the acceptable limit of operation (i.e. 90% degree of saturation) until such time as site generated traffic exceeds 11,475 vehicles per day, or approximately 1,275 detached residential dwellings. It is at this point that the intersection may need to be upgraded to the ultimate configuration **(Trigger 1).**

Initially the urban arterial road will be constructed as a two lane road providing connectivity to the Bruce Highway only. The extent of construction will be limited to that necessary to provide access to the applicable stage of the development.

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Under the ultimate planning intent the north-eastern section of the Urban Arterial Road will have a four lane cross section. However, this will not be required until such time as traffic volumes exceeds 13,000 vehicles per day which approximates 1,450 detached dwellings **(Trigger 2).**

The ultimate geometry for the Bruce Hwy / Olive Street traffic signals has been designed to operate within the acceptable limit of operation (i.e. 90% DOS) for site generate traffic up to approximately 17,100 vehicles per day. This is equivalent to 1,900 lots. Once this trigger has been reached a second point of access to the site is required to accommodate the balance of the development. The second access will be achieved by extending the urban arterial road through to McLaughlin Street **(Trigger 3).**

4.4.1 Trigger 1 – 1,275 dwellings

Traffic signals are proposed at the intersection of the Bruce Highway and Olive Street. The interim geometry shown in **Figure 4.4a** above is expected to reach the acceptable limit of operation (i.e. 90% DOS) when site generated traffic reaches 11,475 vehicles per day, which equates to approximately 1,275 dwellings.

This will be trigger for the construction of the ultimate intersection which is shown diagrammatically in **Figure 4.4.1a** below. For further information regarding the traffic analysis completed to determine this trigger volume please refer to **Section 5.4.1.2** of this report.

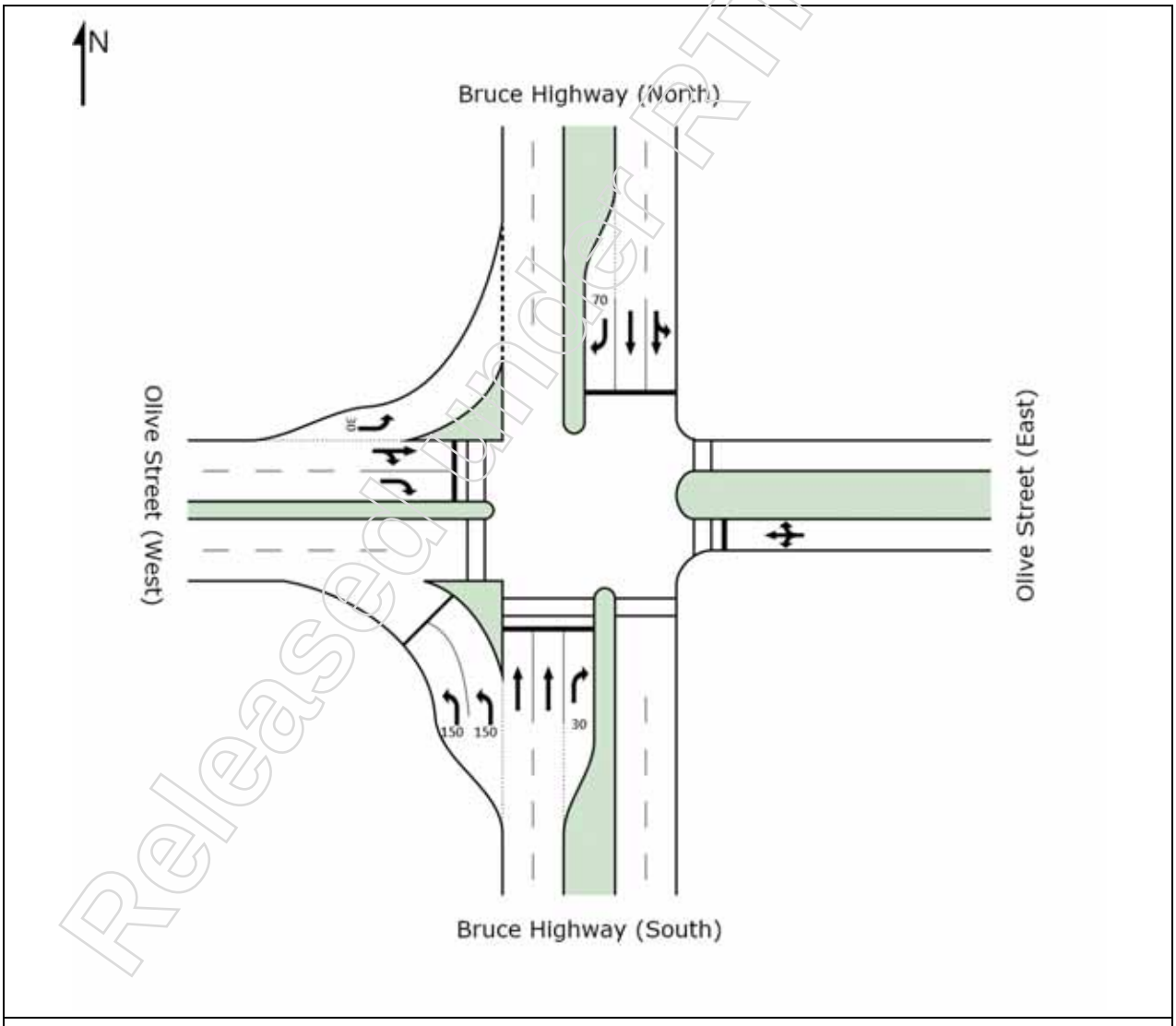

Figure 4.4.1a: Proposed Ultimate Four-Way Signalised Intersection Configuration - Bruce Highway / Olive Street Intersection
****NOTE : Values shown on auxiliary lanes indicate storage length only.**

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4.4.2 Trigger 2 – 1,450 dwellings

Under the ultimate planning intent the north-eastern section of the Urban Arterial Road will have a four lane cross section. However, this will not be required until such time as traffic volumes exceed 13,000 vehicles per day or approximately 1,450 detached dwellings.

The trigger volume of 13,000 vehicles per day was identified as the desirable level of service for a two lane urban arterial roads in the *Rockhampton Traffic Study 2008* report.

4.4.3 Trigger 3 – 1,900 dwellings

The ultimate geometry for the Bruce Hwy / Olive Street traffic signals is expected to operate within the acceptable limit of operation (i.e. 90% DOS) for site generate traffic of approximately 17,100 vehicles per day. This analysis is included in Section 5 of this report. This approximates 1,900 detached dwellings, at which time the urban arterial road through to McLaughlin Street will be constructed.

4.4.4 Delivery of other Parts of the Transport Infrastructure

With the exception of the urban arterial road, there are no trigger volumes which will mandate the delivery of the internal road network. The internal roads will be delivered as necessary to provide access to the relevant stage of the development.

Whilst the current infrastructure charges policy does not recognise the urban arterial or McLaughlin Street as trunk infrastructure they are intended to service a catchment which extends well beyond the subject site. As a consequence, we believe it should be classified as trunk infrastructure and any physical works carried out by the Applicant on these parts of the road network should be creditable against the infrastructure charges paid.

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5.0 Traffic Impact Assessment

5.1 Development Traffic Generation and Distribution

To ensure that the proposed development is in accordance with the overall development yield identified in the PAG development scenario in the *Rockhampton Traffic Study (2008)*, this application seeks preliminary approval for up to 2,350 lots.

The development is also proposed to include approximately 4,500m^2 GFA of non-residential uses including up to 3,500m^2 GFA of retail tenancies. However for the purposes of assessment it has been assumed that the catchments for the non-residential uses will be wholly contained internally within the development, which is considered acceptable for a residential development of this size. As such the traffic generated by the proposed non-residential uses have not been considered when investigating the impact of the proposed development on the external road network.

Using the standard traffic generation rates for residential lots identified in the RTA's *Guide to Traffic Generating Developments* and the proposed development yield, an estimate of the traffic volumes forecast to be generated by the development was established, as summarised in **Table 5.1a** below.

Table 5.1a: Proposed Master Planned Community Ultimate Development Traffic Generation

Use	Yield	Daily Traffic Generation Rate	Daily Traffic Generation	Peak Hour Traffic Generation Rate	Peak Hour Traffic Generation
Standard Residential Lots	2,350 lots	9 trips / lot	21,150 trips	0.85 trips / lot	1,998 trips
		TOTAL	**21,150 trips**	**TOTAL**	**1,998 trips**

The proposed plan of development identifies a connection between McLaughlin Street and the Bruce Highway, via the internal Urban Arterial Road. As such the development is proposed to have two connection points to the external road network, and subsequently it has been assumed that 70% of traffic generated by the development will access the Bruce Highway, whilst the remaining 30% will travel via McLaughlin Street.

These traffic distribution assumptions are believed to be generally consistent with those adopted in the traffic model which underpinned the 2008 *Rockhampton Traffic Study.* A full summary of the traffic distribution assumptions adopted for the analysis of the proposed development can be seen in **Table 5.1b** over page.

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Table 5.1b: Estimated Development Traffic Distribution

Assumed Traffic Distributions	
AM Peak	**PM Peak**
Stockland North Parkhurst Development	
Arrival / Departure Split ▪ 30% Incoming to Development; ▪ 70% Outgoing from Development. ***External Network Distribution*** ▪ 70% to/from the Bruce Highway; of which • 10% to/from Bruce Highway (North); and • 90% to/from Bruce Highway (South). ▪ 30% to/from the McLaughlin Street.	***Arrival / Departure Split*** ▪ 60% Incoming to Development; ▪ 40% Outgoing from Development. ***External Network Distribution*** ▪ 70% to/from the Bruce Highway; of which • 10% to/from Bruce Highway (North); and • 90% to/from Bruce Highway (South). ▪ 30% to/from the McLaughlin Street.
300 Lots from Adjacent Edenbrook Development (Approved)	
Arrival / Departure Split ▪ 30% Incoming to Development; ▪ 70% Outgoing from Development. ***External Network Distribution*** ▪ 100% to/from the Bruce Highway; of which • 10% to/from Bruce Highway (North); and • 90% to/from Bruce Highway (South).	***Arrival / Departure Split*** ▪ 60% Incoming to Development; ▪ 40% Outgoing from Development. ***External Network Distribution*** ▪ 100% to/from the Bruce Highway; of which • 10% to/from Bruce Highway (North); and • 90% to/from Bruce Highway (South).

It is also important to note that the proposed east-west arterial road will also provide connectivity to other residential land uses along the Alexandra Street corridor (e.g. Edenbrook). Therefore as part of the analysis of the proposed access intersection with the Bruce Highway we have conservatively assumed that 30% or 300 of the approved lots (999 lots) within the adjacent Edenbrook development will access the Bruce Highway at this location.

Figure 5.1a and **Figure 5.1b** below show the assumed development volumes at the proposed access intersection with the Bruce Highway for the both the AM and PM peak hours based on the assumptions above. It is noted that at the request of Council a volume of 50 vph has been assigned to the through movements between Olive Street East and West during the AM peak hour to represent the expected traffic movements between the proposed development and the Parkhurst State School on the eastern side of the Highway.

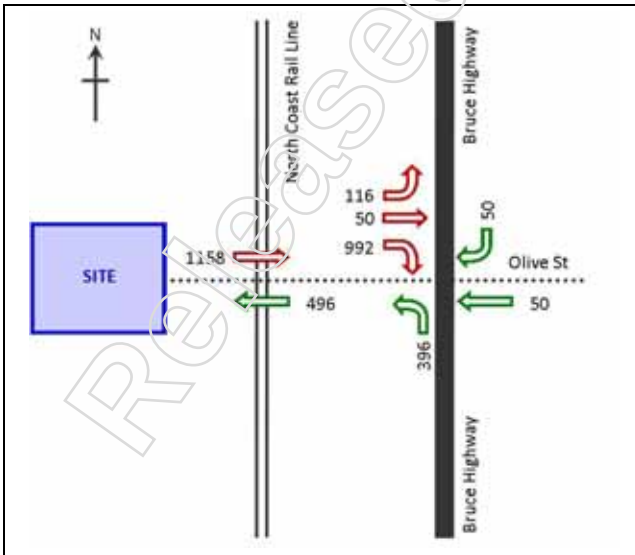

Figure 5.1a: Development Traffic Volumes (AM Peak)

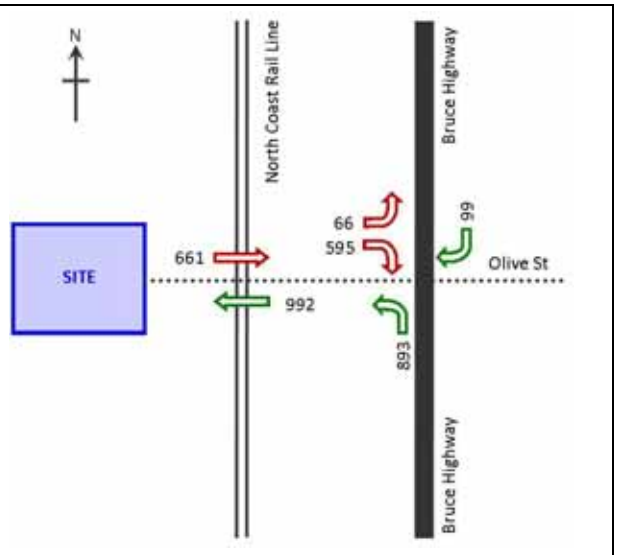

Figure 5.1a: Development Traffic Volumes (PM Peak)

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The peak hour development traffic volumes identified for the proposed access intersection above were then distributed along Bruce Highway corridor through Parkhurst, with the volumes at the each of the relevant intersections including Olive Street, Boundary Road (East), Boundary Road (West) and Yeppoon Road summarised in **Figure 5.1c** below.

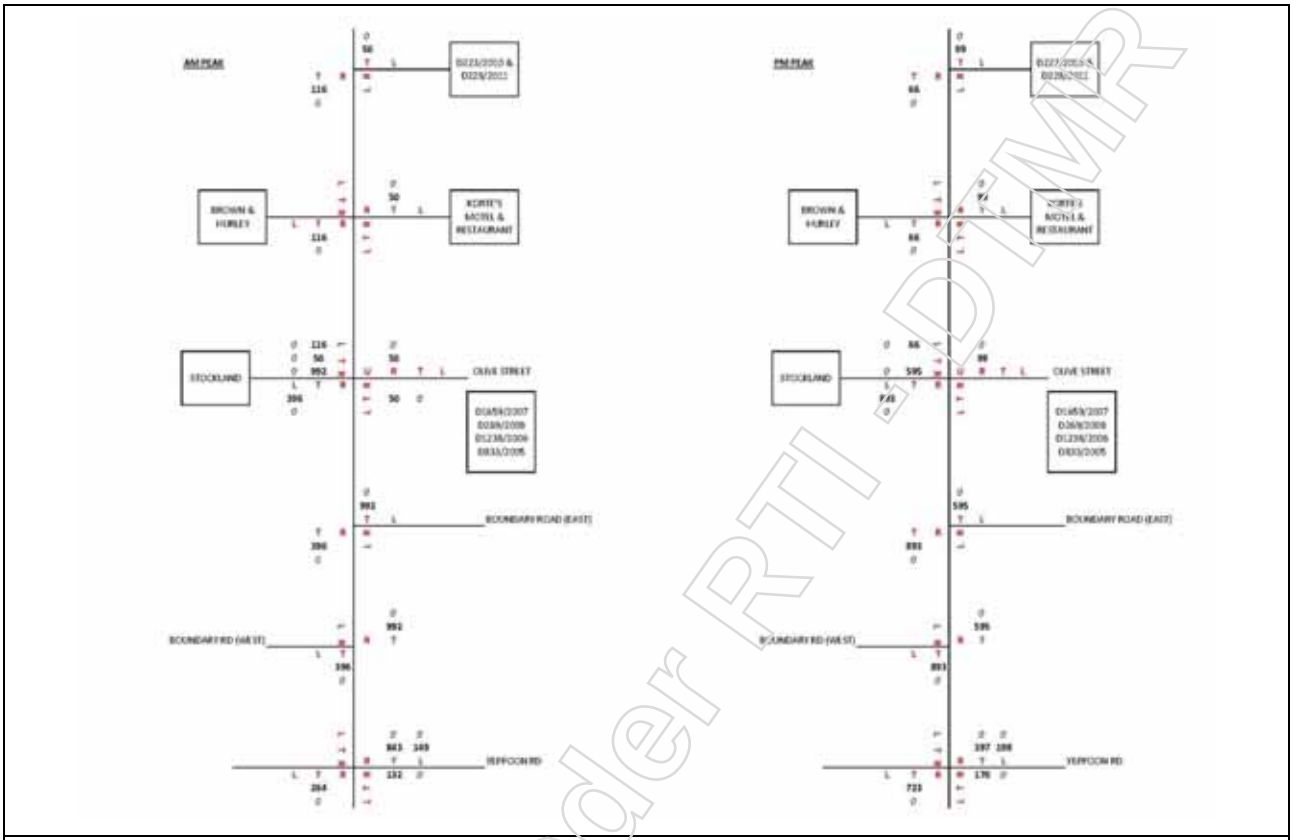

Figure 5.1c: Stockland North Parkhurst - Development Traffic Volumes (Bruce Highway Corridor)

5.2 Pre Development Traffic

To establish the background traffic volumes on the surrounding road network, the latest intersection count data for the relevant intersections along the Bruce Highway corridor were obtained from the Department of Transport and Main Roads (TMR). These included the intersections of the Bruce Highway with Olive Street, Boundary Road (East), Boundary Road (West) and Yeppoon Road. This data was collected via manual turning counts at the intersections which were undertaken throughout 2012, with the raw data for each intersection included as **Appendix H**.

For the purpose of the analysis it has been assumed that full build-out of the proposed master planned community would occur by 2025, resulting in a 10 year design horizon for the development of 2035. It is noted that whilst this assumption regarding the timing of the development has been made, the timing of the key milestone dates identified above will ultimately be determined by the physical sales rate and construction of the proposed lots, and as such may be beyond those assumed for the purpose of this analysis.

Notwithstanding the above, due to the variable nature of traffic networks and the possibility of changes to the forecast traffic characteristics as a result of a number of external factors, it is considered impractical to try and forecast traffic conditions past 2035 as the longer period the current data is extrapolated (especially for periods over 20 years) the less likely that the resultant traffic volumes will be an accurate representation of the future network volumes.

To establish the expected future background traffic volumes at the proposed access intersection location a growth rate of 1% p.a. (compound) was conservatively applied to the through movements on the Bruce Highway. The resultant background traffic volumes along the Parkhurst Bruce Highway corridor can be seen in **Appendix I**.

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In addition to the background traffic volumes on the Bruce Highway, the traffic volumes expected to be generated by developments already approved in the Parkhurst corridor were also considered at the request of both Rockhampton Regional Council and TMR. These developments included Korte's Motel and Restaurant development, the proposed 1 into 5 ROL application over the Brown and Hurley site, several residential developments on the eastern side of the Bruce Highway (D223/2010, D228/2011, D1659/2007, D269/2008, D1238/2006 and D833/2005) and the retail development (shopping centre) on the corner of Boundary Road East and the Highway.

The traffic generation and distribution from these additional developments were based on the *Traffic Impact Assessment* reports submitted for each application. Where such reports were unavailable the traffic distributions adopted were in accordance with those identified in TMR's future planning network spreadsheet models. The traffic calculations for each of the existing approved developments for both the assumed 2025 and 2035[1] road networks can be seen in **Appendix J** with the forecast development volumes at the relevant intersections along the Parkhurst Bruce Highway corridor also included.

It is noted that the inclusion of additional traffic from the approved developments identified above **in addition** to the application of the proposed 1% p.a. compound growth rate for the through movements on the highway is expected to exceed the historical growth rate (1.5% p.a. compound) identified for this section of the highway by TMR, as shown in **Table 5.2a** below.

Table 5.2a: Adopted Background Traffic Growth Rate

Scenario	Traffic Volumes (vph)		Growth Rate	
	AM Peak	PM Peak	AM Peak	PM Peak
2012 Bruce Highway / Olive Street Count Volumes	942 (120)	920 (94)		
Forecast 2025 Pre Development Volumes	1,364 (139)	1,476 (106)	2.71%	3.48%
Forecast 2025 Pre Development Volumes	1,414 (153)	1,584 (117)	1.78%	2.39%

Note: Volumes calculated for midblock section south of Olive Street based on recorded and forecast Bruce Highway / Olive Street intersection volumes. All growth rates identified are compound growth rates per annum.

The pre development volumes were then calculated by combining the forecast background traffic volumes with the volumes generated by the approved developments previously identified. The resultant 2025 and 2035 AM and PM peak pre development traffic volumes for the road network are summarised in **Figure 5.2a** and **Figure 5.2b** below.

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[1] The 2035 road network assumes the connection of the two sections of Norman Road has been completed (in 2031 as per Council's Infrastructure Charges Resolution Ver2), thus leading to a redistribution of the development traffic for the approved developments east of the Bruce Highway.

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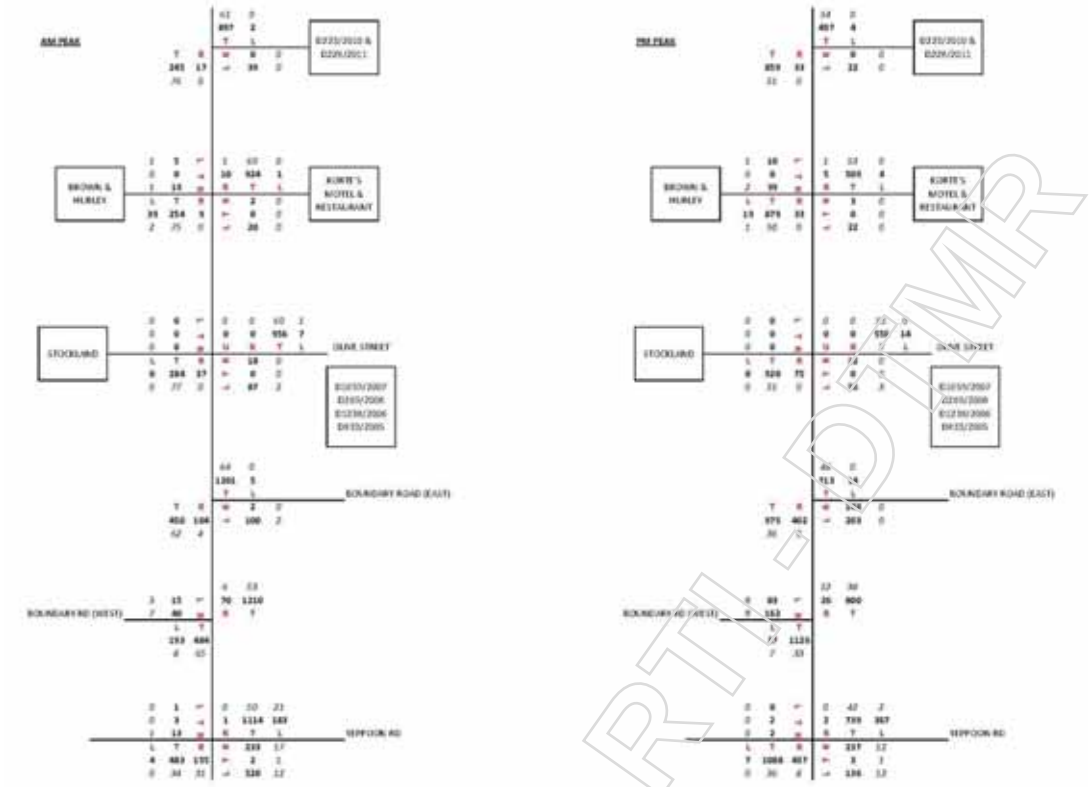

Figure 5.2a: 2025 Pre Development Traffic Volumes (Bruce Highway Corridor)

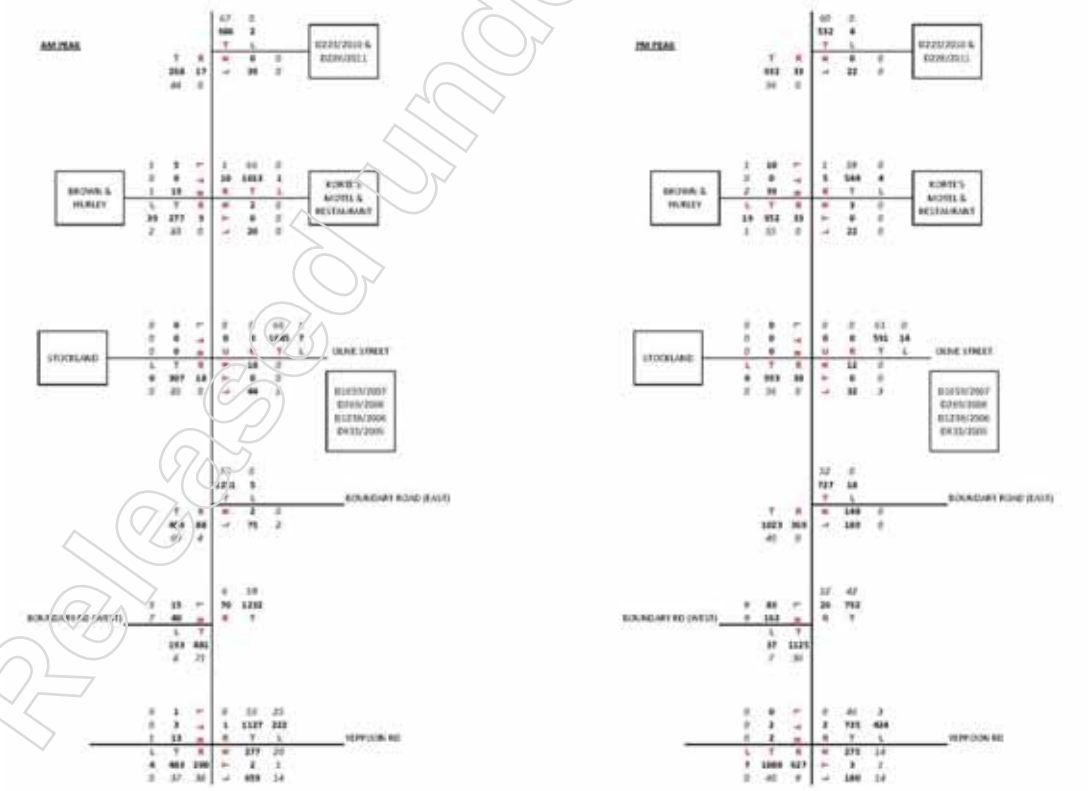

Figure 5.2b: 2035 Pre Development Traffic Volumes (Bruce Highway Corridor)

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5.3 Post Development Traffic

Using the volumes predicted to be generated by the proposed development, those by the already approved developments in the surrounding area and the forecast background traffic volumes, the post development traffic conditions at the relevant intersections along the Bruce Highway corridor through Parkhurst were analysed.

This analysis was completed for both the identified AM and PM peak periods, at the year of completion (2025) and the ten year design horizon (2035). The resultant 2025 and 2035 peak hour post development traffic volumes for the road network are summarised in **Figure 5.3a** and **Figure 5.3b** below.

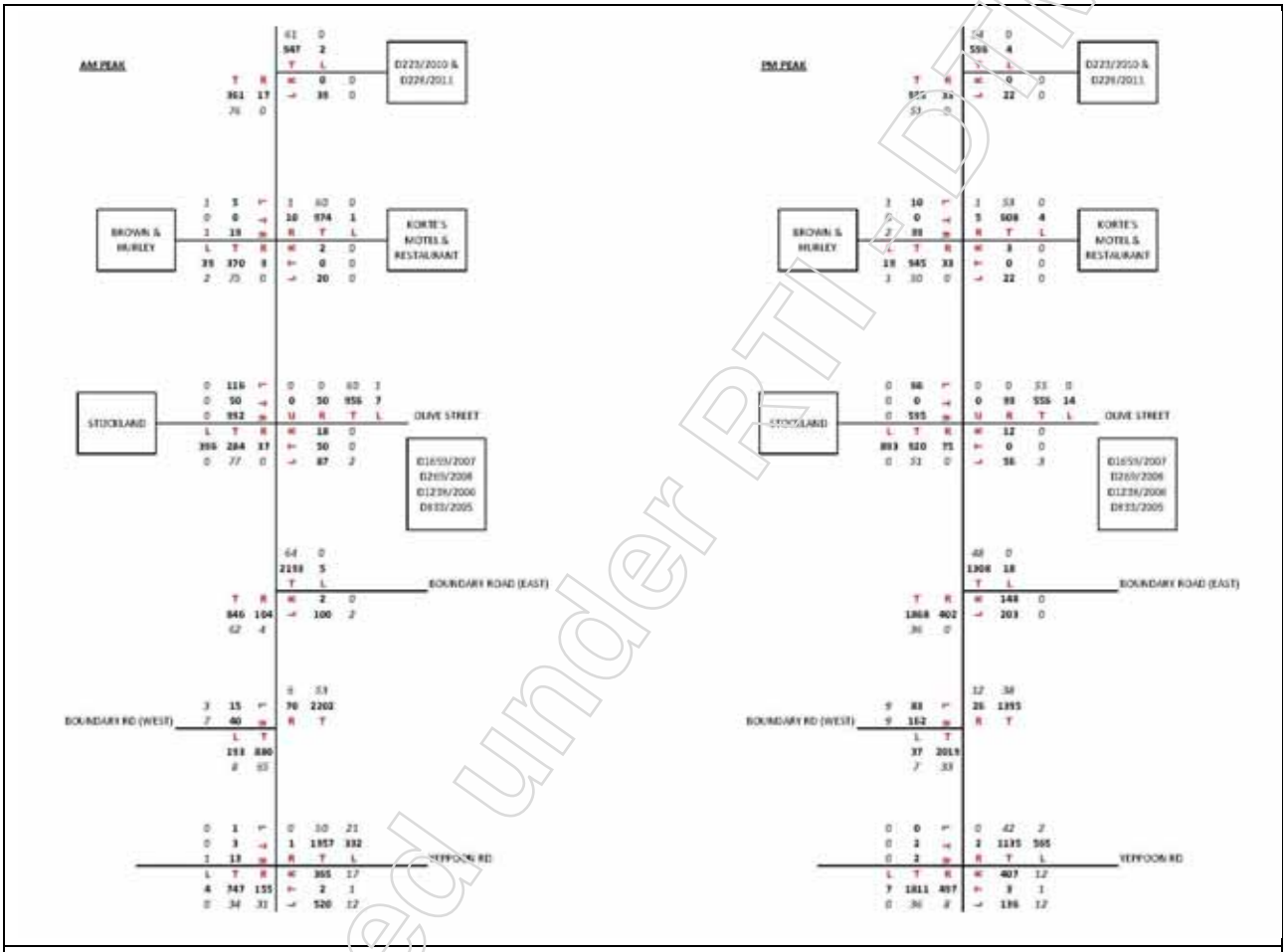

Figure 5.3a: 2025 Post Development Traffic Volumes (Bruce Highway Corridor)

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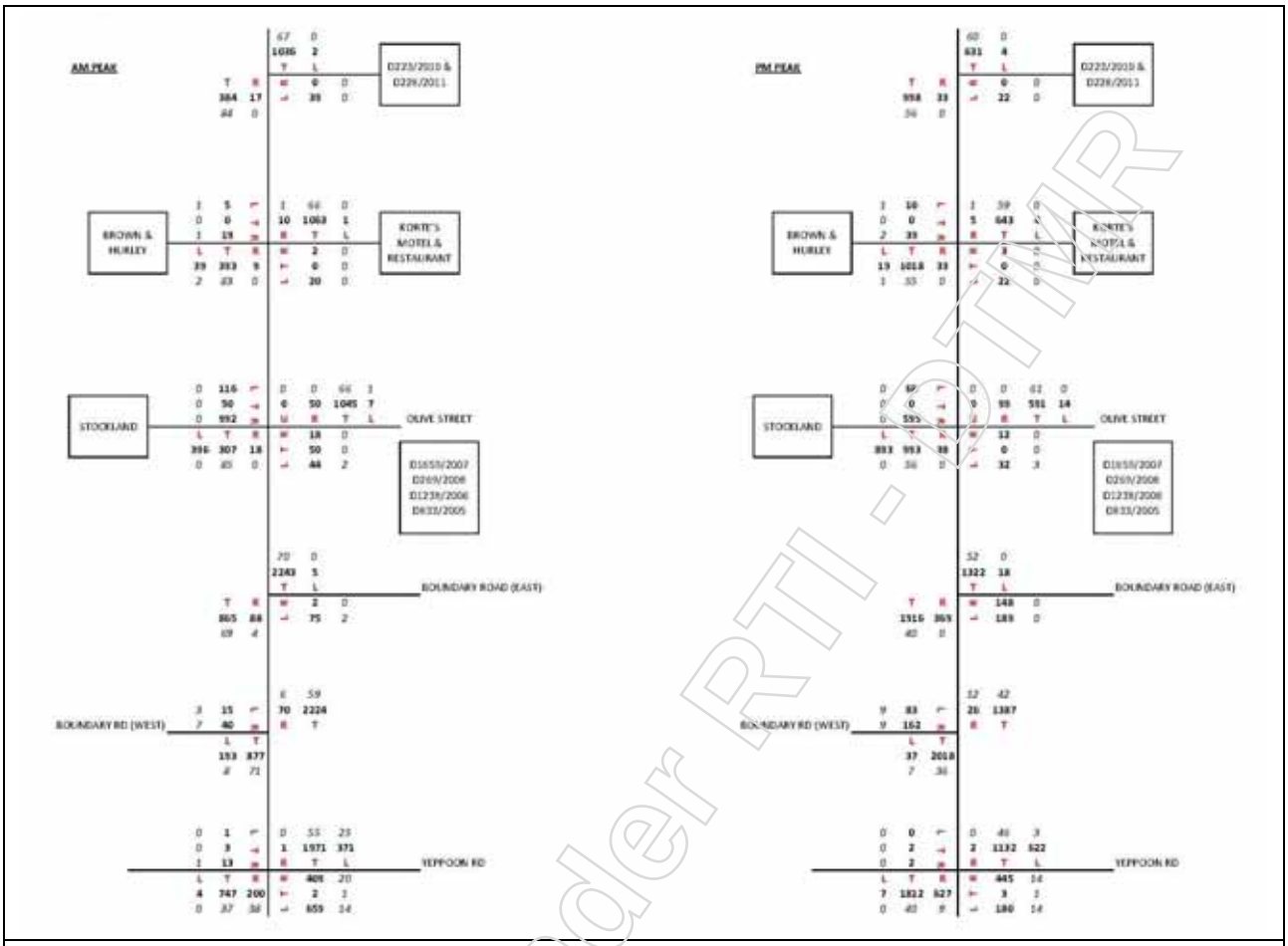

Figure 5.3b: 2035 Post Development Traffic Volumes (Bruce Highway Corridor)

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5.4 Traffic Impact Assessment

As previously mentioned analysis has been completed to determine the impact of the proposed master planned community on both the state and local government controlled external road networks. The investigation into the operation of the state controlled road network will focus on the relevant section of the Parkhurst Bruce Highway corridor, including the major intersections, whilst the assessment of the impact on the local government controlled network will focus on the Alexandra Street corridor.

5.4.1 State Controlled Road Network Analysis

An investigation into the impacts of the proposed development on the state controlled road network has been completed, with analysis being undertaken on the relevant section of the Bruce Highway (Yeppoon Road to Olive Street) including mid-block volumes and the operation of the major intersections of:

- Olive Street (Interim and Ultimate configurations);
- Boundary Road (East);
- Boundary Road (West); and
- Yeppoon Road.

These analyses are discussed in further detail in the following sections.

5.4.1.1 Midblock Volumes – Capacity of Current Cross Section

TMR has previously advised that the desired maximum daily flow and hence trigger volume for an upgrade from two lanes to four is 15,000 vehicles per day. Whilst Annual Average Daily Traffic (AADT) segment volumes for the relevant sections of the highway are currently available, these do not include the additional traffic generated by the approved developments in the area and as such do not provide an accurate representation of the expected pre-development traffic volumes.

The mid-block volumes have been derived from the pre-development intersection volumes. This was achieved by extracting the approach and departure volumes. **Figure 5.4.1.1a** below identifies the intersection volumes and corresponding mid-block volumes for the forecast 2013 pre development traffic scenario.

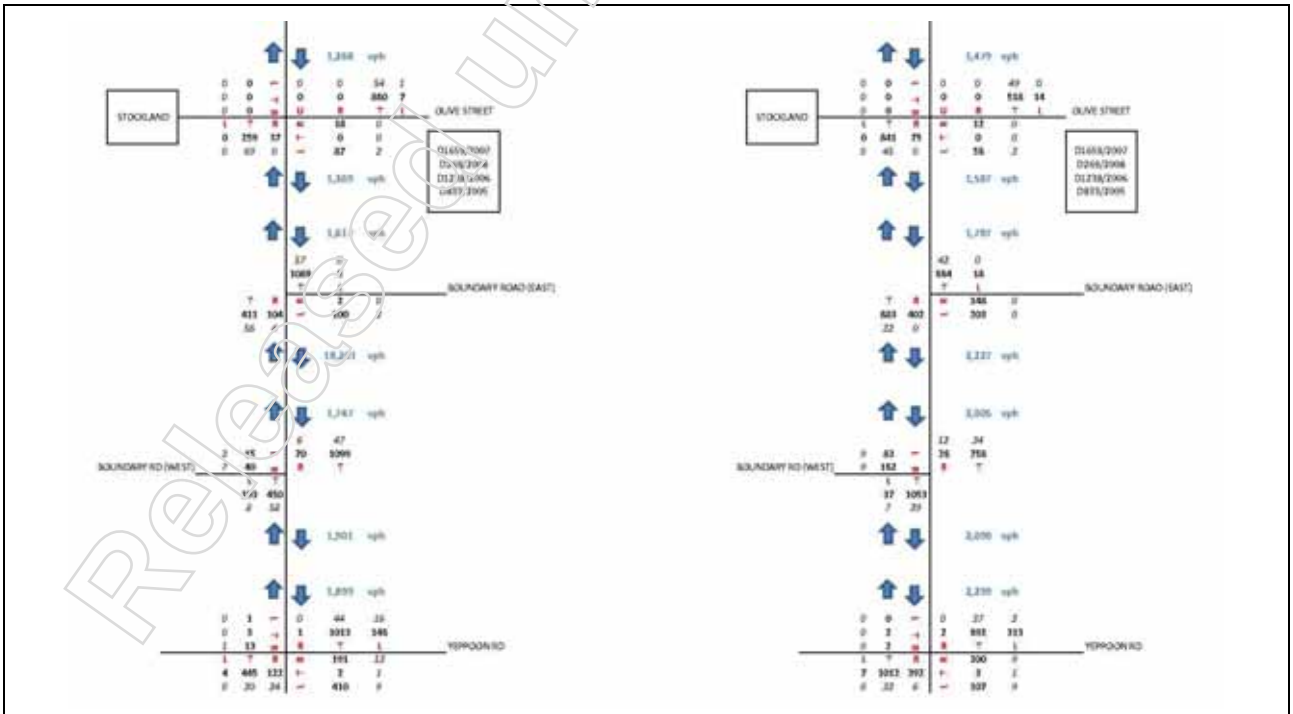

Figure 5.4.1.1a: 2013 Forecast Peak Hour Mid-Block Traffic Volumes (Bruce Highway Corridor)

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Section 5.2 of TMR's *Road Planning and Design Manual* describes the generally accepted method of applying a factor of ten (10) for urban arterial roads to calculated peak hour volumes from daily traffic volumes, and vice versa. By applying this factor of ten to the peak hour mid-block values shown above the expected daily volumes were estimated, as shown in **Figure 5.4.1.1b** below.

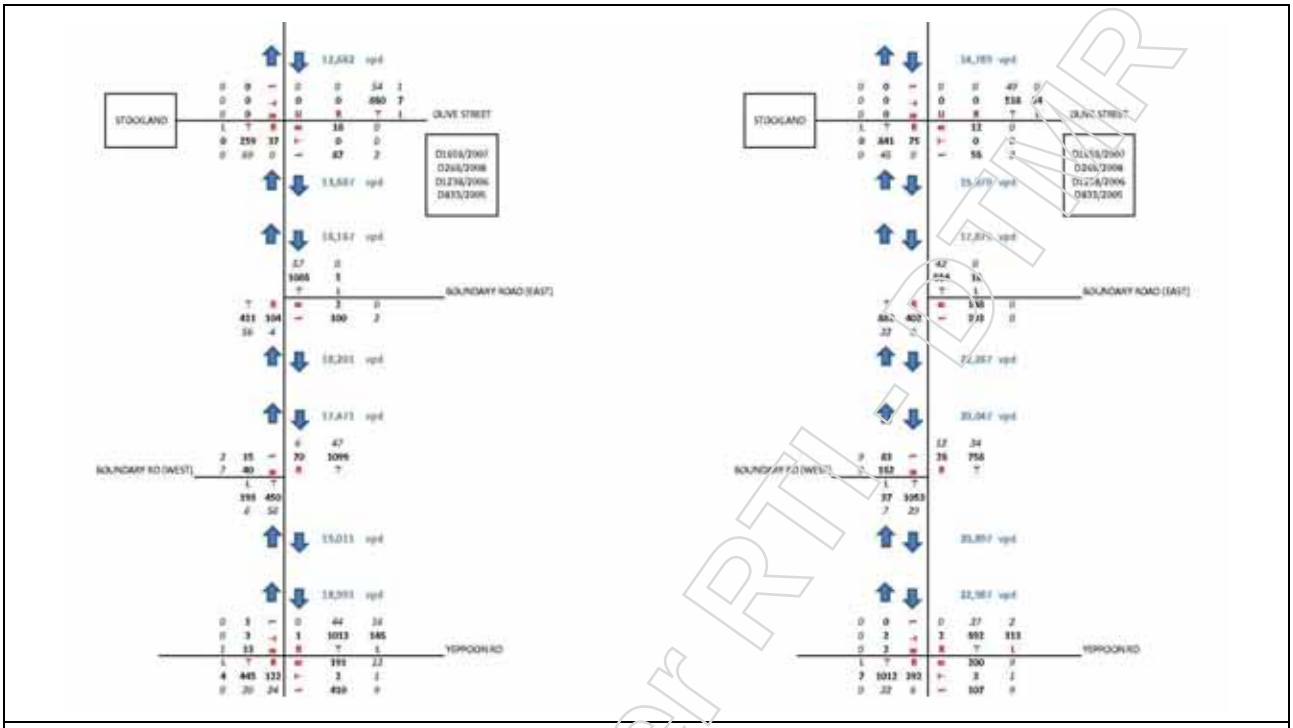

Figure 5.4.1.1b: 2013 Forecast Daily Mid-Block Traffic Volumes (Bruce Highway Corridor)

From the values identified in the figure above it can be seen that the expected pre development daily mid-block volumes on each relevant section of the Bruce Highway between Yeppoon Road and Olive Street exceed the TMR trigger volume of 15,000 vehicles per day. These values also therefore validate both DTMR's future intent for this road corridor and current planning studies, as well as the recommendation from the 2008 *Rockhampton Traffic Study* (prepared by Arup) that the initial section of the Highway (Yeppoon Road to Boundary Road (East) required duplication by 2011.

As such it is expected that an upgrade of the Highway from two to four lanes, including the provision of additional through lanes at existing intersections, will be required regardless of the construction of the proposed North Parkhurst development.

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5.4.1.2 Bruce Highway / Olive Street

The analysis of the intersections was then completed using SIDRA 5.1 software, adopting a proposed four-way signalised intersection for the Bruce Highway / Olive Street intersection in accordance with the future planning intent of both TMR and Council.

As previously mentioned, an interim intersection configuration has been proposed to accommodate the traffic generated by the initial stages of the development, and an upgrade trigger of 1,275 lots identified as the limit of operation for the proposed interim configuration. As such traffic analysis has been completed to confirm this proposed upgrade trigger, with the assumptions and results of the analysis described below.

For the purpose of analysis the majority of the traffic assumptions listed in **Table 5.1a** and **Table 5.1b** were adopted, however as is anticipated that a connection to the west (i.e. McLaughlin Street) would not be provided as part of the works for the initial 1,000 lots, it has been assumed that 100% of the traffic from these lots would access the external road network via the proposed signals at the Bruce Highway / Olive Street intersection.

In addition, the identified design horizon for the overall development (2035) has been conservatively been adopted for the analysis of the interim configuration for the initial 1,275 lots to verify the proposed intersection upgrade trigger. The interim intersection configuration adopted for the analysis of the proposed Bruce Highway / Olive Street intersection upgrade trigger (1,275 lots) can be seen in **Figure 5.4.1.2a** below.

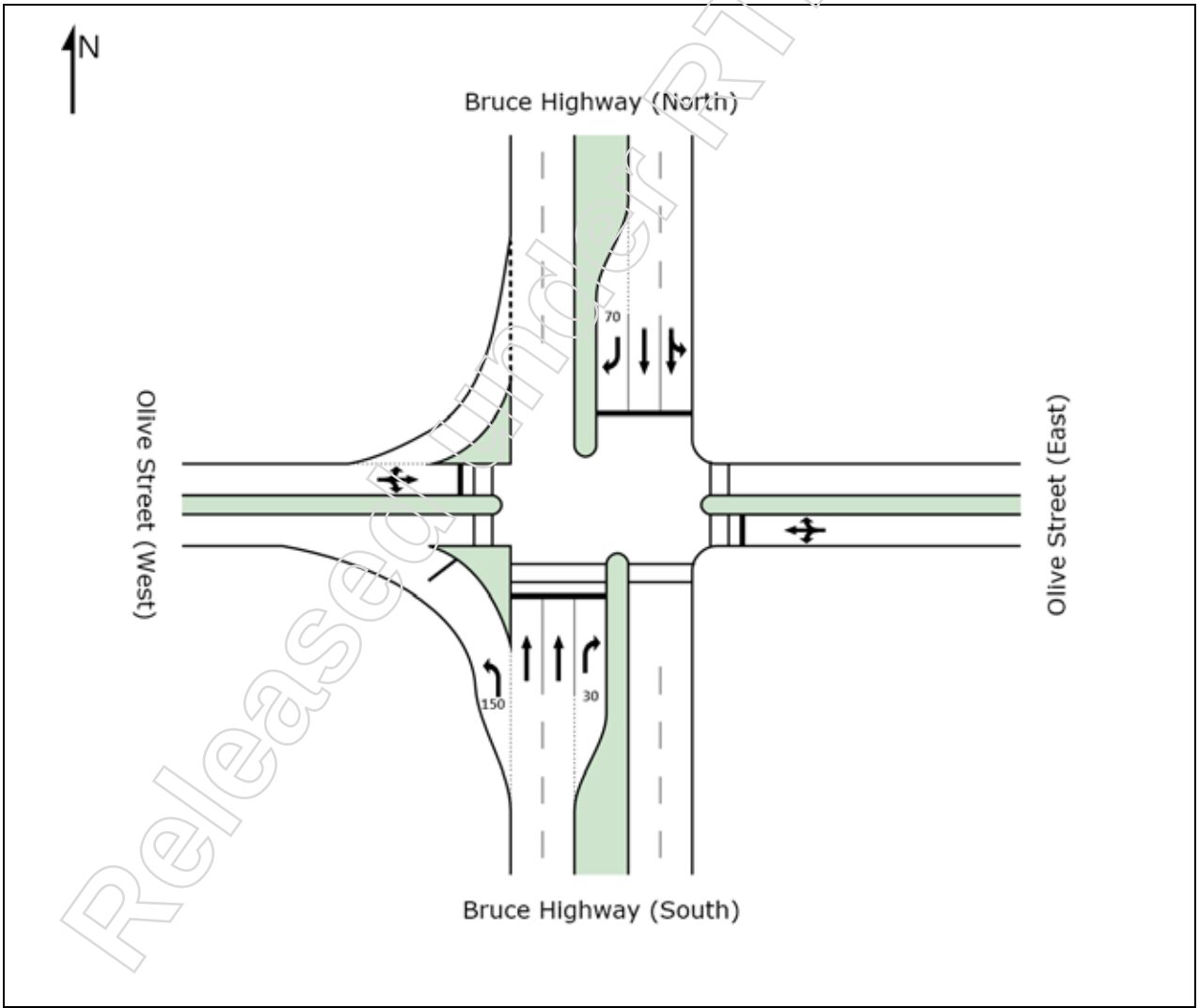

Figure 5.4.1.2a: Proposed Interim Four-Way Signalised Intersection Configuration - Bruce Highway/Olive Street Intersection
****NOTE : Values shown on auxiliary lanes indicate storage length only.**

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The interim intersection configuration identified above includes the provision of a four lane cross section for the Highway which in Section 5.4.1.1 was identified to be required regardless of the development due to the forecast pre development mid-block volumes exceeding 15,000 vehicles per day which triggers the need for TMR to four-lane the Bruce Highway between Yeppoon Road and Olive Street, which would include the southern approach to this intersection.

It is also noted that the required storage lengths of the auxiliary lanes for the left turn into the site from the south and the right turn from the north have been sized to accommodate the expected queue lengths developed during a train passing over the proposed level crossing on the new access road into the site. These storage lengths have been calculated assuming a two and a half minute delay to vehicles at the level crossing.

A four (4) phase signal configuration with pedestrian crossings on the southern (staged), eastern and western approaches was adopted for the purpose of the intersection analysis. The modelled phasing is shown in **Figure 5.4.1.2b** below.

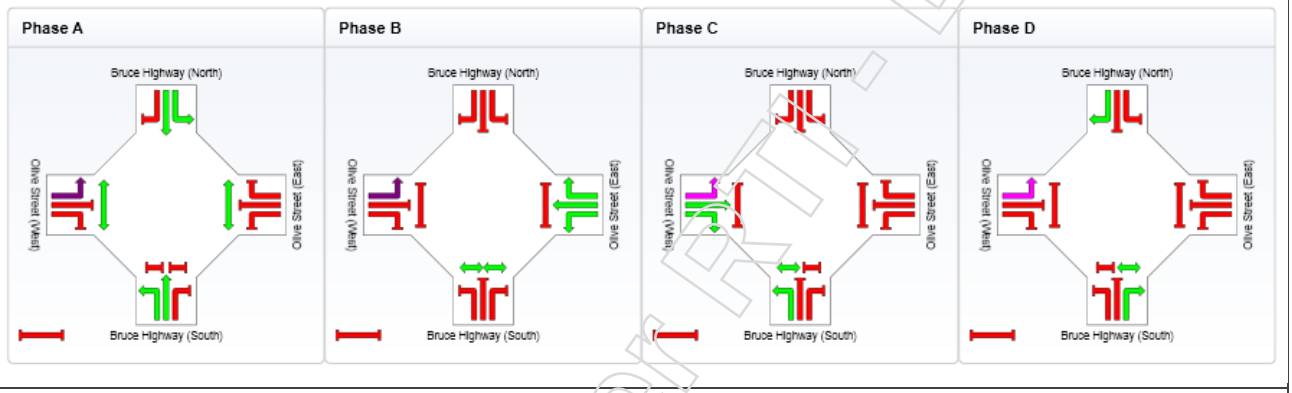

Figure 5.4.1.2b: Adopted Signal Phasing – Bruce Highway / Olive Street Intersection

The results of the analyses detailing the predicted operation of the proposed interim configuration of the Bruce Highway / Olive Street intersection for the adopted design horizons have been included within **Appendix K**, with a summary of the results provided in **Table 5.4.1.2a** below.

Table 5.4.1.2a: Summary of SIDRA Analysis Results – Bruce Highway / Olive Street Intersection – Interim Configuration Post Development Scenarios – Proposed Signalised Intersection Configuration

Intersection	Intersection Control	Year	Peak Hour	DOS %
Interim (1,275 Lots) Bruce Highway / Olive Street	Four-way Signalised	2035	AM	**89.3**
			PM	**67.4**

From the results above it can be seen that the proposed interim four-way signalised intersection configuration of the Bruce Highway / Olive Street intersection is expected to operate satisfactorily up to the proposed intersection trigger (1,275 lots) with all calculated values for intersection Degree of Saturation (DOS) for the assumed post development scenarios within the acceptable limits of operation (90%) for signalised intersections.

Once the identified development trigger (1,275 lots) has been reached[2], it is proposed that the intersection will be upgraded to the identified ultimate intersection configuration. This ultimate intersection configuration includes an additional entry and exit lane on the western approach leg to the intersection, as well as an additional signalised left turn lane into the site from the southern Bruce Highway approach.

[2] Note – Development trigger may be extended beyond 1,275 lots if subsequent traffic analysis identifies the interim intersection configuration will operate within acceptable limits of operation for a signalised intersection.

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The ultimate configuration for the Bruce Highway / Olive Street intersection adopted during the analysis of the post development traffic conditions for the development can be seen in **Figure 5.4.1.2c** below.

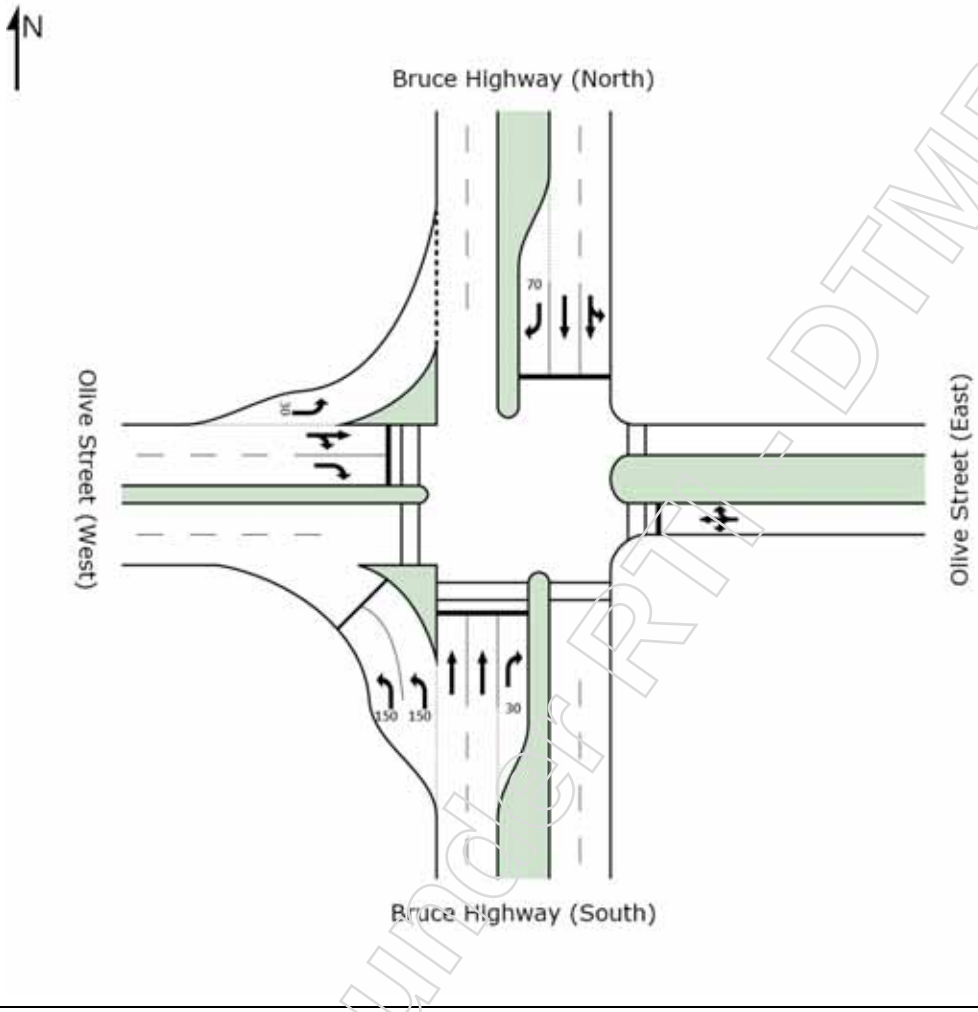

Figure 5.4.1.2c: Proposed Four-Way Signalised Intersection Configuration - Bruce Highway / Olive Street Intersection
****NOTE : Values shown on auxiliary lanes indicate storage length only.**

Again a four (4) phase signal configuration with pedestrian crossings on the southern (staged), eastern and western approaches was adopted in the analysis with a summary of the phasing used shown in **Figure 5.4.1.2d** below.

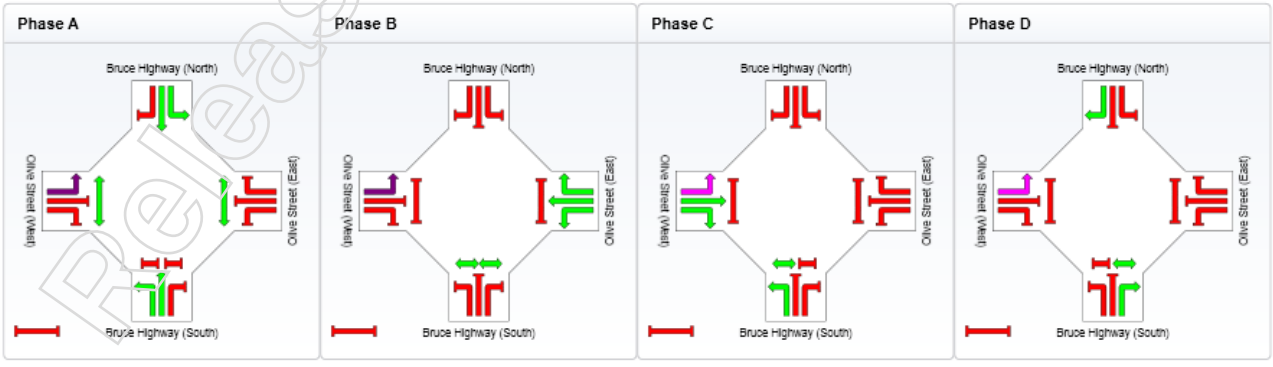

Figure 5.4.1.2d: Adopted Signal Phasing – Bruce Highway / Olive Street Intersection

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The results of the analyses detailing the predicted operation of the proposed Bruce Highway / Olive Street intersection for the forecast post development traffic conditions are attached as **Appendix K.** A summary of these results is provided in **Table 5.4.1.2b** over page.

Table 5.4.1.2b: Summary of SIDRA Analysis Results – Bruce Highway / Olive Street Intersection – Ultimate Configuration Post Development Scenarios – Proposed Signalised Intersection Configuration

Intersection	Intersection Control	Year	Peak Hour	DOS %
Bruce Highway / Olive Street	Four-Way Signalised	2025	AM	**84.0**
			PM	**74.9**
		2035	AM	**84.3**
			PM	**73.8**

From the results above it can be seen that the proposed ultimate configuration of the four-way signalised intersection of the Bruce Highway / Olive Street intersection is expected to operate satisfactorily for all post development scenarios, with all calculated values for intersection Degree of Saturation (DOS) below the acceptable limit of operation (90%) for signalised intersections.

5.4.1.3 Bruce Highway / Boundary Road (East)

Following consultation with TMR the signalised configuration of the Boundary Road (East) / Bruce Highway intersection conditioned as part of a recently approved shopping centre development (on Boundary Road East) was identified, as shown in **Figure 5.4.1.3a** below.

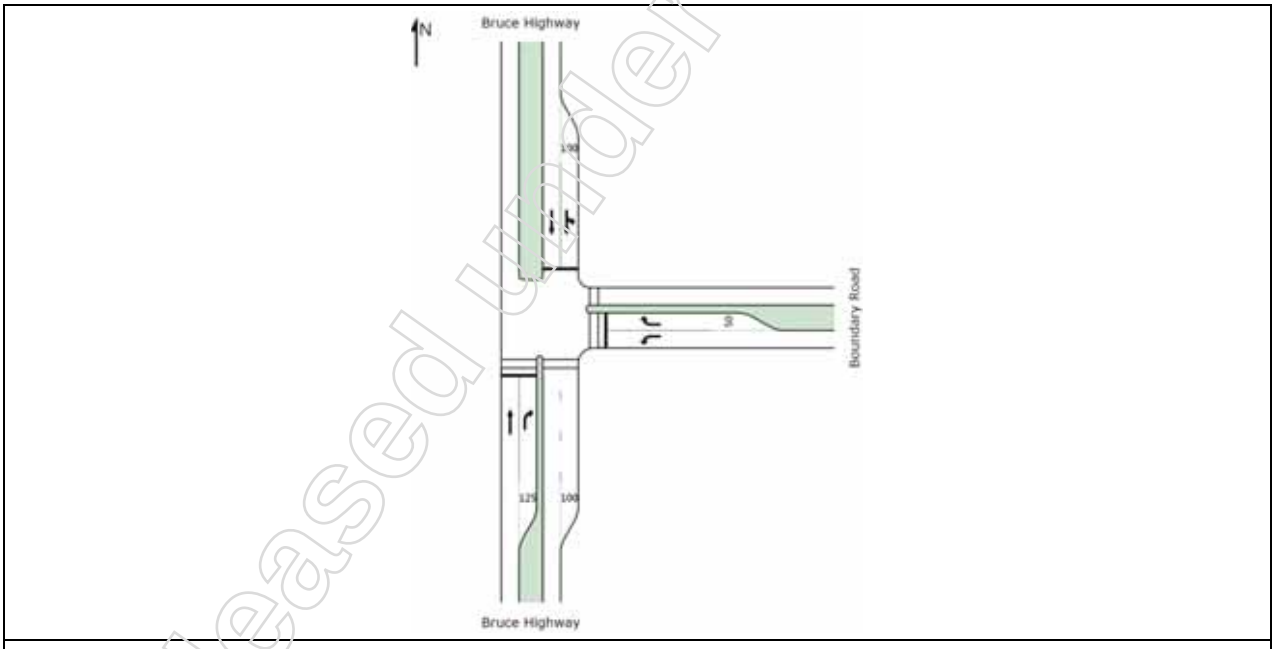

Figure 5.4.1.3a: Approved Signalised Intersection Configuration - Bruce Highway / Boundary Road (East) Intersection

It is noted that the geometry indicated in this approved intersection configuration only provides one through lane for northbound traffic and a short secondary through lane for southbound traffic. Therefore to align with the previously identified requirement for a four lane cross section of the Highway on both approaches to the intersection, an alternative, upgraded intersection configuration to address this existing deficiency has been proposed as shown in **Figure 5.4.1.3c** below.

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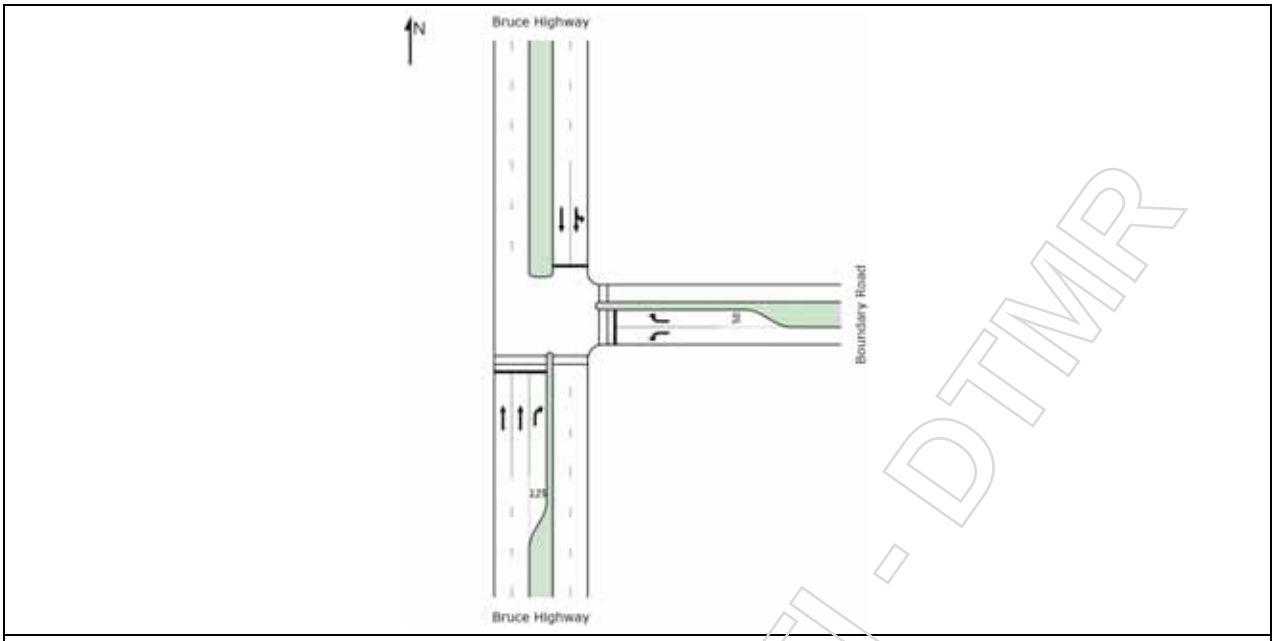

Figure 5.4.1.3c: Upgraded Intersection Configuration - Bruce Highway / Boundary Road (East) Intersection

A three (3) phase signal configuration with pedestrian crossings on the southern and eastern approaches was adopted for the purpose of the intersection analysis. A generalised summary of the adopted signal phasing is shown in **Figure 5.4.1.3b** below.

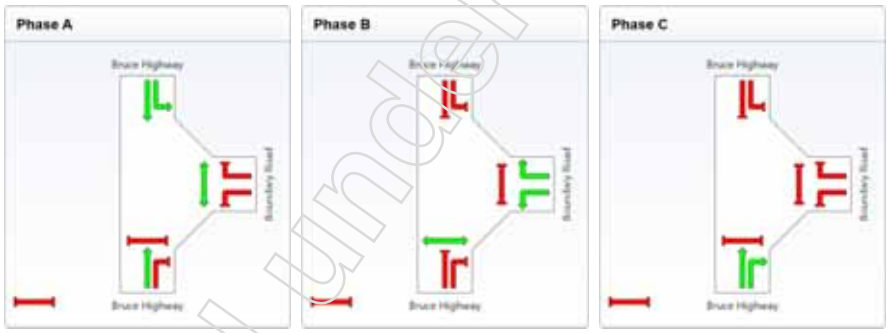

Figure 5.4.1.3b: Adopted Signal Phasing – Bruce Highway / Boundary Road (East) Intersection

The results of the analyses detailing the predicted operation of the proposed upgraded configuration of the Bruce Highway / Boundary Road (East) intersection for the forecast post development traffic conditions are attached as **Appendix L.** A summary of these results is provided in **Table 5.4.1.3b** below.

Table 5.4.1.3b: Summary of SIDRA Analysis Results – Bruce Highway / Boundary Road (East) Intersection
Post Development Scenarios – Proposed Upgraded Signalised Intersection Configuration

Intersection	Intersection Control	Year	Peak Hour	DOS %
Bruce Highway / Boundary Road (East)	Three-Way Signalised	2025	AM	**85.3**
			PM	**83.2**
		2035	AM	**85.3**
			PM	**81.9**

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From the results above it can be seen that the proposed upgrade to the signalised intersection configuration of the Bruce Highway / Boundary Road (East) intersection is expected to operate satisfactorily for all post development scenarios, with all calculated values for intersection Degree of Saturation (DOS) below the acceptable limit of operation (90%) for signalised intersections.

5.4.1.4 Bruce Highway / Boundary Road (West)

The existing priority controlled geometry of the Bruce Highway / Boundary Road West intersection is shown in **Figure 5.4.1.4a** below.

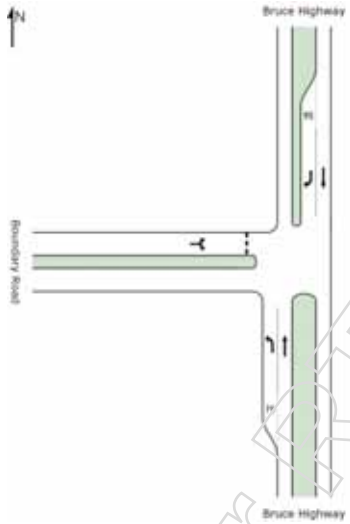

Figure 5.4.1.4a: Existing Intersection Configuration - Bruce Highway / Boundary Road (West) Intersection

It is noted that the current geometry of the intersection, as identified above, is based on the existing two-lane alignment of the Bruce Highway. However as established in Section 5.4.1.1 the Bruce Highway requires duplication to provide a four lane cross section and as such the requirement to provide these additional through lanes on both Bruce Highway approaches to the intersection can be considered an existing deficiency of the road network.

The geometry that will be required to address the identified existing deficiencies is shown in **Figure 5.4.1.4b** below. This alternative configuration includes additional through lanes in both directions, as well as including pedestrian crossings on both the northern and western approaches which whilst included are not expected to cater for large volume of pedestrian traffic.

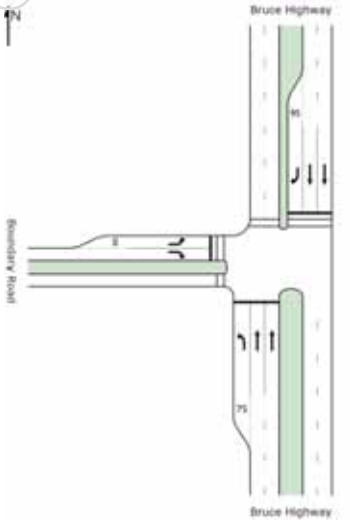

Figure 5.4.1.4b: Upgraded Intersection Configuration - Bruce Highway / Boundary Road (West) Intersection

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A three (3) phase signal configuration with pedestrian crossings on the northern and western approaches was adopted for the purpose of the intersection analysis. A generalised summary of the adopted signal phasing is shown in **Figure 5.4.1.4c** below.

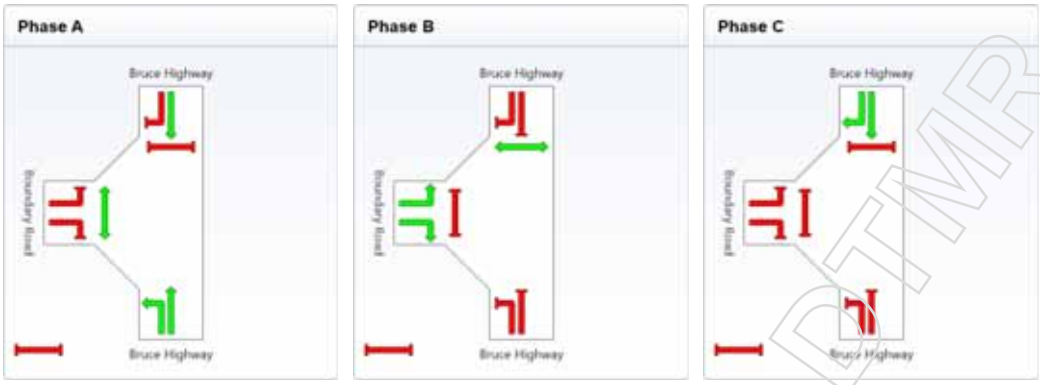

Figure 5.4.1.4c: Adopted Signal Phasing – Bruce Highway / Boundary Road (West) Proposed Signalised Intersection

The results of the analyses detailing the predicted operation of the proposed upgraded configuration of the Bruce Highway / Boundary Road (West) intersection for the forecast post development traffic conditions are attached as **Appendix M,** with a summary provided in **Table 5.4.1.4b** below.

Table 5.4.1.4b: Summary of SIDRA Analysis Results – Bruce Highway / Boundary Road (West) Intersection Post Development Scenarios – Proposed Upgraded Intersection Configuration

Intersection	Intersection Control	Year	Peak Hour	DOS %
Bruce Highway / Boundary Road (West)	Three-Way Signalised	2025	AM	**74.5**
			PM	**75.2**
		2035	AM	**75.5**
			PM	**75.3**

From the results above it can be seen that once the existing deficiencies of the intersection have been rectified the proposed upgraded Bruce Highway / Boundary Road (West) intersection (three way signalised) is expected to operate satisfactorily during the analysed post development scenarios, with all calculated values for intersection Degree of Saturation (DOS) within the acceptable limits of operation (90%) for signalised intersections.

5.4.1.5 Bruce Highway / Yeppoon Road

Initial analysis was completed to assess the future operation of the existing signalised intersection configuration of the Bruce Highway / Yeppoon Road intersection. A diagram of the configuration adopted for this analysis is in **Figure 5.4.1.5a** below.

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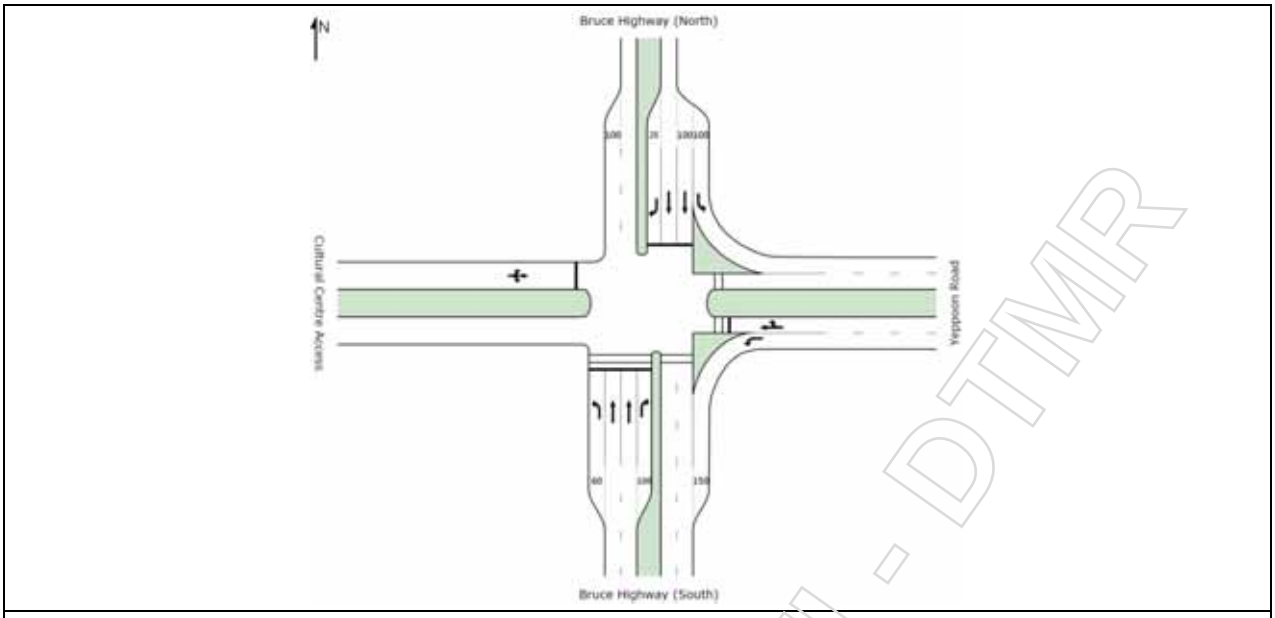

Figure 5.4.1.5a: Existing Intersection Configuration - Bruce Highway / Yeppoon Road (West) Intersection

A four (4) phase signal configuration with pedestrian crossings on the southern and eastern approaches was adopted for the purpose of the intersection analysis. A generalised summary of the adopted signal phasing is shown in **Figure 5.4.1.5b** below.

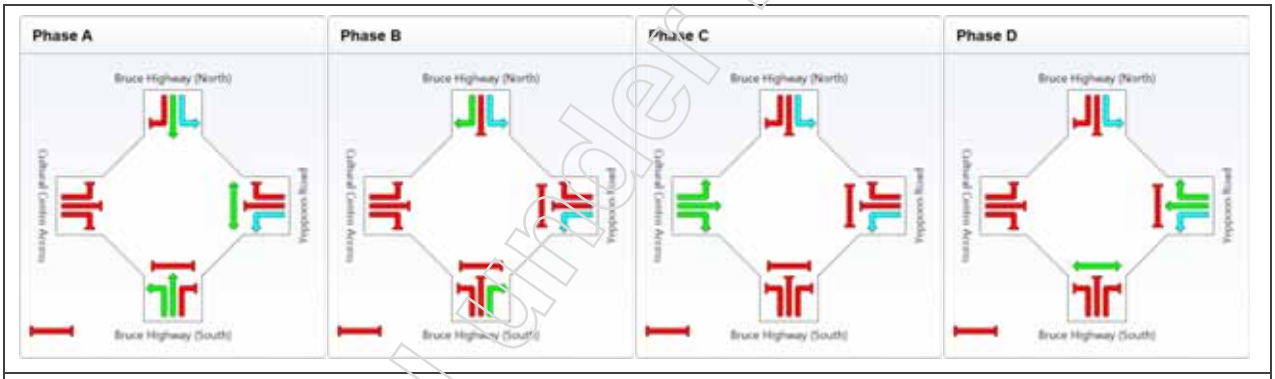

Figure 5.4.1.5b: Adopted Signal Phasing – Bruce Highway / Yeppoon Road Intersection (Existing Configuration)

The results of the analysis detailing the predicted operation of the existing Bruce Highway / Yeppoon Road intersection for the forecast pre development traffic conditions are attached as **Appendix N**, with a summary of these results provided in **Table 5.4.1.5a** over page.

Table 5.4.1.5a: Summary of SIDRA Analysis Results – Bruce Highway / Yeppoon Road Intersection
Pre Development Scenarios – Existing Signalised Intersection Configuration

Intersection	Intersection Control	Year	Peak Hour	DOS %
Bruce Highway / Yeppoon Road	Four-Way Signalised	2013	AM	75.3
			PM	101.3

The results above indicate that the current intersection configuration of the Bruce Highway / Yeppoon Road intersection is not expected to operate satisfactorily during the 2013 PM pre development scenario (including assumed traffic volumes from approved developments), with the calculated value for intersection Degree of Saturation (DOS) outside the acceptable limits of operation (90%) for signalised intersections.

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A detailed investigation of the calculated results for the 2013 PM peak analysis indicates that the failure mechanism for the current intersection configuration is the right turn lane and adjacent through lanes on the southern approach to the intersection. Furthermore the results indicate an underutilisation of the outside or westernmost through lane on the southern approach, which can be attributed to the provision of a short (100m) auxiliary through lane downstream of this movement. The results further reinforce the need for the provision of a four lane cross section of the highway north of Yeppoon Road as identified earlier, and also demonstrate that the current configuration of the Bruce Highway / Yeppoon Road intersection will need to be upgraded regardless of the addition of traffic from the proposed Stockland North Parkhurst development.

An upgraded intersection configuration, including the provision of the full four through lane cross section on the northern approach, as shown in **Figure 5.4.1.5c** below, was then analysed. This alternative configuration also incorporated an increase in the current length of the right turn pocket on the southern approach from 100m to 250m, and adopted that same signal phasing as the existing configuration analysis shown above.

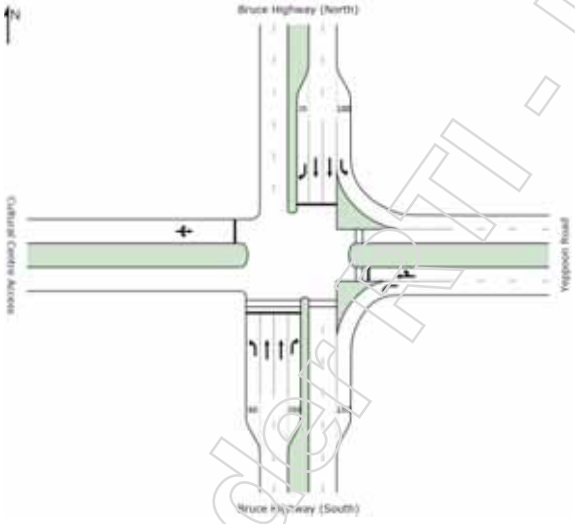

Figure 5.4.1.5c: Upgraded Intersection Configuration - Bruce Highway / Yeppoon Road Intersection

The results of the analyses detailing the predicted operation of the proposed upgraded Bruce Highway / Yeppoon Road intersection for the forecast pre development traffic conditions are attached as **Appendix N.** A summary of these results is provided in **Table 5.4.1.5b** below.

Table 5.4.1.5b: Summary of SIDRA Analysis Results – Bruce Highway / Yeppoon Road Intersection
Pre Development Scenarios – Proposed Upgraded Signalised Intersection Configuration

Intersection	Intersection Control	Year	Peak Hour	DOS %
Bruce Highway / Yeppoon Road	Four-Way Signalised	2013	AM	**72.5**
			PM	**81.0**
		2025	AM	**72.4**
			PM	**92.1**
		2035	AM	**81.1**
			PM	**102.2**

From the results above it can be seen that the proposed upgraded Bruce Highway / Yeppoon Road intersection including the provision of the required four through lane cross section is not expected to operate satisfactorily during the analysed pre development scenarios, with the calculated values of intersection Degree of Saturation (DOS) for both the 2025 and 2035 PM peak period outside the acceptable limits of operation (90%) for signalised intersections.

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A second iteration of an upgraded intersection layout was then developed to improve the operational performance of the intersection under the forecast pre development traffic conditions. This second iteration of the layout included the provision of two right turn pockets on the southern approach, which in turn led to the formation of a combined through and left lane on this approach and the modification of the left turn lane on the northern approach from a continuous lane with designated downstream lane to a standard priority controlled slip lane. A diagram of the analysed intersection configuration is shown in **Figure 5.4.1.5d** below

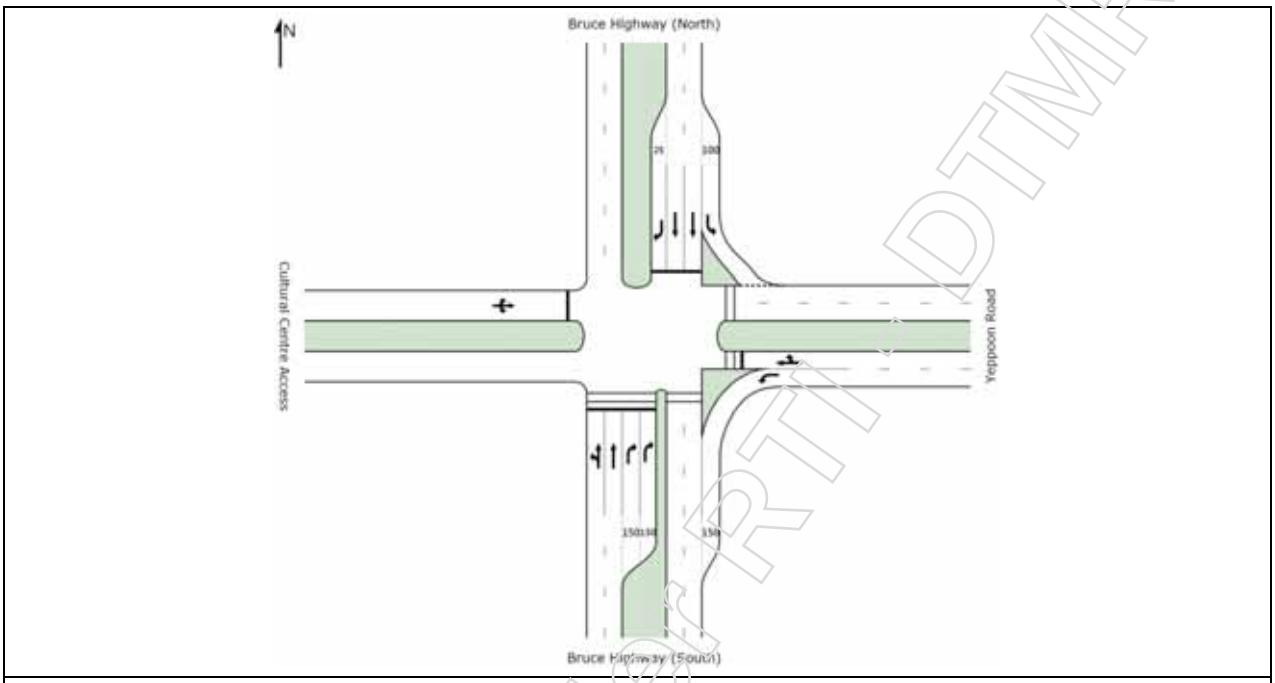

Figure 5.4.1.5d: Upgraded (Second Iteration) Intersection Configuration - Bruce Highway / Yeppoon Road Intersection

These alterations to the intersection configuration also led to minor modifications to the movement restrictions during each phase of the signal cycle, primarily concerning the left turn from the northern approach, as shown in the signal phasing summary shown in **Figure 5.4.1.5e** below.

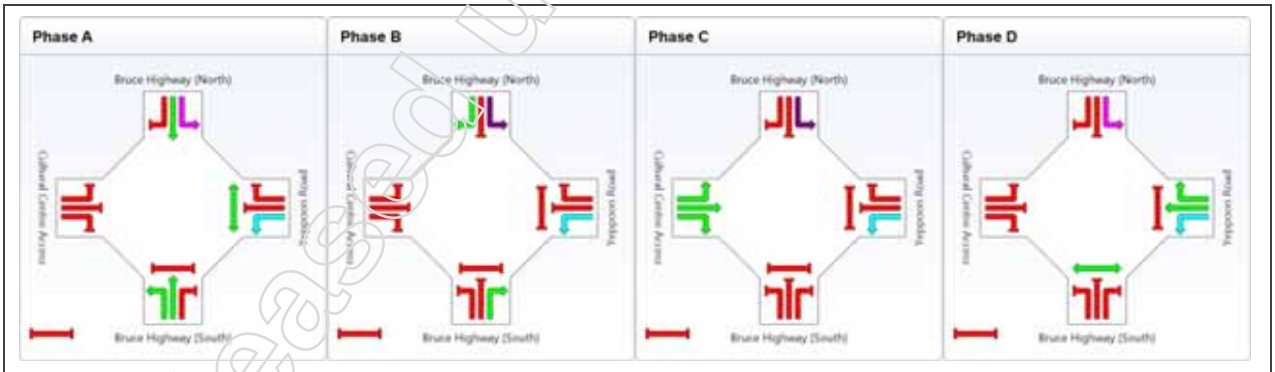

Figure 5.4.1.5e: Adopted Signal Phasing (Second Upgrade Iteration) – Bruce Highway / Yeppoon Road Intersection

The results of the analysis detailing the predicted operation of the second iteration of proposed upgrades to the Bruce Highway / Yeppoon Road intersection for the forecast pre development traffic conditions are attached as **Appendix N.** A summary of these results is provided in **Table 5.4.1.5c** below.

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Table 5.4.1.5c: Summary of SIDRA Analysis Results – Bruce Highway / Yeppoon Road Intersection
Pre Development Scenarios – Proposed Upgraded (Second Iteration) Signalised Intersection Configuration

Intersection	Intersection Control	Year	Peak Hour	DOS %
Bruce Highway / Yeppoon Road	Four-Way Signalised	2025	AM	66.6
			PM	77.5
		2035	AM	75.6
			PM	81.2

From the results above it can be seen that the proposed upgraded Bruce Highway / Yeppoon Road intersection is expected to operate satisfactorily during the analysed pre development scenarios, with all calculated values for intersection Degree of Saturation (DOS) within the acceptable limits of operation (90%) for signalised intersections.

The results also demonstrate that the proposed upgraded layout (second iteration) identified above could be considered to represent the minimum infrastructure provision requirements at the intersection to cater for the pre development traffic from 2025 onwards, and that the provision of these upgrades will be required regardless development of the Stockland North Parkhurst site.

The operation of the proposed upgraded configuration of the Bruce Highway / Yeppoon Road intersection was then analysed for the forecast post development scenarios. The results of this analysis are attached as **Appendix N** and summary of these results is provided in **Table 5.4.1.5d** below.

Table 5.4.1.5d: Summary of SIDRA Analysis Results – Bruce Highway / Yeppoon Road Intersection
Post Development Scenarios – Proposed Upgraded (Second Iteration) Signalised Intersection Configuration

Intersection	Intersection Control	Year	Peak Hour	DOS %
Bruce Highway / Yeppoon Road	Four-Way Signalised	2025	AM	99.3
			PM	106.7
		2035	AM	105.0
			PM	115.2

From the results above it can be seen that the geometry shown in **Figure 5.4.1.5d** is not expected to operate satisfactorily during the analysed post development scenarios, with the calculated values for intersection Degree of Saturation (DOS) outside the acceptable limits of operation (90%) for signalised intersections.

Therefore a final upgrade to the intersection has been proposed to improve the intersection operation under the forecast post development traffic conditions. As shown in **Figure 5.4.1.5f** below, this proposed upgrade provides an additional auxiliary through lane on the northern approach to the intersection and the corresponding downstream auxiliary through lane. In addition a second short right turn lane has been provided on the eastern approach to the intersection and the left turn provision on this approach has been modified from a single continuous lane to a double signalised left turn (including one short turn pocket).

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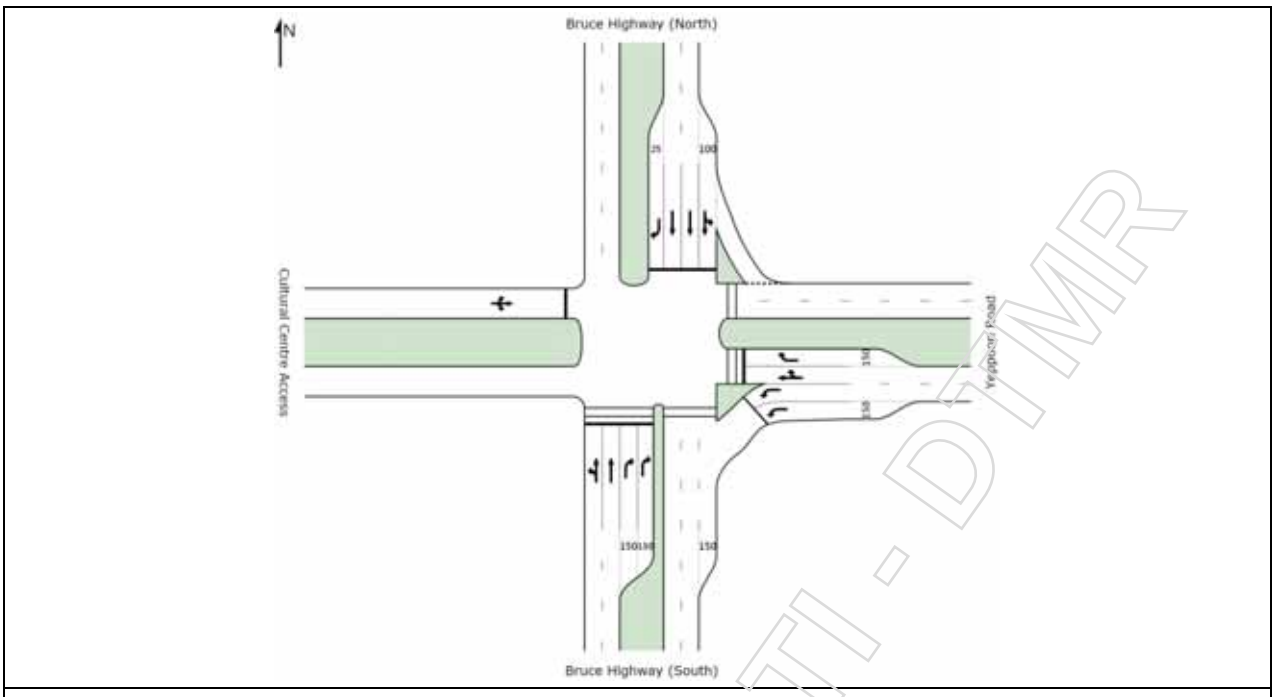

Figure 5.4.1.5f: Upgraded (Final) Intersection Configuration - Bruce Highway / Yeppoon Road Intersection

The upgrades identified above have also led to a modification to the proposed signal phasing for the intersection. As part of the analysis different signal phasings were adopted for the AM and PM peak periods as shown in **Figure 5.4.1.5g** and **Figure 5.4.1.5h** below. It is also noted that the pedestrian crossing on the southern approach to the intersection has been staged across several phases to optimise the operation of the intersection.

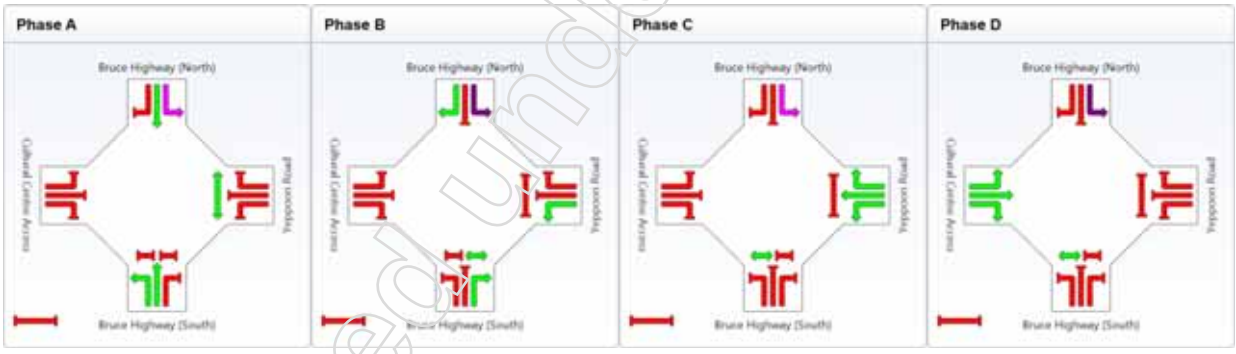

Figure 5.4.1.5g: Adopted AM Peak Signal Phasing (Final Upgrade) – Bruce Highway / Yeppoon Road Intersection

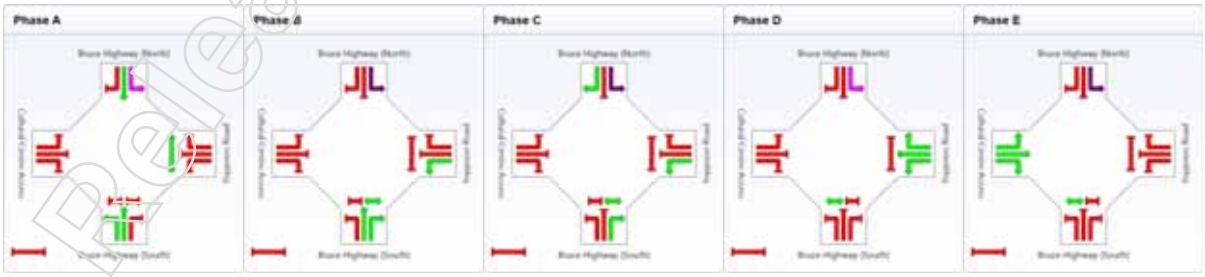

Figure 5.4.1.5h: Adopted PM Peak Signal Phasing (Final Upgrade) – Bruce Highway / Yeppoon Road Intersection

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The results of the analysis detailing the predicted operation of the proposed upgraded Bruce Highway / Yeppoon Road intersection for the forecast post development traffic conditions are attached as **Appendix N.** A summary of these results is provided in **Table 5.4.1.5e** below.

Table 5.4.1.5e: Summary of SIDRA Analysis Results – Bruce Highway / Yeppoon Road Intersection Post Development Scenarios – Proposed Upgraded (Final) Signalised Intersection Configuration

Intersection	Intersection Control	Year	Peak Hour	DOS %
Bruce Highway / Yeppoon Road	Four-Way Signalised	2025	AM	**79.5**
			PM	**84.6**
		2035	AM	**83.4**
			PM	**86.3**

From the results above it can be seen that the proposed upgraded Bruce Highway / Yeppoon Road intersection is expected to operate satisfactorily during the analysed post development scenarios, with all calculated values for intersection Degree of Saturation (DOS) within the acceptable limits of operation (90%) for signalised intersections.

5.4.2 Local Government Controlled Road Network Analysis

An investigation into the impacts of the proposed development on the local government controlled road network has also been completed, with analysis being undertaken on several key intersections on both the existing external and proposed internal road networks, in accordance with the request from Rockhampton Regional Council. These key intersections include:

- William Palfrey Road / McLaughlin Street;
- Alexandra Road / Belmont Road / Birkbeck Drive; and
- Proposed internal signalised intersection at junction of Access Arterial (Olive Street), the East-West Sub Arterial and Southern Sub Arterial (William Palfrey Realignment).

To assist with the assessment of the intersections identified above and to inform the internal road hierarchy of the development, a full internal road network model has been constructed assuming the full build-out scenario of both Edenbrook and the proposed North Parkhurst site. Further information regarding the completed analysis for each intersection can be seen in the following sections and a diagram summarising the calculated daily traffic volumes on the identified higher order road links within the site has been included for reference as **Appendix O**.

5.4.2.1 William Palfrey Road / McLaughlin Street

Using the road link volumes forecast using the internal road network model, the expected daily traffic volumes at the proposed William Palfrey Road / McLaughlin Street intersection were identified as shown in **Figure 5.4.2.1a** below. It is noted that this intersection is also assumed to be the access point for the Edenbrook development to the external road network via McLaughlin Street, and as such the assumed traffic volumes generated by this development have also been included within the analysis.

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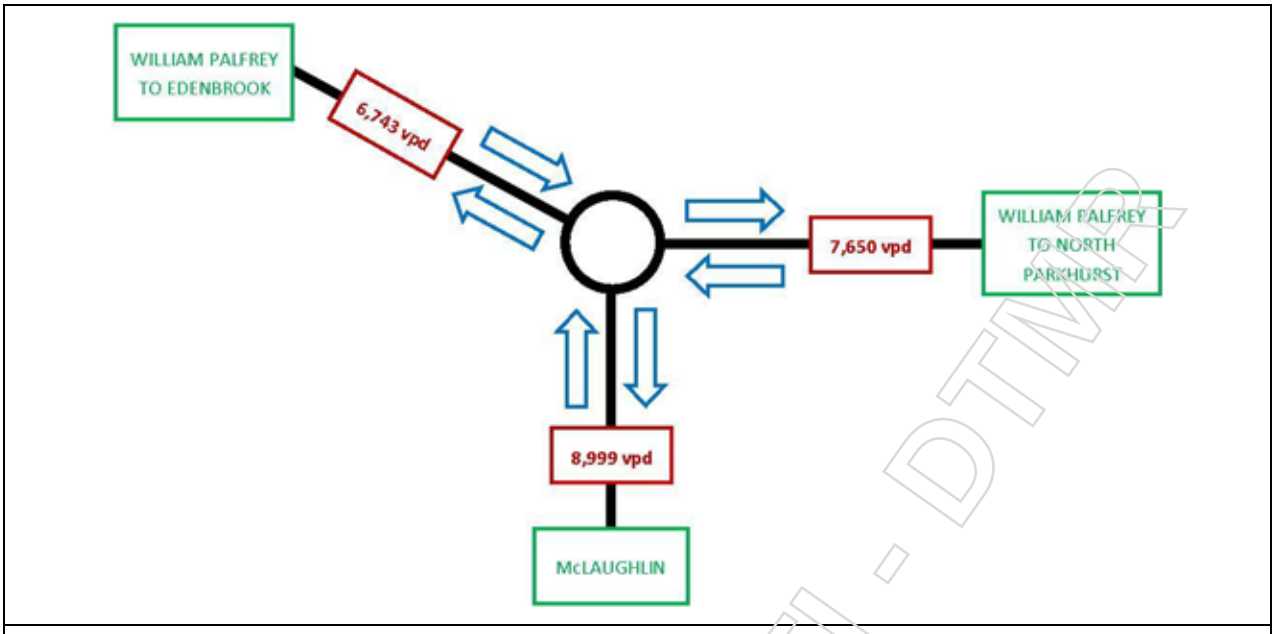

Figure 5.4.2.1a: Forecast Daily Traffic Volumes – William Palfrey Road / McLaughlin Street Intersection

Adopting the development traffic distribution assumptions as previously identified in **Table 5.1b**, the forecast daily traffic volumes were used to establish an estimate of the likely hourly volumes at the intersection, with the resultant AM and PM peak volumes summarised in **Figure 5.4.2.1b** and **Figure 5.4.2.1c** below. It is also noted that a heavy vehicle percentage of 2% has been adopted for the purpose of the analysis.

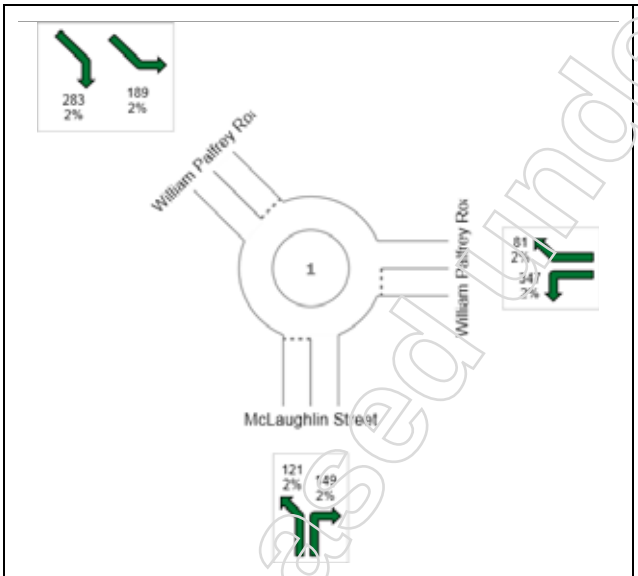

Figure 5.4.2.1b: Forecast AM Peak Traffic Volumes – William Palfrey Road / McLaughlin Street Intersection

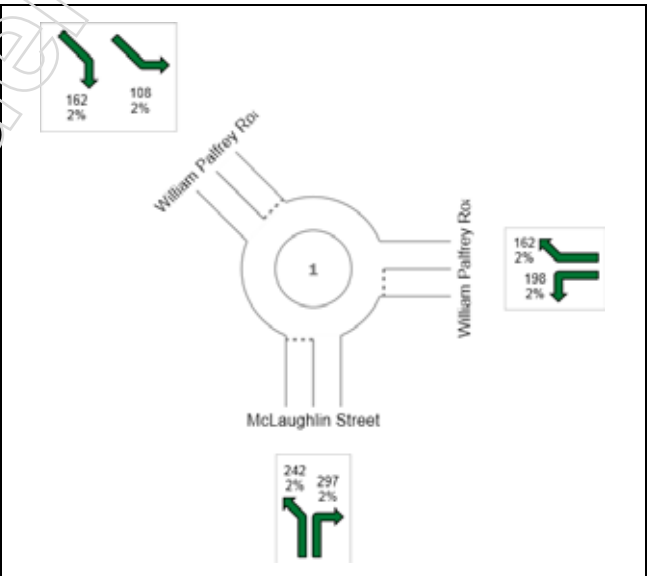

Figure 5.4.2.1c: Forecast PM Peak Traffic Volumes – William Palfrey Road / McLaughlin Street Intersection

These forecast peak hour volumes shown above were then used to complete the analysis for the intersection. Due to the higher order road approaches to the intersection and the fact that the intersection will serve as an access point to two residential developments, a roundabout has been proposed for the configuration of the roundabout, with the geometry adopted for the analysis consistent with that required to accommodate 19m Articulated vehicle movements (if required).

It is also noted that due to the assumed timings of both the proposed development and the adjacent Edenbrook development, it is not expected that traffic from North Parkhurst would utilise this intersection until the later stages of the project, and therefore it has been assumed this intersection (at least the relevant parts) would have been

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constructed as part of the external works required for the Edenbrook development. A diagram indicating the proposed configuration of the intersection adopted for the analysis is in **Figure 5.4.2.1d** below.

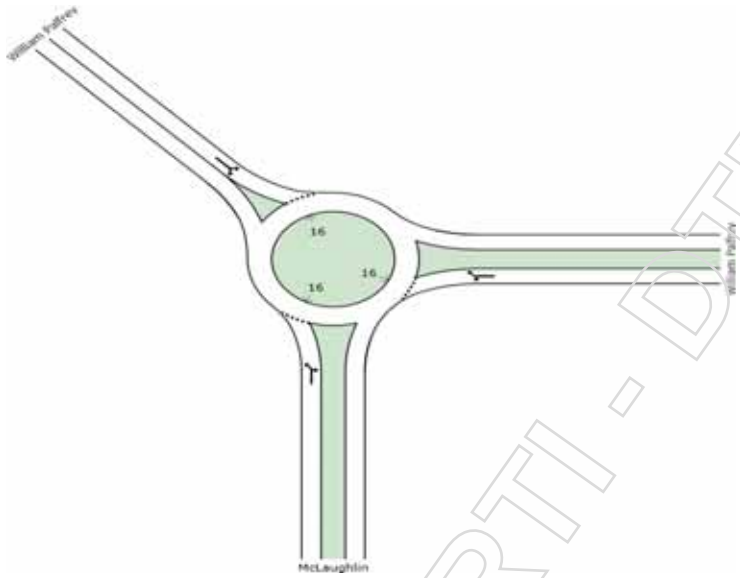

Figure 5.4.2.1d: Proposed Intersection Configuration – William Palfrey Road / McLaughlin Street

The results of the analysis detailing the predicted operation of the proposed William Palfrey Road / McLaughlin Street intersection for the forecast full build-out traffic conditions are attached as **Appendix P.** A summary of these results is provided in **Table 5.4.2.1a** below.

Table 5.4.2.1a: Summary of SIDRA Analysis Results – William Palfrey Road / McLaughlin Street Intersection Post Development Scenarios – Full Build-out Proposed Roundabout Intersection Configuration

Intersection	Intersection Control	Scenario	Peak Hour	DOS %
William Palfrey Road / McLaughlin Street	Three-Way Roundabout	Full Build-out	AM	**39.4**
			PM	**42.9**

From the results above it can be seen that the proposed roundabout configuration of the William Palfrey Road / McLaughlin Street intersection is expected to operate satisfactorily for both the AM and PM peaks assuming the full build-out development scenario, with all calculated values for intersection Degree of Saturation (DOS) well within the acceptable limits of operation (85%) for roundabouts.

As such it can be considered that the proposed roundabout configuration of the William Palfrey Road / McLaughlin Street intersection is adequate to cater for the expected traffic volumes associated with the full build-out of the proposed North Parkhurst development.

5.4.2.2 Proposed Internal Signals

As part of the internal road network it has been identified that the intersection of the arterial access road (Olive Street West), the main east-west collector and the realignment of William Palfrey Road is to be controlled by a signalised intersection, with the proposed location of the signals shown in **Figure 5.2.4.2a** below.

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Figure 5.4.2.2a: Proposed Location of Internal Signalised Intersection

Using the road link volumes forecast within the internal road network model, the expected daily traffic volumes at the proposed internal signals were identified as shown in **Figure 5.4.2.2b** below.

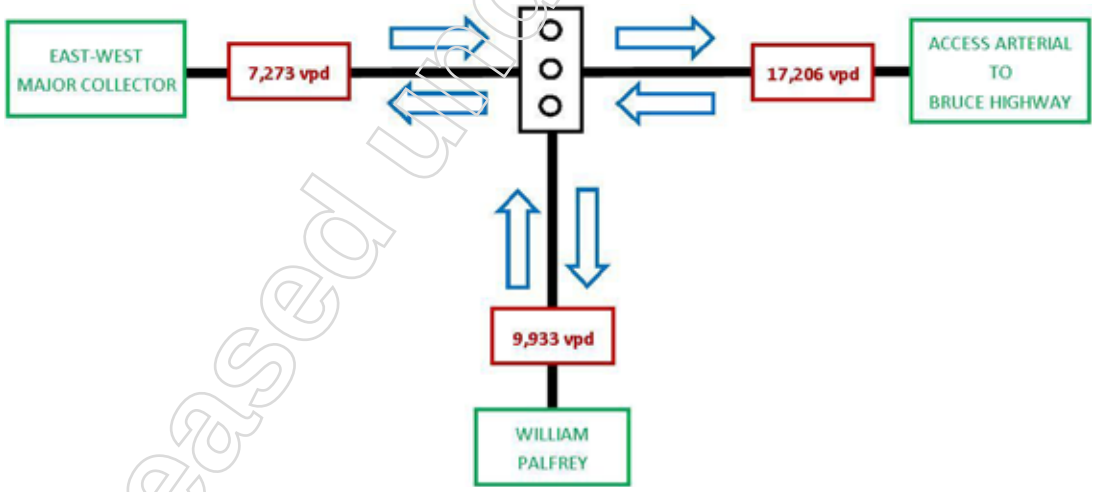

Figure 5.4.2.2b: Forecast Daily Traffic Volumes – Internal Signals

Adopting the development traffic distribution assumptions as previously identified in **Table 5.1b**, the forecast daily traffic volumes were used to establish an estimate of the likely hourly volumes at the intersection, with the resultant AM and PM peak volumes summarised in **Figure 5.4.2.2c** and **Figure 5.4.2.2d** below. It is also noted that a heavy vehicle percentage of 2% was again adopted for the purpose of the analysis.

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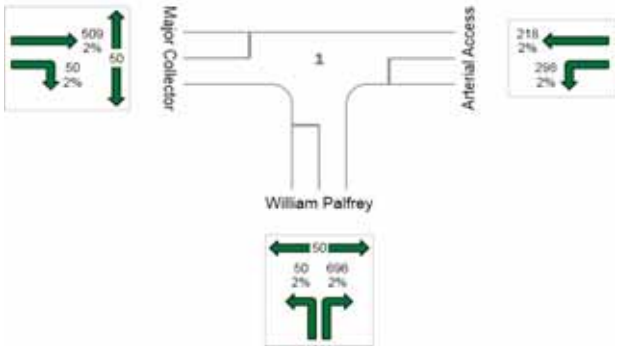

Figure 5.4.2.2c: Forecast AM Peak Traffic Volumes – Internal Signals

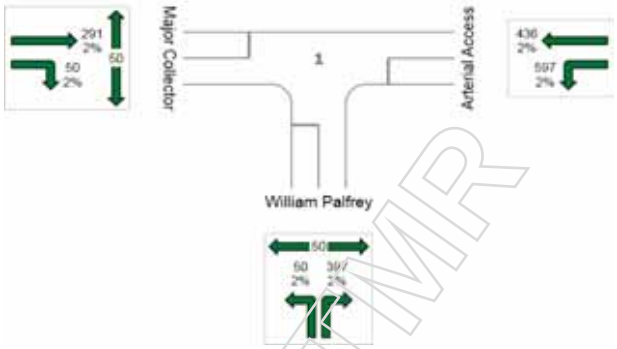

Figure 5.4.2.2d: Forecast PM Peak Traffic Volumes – Internal Signals

These forecast peak hour volumes as shown above were then used to complete the analysis for the intersection, with a diagram of the proposed configuration of the intersection shown in **Figure 5.4.2.2e** below.

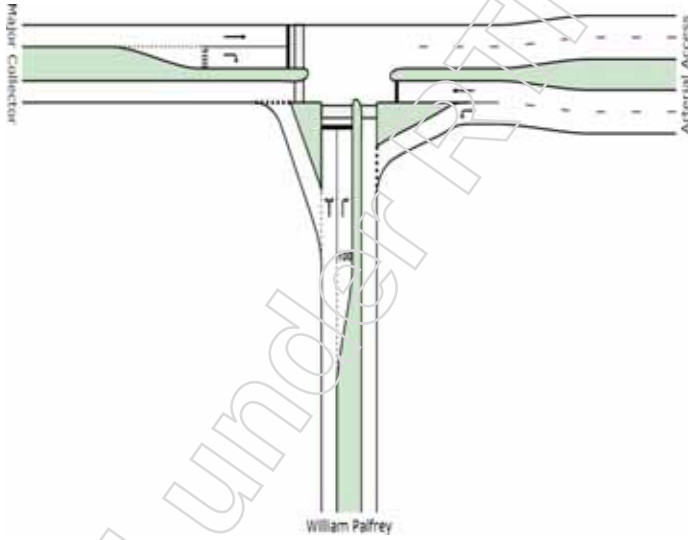

Figure 5.4.2.2e: Proposed Intersection Configuration – Internal Signals

A standard three (3) phase signal configuration with pedestrian crossings on the southern and western approaches was adopted for the purpose of the intersection analysis. A generalised summary of the adopted signal phasing is shown in **Figure 5.4.2.2f** below.

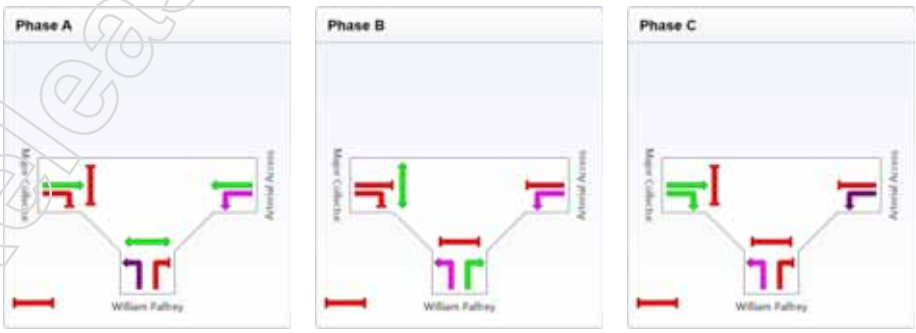

Figure 5.4.2.2f: Adopted Signal Phasing – Proposed Internal Signals

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The results of the analysis detailing the predicted operation of the proposed internal signals for the forecast full build-out traffic conditions are attached as **Appendix R.** A summary of these results is provided in **Table 5.4.2.2a** below.

Table 5.4.2.2a: Summary of SIDRA Analysis Results – Proposed Internal Signals
Post Development Scenarios – Full Build-out Proposed Internal Signals

Intersection	Intersection Control	Scenario	Peak Hour	DOS %
Internal Signals	Signalised Three Way	Full Build-out	AM	59.6
			PM	67.2

From the results above it can be seen that the proposed configuration of the internal signalised intersection is expected to operate satisfactorily for both the AM and PM peaks assuming the full build-out development scenario, with all calculated values for intersection Degree of Saturation (DOS) within the acceptable limits of operation (90%) for signalised intersections.

As such it can be considered that the proposed configuration of the internal signals is adequate to cater for the expected traffic volumes associated with the full build-out of the proposed North Parkhurst development.

5.4.2.3 Alexandra Road / Belmont Road / Birkbeck Drive

The final intersection that Council has been requested to be analysed is the existing intersection of Alexandra Road, Belmont Road and Birkbeck Drive. As this is an existing intersection that currently forms part of the Council controlled road network, the investigation will include analysis of both the forecast pre development and post development traffic conditions to determine the impacts of the proposed North Parkhurst on the operation of the intersection, as described in the following sections.

5.4.2.3.1 *Pre Development Traffic Conditions*

To determine the background traffic at the Alexandra Road / Belmont Road / Birkbeck Drive intersection a manual traffic count was undertaken on 28 May 2013, with the raw count data included as **Appendix S**. From the count data the AM peak was established as 7:30-8:30am and a PM peak from 4:30-5:30pm. The recorded turning movement volumes at the intersection for these peak periods are summarised in **Figure 5.4.2.3a** and **Figure 5.4.2.3b** below.

It is also noted that due to the fact that the Belmont Road – Alexandra Road corridor does not provide a direct through connection to the north, and is essentially a closed catchment, it is not expected that any background traffic growth will occur, and that the only increases in traffic volumes will be as a direct result of future developments. As such the current volumes at the intersection are considered appropriate to forecast the future background traffic volumes under the full build-out scenario for the North Parkhurst development.

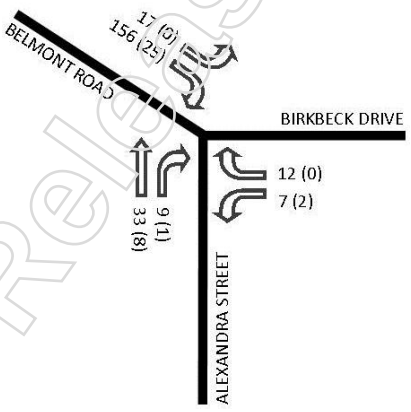

Figure 5.4.2.3a: AM Peak Background Volume (2013)

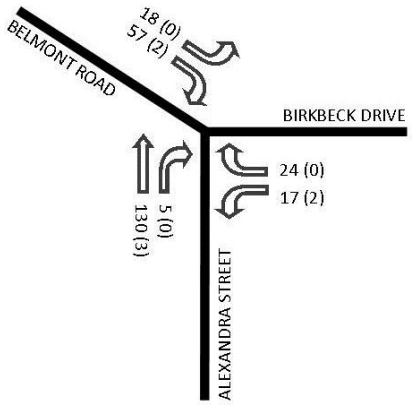

Figure 5.4.2.3B: PM Peak Background Volume (2013)

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Then to establish the pre development traffic volumes at the intersection, the expected traffic volumes from the approved development in the area was added to the current volumes recorded at the intersection. From discussions with Council the approved development in the area was identified to be Edenbrook and Stages 5-8 of Riverside Estate (noting that traffic from Stages 1-4 are assumed to be included in current volumes).

It is understood that Stages 5-8 of Riverside Estate will yield 84 standard residential lots, and using a standard generation rate, a 100% distribution to/from Alexandra Road to the south and the standard AM and PM inbound/outbound traffic splits identified in **Table 5.1b** above, the peak hour traffic volumes at the Alexandra Road / Belmont Road / Birkbeck Drive intersection generated by Stages 5-8 were forecast, as shown in **Figure 5.4.2.3c** below.

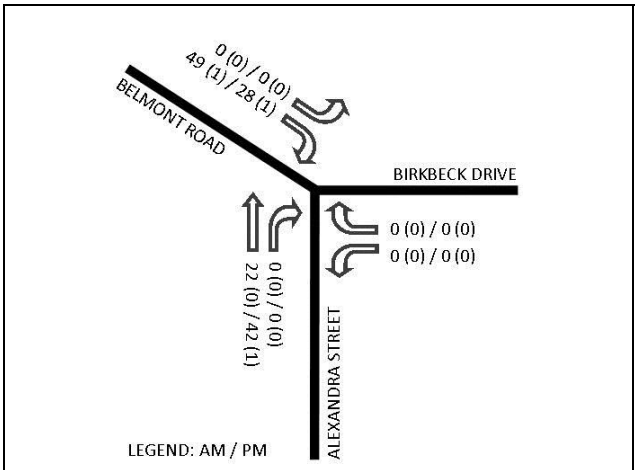

Figure 5.4.2.3c: Forecast Peak Hour Development Volumes (Stages 5-8 Riverside Estate)
Alexandra Road / Belmont Road / Birkbeck Drive

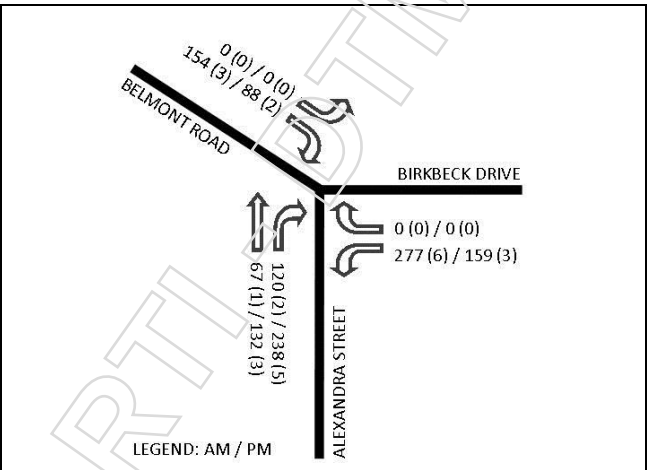

Figure 5.4.2.3d: Forecast Peak Hour Development Volumes (Edenbrook)
Alexandra Road / Belmont Road / Birkbeck Drive

Similarly the traffic volumes generated at the Alexandra Road / Belmont Road / Birkbeck Drive intersection by the approved Edenbrook development were also forecast, as shown in **Figure 5.4.2.3d** above. These volumes were calculated by applying the traffic distribution rates for Edenbrook identified within internal road network model for the North Parkhurst site (refer to **Appendix O**), with approximately 25% of the traffic assumed to utilised the Belmont Road approach and 45% the Birkbeck Drive approach to the intersection. It is also noted that a heavy vehicle percentage of 2% has been adopted for each of the development traffic volumes identified in the analysis.

As identified above, the pre development traffic volumes were established by adding the calculated approved development traffic volumes to those recorded during the background traffic count, with the resultant pre development AM and PM peak volumes summarised in **Figure 5.4.2.3e** and **Figure 5.4.2.3f** below

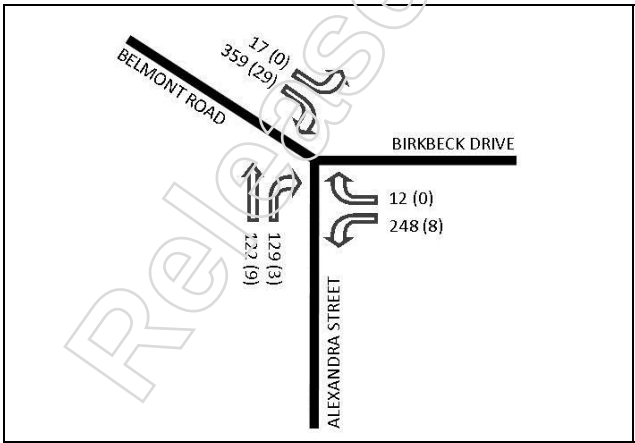

Figure 5.4.2.3e: Pre Development Volumes (AM Peak)
Alexandra Road / Belmont Road / Birkbeck Drive

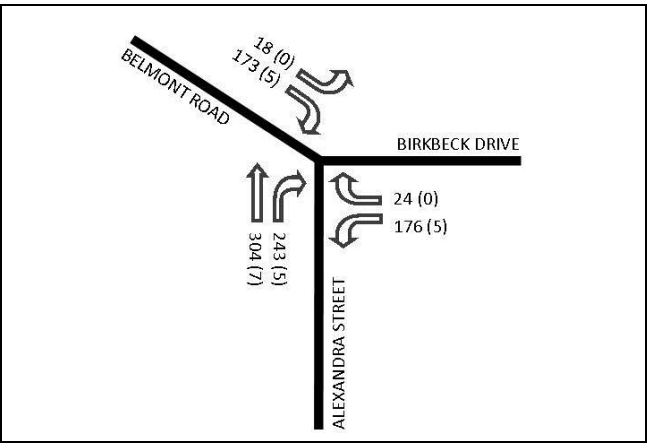

Figure 5.4.2.3f: Pre Development Volumes (PM Peak)
Alexandra Road / Belmont Road / Birkbeck Drive

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As shown in **Figure 5.4.2.3g** below, the existing configuration of the intersection operates as a three way priority controlled junction with the Alexandra Street – Belmont Road legs maintaining priority as the major legs of the intersection, with the Birkbeck Drive approach giving way. All approaches to the intersection currently operate as two way two lane roads and it is noted that neither of the priority approaches provide designated auxiliary turn lanes for movements into Birkbeck Drive.



Figure 5.4.2.3g: Existing Intersection Configuration
Alexandra Street / Belmont Road / Birkbeck Drive

As such, a turn warrants assessment has been undertaken for the forecast pre development traffic volumes at the Alexandra Street / Belmont Road / Birkbeck Drive intersection, with the resultant graph shown in **Figure 5.4.2.3h** below.

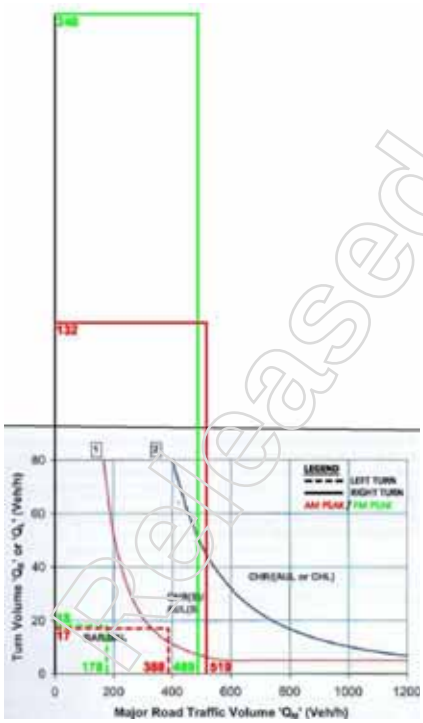

Figure 5.4.2.3h: Turn Warrants Assessment (Austroads) – Pre Development
Alexandra Street / Belmont Road / Birkbeck Drive

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Based on the figure above it can be seen that the current configuration of the Alexandra Street / Belmont Road / Birkbeck Drive intersection should be upgraded to provide a full CHR treatment for the right turn into Birkbeck Drive from Alexandra Street and an AUL(s) treatment for the left turn into Birkbeck Drive from Belmont Drive, to cater for the expected pre development traffic volumes at the intersection.

It is noted that as this upgrade/provision of auxiliary lanes has been identified to be required for the forecast pre development traffic volumes at the intersection, it can be concluded that these upgrades will be required regardless of the inclusion of the traffic from the North Parkhurst site, and as such cannot reasonably be attributed to the proposed development.

5.4.2.3.2 Development Traffic Volumes

Based on the assumption that 30% of the overall North Parkhurst development would access the Alexandra Street corridor via its intersection with Birkbeck Drive, and using the traffic distribution assumptions previously identified in **Table 5.1b**, the expected peak hour development traffic volumes at the Alexandra Street / Belmont Road / Birkbeck Drive intersection were calculated, as shown in **Figure 5.4.2.3i** and **Figure 5.4.2.3j** below.

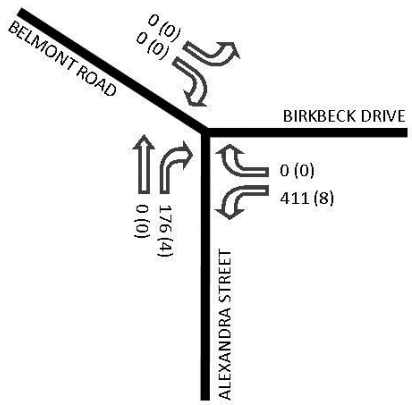

Figure 5.4.2.3i: AM Peak Hour Development Volumes (North Parkhurst)
Alexandra Road / Belmont Road / Birkbeck Drive

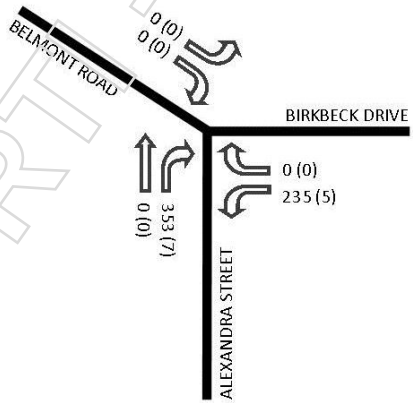

Figure 5.4.2.3j: PM Peak Hour Development Volumes (North Parkhurst)
Alexandra Road / Belmont Road / Birkbeck Drive

5.4.2.3.3 Post Development Traffic Conditions

Using the volumes predicted to be generated by the proposed North Parkhurst development and the forecast pre development traffic volumes, the post development traffic conditions at the Alexandra Street / Belmont Road / Birkbeck Drive intersection was analysed. The analysis was completed using SIDRA 5.1 software and was undertaken for both the AM and PM peak periods for the full build-out design scenario for the development. The resultant AM and PM peak post development traffic volumes at the intersection are summarised in **Figure 5.4.2.3k** and **Figure 5.4.2.3l** below.

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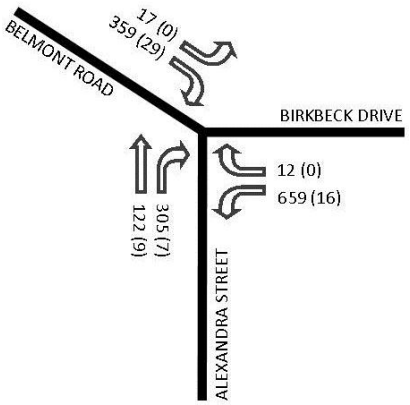

Figure 5.4.2.3k: Post Development Volumes (AM Peak) Alexandra Road / Belmont Road / Birkbeck Drive

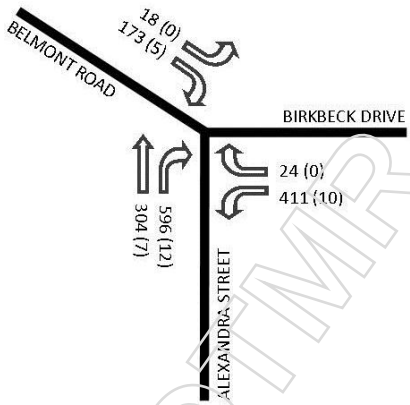

Figure 5.4.2.3l: Post Development Volumes (PM Peak) Alexandra Road / Belmont Road / Birkbeck Drive

As identified above, the upgrade of the current intersection configuration to provide designated auxiliary lanes for both the right and left turns into Birkbeck Drive are required to accommodate the pre development traffic volumes. As such it has been assumed that these upgrade works have been completed prior to the inclusion of traffic from North Parkhurst, with a diagram indicating the proposed configuration of the intersection adopted for the analysis is in **Figure 5.4.2.1m** below.

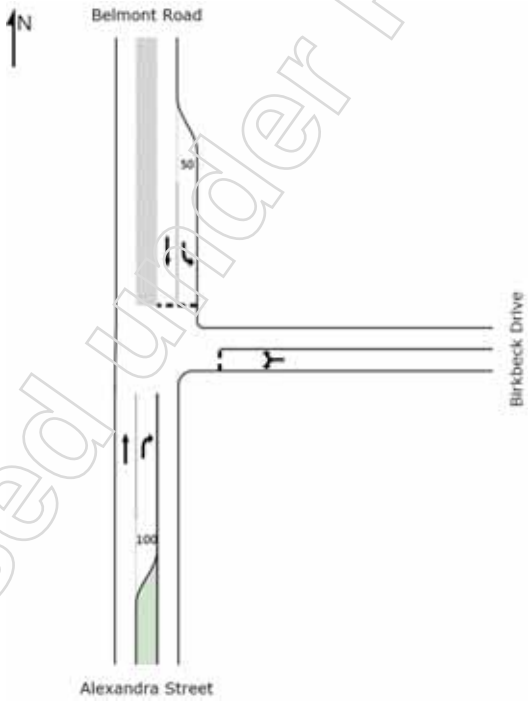

Figure 5.4.2.1m: Proposed Upgraded Intersection Configuration – Alexandra Street / Belmont Road / Birkbeck Drive

The results of the analysis detailing the predicted operation of the upgraded Alexandra Street / Belmont Road / Birkbeck Drive intersection for the forecast full build-out (post development) traffic conditions are attached as **Appendix T.** A summary of these results is provided in **Table 5.4.2.3a** below.

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Table 5.4.2.3a: Summary of SIDRA Analysis Results – Alexandra Street / Belmont Road / Birkbeck Drive
Post Development Scenarios – Full Build-out

Intersection	Intersection Control	Scenario	Peak Hour	DOS %
Alexandra Street / Belmont Road / Birkbeck Drive	Three-Way Priority Controlled	Full Build-out	AM	38.7
			PM	33.2

From the results above it can be seen that the proposed upgraded configuration of the Alexandra Street / Belmont Road / Birkbeck Drive intersection is expected to operate satisfactorily for both the AM and PM peaks assuming the full build-out development scenario, with all calculated values for intersection Degree of Saturation (DOS) within the acceptable limits of operation (80%) for priority controlled intersections. As such it can be considered that the proposed upgraded configuration of the intersection (upgrade works to be completed by others) is adequate to cater for the expected traffic volumes associated with the full build-out of the proposed North Parkhurst development.

5.4.2.4 Balance of Local Government Road Network

In addition to the investigation into the impacts of the proposed development on the key intersections listed above, a high level assessment of the expected traffic impacts of the North Parkhurst site on the balance of the Council controlled road network was also completed, as described below.

Section 5.1 of this report describes how the proposed development of both the North Parkhurst and adjacent Edenbrook sites is consistent with the development scenario identified in the Parkhurst Accelerated Growth (PAG) scenario assessed in the *Rockhampton Traffic Study 2008 (RTS)*. Furthermore it demonstrated that the assumed ultimate development yield (2,350 lots) and the traffic distribution assumptions (70% to Bruce Highway / 30% to Alexandra Street) adopted as part of this analysis were generally consistent with those identified within the traffic network model which underpinned the RTS.

Therefore to simplify the analysis of the impacts of the proposed development on the local government road network and to avoid the duplication of the assessment already completed during the RTS (2008), it is proposed that the additional road network upgrade works attributed to the PAG scenario (above those identified in the City Plan scenario within the RTS) be adopted as the transport infrastructure requirements of the North Parkhurst and Edenbrook developments combined.

Furthermore, Council's *Adopted Infrastructure Charges Resolution No. 2 (2012)* subsequently detailed the transport infrastructure that has been attributed to the future development parcels identified within the designated Priority Infrastructure Area (PIA). Whilst the whole Edenbrook site was shown to be within the boundaries of the PIA only the easternmost portion of the North Parkhurst site was included, the yield of which is understood to be approximately 500 lots.

As the transport infrastructure works identified in the resolution are understood to be solely provided by the infrastructure charges applied to future development located within the PIA, it can reasonably be assumed the only contribution of the North Parkhurst site to the delivery of the transport infrastructure listed in Council's *Adopted Infrastructure Charges Resolution No. 2 (2012)* would be via the relevant transport infrastructure charges collected from the portion of the development (approximately 500 lots) within the PIA.

Using the information above, the conclusion can therefore be drawn that the transport infrastructure requirements of the portion of the North Parkhurst site outside the PIA would equate to the infrastructure upgrade works identified within the analysis of the PAG scenario in the *Rockhampton Traffic Study*, but not listed in Council's *Adopted Infrastructure Charges Resolution No. 2 (2012).*

Furthermore it is understood that the one of these items, the construction of the Alexandra Street extension to William Palfrey Road (McLaughlin Street realignment), has been conditioned on the adjacent Edenbrook development as part of a previous Infrastructre Agreement. As such its construction should not be attributable to the proposed Stockland North Parkhurst development.

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In addition, the proposed plan of development identifies William Palfrey Road as a high order Urban Arterial Road / Urban Sub Arterial Road. Once connected to the west via McLaughlin Street, this road will connect the Alexandra Street and Bruce Highway corridors, providing a direct east-west connection for development west of the highway.

As this connection will service a catchment which extends well beyond the North Parkhurst site it can reasonable be considered that the upgrade of William Palfrey Road to the identified Urban Arterial Road / Urban Sub Arterial Road standard should be classified as trunk infrastructure works. As a consequence, any physical works carried out by Stockland to deliver the arterial road should be creditable against the infrastructure charges paid by the applicant.

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6.0 Conclusion and Recommendations

The proposed development site has been identified for several years as an area for future residential development growth, by both Council and Main Roads. This can be seen by its inclusion in such planning documents as

- Council's Parkhurst and Yeppoon Road Corridor Structure Plan (GHD 2007);
- Rockhampton Traffic Study (Arup 2008);
- RRC Priority Infrastructure Plan Planning Assumptions Report (GHD 2011), and
- TMR's draft Parkhurst Forward Planning Traffic Analysis Study (2010).

All of these planning documents envisaged a large residential development (i.e. > 2,000 lots) with the primary access from the Bruce Highway and secondary access via McLaughlin Street and the Alexandra Street corridor. Common to each study was an Urban Arterial Road providing connectivity between the Bruce Highway and the planned residential catchments to the west of the Highway. Several of these planning documents identify this proposed Urban Arterial Road joining the Bruce Highway at Olive Street, creating a fourth (western) leg to the existing intersection. It was also identified that this intersection would require signalisation and would incorporate an at-grade crossing of the adjacent rail corridor on the proposed development access road approach to the intersection.

The masterplan that has been submitted as part of the application for preliminary approval is consistent with the above planning intent.

6.1 Rail Crossing, Internal Road Network and Staging

A series of meetings have been held with Queensland Rail and other stakeholders wherein an assessment of the proposed at grade rail crossing has been carried out. This report provides detail on the proposed co-ordination of the traffic signals at the proposed Olive Street intersection with the rail signals at the relocated at grade crossing to enable the proposed rail crossing to operate in a safe and efficient manner.

The internal road network has been developed generally in accordance with Rockhampton City Council's Planning Policy No. 13 *Road Hierarchy* and the Capricorn Municipal Development Guidelines (CMDG). The road layout seeks to achieve a safe, efficient and convenient road system. Some minor amendments are proposed to the standard cross sections to address site specific aspects (e.g. roads adjacent to the esplanade and roads split by drainage corridors). We are also seeking to activate the major collector streets by providing direct property access which aligns with current industry standards.

The applicant intends staging the development from east to west. Access to the development under the early stages will be via the Bruce Highway only. This will require the construction of traffic signals at the Bruce Highway / Olive Street intersection and a part of the urban arterial road (2 lanes initially). It will not be until the later stages of the development that the western part of the site will be developed and connection provided to McLaughlin Street. The transport infrastructure will be delivered based on trigger volumes. This report provides detail on the trigger volumes and staging which can be summarised as follows:

	Stage 1	Trigger 1	Trigger 2	Trigger 3
Number detached dwellings	**1**	**1,275**	**1,450**	**1,900**
Interim Traffic Signals Bruce Hwy / Olive Street. Construct at-grade rail crossing 2-lane	✓			
Upgrade Bruce Hwy / Olive Street traffic signals to ultimate geometry. Duplicate the at grade crossing of the rail corridor (i.e. 4-lanes)		✓		
Upgrade the north-eastern part of the Urban Arterial to 4-lanes			✓	
Provide a secondary point of access to the site via McLaughlin Street. This will be achieved by constructing the balance of the Urban Arterial / Urban Sub Arterial Road (William Palfrey Road).				✓

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6.2 Traffic Impact

Analysis was completed to determine the impact of the proposed master planned community on both the state and local government controlled external road networks. The investigation into the operation of the state controlled road network focused on the impact on the relevant section of the Parkhurst Bruce Highway corridor, including the major intersections, whilst the assessment of the impact on the local government controlled network focused on the impact on the Alexandra Street corridor, as well as a number of key intersections identified by Council.

An investigation into the impacts of the proposed development on the relevant section of the Bruce Highway (Yeppoon Road to Olive Street) including an assessment of the expected mid-block volumes and the operation of the major intersections of Olive Street, Boundary Road (East), Boundary Road (West) and Yeppoon Road. For the purpose of this analysis it has been assumed that full build-out of proposed master planned community development would occur by 2025, with a 10 year design horizon for the development of 2035.

From the analysis in to the mid-block volumes on the each relevant section of the Bruce Highway between Yeppoon Road and Olive Street it was identified that expected pre development daily volumes exceeded the TMR specified trigger volume of 15,000 vehicles per day in 2013. As such it is considered that the requirement to upgrade of the Highway from two to four lanes, including the provision of additional through lanes at existing intersections is an existing deficiency and would be required regardless of the development of the proposed Stockland North Parkhurst site. Therefore it would be unreasonable to attribute the upgrade of the Bruce Highway (Yeppoon Road to Olive Street) from two lanes to four to the proposed Stockland North Parkhurst development.

Analysis of the Bruce Highway / Olive Street intersection identified that the ultimate intersection configuration required the provision of a four lane cross section for the Highway which was identified to be required regardless of the development due to the forecast pre development mid-block volumes exceeding 15,000 vehicles per day. This existing deficiency triggers the need for TMR to four-lane the Bruce Highway between Yeppoon Road and Olive Street, which would include the southern approach to this intersection.

As a consequence, it is considered unreasonable to attribute the full upgrade of the Bruce Highway / Olive Street intersection (as shown in the figure above) to the Stockland North Parkhurst development.

Analysis of the Bruce Highway / Boundary Road (East) intersection identified that the ultimate intersection configuration requires the provision of a four lane cross section for the Highway which was identified to be required regardless of the development due to the forecast pre development mid-block volumes exceeding 15,000 vehicles per da. This exising deficiency triggers the need for DTMR to four-lane the Bruce Highway between Yeppoon Road and Olive Street, which would include the both the northern and southern approaches to the Bruce Highway / Boundary Road (East) intersection.

Analysis of the Bruce Highway / Boundary Road (West) intersection identified that the ultimate intersection configuration requires signalisation of the existing intersection and the provision of a four lane cross section for the Highway, which as identified in Section 5.4.1.1 is needed regardless of the development due to the forecast pre development mid-block volumes exceeding 15,000 vehicles per day. This existing deficiency triggers the requirement for TMR to four-lane the Bruce Highway between Yeppoon Road and Olive Street, which would include the both the northern and southern approaches to the Bruce Highway / Boundary Road (West) intersection.

Analysis of the Bruce Highway / Yeppoon Road intersection identified that major upgrades from the existing intersection configuration would have been required before the assumed year of completion (2025) for the proposed development regardless of the addition of traffic generated by the Stockland site. Therefore it is considered unreasonable to attribute the full upgrade of the Bruce Highway / Yeppoon Road intersection to the proposed Stockland North Parkhurst development.

Notwithstanding this, it is acknowledged that the inclusion of traffic from the proposed development site will require additional upgrades over and above those required to address deficiencies unrelated to Stockland. As such, a contribution towards the cost of the upgrade of the intersection based on the provision of attributable infrastructure is deemed appropriate.

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The investigation into the impacts of the proposed development on the relevant local government controlled road network included an assessment of several key intersections on both the existing external (Alexandra Street / Belmont Road / Birkbeck Drive) and proposed internal road networks (William Palfrey Road / McLaughlin Street and the proposed internal signals), in accordance with the request from Rockhampton Regional Council, as well a high level assessment of the expected traffic impacts of the North Parkhurst site on the balance of the Council controlled road network.

The analysis of the Alexandra Street / Belmont Road / Birkbeck Drive intersection identified that upgrade works including the provision of a CHR right turn treatment on the Alexandra Street approach, and an AUL(s) left turn treatment on the Belmont Road approach was required to accommodate the forecast pre development traffic volumes. It was then demonstrated that once upgraded, the intersection would be adequate to cater for the expected post development traffic conditions for the full build-out of the North Parkhurst site. As the need to upgrade the intersection was identified to be required regardless of the addition of traffic from the North Parkhurst site, it can be considered an existing deficiency in the road network and cannot be reasonable be attributed to the proposed development.

The analysis of the William Palfrey / McLaughlin Street intersection identified that the proposed roundabout configuration of the William Palfrey Road / McLaughlin Street intersection was expected to operate satisfactorily for both the AM and PM peaks assuming the full build-out development scenario, and as such is adequate to cater for the expected traffic volumes associated with the full build-out of the proposed North Parkhurst development. It was also noted that due to the assumed timings of both the proposed development and the adjacent Edenbrook development, that it is not expected that traffic from North Parkhurst would utilise this intersection until the later stages of the project, and therefore it has been assumed this intersection (or at least the relevant parts) would have been constructed as part of the external works required for the Edenbrook development.

Similarly the analysis of the proposed internal signalised intersection identified that the proposed configuration was expected to operate within acceptable limits for both the AM and PM peaks assuming the full build-out development scenario, and as such it can be considered that the proposed configuration of the internal signals is adequate to cater for the anticipated traffic volumes associated with the full build-out of the proposed North Parkhurst development.

In addition to the investigation into the impacts of the proposed development on the key intersections listed above, a high level assessment of the expected traffic impacts of the North Parkhurst site on the balance of the Council controlled road network was also completed.

Section 5.1 of this report describes how the proposed development of both the North Parkhurst and adjacent Edenbrook sites is consistent with the development scenario identified in the Parkhurst Accelerated Growth (PAG) scenario assessed in the *Rockhampton Traffic Study 2008 (RTS)*. Furthermore it demonstrated that the assumed ultimate development yield (2,350 lots) and the traffic distribution assumptions (70% to Bruce Highway / 30% to Alexandra Street) adopted as part of this analysis were generally consistent with those identified within the traffic network model which underpinned the RTS.

Therefore to simplify the analysis of the impacts of the proposed development on the local government road network and to avoid the duplication of the assessment already completed during the RTS (2008), it is proposed that the additional road network upgrade works attributed to the PAG scenario (above those identified in the City Plan scenario within the RTS) be adopted as the transport infrastructure requirements of the North Parkhurst and Edenbrook developments combined.

Furthermore, Council's *Adopted Infrastructure Charges Resolution No. 2 (2012)* subsequently detailed the transport infrastructure that has been attributed to the future development parcels identified within the designated Priority Infrastructure Area (PIA). Whilst the whole Edenbrook site was shown to be within the boundaries of the PIA only the easternmost portion of the North Parkhurst site was included, the yield of which is understood to be approximately 500 lots.

As the transport infrastructure works identified in the resolution are understood to be solely provided by the infrastructure charges applied to future development located within the PIA, it can reasonably be assumed the only contribution of the North Parkhurst site to the delivery of the transport infrastructure listed in Council's *Adopted*

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Infrastructure Charges Resolution No. 2 (2012) would be via the relevant transport infrastructure charges collected from the portion of the development (approximately 500 lots) within the PIA.

Using the information above, the conclusion can therefore be drawn that the transport infrastructure requirements of the portion of the North Parkhurst site outside the PIA would equate to the infrastructure upgrade works identified within the analysis of the PAG scenario in the *Rockhampton Traffic Study*, but not listed in Council's *Adopted Infrastructure Charges Resolution No. 2 (2012).*

Furthermore it is understood that the one of these items, the construction of the Alexandra Street extension to William Palfrey Road (McLaughlin Street realignment), has been conditioned on the adjacent Edenbrook development as part of a previous Infrastructre Agreement. As such its construction should not be attributable to the proposed Stockland North Parkhurst development.

In addition, the proposed plan of development identifies William Palfrey Road as a high order Urban Arterial Road / Urban Sub Arterial Road. Once connected to the west via McLaughlin Street, this road will connect the Alexandra Street and Bruce Highway corridors, providing a direct east-west connection for development west of the highway.

As this connection will service a catchment which extends well beyond the North Parkhurst site it can reasonable be considered that the upgrade of William Palfrey Road to the identified Urban Arterial Road / Urban Sub Arterial Road standard should be classified as trunk infrastructure works. As a consequence, any physical works carried out by Stockland to deliver the arterial road should be creditable against the infrastructure charges paid by the applicant.

We therefore consider that the proposal is satisfactory from a traffic operations perspective, and recommend that the development application be approved from a traffic engineering viewpoint.

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APPENDIX A

Parkhurst Area Land Use Figure

Parkhurst and Yeppoon Road Corridor Structure Plan (2007)

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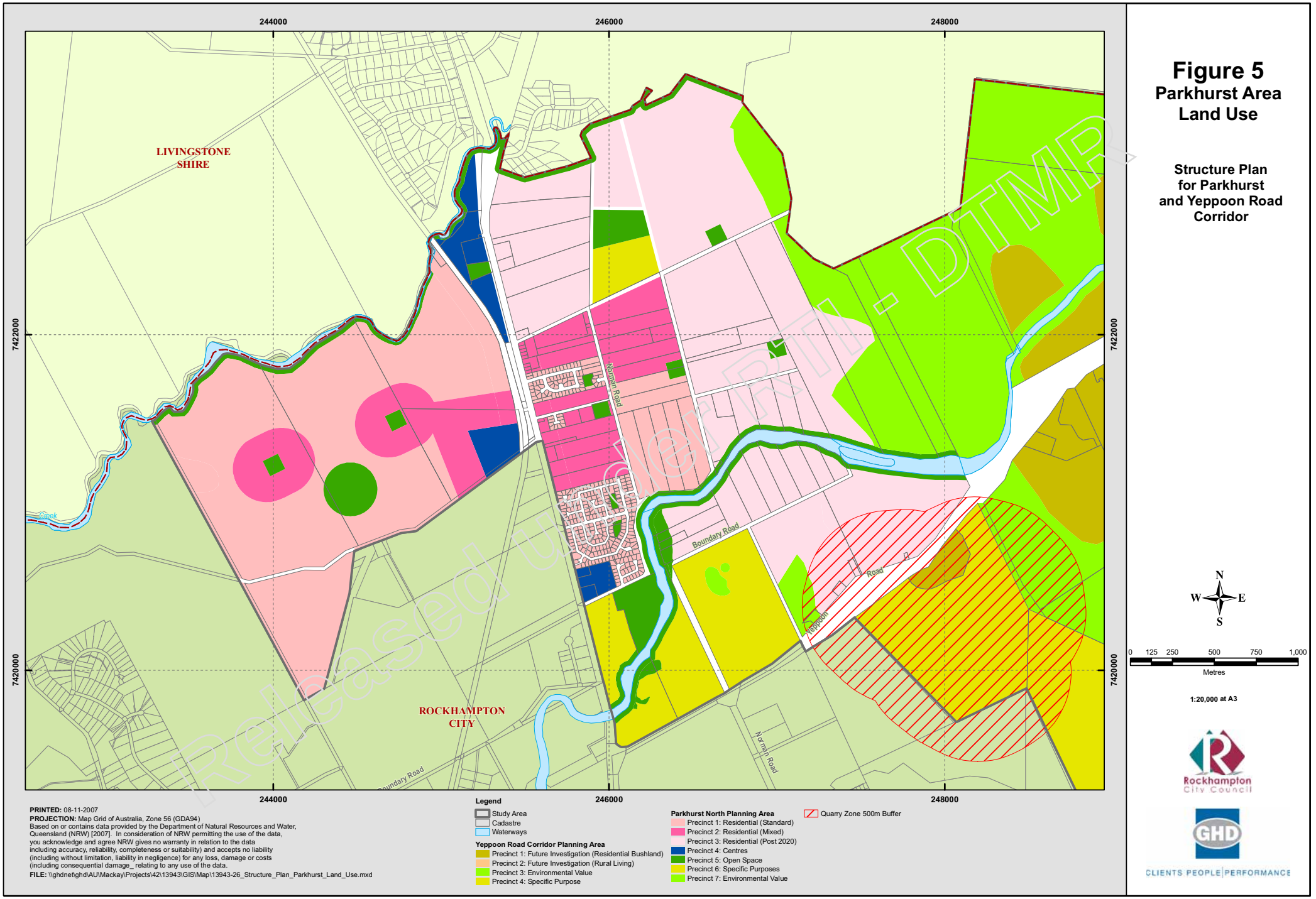

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Figure 5
Parkhurst Area Land Use

Structure Plan for Parkhurst and Yeppoon Road Corridor

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APPENDIX B

Proposed Road Parkhurst Hierarchy Figure

Parkhurst and Yeppoon Road Corridor Structure Plan (2007)

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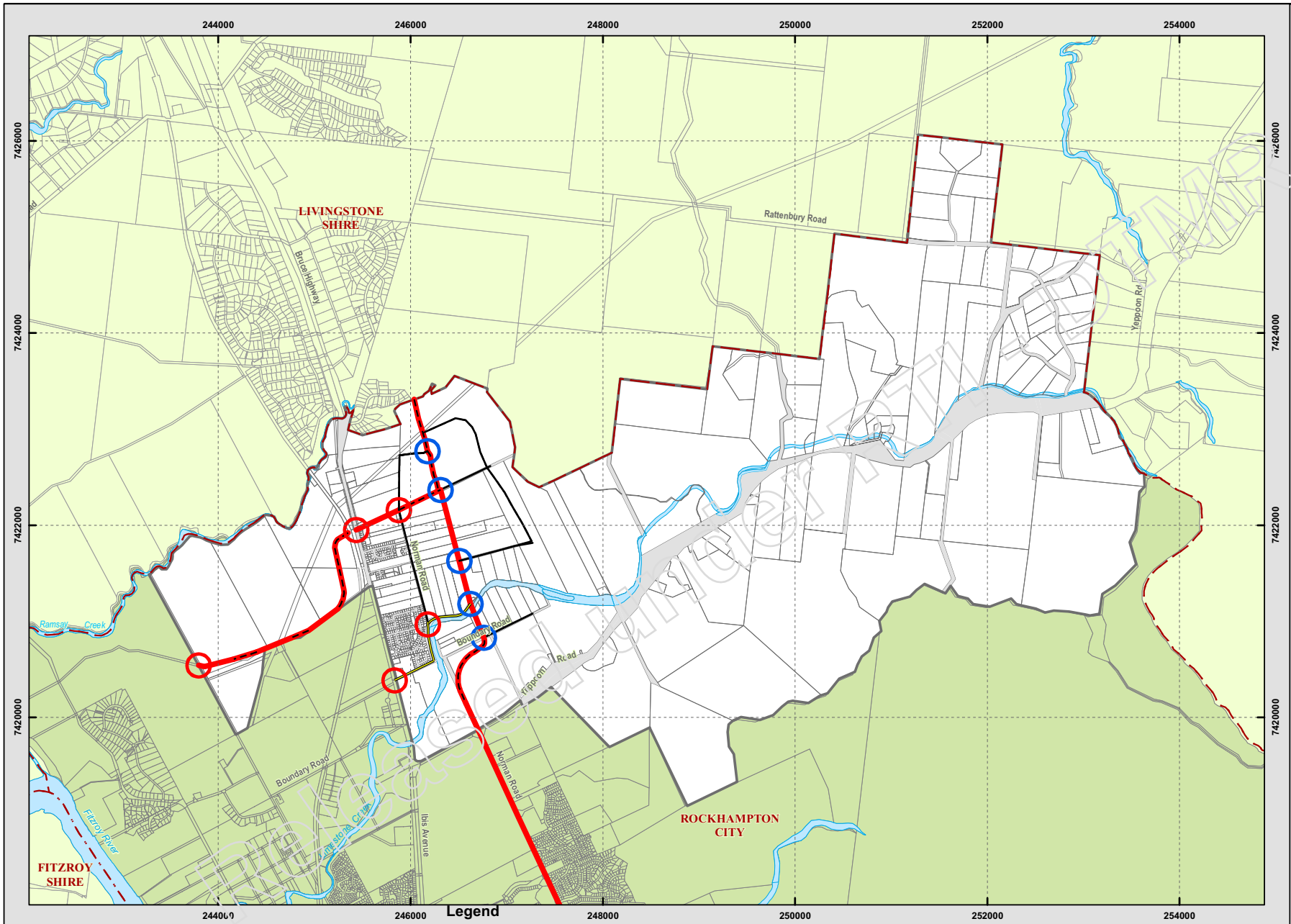

Figure 8
Overlay: Proposed Plan Area Road Hierarchy Post 2020

Structure Plan for Parkhurst and Yeppoon Road Corridor

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Legend

- Local Government Boundary
- Waterways
- Study Area
- Cadastre
- Urban Arterial
- Urban Sub-Arterial
- Major Urban Collector
- New Road Reserve

Road Intersection Upgrades

- Post 2020
- Pre 2020

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APPENDIX C

Parkhurst Priority Infrastructure Area Figure

Planning Assumptions Report (2011)

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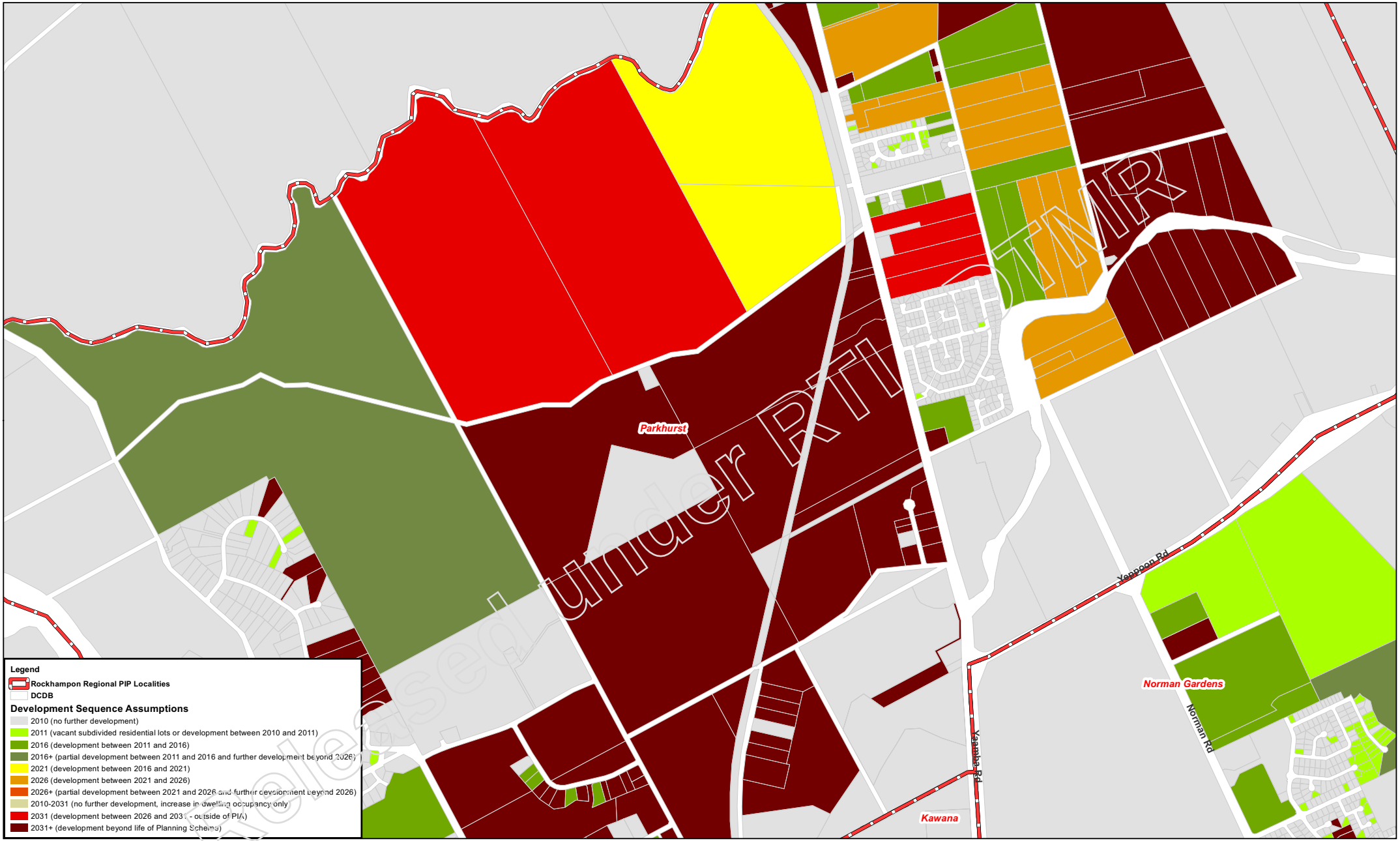

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Paper Size A3

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Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

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Rockhampton Regional Council

Rockhampton Regional Council
Planning Assumptions Report

Job Number	41-23156
Revision	C
Date	22 Jul 2011

Development Sequencing Assumptions - Parkhurst

Map 30

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Data source: RRC,DERM & GHD, Data Custodian: RRC & GHD, Data Set: RRC Land Use data 2010 (based on DERM Land Valuation Land Use Codes), RRC Localities 2011 (modified by GHD). Created by:cteitzel

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APPENDIX D

Parkhurst Transport Network Infrastructure Map

Adopted Infrastructure Charges Resolution No. 2 (2012)

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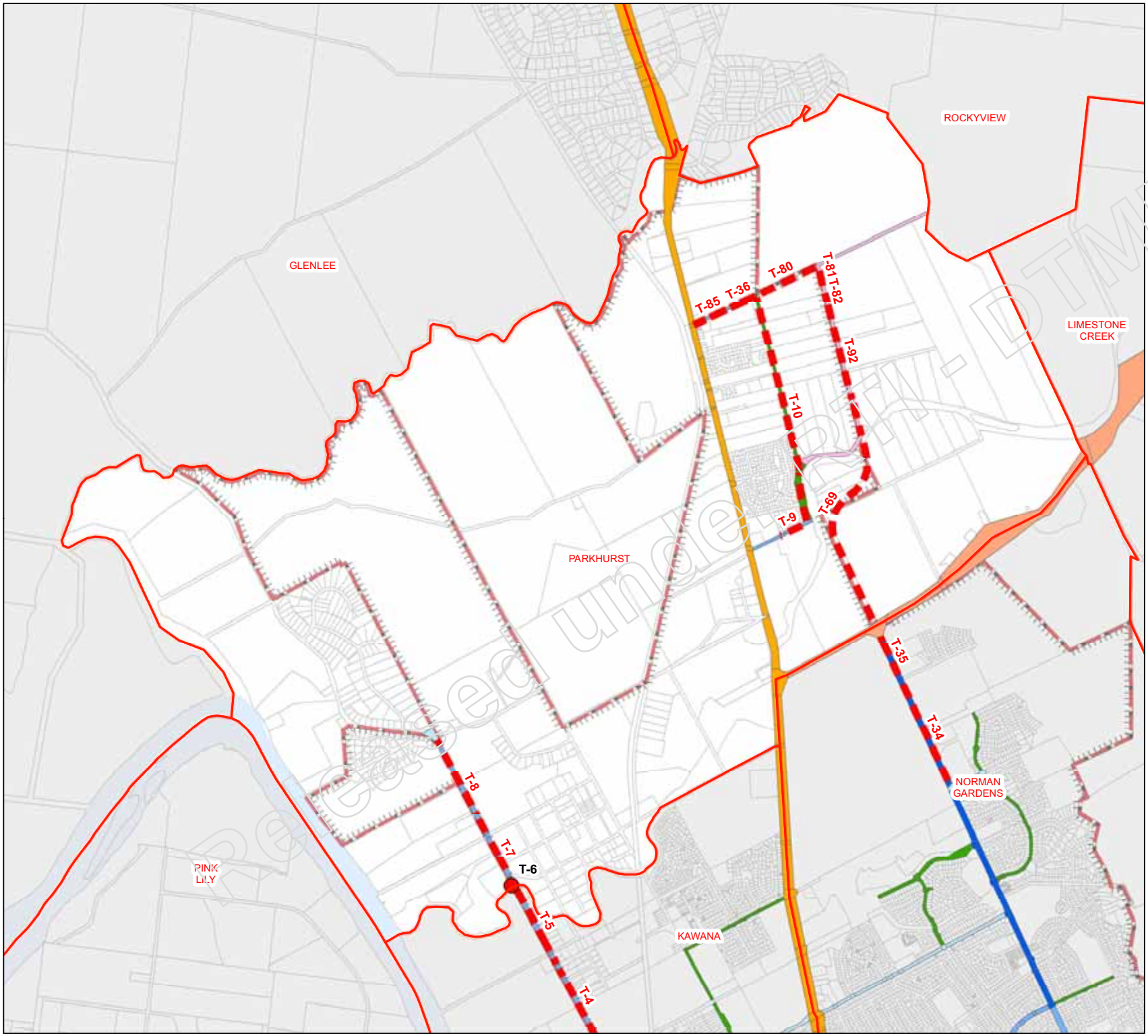

Trunk Infrastructure - Transport

- Locality Boundaries

Future Trunk Infrastructure

- Bridge
- Intersection
- Road Works

Existing Trunk Infrastructure

- 1 - Highway
- 2 - Main Road
- 3 - Rural Arterial
- 4A - Major Rural Collector
- 6A - Major Urban Arterial
- 6B - Urban Arterial
- 6C - Urban Sub-Arterial
- 7 - Major Urban Collector
- Cadastral Parcels
- Priority Infrastructure Area

Note: Priority Infrastructure Area located inside hashed boundary.

Approx Scale @A3 1:25,000

0 380 760 1,520 Metres

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Map 86-3
PARKHURST
Transport Network Infrastructure Map

December 2012

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APPENDIX E

Proposed Plan of Development

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SC2.2 ELLIDA MASTER PLAN



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APPENDIX F

Proposed Road Hierarchy Plan & Bus Route

(Prepared by RPS)

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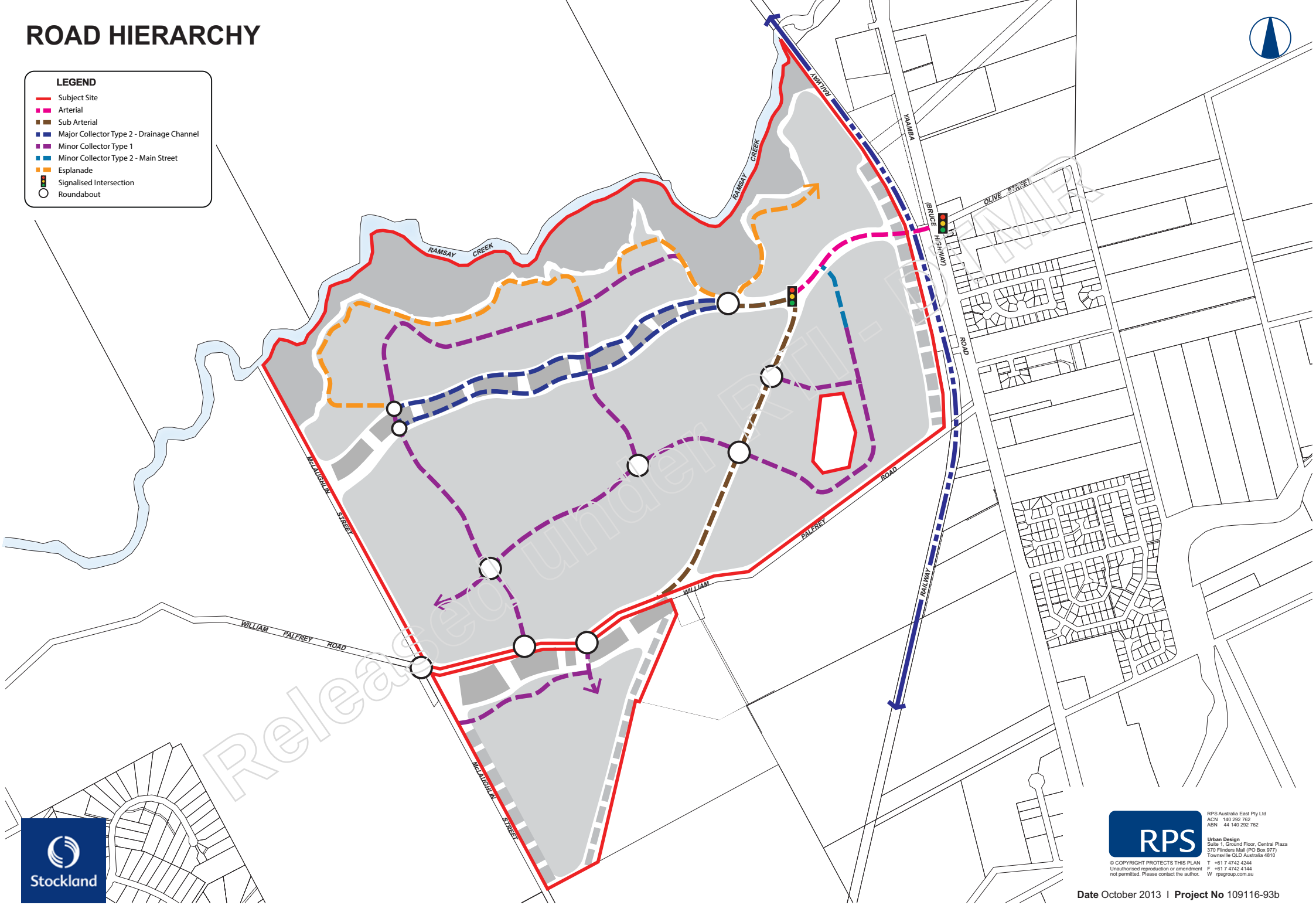
ROAD HIERARCHY



RPS Australia East Pty Ltd
ACN 140 292 762
ABN 44 140 292 762

Urban Design
Suite 1, Ground Floor, Central Plaza
370 Flinders Mall (PO Box 977)
Townsville QLD Australia 4810

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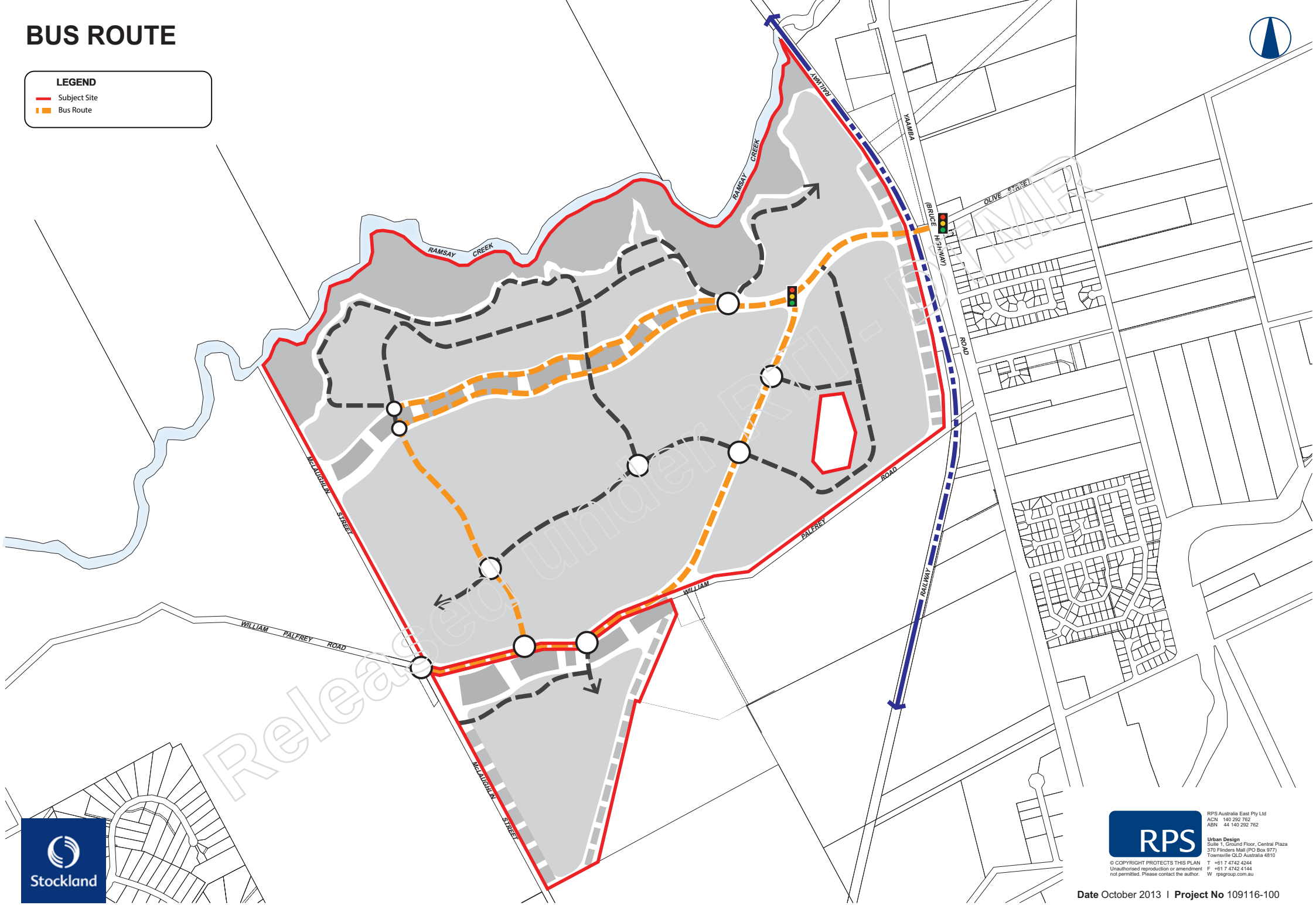
Date October 2013 I **Project No** 109116-93b

BUS ROUTE



Released under RTI - DTMR

RPS
RPS Australia East Pty Ltd
ACN 140 292 762
ABN 44 140 292 762
Urban Design
Suite 1, Ground Floor, Central Plaza
370 Flinders Mall (PO Box 977)
Townsville QLD Australia 4810
T +61 7 4742 4244
F +61 7 4742 4144
W rpsgroup.com.au

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Date October 2013 I **Project No** 109116-100



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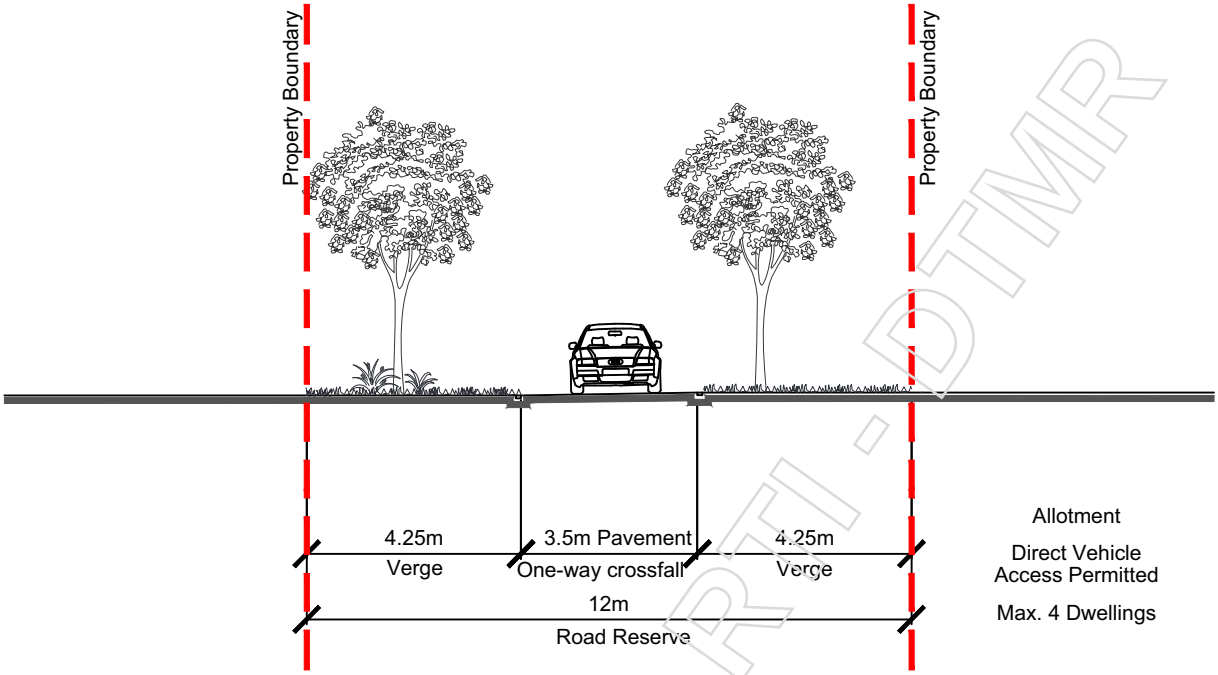
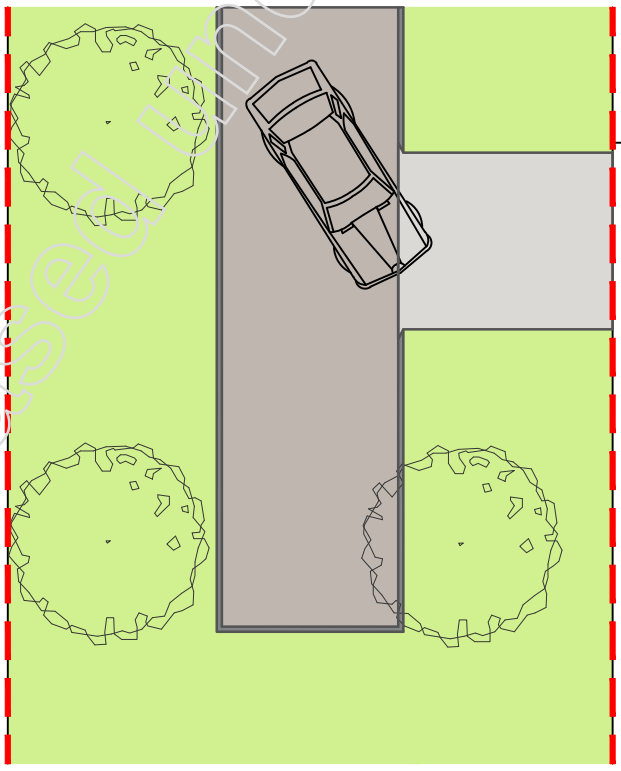
APPENDIX G

Proposed Road Cross Sections

(Prepared by RPS)

r_RTI-3295 file1 Release.pdf - Page Number: 477 of 672





Released under RTI - DTMR

RPS

SCALE 1 : 150 @ A4

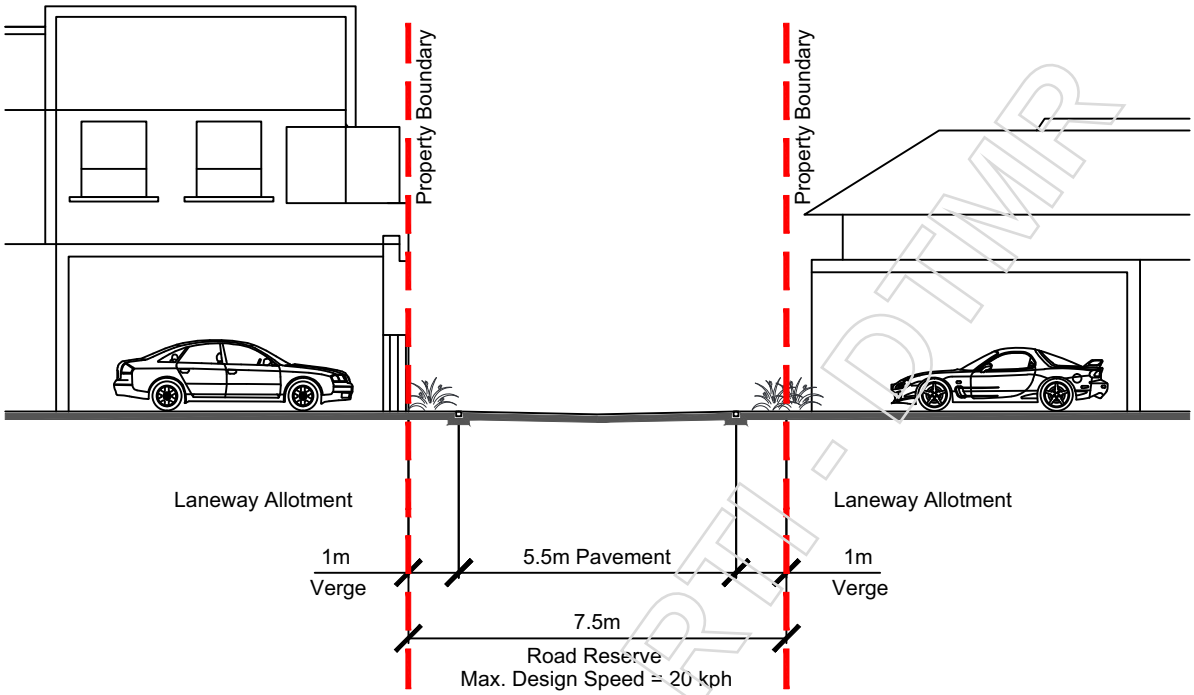
0 1 2 4 6 8

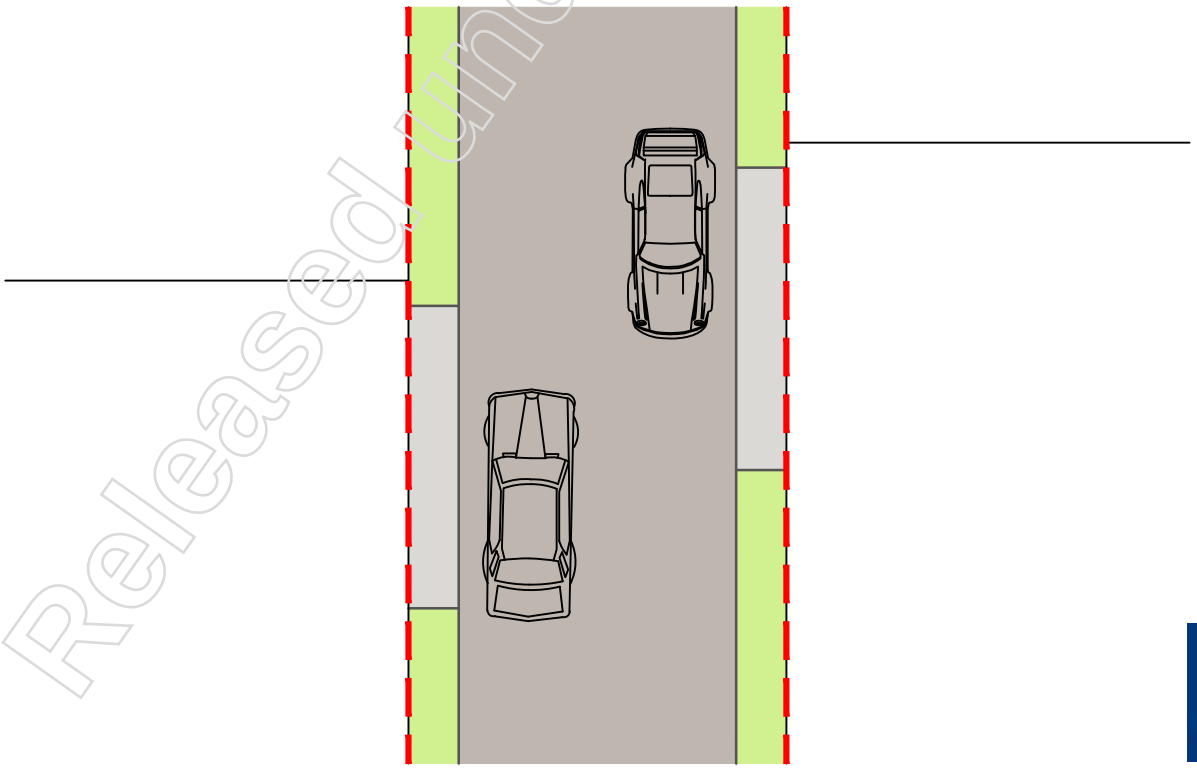
Driveway

Ellida

DATE : 12 June 2013

DWG NAME : 109116-84c Road Cross-Sections





Released under RTI - DTMR

RPS

DATE : 04 July 2013

SCALE 1 : 150 @ A4

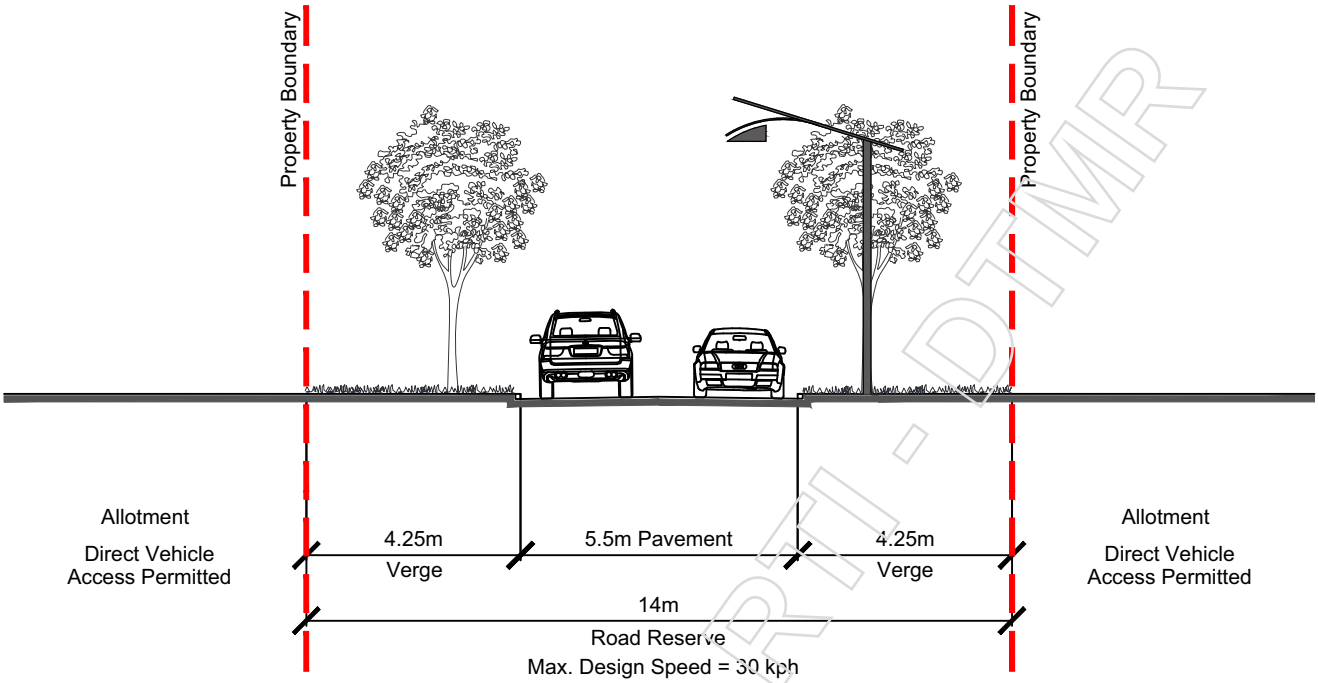
0 1 2 4 6 8

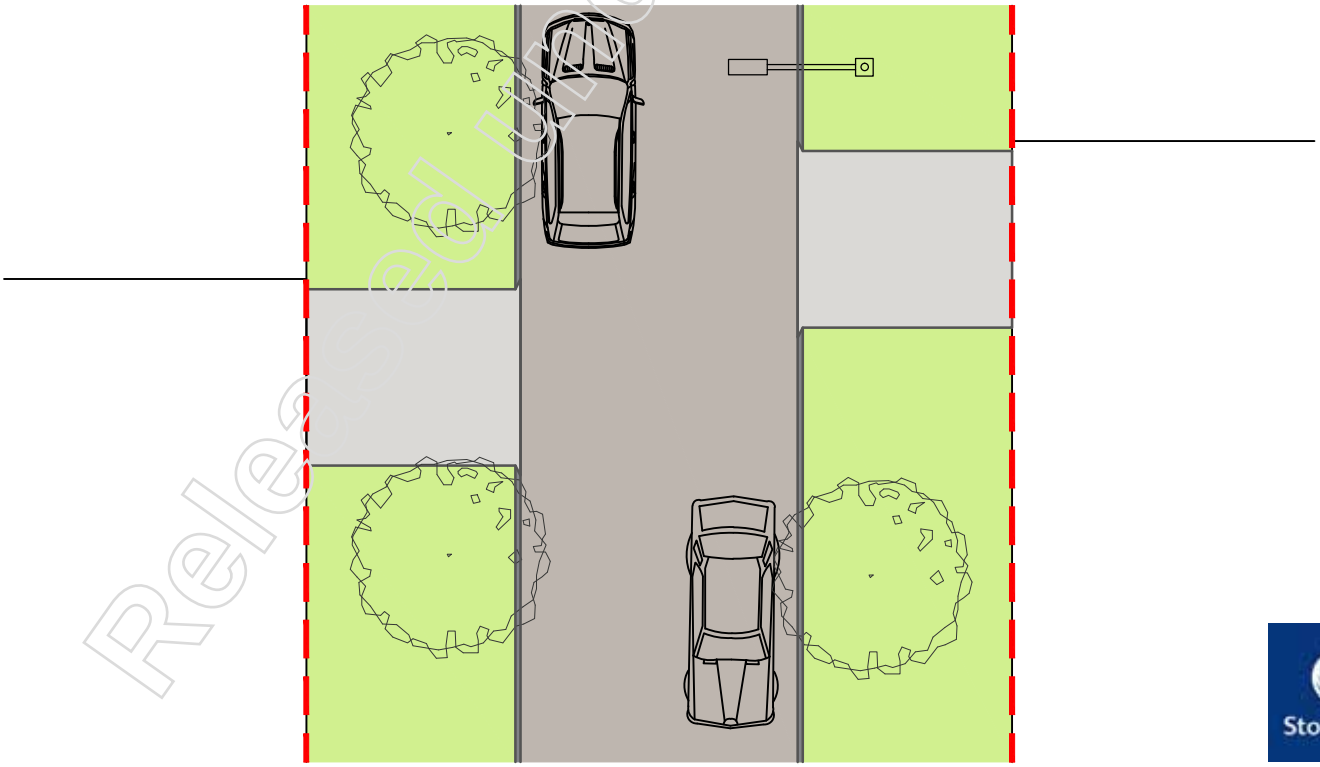
DWG NAME : 109116-84c Road Cross-Sections

Laneway

Ellida

Stockland





Released under RTI - DTMR

RPS

SCALE 1 : 150 @ A4

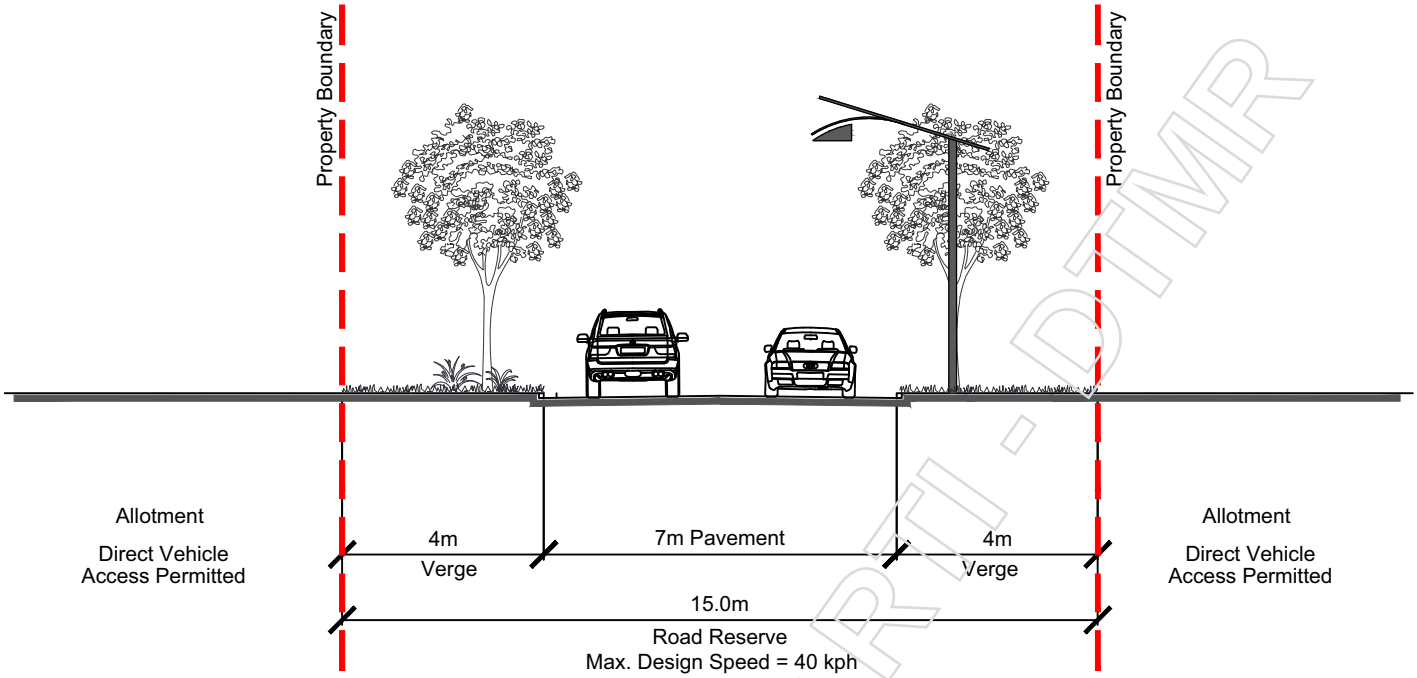
0 1 2 4 6 8

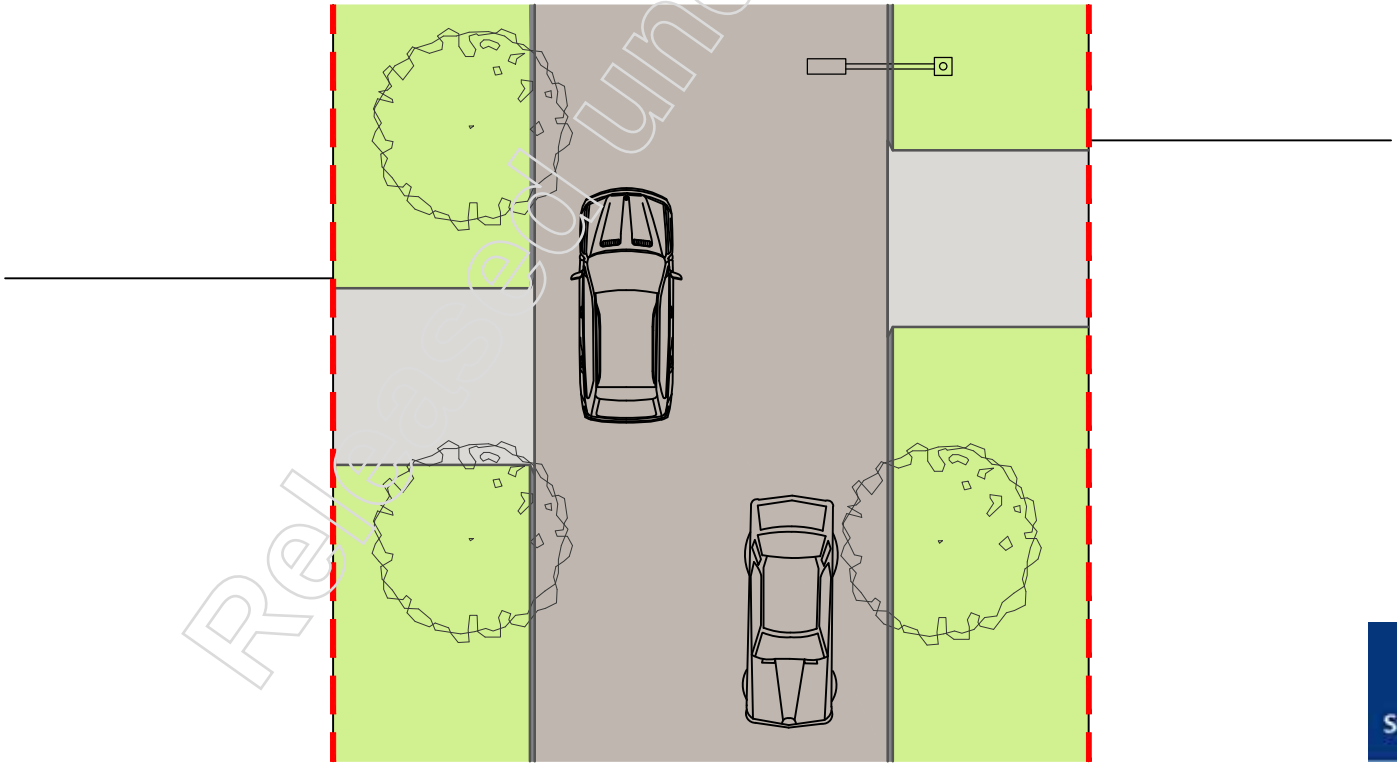
Access Place

Ellida

DATE : 04 July 2013

DWG NAME : 109116-84c Road Cross-Sections





Released under RTI - DTMR

RPS

DATE : 04 July 2013

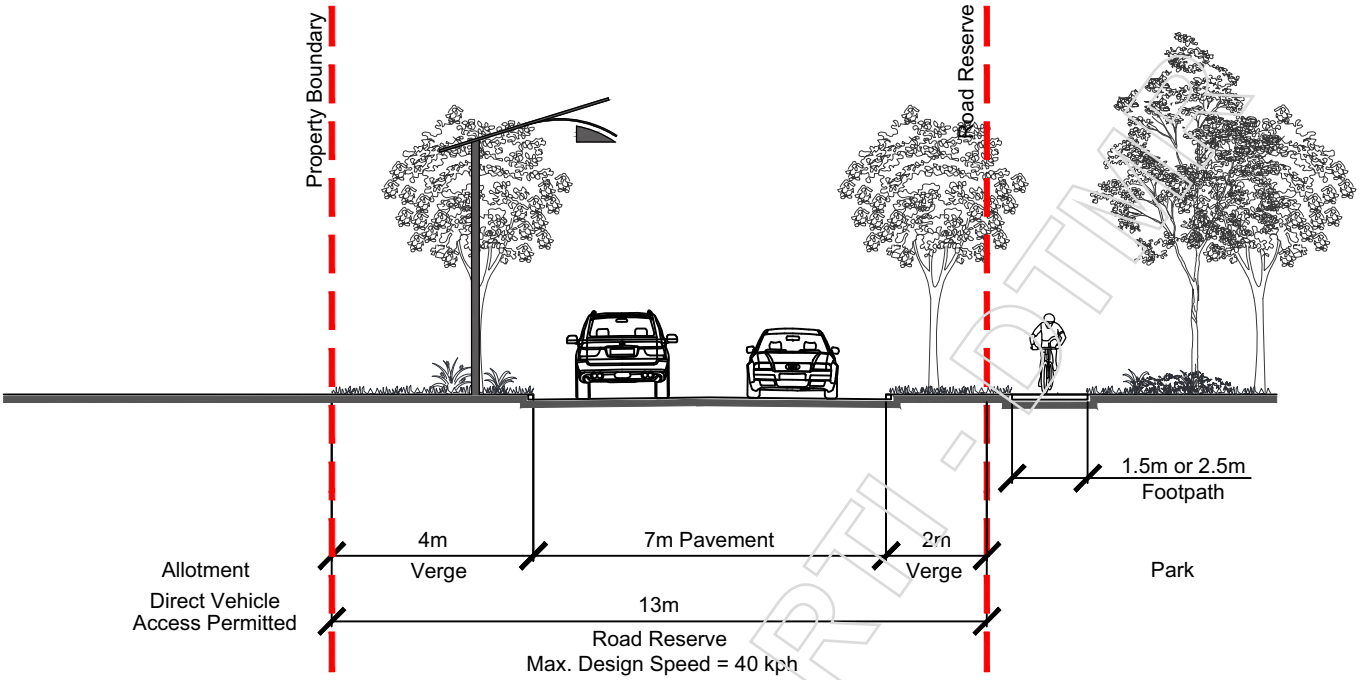
SCALE 1 : 150 @ A4

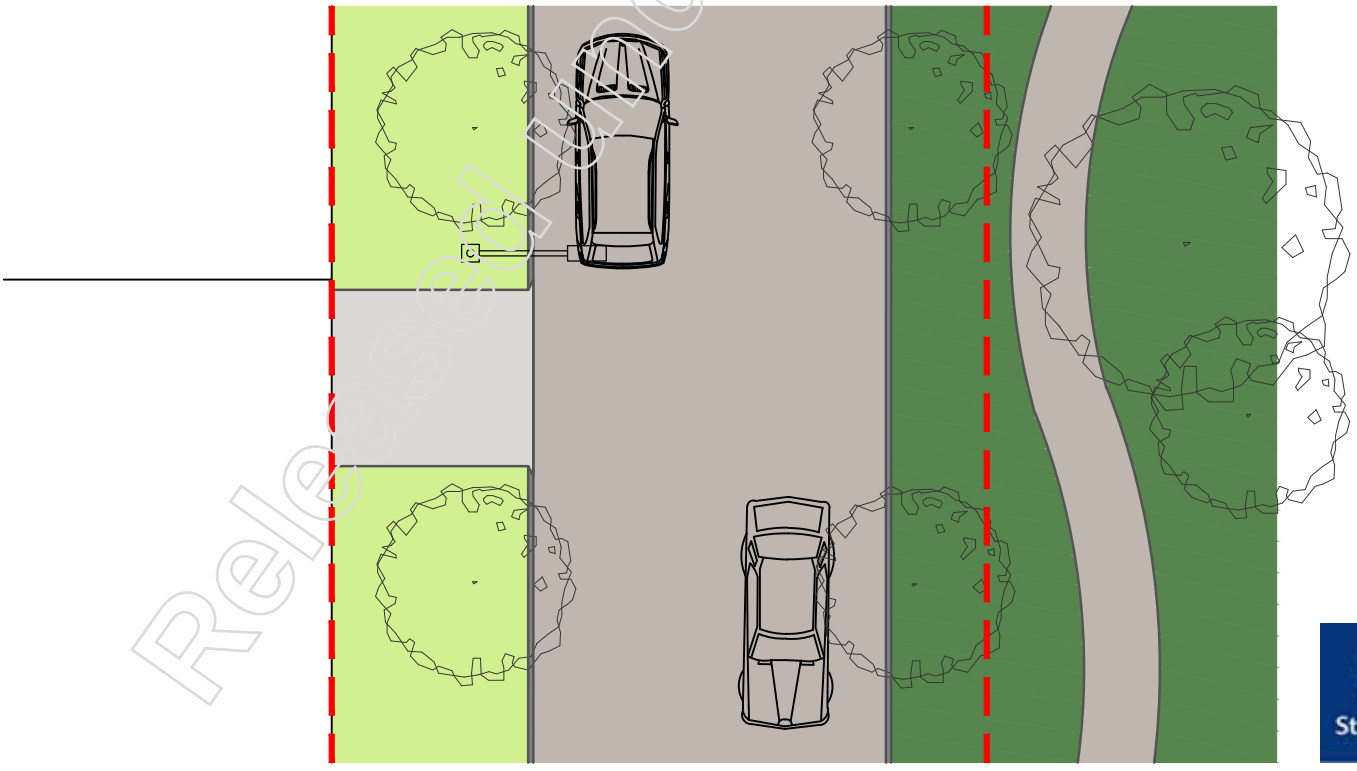
0 1 2 4 6 8

DWG NAME : 109116-84c Road Cross-Sections

Access Street

Ellida





Released under RTI - DTMR

RPS

SCALE 1 : 150 @ A4

0 1 2 4 6 8

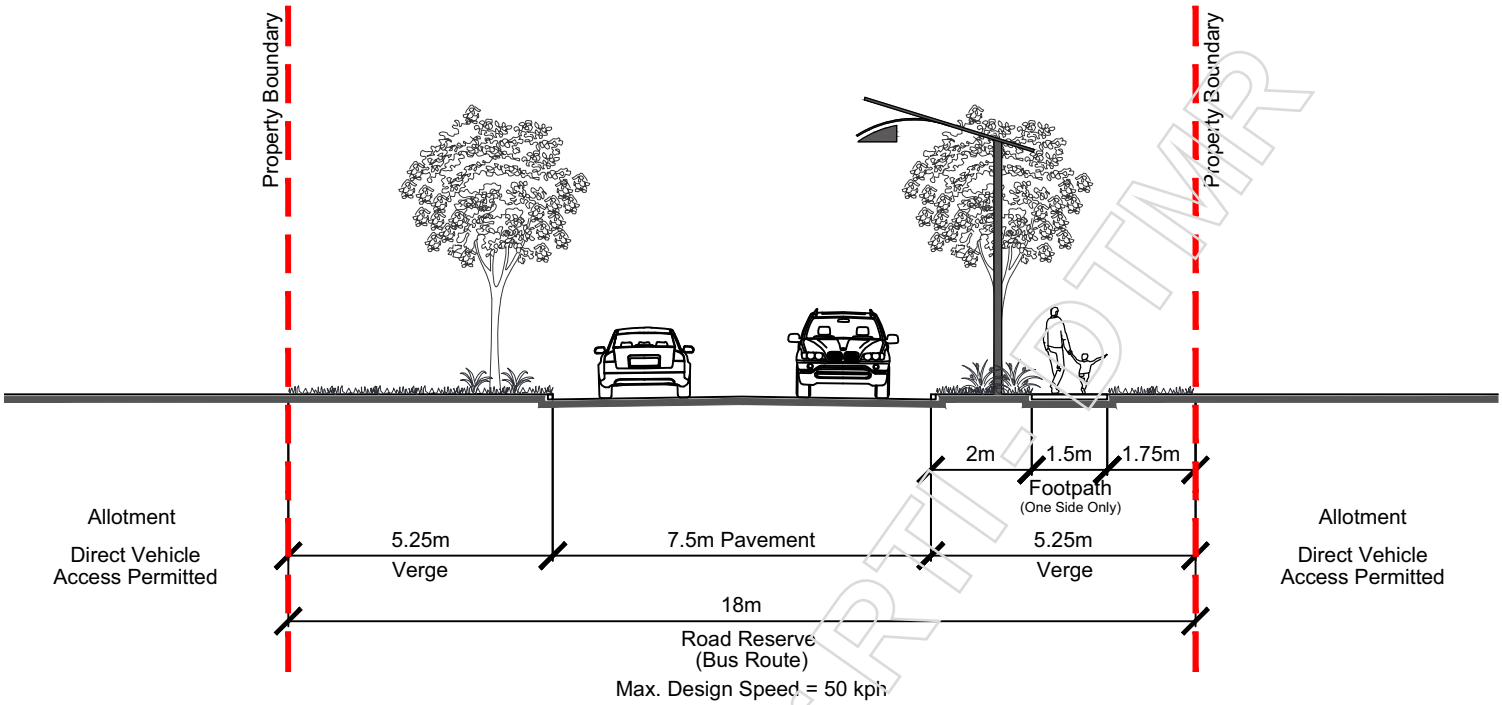
DATE : 12 June 2013

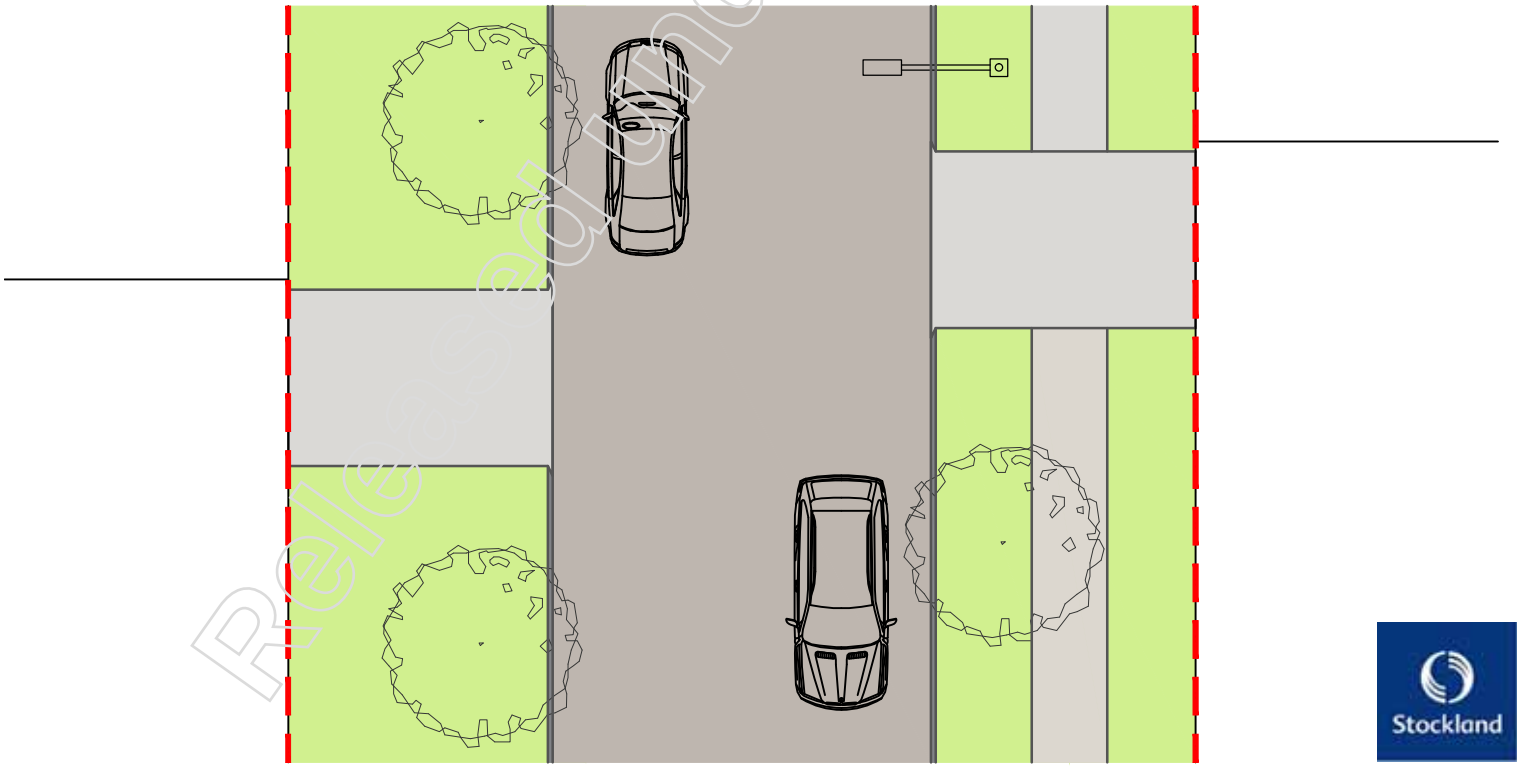
DWG NAME : 109116-84c Road Cross-Sections

Esplanade

Ellida

Stockland





Released under RTI to DTMR

RPS

SCALE 1 : 150 @ A4

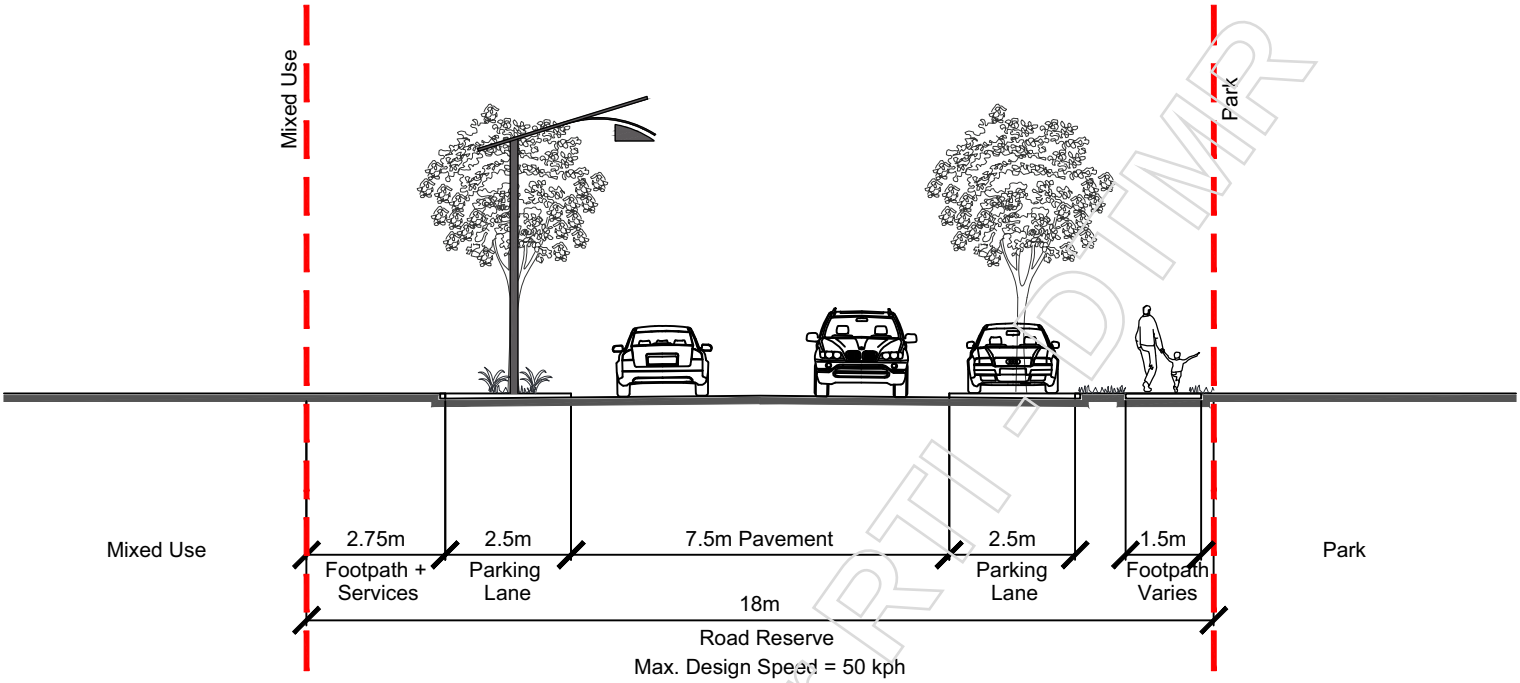
0 1 2 4 6 8

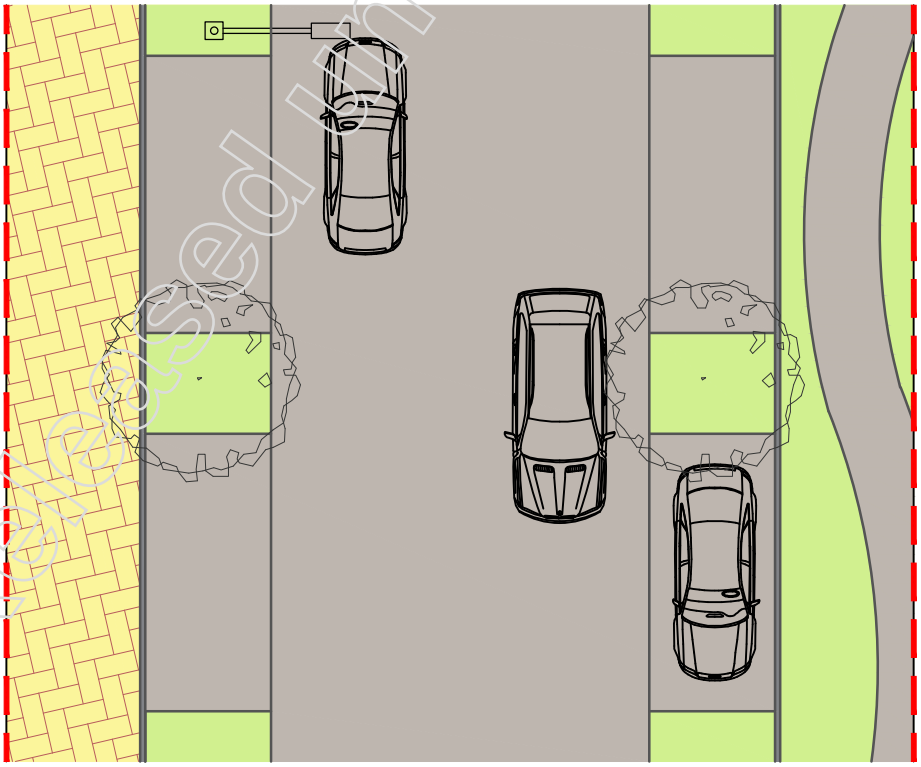
Minor Collector (Type 1)

Ellida

DATE : 12 June 2013

DWG NAME : 109116-84c Road Cross-Sections





Released Under RTI - DTMR

RPS

SCALE 1 : 150 @ A4

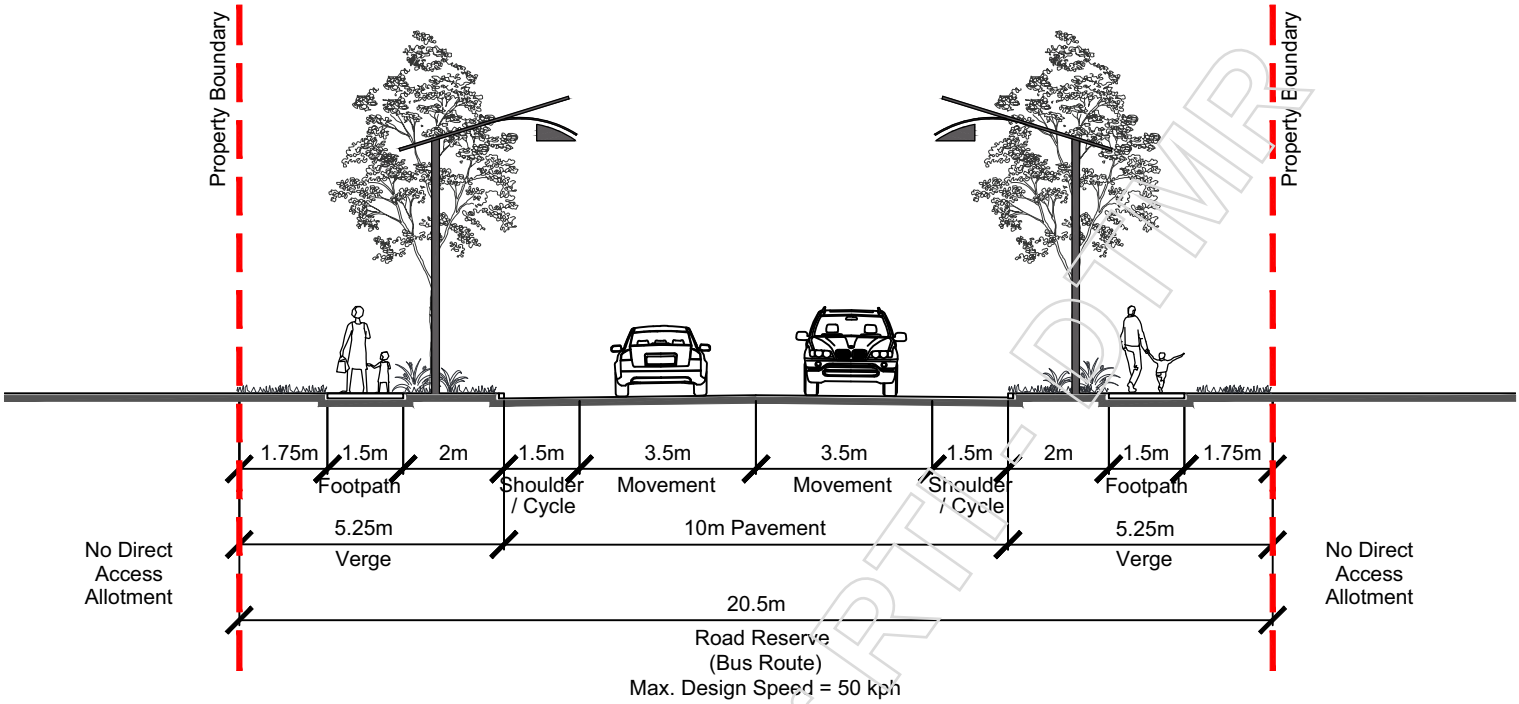
0 1 2 4 6 8

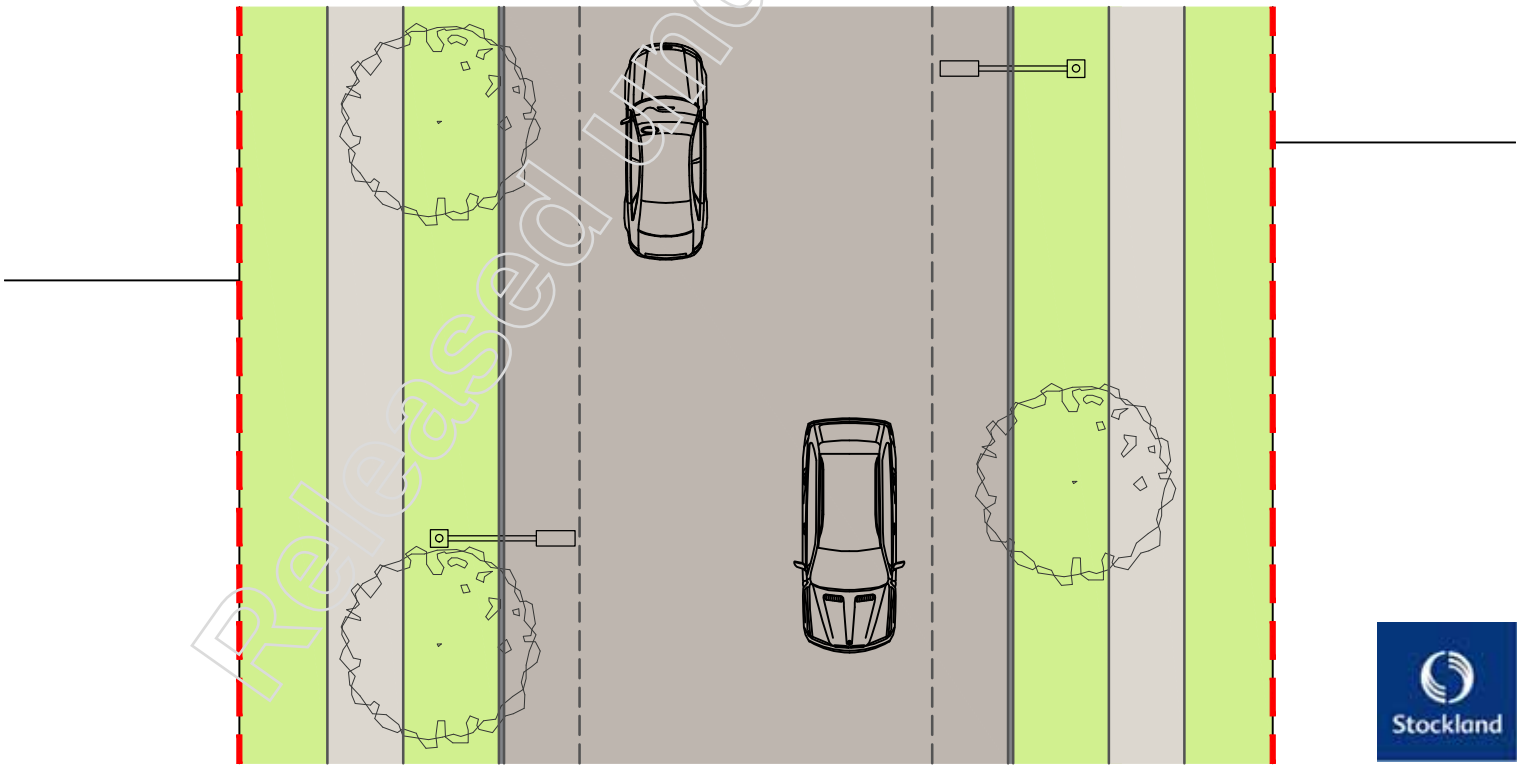
Minor Collector (Type 2 - Main St)

Ellida

DATE : 12 June 2013

DWG NAME : 109116-84c Road Cross-Sections





Released Under RTI DTMR

RPS

SCALE 1 : 150 @ A4

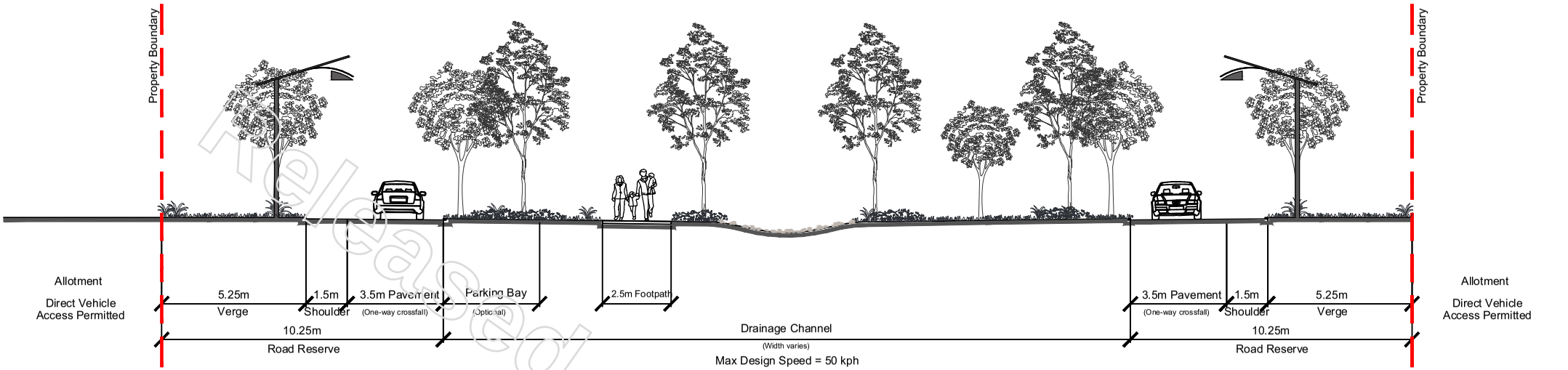
0 1 2 4 6 8

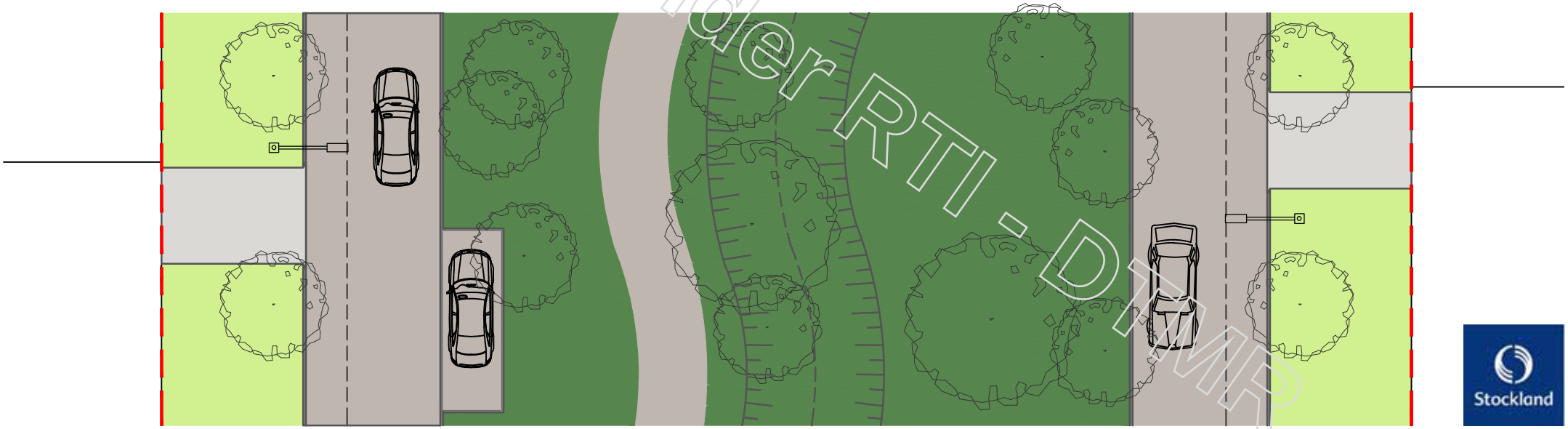
Major Collector (Type 1)

Ellida

DATE : 12 June 2013

DWG NAME : 109116-84c Road Cross-Sections





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[RTI-3295 file1 Release.pdf - Page Number: 486 of 672

RPS

DATE : 12 June 2013

SCALE 1 : 200 @ A4

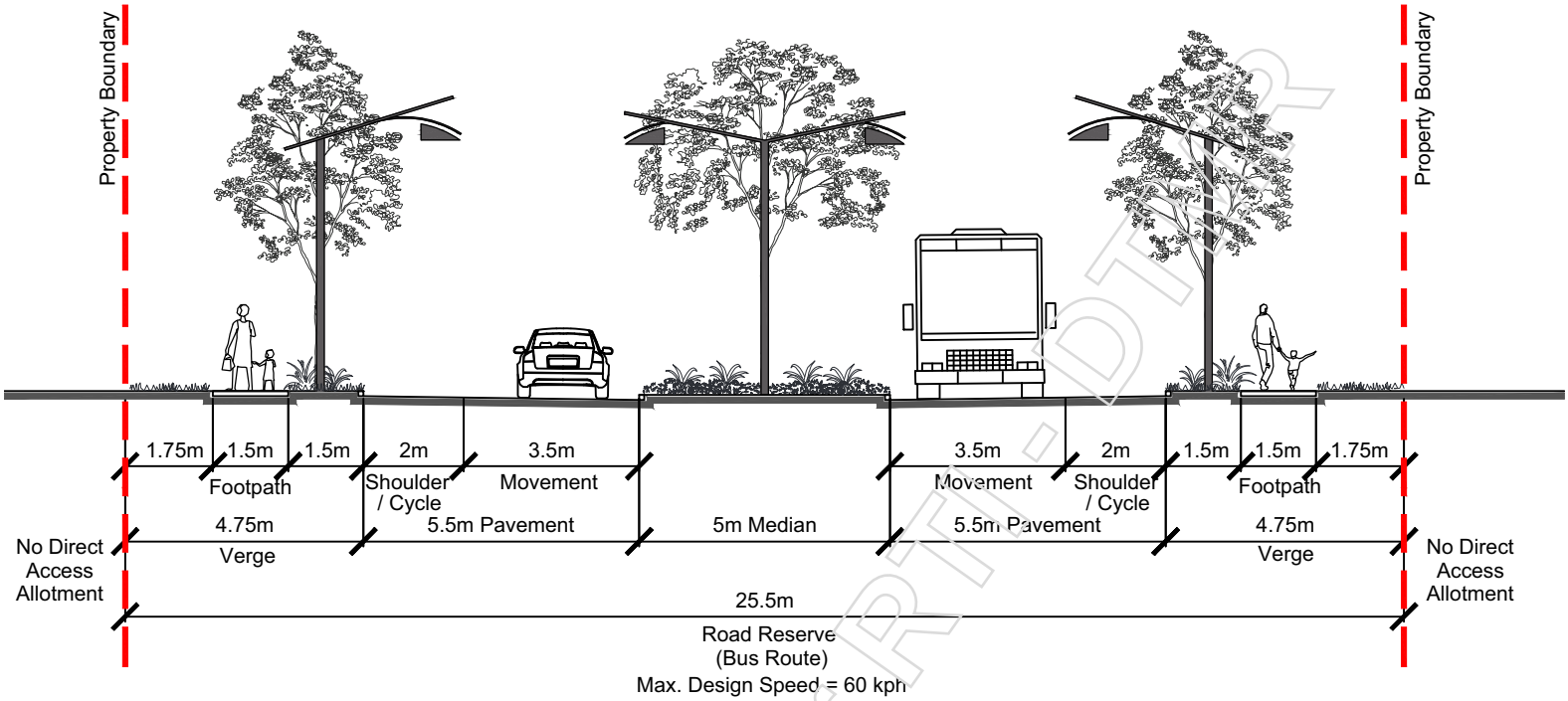
0 2 4 6 8 10 12

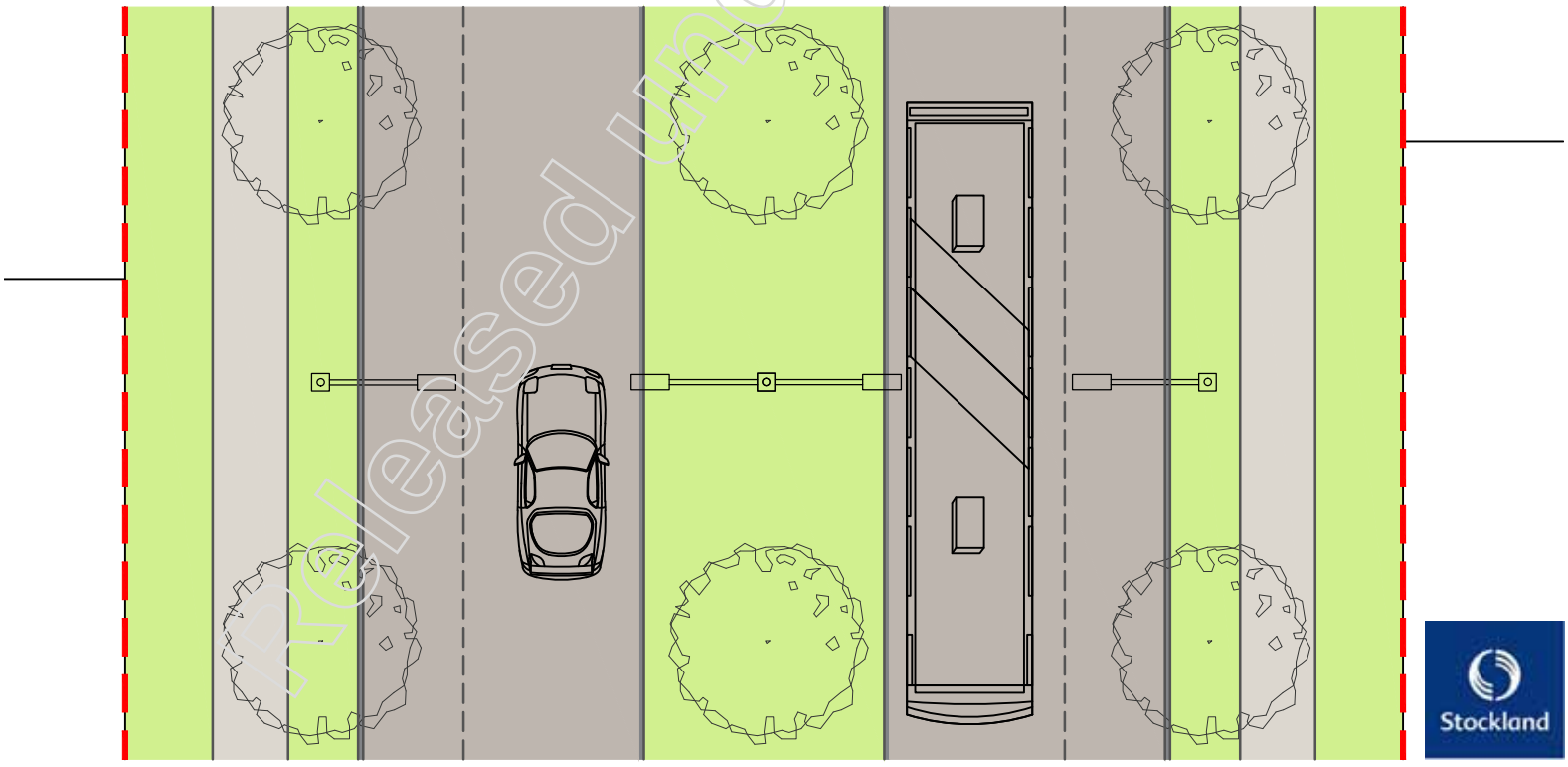
DWG NAME : 109116-84c Road Cross-Sections

Major Collector (Type 2 - Drainage Channel)

Ellida

Stockland





Released Under RTI-DTMR

RPS

SCALE 1 : 150 @ A4

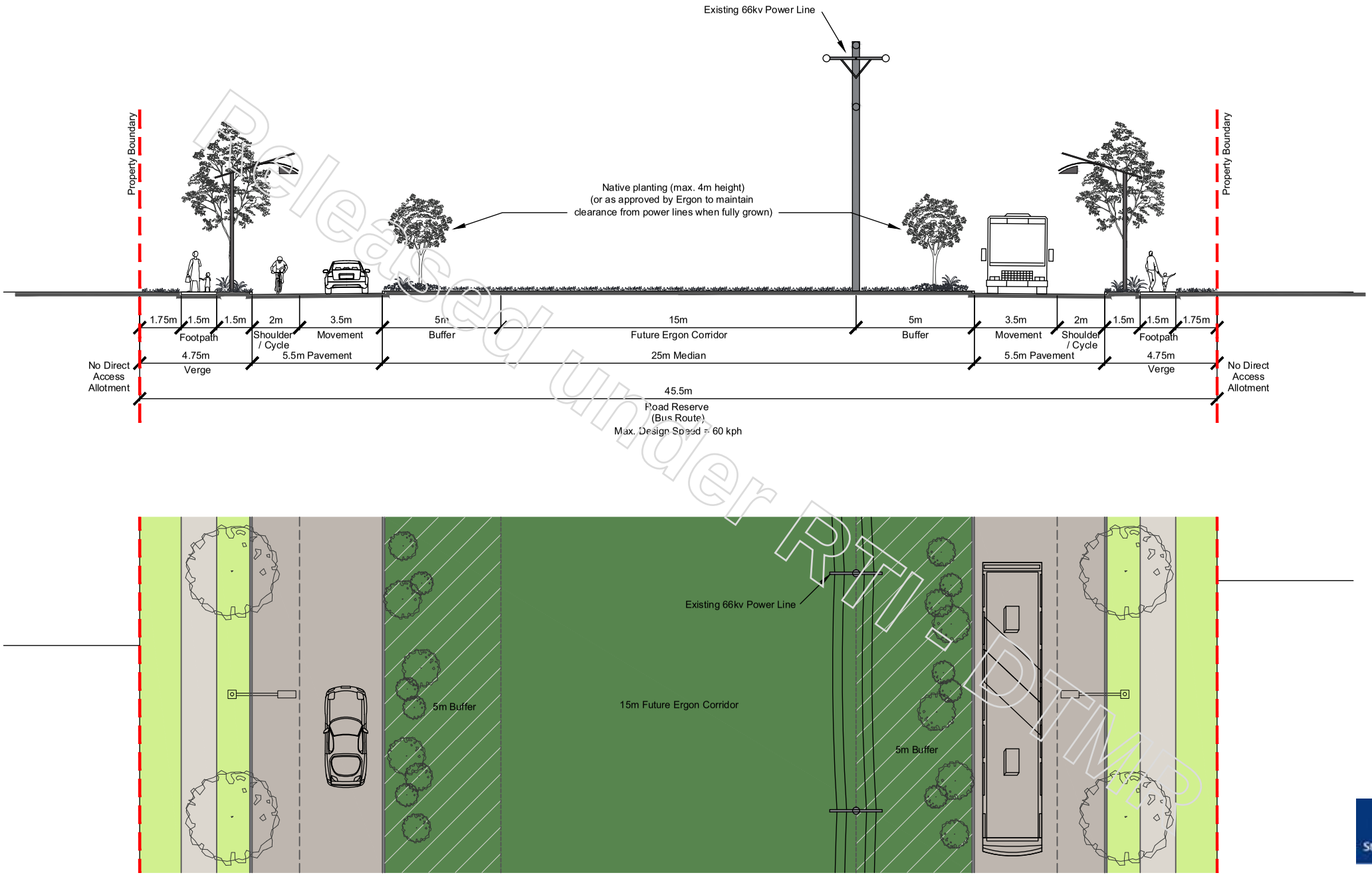
0 1 2 4 6 8

Urban Sub-Arterial

Ellida

DATE : 12 June 2013

DWG NAME : 109116-84c Road Cross-Sections



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[RTI-3295 file1 Release.pdf - Page Number: 488 of 672

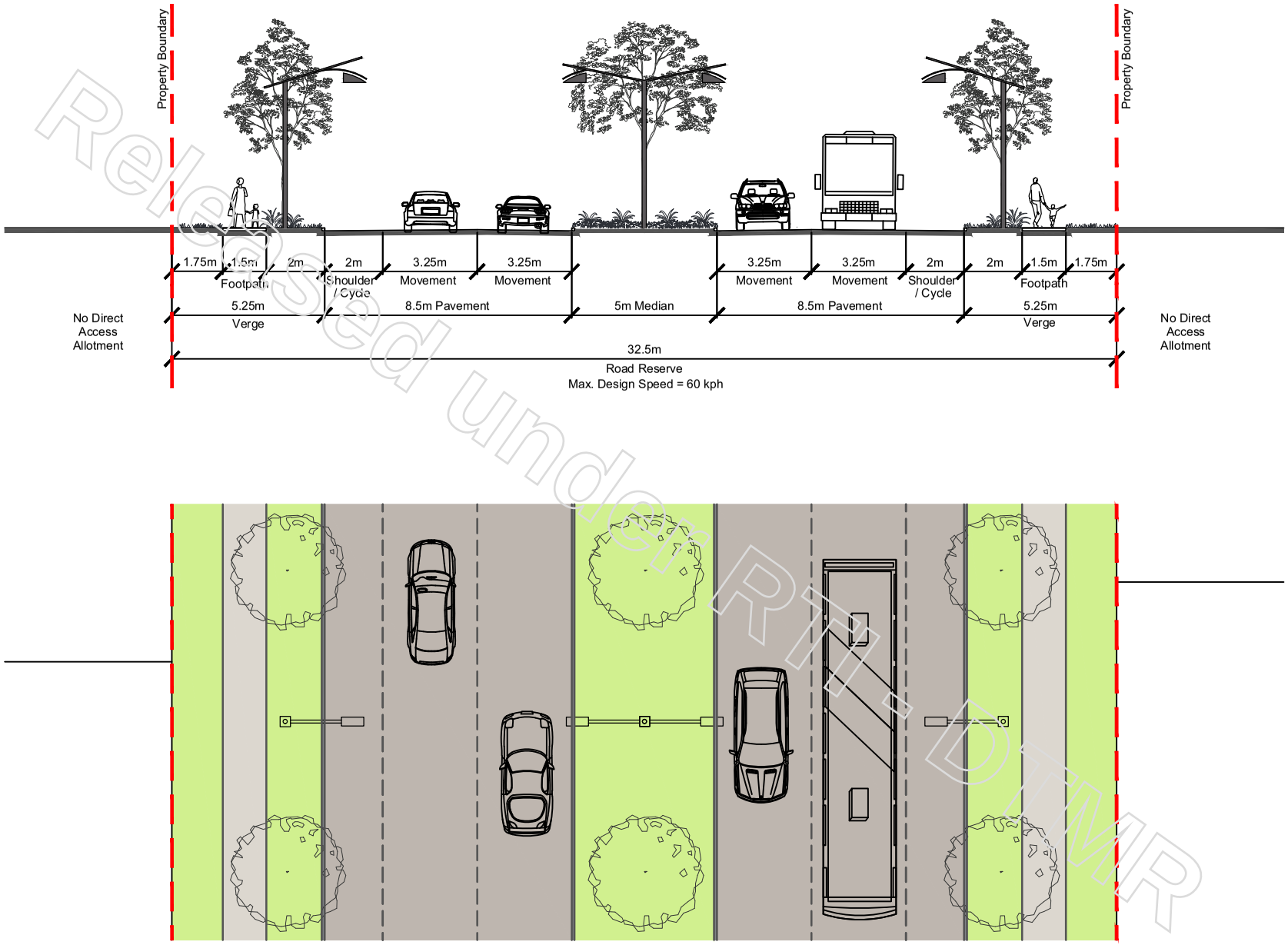
SCALE 1 : 150 @ A4

0 1 2 4 6 8

DATE : 23 October 2013 DWG NAME : 109116-84c Road Cross-Sections

Urban Sub-Arterial and Ergon Corridor

Ellida



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[RTI-3295 file1 Release.pdf - Page Number: 489 of 672

RPS

SCALE 1 : 200 @ A4

0 2 4 6 8 10 12

DATE : 12 June 2013

DWG NAME : 109116-84c Road Cross-Sections

Urban Arterial

Ellida

Stockland



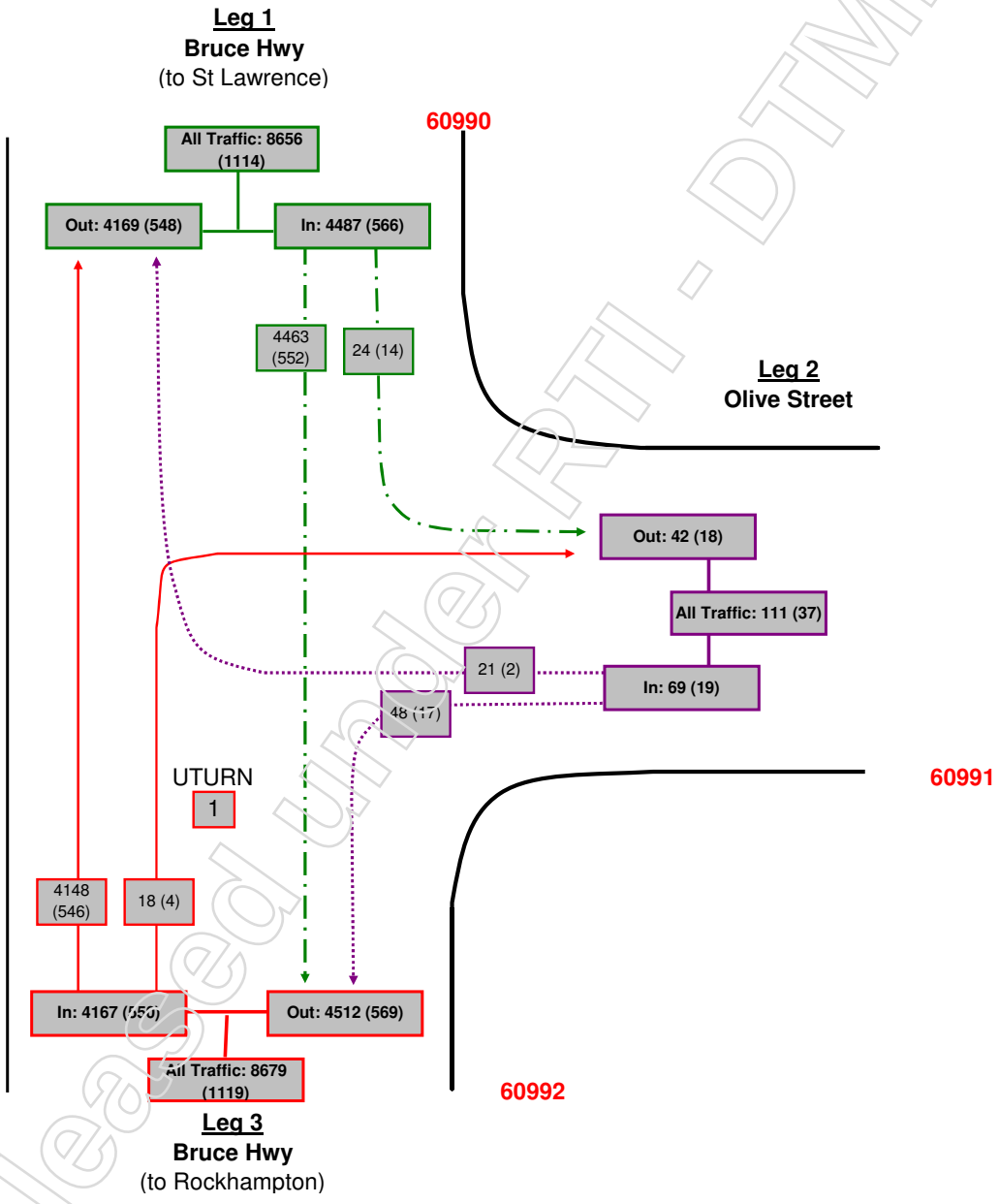
APPENDIX H

2012 TMR Intersection Counts

Released under RTI to DTMR

r RTI-3295 file1 Release.pdf - Page Number: 490 of 672

LOCATION: Bruce Hwy & Olive Street
ROAD No: 10F (Int. 588 @ Tdist 11.1Km)
DATE: Thu, 15/03/12
TIME: 06:00 - 18:00



Released under RTI - DTMR

Count Tally Sheet With Totals and Peak Flows.

Queensland Government

LOCATION: Bruce Hwy & Olive Street
ROAD No: 10F (Int. 588 @ Tdist 11.1Km)
DATE: Thu, 15/03/12
TIME: 06:00 - 18:00

	Leg 1						Leg 2						Leg 3					
	Left		Thru		U-turn	Leg	Left		Right		U-turn	Leg	Thru		Right		U-turn	Leg
Time	*Light*	*Heavy*	*Light*	*Heavy*	*All*	Total	*Light*	*Heavy*	*Light*	*Heavy*	*All*	Total	*Light*	*Heavy*	*Light*	*Heavy*	*All*	Total
6:00 - 6:15	0	0	60	4		**64**	0	0	0	0		**0**	19	18	1	0	0	**38**
6:15 - 6:30	0	0	73	9		**82**	1	0	0	0		**1**	40	6	0	0	0	**46**
6:30 - 6:45	0	0	91	3		**94**	0	0	0	0		**0**	47	9	0	0	0	**56**
6:45 - 7:00	0	1	81	9		**91**	0	0	1	0		**1**	52	13	0	0	0	**65**
7:00 - 7:15	1	2	125	2		**130**	1	0	0	0		**1**	46	15	1	1	0	**63**
7:15 - 7:30	0	0	155	12		**167**	0	0	1	0		**1**	56	12	0	0	0	**68**
7:30 - 7:45	1	0	175	16		**192**	0	0	1	0		**1**	47	18	0	0	0	**65**
7:45 - 8:00	0	0	190	16		**206**	0	2	0	0		**2**	45	11	0	0	0	**56**
8:00 - 8:15	0	1	228	8		**237**	1	0	0	0		**1**	45	25	0	0	0	**70**
8:15 - 8:30	0	0	165	6		**171**	0	1	0	0		**1**	53	11	0	0	0	**64**
8:30 - 8:45	0	1	127	14		**142**	2	0	3	0		**5**	54	13	0	0	0	**67**
8:45 - 9:00	1	0	81	15		**97**	1	0	1	0		**2**	71	11	0	0	0	**82**
9:00 - 9:15	1	0	82	7		**90**	0	0	0	0		**0**	58	10	1	0	0	**69**
9:15 - 9:30	0	0	74	11		**85**	0	0	0	0		**0**	63	11	0	0	0	**74**
9:30 - 9:45	0	0	76	11		**87**	1	1	0	0		**2**	59	16	2	0	1	**78**
9:45 - 10:00	0	0	60	11		**71**	0	0	0	0		**0**	76	4	0	0	0	**80**
10:00 - 10:15	0	0	66	12		**78**	1	0	0	0		**1**	49	9	1	0	0	**59**
10:15 - 10:30	0	0	44	13		**57**	0	0	1	0		**1**	58	11	0	1	0	**70**
10:30 - 10:45	0	0	72	6		**78**	0	0	0	0		**0**	50	5	0	0	0	**55**
10:45 - 11:00	0	1	50	9		**60**	0	1	0	0		**1**	55	12	0	0	0	**67**
11:00 - 11:15	0	0	45	16		**61**	1	0	0	0		**1**	57	9	0	0	0	**66**
11:15 - 11:30	1	0	65	13		**79**	1	0	0	0		**1**	60	9	1	0	0	**70**
11:30 - 11:45	0	0	42	12		**54**	0	0	2	0		**2**	43	24	0	0	0	**67**
11:45 - 12:00	0	0	59	9		**68**	0	0	0	0		**0**	68	8	0	0	0	**76**

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Data Compiled Date: 19/03/2012
Compiled by: ALH

Count Tally Sheet With Totals and Peak Flows.

Queensland Government

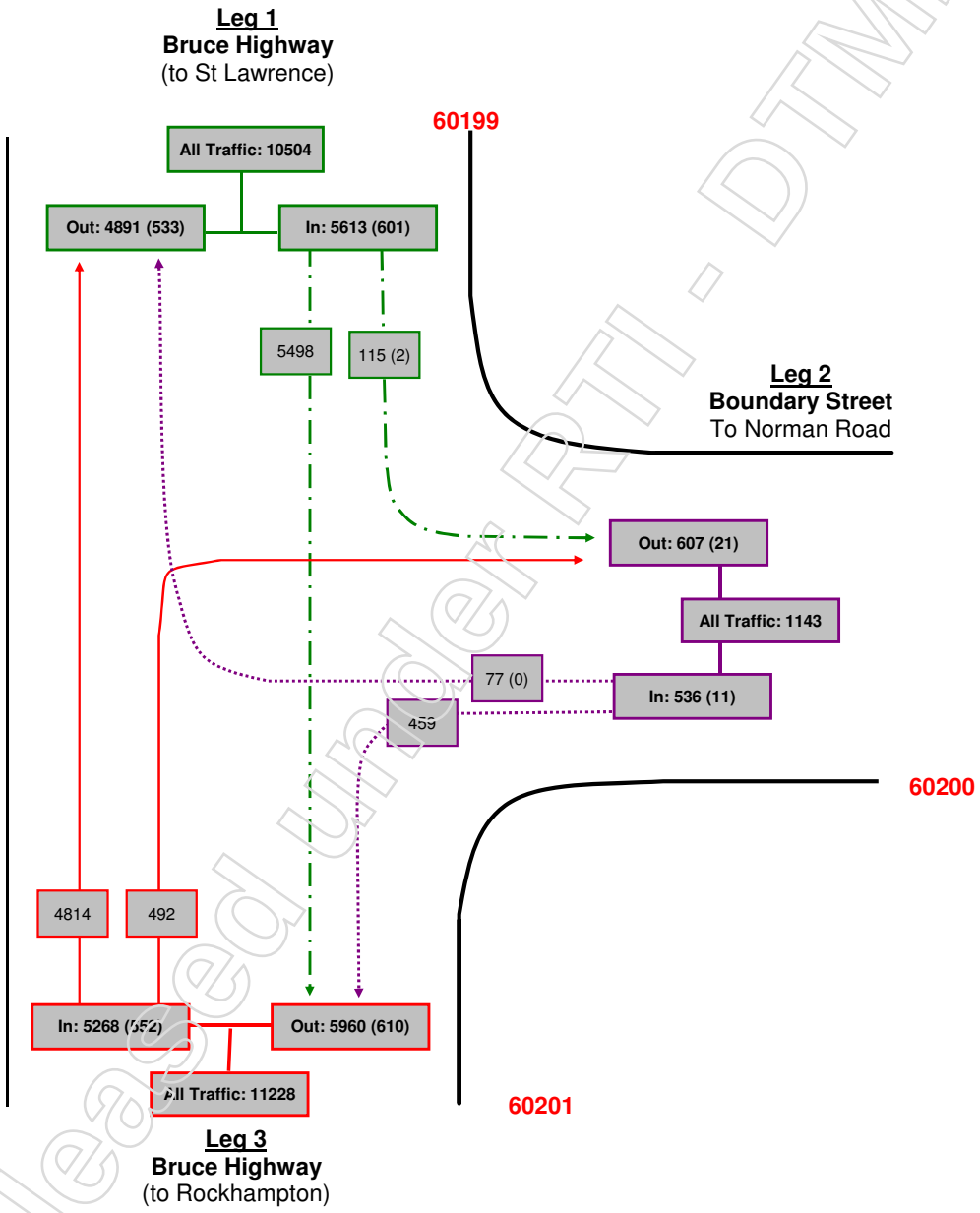
LOCATION: Bruce Hwy & Olive Street
ROAD No: 10F (Int. 588 @ Tdist 11.1Km)
DATE: Thu, 15/03/12
TIME: 06:00 - 18:00

	Leg 1						Leg 2						Leg 3					
	Left		Thru		U-turn	Leg	Left		Right		U-turn	Leg	Thru		Right		U-turn	Leg
Time	*Light*	*Heavy*	*Light*	*Heavy*	*All*	Total	*Light*	*Heavy*	*Light*	*Heavy*	*All*	Total	*Light*	*Heavy*	*Light*	*Heavy*	*All*	Total
12:00 - 12:15	0	0	54	13		**67**	1	0	1	0		**2**	56	13	0	0	0	**69**
12:15 - 12:30	0	0	52	13		**65**	0	1	0	1		**2**	64	4	0	0	0	**68**
12:30 - 12:45	0	1	55	15		**71**	0	0	1	0		**1**	61	7	0	0	0	**68**
12:45 - 13:00	0	0	56	20		**76**	1	0	0	0		**1**	66	12	1	1	0	**80**
13:00 - 13:15	0	0	59	11		**70**	0	0	0	0		**0**	63	14	1	0	0	**78**
13:15 - 13:30	0	0	62	16		**78**	1	0	0	0		**1**	58	11	0	0	0	**69**
13:30 - 13:45	2	0	56	10		**68**	0	0	0	0		**0**	57	10	1	0	0	**68**
13:45 - 14:00	0	0	49	14		**63**	1	0	1	0		**2**	62	11	0	0	0	**73**
14:00 - 14:15	0	1	57	10		**68**	0	2	0	0		**2**	68	15	0	0	0	**83**
14:15 - 14:30	0	1	56	12		**69**	0	1	0	0		**1**	69	15	0	0	0	**84**
14:30 - 14:45	0	1	92	20		**113**	1	1	0	0		**2**	75	12	0	0	0	**87**
14:45 - 15:00	0	1	84	15		**100**	0	1	0	0		**1**	55	11	0	0	0	**66**
15:00 - 15:15	0	0	78	15		**93**	5	1	1	0		**7**	95	11	0	0	0	**106**
15:15 - 15:30	0	1	77	8		**86**	0	0	0	0		**0**	132	9	0	0	0	**141**
15:30 - 15:45	0	1	55	8		**64**	1	1	0	0		**2**	126	13	1	1	0	**141**
15:45 - 16:00	0	1	84	11		**96**	0	1	1	1		**3**	105	12	1	0	0	**118**
16:00 - 16:15	0	0	90	22		**112**	0	0	1	0		**1**	100	11	0	0	0	**111**
16:15 - 16:30	0	0	87	10		**97**	0	0	0	0		**0**	126	5	0	0	0	**131**
16:30 - 16:45	0	0	80	19		**99**	3	0	0	0		**3**	131	15	0	0	0	**146**
16:45 - 17:00	0	0	83	7		**90**	1	0	0	0		**1**	135	9	1	0	0	**145**
17:00 - 17:15	1	0	80	10		**91**	3	3	3	0		**9**	162	14	0	0	0	**176**
17:15 - 17:30	1	0	54	11		**66**	0	0	0	0		**0**	187	6	0	0	0	**193**
17:30 - 17:45	0	0	62	12		**74**	0	0	0	0		**0**	136	6	1	0	0	**143**
17:45 - 18:00	1	0	63	6		**70**	3	0	0	0		**3**	142	10	0	0	0	**152**
Total:	10	14	3911	552	0	**4487**	31	17	19	2	0	**69**	3602	546	14	4	1	**4167**
Peak Count:	3	4	758	62	0	806	7	5	4	1	0	13	627	66	3	1	1	664
Peak Hour:	17:00 to 18:00	14:00 to 15:00	07:30 to 08:30	12:30 to 13:30	06:00 to 07:00	07:30 to 08:30	16:15 to 17:15	14:00 to 15:00	08:00 to 09:00	11:30 to 12:30	06:00 to 07:00	16:15 to 17:15	17:00 to 18:00	07:15 to 08:15	08:45 to 09:45	06:15 to 07:15	08:45 to 09:45	17:00 to 18:00

Released under RTI - DTMR

Data Compiled Date: 19/03/2012
Compiled by: ALH

LOCATION: Bruce Hwy & Boundary Street
ROAD No: 10F (Int. 583 @ Tdist 9.489)
DATE: Thu, 08/03/12
TIME: 06:00 - 18:00



Released under RTI - DTMR

Count Tally Sheet With Totals and Peak Flows.

Queensland Government

LOCATION: Bruce Hwy & Boundary Street
ROAD No: 10F (Int. 583 @ Tdist 9.489)
DATE: Thu, 08/03/12
TIME: 06:00 - 18:00

	Leg 1						Leg 2						Leg 3					
	Left		Thru		U-turn	Leg	Left		Right		U-turn	Leg	Thru		Right		U-turn	Leg
Time	*Light*	*Heavy*	*Light*	*Heavy*	*All*	Total	*Light*	*Heavy*	*Light*	*Heavy*	*All*	Total	*Light*	*Heavy*	*Light*	*Heavy*	*All*	Total
6:00 - 6:15	0	0	77	6		**83**	3	0	0	0		**0**	31	10	3	0	0	**3**
6:15 - 6:30	1	0	80	12		**92**	3	0	0	0		**3**	48	6	2	0	0	**56**
6:30 - 6:45	0	0	115	8		**123**	6	0	0	0		**6**	64	9	2	0	0	**75**
6:45 - 7:00	0	0	102	4		**106**	1	0	0	0		**1**	61	14	2	0	0	**77**
7:00 - 7:15	0	0	120	8		**128**	6	0	0	0		**6**	33	17	4	1	0	**55**
7:15 - 7:30	1	0	184	16		**200**	9	0	1	0		**10**	57	12	6	1	0	**76**
7:30 - 7:45	1	0	207	10		**217**	11	0	1	0		**12**	68	8	7	1	0	**84**
7:45 - 8:00	2	0	230	14		**244**	18	1	1	0		**20**	71	11	7	0	0	**89**
8:00 - 8:15	1	0	241	11		**252**	21	0	0	0		**21**	84	18	7	3	0	**112**
8:15 - 8:30	1	0	221	20		**241**	9	1	0	0		**10**	84	16	6	0	0	**106**
8:30 - 8:45	2	0	144	14		**158**	14	0	1	0		**15**	103	19	6	0	0	**128**
8:45 - 9:00	2	0	125	5		**130**	12	0	1	0		**13**	77	26	12	0	0	**115**
9:00 - 9:15	2	0	109	12		**121**	6	0	1	0		**7**	61	19	11	0	1	**92**
9:15 - 9:30	0	0	80	14		**94**	3	0	0	0		**3**	65	12	5	0	0	**82**
9:30 - 9:45	2	0	77	13		**90**	1	0	0	0		**1**	62	9	3	0	0	**74**
9:45 - 10:00	1	0	107	11		**118**	3	0	0	0		**3**	74	8	9	0	0	**91**
10:00 - 10:15	0	0	85	18		**103**	5	0	2	0		**7**	70	15	5	1	0	**91**
10:15 - 10:30	0	0	72	7		**79**	3	0	0	0		**3**	58	8	4	0	0	**70**
10:30 - 10:45	2	0	65	11		**78**	4	0	0	0		**4**	44	14	1	0	0	**59**
10:45 - 11:00	1	0	52	9		**61**	8	0	0	0		**8**	62	13	2	0	0	**77**
11:00 - 11:15	1	0	69	21		**90**	5	0	2	0		**7**	58	11	7	0	1	**77**
11:15 - 11:30	2	0	62	18		**80**	11	0	1	0		**12**	72	13	10	1	0	**96**
11:30 - 11:45	2	0	79	13		**92**	3	2	5	0		**10**	62	12	13	0	0	**87**
11:45 - 12:00	1	0	70	18		**88**	8	1	3	0		**12**	57	9	12	0	0	**78**

Released under RTI - DTMR

Data Compiled Date: 13/03/2012
Compiled by: ALH

Count Tally Sheet With Totals and Peak Flows.

Queensland Government

LOCATION: Bruce Hwy & Boundary Street
ROAD No: 10F (Int. 583 @ Tdist 9.489)
DATE: Thu, 08/03/12
TIME: 06:00 - 18:00

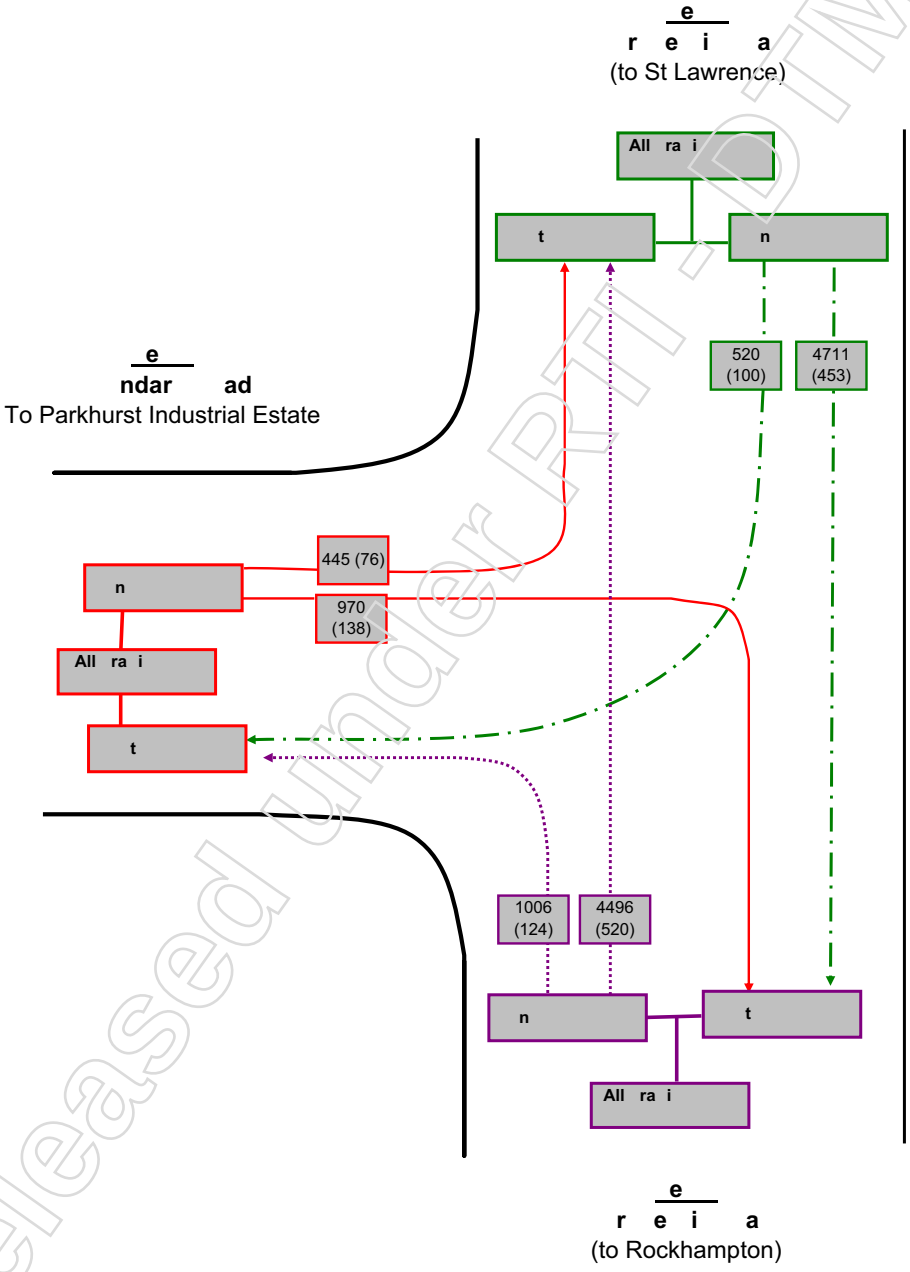
	Leg 1						Leg 2						Leg 3					
	Left		Thru		U-turn	Leg	Left		Right		U-turn	Leg	Thru		Right		U-turn	Leg
Time	*Light*	*Heavy*	*Light*	*Heavy*	*All*	Total	*Light*	*Heavy*	*Light*	*Heavy*	*All*	Total	*Light*	*Heavy*	*Light*	*Heavy*	*All*	Total
12:00 - 12:15	2	0	79	10		**89**	5	3	0	0		**8**	74	6	10	1	0	**91**
12:15 - 12:30	1	0	73	9		**82**	6	0	2	0		**8**	86	12	14	1	0	**113**
12:30 - 12:45	4	0	59	15		**74**	8	0	1	0		**9**	75	8	7	1	0	**91**
12:45 - 13:00	2	1	71	13		**84**	9	0	2	0		**11**	75	4	14	0	0	**93**
13:00 - 13:15	3	0	70	13		**83**	13	1	1	0		**15**	80	8	16	0	0	**104**
13:15 - 13:30	0	0	77	18		**95**	13	0	0	0		**13**	72	11	9	0	0	**92**
13:30 - 13:45	3	0	81	11		**92**	14	0	0	0		**14**	70	5	4	0	1	**80**
13:45 - 14:00	9	0	88	25		**113**	12	0	0	0		**12**	67	10	4	1	0	**82**
14:00 - 14:15	16	1	91	13		**104**	11	0	1	0		**12**	72	4	12	0	0	**88**
14:15 - 14:30	3	0	75	14		**89**	12	0	1	0		**13**	71	8	6	0	0	**85**
14:30 - 14:45	1	0	106	16		**122**	10	0	5	0		**15**	77	12	10	1	0	**100**
14:45 - 15:00	1	0	90	19		**109**	14	0	2	0		**16**	125	17	7	0	0	**149**
15:00 - 15:15	7	0	136	14		**150**	26	1	3	0		**30**	113	16	13	0	0	**142**
15:15 - 15:30	2	0	91	10		**101**	12	0	4	0		**16**	128	8	18	1	0	**155**
15:30 - 15:45	2	0	100	8		**108**	6	0	4	0		**10**	127	13	11	3	0	**154**
15:45 - 16:00	1	0	85	14		**99**	6	0	3	0		**9**	113	11	17	2	0	**143**
16:00 - 16:15	4	0	105	11		**116**	16	0	5	0		**21**	150	12	19	0	0	**181**
16:15 - 16:30	1	0	93	13		**106**	6	0	0	0		**6**	167	12	16	0	0	**195**
16:30 - 16:45	3	0	79	15		**94**	21	1	7	0		**29**	133	10	22	0	0	**165**
16:45 - 17:00	4	0	96	17		**113**	15	0	7	0		**22**	158	7	18	0	0	**183**
17:00 - 17:15	2	0	94	5		**99**	7	0	2	0		**9**	186	10	18	0	0	**214**
17:15 - 17:30	8	0	109	9		**118**	9	0	1	0		**10**	214	8	28	0	0	**250**
17:30 - 17:45	4	0	87	9		**96**	15	0	4	0		**19**	159	6	22	0	0	**187**
17:45 - 18:00	5	0	91	5		**96**	9	0	3	0		**12**	163	6	12	0	0	**181**
Total:	113	2	4899	599	0	**5613**	448	11	77	0	0	**536**	4281	533	473	19	3	**5268**
Peak Count:	0	0	0	70	0	954	62	6	19	0	0	78	722	80	86	6	3	834
Peak Hour:	#N/A	#N/A	#N/A	11:00 to 12:00	06:00 to 07:00	07:30 to 08:30	07:45 to 08:45	11:15 to 12:15	16:00 to 17:00	06:00 to 07:00	06:00 to 07:00	16:00 to 17:00	17:00 to 18:00	08:15 to 09:15	16:30 to 17:30	15:00 to 16:00	17:15 to 18:15	16:45 to 17:45

Released under RTI - DTMR

Data Compiled Date: 13/03/2012
Compiled by: ALH

Queensland Government

A 10F (Rockhampton-St Lawrence) & Boundary Rd
A 10F (Int. 582 @ Tdist 9.016km)
A E Tue, 06/03/12
ME 06:00 - 18:00



Released under RTI - DTMR

Count Tally Sheet With Totals and Peak Flows.

Queensland Government

A 10F (Rockhampton-St Lawrence) & Boundary Rd
A 10F (Int. 582 @ Tdist 9.016km)
A E Tue, 06/03/12
ME 06:00 - 18:00

i e	e r Light	e r Heavy	e i t Light	e i t Heavy	e U t rn All	e tal	e e t Light	e e t Heavy	e r Light	e r Heavy	e U t rn All	e tal	e e t Light	e e t Heavy	e i t Light	e i t Heavy	e U t rn All	e tal
6:00 - 6:15	78	4	6	2			26	2	40	5			4	0	7	4		
6:15 - 6:30	57	13	17	0			39	1	54	8			7	4	5	6		
6:30 - 6:45	82	8	36	3			77	1	80	14			5	5	5	8		
6:45 - 7:00	95	5	26	2			43	4	46	23			3	0	5	2		
7:00 - 7:15	121	12	34	3			36	0	53	11			6	6	14	4		
7:15 - 7:30	201	9	24	1			56	0	67	10			1	0	7	0		
7:30 - 7:45	218	16	21	4			45	5	71	12			0	1	14	1		
7:45 - 8:00	211	9	10	0			49	1	58	13			4	0	12	5		
8:00 - 8:15	241	12	15	1			43	2	72	20			10	2	7	1		
8:15 - 8:30	210	5	15	4			22	0	89	9			3	0	7	5		
8:30 - 8:45	142	11	14	6			21	3	91	11			3	2	10	2		
8:45 - 9:00	147	10	10	1			17	2	87	15			5	5	6	3		
9:00 - 9:15	101	12	10	1			8	1	71	13			5	2	12	2		
9:15 - 9:30	70	11	4	2			9	2	72	11			3	0	4	1		
9:30 - 9:45	65	9	8	2			14	5	62	10			8	1	6	3		
9:45 - 10:00	55	15	6	1			10	1	59	12			6	2	9	4		
10:00 - 10:15	68	6	8	1			13	4	56	10			5	0	12	1		
10:15 - 10:30	56	18	5	2			12	7	66	18			5	2	13	1		
10:30 - 10:45	50	5	4	4			9	3	64	9			6	3	11	3		
10:45 - 11:00	64	8	7	2			8	3	41	13			3	1	14	4		
11:00 - 11:15	45	9	2	3			10	3	64	14			2	1	8	4		
11:15 - 11:30	60	10	5	0			11	4	69	13			2	2	12	3		
11:30 - 11:45	69	8	2	2			10	3	66	9			7	5	4	8		
11:45 - 12:00	57	9	11	6			11	2	62	15			10	2	8	1		

Released under RTI - DTMR

Data Compiled Date: 12/03/12
Compiled by: ALH

Count Tally Sheet With Totals and Peak Flows.

Queensland Government

A 10F (Rockhampton-St Lawrence) & Boundary Rd
A 10F (Int. 582 @ Tdist 9.016km)
A E Tue, 06/03/12
ME 06:00 - 18:00

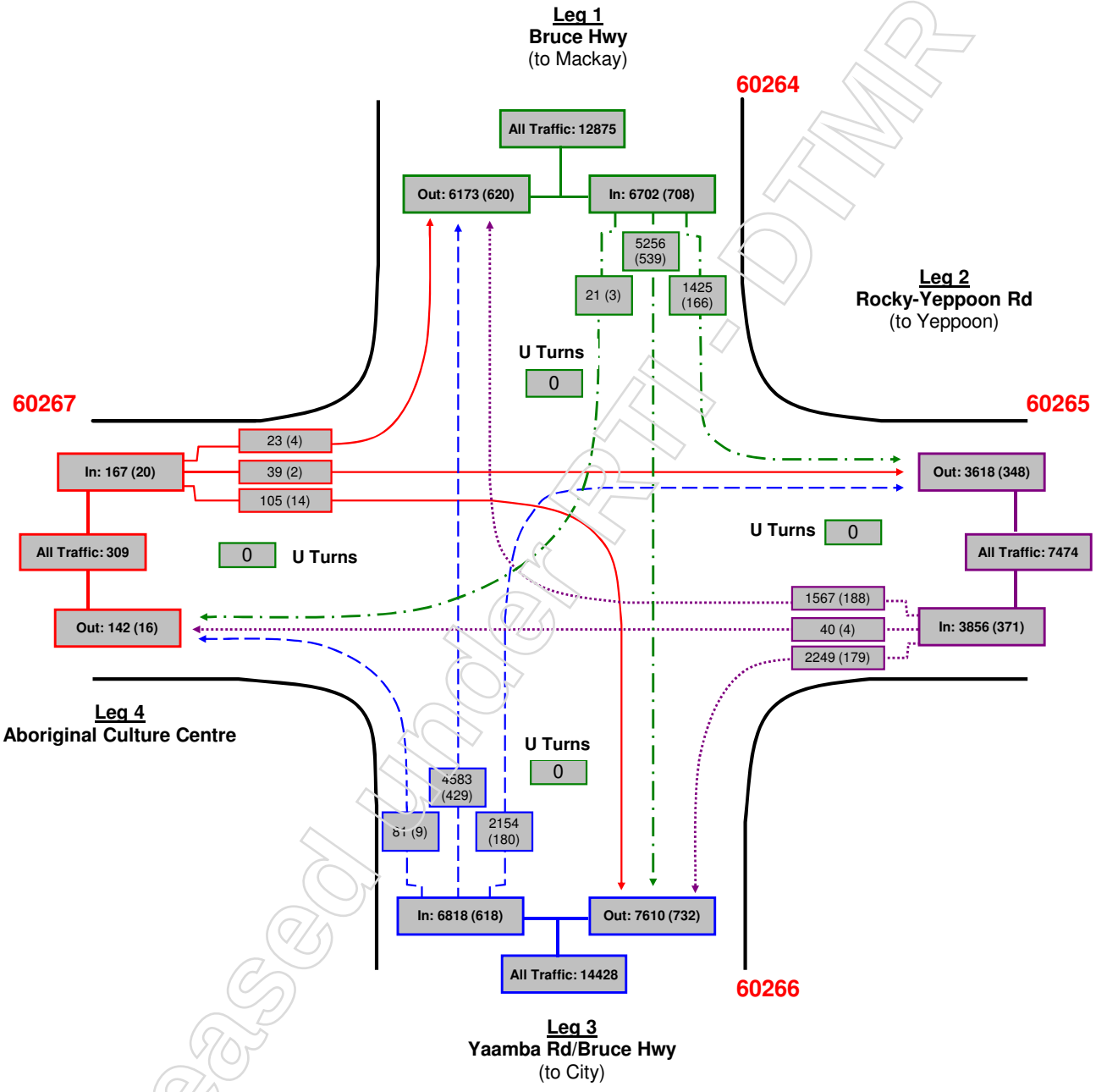
	e						e						e					
	r		i t		U t rn	e	e t		r		U t rn	e	e t		i t		U t rn	e
i e	*Light*	*Heavy*	*Light*	*Heavy*	*All*	tal	*Light*	*Heavy*	*Light*	*Heavy*	*All*	tal	*Light*	*Heavy*	*Light*	*Heavy*	*All*	tal
12:00 - 12:15	43	16	2	3			7	5	71	15			9	0	19	1		
12:15 - 12:30	56	11	6	1			20	2	65	9			4	0	11	2		
12:30 - 12:45	53	13	3	0			16	4	68	9			4	0	12	3		
12:45 - 13:00	42	13	2	1			7	2	47	13			0	0	14	4		
13:00 - 13:15	67	11	5	1			15	2	52	12			6	1	9	4		
13:15 - 13:30	52	15	5	3			7	4	61	8			3	0	6	3		
13:30 - 13:45	64	7	4	3			15	4	78	13			4	2	9	3		
13:45 - 14:00	59	7	2	2			17	1	62	6			3	1	13	5		
14:00 - 14:15	76	8	2	0			14	4	62	10			3	0	10	6		
14:15 - 14:30	85	15	4	4			9	1	79	9			7	0	11	4		
14:30 - 14:45	92	12	9	3			12	4	79	8			7	1	21	6		
14:45 - 15:00	66	10	5	3			9	5	81	10			11	7	18	1		
15:00 - 15:15	125	8	9	0			11	5	115	14			13	2	33	2		
15:15 - 15:30	80	8	7	5			19	1	144	6			7	2	33	2		
15:30 - 15:45	52	5	4	2			20	2	116	13			4	0	33	2		
15:45 - 16:00	67	6	7	0			12	3	123	12			25	2	62	2		
16:00 - 16:15	102	4	7	3			8	3	121	4			13	1	66	2		
16:15 - 16:30	87	7	7	2			9	4	130	5			18	1	28	2		
16:30 - 16:45	72	11	3	3			12	1	131	9			17	2	48	3		
16:45 - 17:00	69	7	7	4			7	2	143	6			18	2	33	1		
17:00 - 17:15	96	7	9	3			9	0	168	8			30	4	53	3		
17:15 - 17:30	51	4	3	0			9	1	147	8			22	0	15	0		
17:30 - 17:45	61	8	5	1			15	3	146	7			14	0	32	1		
17:45 - 18:00	78	6	3	0			4	2	127	8			14	2	31	0		
Total:	4258	453	420	100	0		882	124	3976	520	0		369	76	832	138	0	
Peak Count:	880	53	120	12	0	993	212	17	604	58	0	679	87	15	204	21	0	292
Peak Hour:	07:30 to 08:30	12:00 to 13:00	06:30 to 07:30	08:00 to 09:00	06:00 to 07:00	07:15 to 08:15	06:30 to 07:30	09:30 to 10:30	16:45 to 17:45	06:30 to 07:30	06:00 to 07:00	16:45 to 17:45	16:30 to 17:30	06:15 to 07:15	15:45 to 16:45	13:45 to 14:45	06:00 to 07:00	15:45 to 16:45

Released under RTI - DTMR

Data Compiled Date: 12/03/12
Compiled by: ALH

Count Tally Sheet

LOCATION: Intersection Of Bruce Hwy & Rton-Yeppoon Rd
ROAD No: 10F (Int 827 @ Tdist 8.550km)
DATE: Thu, 02/08/12
TIME: 06:00 - 18:00



Released Under RTI - DTMR

Data Collection Date:
Compiled by:

Count Tally Sheet
Intersectiomn of bruce Hwy Rton-Yeppoon Rd
10F Int 827 @ 8.550km

	Leg 1								Leg 2								Leg 3								Leg 4							
	Left		Thru		Right		U-turn	Leg Total	Left		Thru		Right		U-turn	Leg Total	Left		Thru		Right		U-turn	Leg Total	Left		Thru		Right		U-turn	Leg Total
	2	2H	3	3H	4	4H			3	3H	4	4H	1	1H			4	4H	1	1H	2	2H			1	1H	2	2H	3	3H		
Time	*Light*	*Heavy*	*Light*	*Heavy*	*Light*	*Heavy*	*All*		*Light*	*Heavy*	*Light*	*Heavy*	*Light*	*Heavy*	*All*		*Light*	*Heavy*	*Light*	*Heavy*	*Light*	*Heavy*	*All*		*Light*	*Heavy*	*Light*	*Heavy*	*Light*	*Heavy*	*All*	
6:00 - 6:15	12	3	52	8	0	0		**75**	47	1	1	0	25	2		**76**	9	0	21	9	13	2		**54**	0	0	14	1	3	1		**19**
6:15 - 6:30	12	3	72	8	0	0		**95**	43	2	0	0	33	2		**80**	0	0	36	6	23	1		**66**	1	1	0	0	0	0		**2**
6:30 - 6:45	14	3	73	8	0	0		**98**	56	1	2	0	55	3		**117**	4	0	60	6	11	10		**91**	0	0	0	0	1	0		**1**
6:45 - 7:00	14	4	87	12	0	0		**117**	56	3	1	0	91	3		**154**	1	0	66	10	12	3		**92**	0	0	0	0	2	0		**2**
7:00 - 7:15	9	5	83	4	0	0		**101**	58	3	2	0	44	7		**114**	0	0	48	9	13	6		**76**	3	0	2	0	6	0		**11**
7:15 - 7:30	17	5	124	5	0	0		**151**	78	3	2	0	55	2		**140**	2	0	62	6	9	3		**82**	0	0	0	0	3	0		**3**
7:30 - 7:45	24	3	157	9	1	0		**194**	88	6	3	0	40	4		**141**	1	1	64	3	23	4		**96**	0	0	0	0	2	1		**3**
7:45 - 8:00	36	3	208	17	0	0		**264**	107	1	1	0	55	2		**166**	1	0	74	5	17	7		**104**	1	0	1	0	1	0		**3**
8:00 - 8:15	40	7	210	16	1	0		**274**	112	4	1	0	32	1		**150**	1	0	64	12	35	5		**117**	0	0	2	0	5	0		**7**
8:15 - 8:30	46	3	212	5	0	0		**266**	104	2	0	0	35	4		**145**	0	0	76	8	34	7		**125**	0	0	0	0	5	1		**6**
8:30 - 8:45	15	3	162	5	0	0		**185**	79	2	0	1	32	5		**119**	2	0	83	4	34	5		**128**	0	0	0	0	2	0		**2**
8:45 - 9:00	18	4	134	6	2	0		**164**	73	4	0	0	35	9		**121**	1	0	75	12	42	4		**134**	1	1	2	0	1	0		**5**
9:00 - 9:15	19	2	98	18	0	0		**137**	46	4	0	0	26	2		**78**	0	1	93	6	37	8		**135**	1	0	0	0	2	0		**3**
9:15 - 9:30	20	2	99	9	1	0		**131**	37	5	2	0	23	6		**73**	2	0	70	5	42	5		**124**	0	1	2	0	1	0		**4**
9:30 - 9:45	26	4	85	12	0	0		**127**	57	7	6	0	22	2		**94**	1	0	84	9	26	5		**125**	0	0	1	0	2	0		**3**
9:45 - 10:00	12	2	89	8	1	0		**112**	42	4	0	0	19	6		**71**	2	0	59	10	25	5		**101**	0	0	1	0	2	0		**3**
10:00 - 10:15	14	2	77	12	0	1		**106**	45	3	0	0	22	3		**73**	1	0	62	10	32	5		**110**	1	0	0	0	1	0		**2**
10:15 - 10:30	9	5	76	9	1	0		**100**	25	6	0	0	22	2		**55**	1	0	57	8	29	3		**98**	0	0	0	0	1	3		**4**
10:30 - 10:45	15	2	97	6	0	0		**120**	32	3	0	0	15	5		**55**	2	0	78	9	32	1		**122**	1	0	1	0	1	0		**3**
10:45 - 11:00	22	4	66	11	0	0		**103**	32	4	0	0	17	4		**57**	2	0	61	11	29	4		**107**	1	0	0	0	2	0		**3**
11:00 - 11:15	7	1	75	12	0	0		**95**	32	3	1	0	18	2		**56**	2	0	69	9	27	2		**109**	0	0	1	0	4	0		**5**
11:15 - 11:30	17	2	71	10	0	0		**100**	35	4	1	0	20	5		**65**	1	0	61	10	23	6		**101**	0	0	0	0	1	0		**1**
11:30 - 11:45	11	6	67	6	1	0		**91**	32	1	0	0	12	3		**48**	1	1	86	6	24	4		**122**	0	0	0	0	1	0		**1**
11:45 - 12:00	15	6	83	12	1	0		**117**	38	5	1	0	13	3		**60**	1	0	72	10	33	3		**119**	0	0	0	0	0	0		**0**

Released under RTI

Compilation Date:29/08/12
Compiled by: KRA

Count Tally Sheet
Intersectiomn of bruce Hwy Rton-Yeppoon Rd
10F Int 827 @ 8.550km

	Leg 1								Leg 2								Leg 3								Leg 4							
	Left		Thru		Right		U-turn	Leg Total	Left		Thru		Right		U-turn	Leg Total	Left		Thru		Right		U-turn	Leg Total	Left		Thru		Right		U-turn	Leg Total
	2	2H	3	3H	4	4H			3	3H	4	4H	1	1H			4	4H	1	1H	2	2H			1	1H	2	2H	3	3H		
Time	*Light*	*Heavy*	*Light*	*Heavy*	*Light*	*Heavy*	*All*		*Light*	*Heavy*	*Light*	*Heavy*	*Light*	*Heavy*	*All*		*Light*	*Heavy*	*Light*	*Heavy*	*Light*	*Heavy*	*All*		*Light*	*Heavy*	*Light*	*Heavy*	*Light*	*Heavy*	*All*	
12:00 - 12:15	19	5	72	14	0	0		**110**	29	3	0	0	20	4		**56**	1	0	72	16	40	3		**132**	0	0	0	0	4	0		**4**
12:15 - 12:30	18	3	67	9	0	0		**97**	31	5	2	0	21	3		**62**	1	0	86	8	21	4		**120**	1	0	0	0	0	1		**2**
12:30 - 12:45	24	3	89	11	0	0		**127**	20	6	1	0	26	3		**56**	1	0	71	13	25	2		**112**	0	0	0	0	3	0		**3**
12:45 - 13:00	16	6	89	17	1	2		**131**	29	4	0	0	20	5		**58**	1	1	87	7	34	1		**131**	0	0	0	0	5	0		**5**
13:00 - 13:15	14	8	86	17	0	0		**125**	36	7	0	0	11	5		**59**	1	0	101	11	34	9		**156**	1	0	0	0	1	1		**3**
13:15 - 13:30	17	6	76	11	0	0		**110**	28	6	0	1	16	2		**53**	1	0	75	14	32	2		**124**	0	0	1	0	1	1		**3**
13:30 - 13:45	17	4	69	15	0	0		**105**	20	2	0	0	11	4		**37**	1	0	91	10	38	4		**144**	0	0	1	0	1	0		**2**
13:45 - 14:00	19	5	74	7	0	0		**105**	22	3	0	0	15	6		**46**	3	1	79	11	32	1		**127**	0	0	0	0	4	1		**5**
14:00 - 14:15	21	3	80	10	1	0		**115**	27	4	2	0	13	3		**49**	0	0	82	7	37	5		**131**	0	0	1	0	1	0		**2**
14:15 - 14:30	25	3	79	18	0	0		**125**	28	2	0	0	28	4		**62**	2	1	78	4	28	6		**119**	0	0	0	0	1	0		**1**
14:30 - 14:45	36	3	82	15	0	0		**136**	40	4	0	0	23	5		**72**	2	1	91	15	49	3		**161**	0	0	1	1	1	1		**4**
14:45 - 15:00	18	5	105	12	0	0		**140**	33	4	0	0	36	5		**78**	1	0	110	7	36	2		**176**	2	0	0	0	2	1		**5**
15:00 - 15:15	45	1	124	18	0	0		**188**	38	6	1	0	38	14		**97**	1	0	114	11	45	2		**173**	0	0	0	0	4	0		**4**
15:15 - 15:30	30	5	106	20	0	0		**161**	37	4	1	0	30	4		**76**	2	0	102	11	64	5		**184**	2	0	0	0	1	1		**4**
15:30 - 15:45	53	5	107	18	2	0		**185**	34	12	0	0	30	10		**86**	4	0	125	17	59	6		**211**	0	0	0	0	2	1		**3**
15:45 - 16:00	29	6	98	15	0	0		**148**	39	3	0	0	27	4		**73**	1	1	120	8	74	1		**205**	0	0	1	0	3	0		**4**
16:00 - 16:15	71	6	103	15	2	0		**197**	38	5	0	0	19	6		**68**	1	0	125	9	72	5		**212**	0	0	1	0	3	0		**4**
16:15 - 16:30	38	3	94	5	1	0		**141**	35	6	0	0	32	3		**76**	2	1	115	9	88	0		**215**	2	1	1	0	0	0		**4**
16:30 - 16:45	62	0	101	16	0	0		**179**	29	2	1	0	27	0		**59**	1	0	130	11	66	4		**212**	1	0	0	0	1	0		**2**
16:45 - 17:00	52	1	84	15	1	0		**153**	26	1	0	0	37	3		**67**	1	0	130	14	90	3		**238**	0	0	0	0	1	0		**1**
17:00 - 17:15	59	0	96	7	1	0		**163**	19	3	1	0	22	1		**46**	0	0	152	4	104	1		**261**	0	0	0	0	0	0		**0**
17:15 - 17:30	39	0	91	8	0	0		**138**	35	4	1	1	44	4		**89**	1	0	156	7	117	0		**281**	0	0	1	0	0	0		**1**
17:30 - 17:45	49	0	95	6	0	0		**150**	25	1	1	0	33	1		**61**	5	0	154	6	73	2		**240**	0	0	1	0	1	0		**2**
17:45 - 18:00	44	1	93	12	0	0		**150**	18	1	1	1	39	2		**62**	0	0	137	6	71	1		**215**	0	0	1	0	2	0		**3**
Total:	1259	166	4717	539	18	3	0	**6702**	2070	179	36	4	1379	188	0	**3856**	72	9	4154	429	1974	180	0	**6818**	19	4	37	2	91	14	0	**167**
Peak Count:	233		835		5		0	998	424		8		260		0	602	14		623		390		0	1020	5		15		15		0	24
Peak Hour:	16:00 to 17:00		07:45 to 08:45		15:30 to 16:30		06:00 to 07:00	07:30 to 08:30	07:30 to 08:30		06:45 to 07:45		06:30 to 07:30		06:00 to 07:00	07:30 to 08:30	06:00 to 07:00		16:45 to 17:45		16:45 to 17:45		06:00 to 07:00	16:45 to 17:45	06:15 to 07:15		06:00 to 07:00		07:30 to 08:30		06:00 to 07:00	06:00 to 07:00

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Compiled by: KRA



APPENDIX I

Background Traffic Network Volumes

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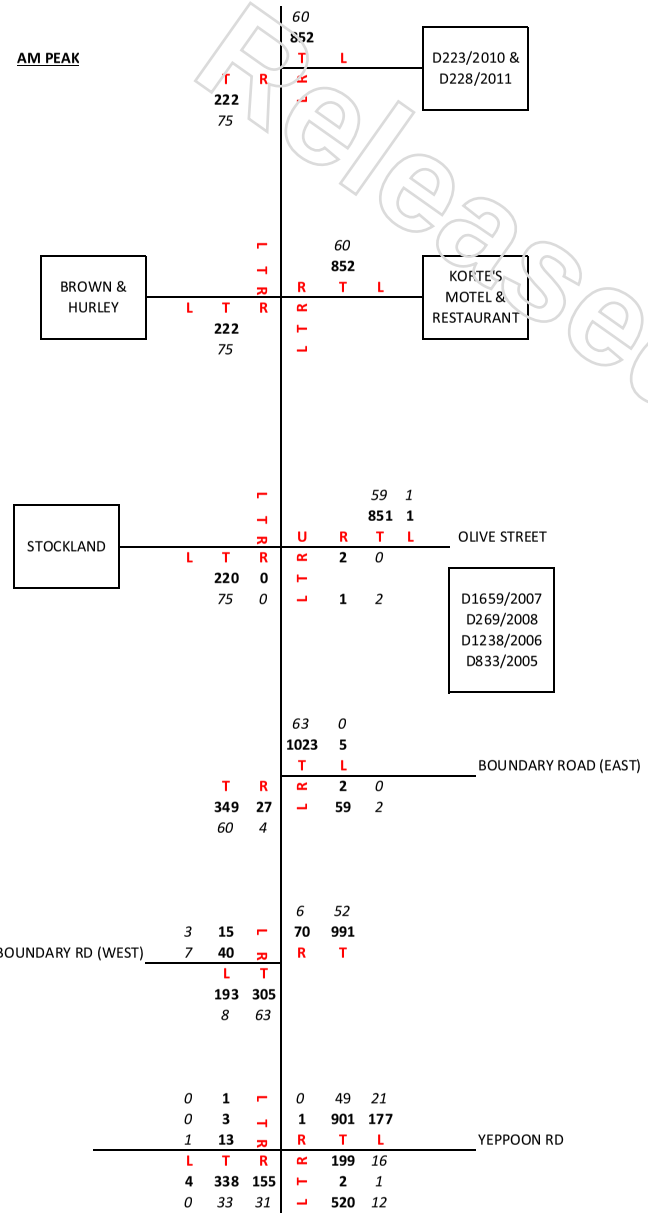
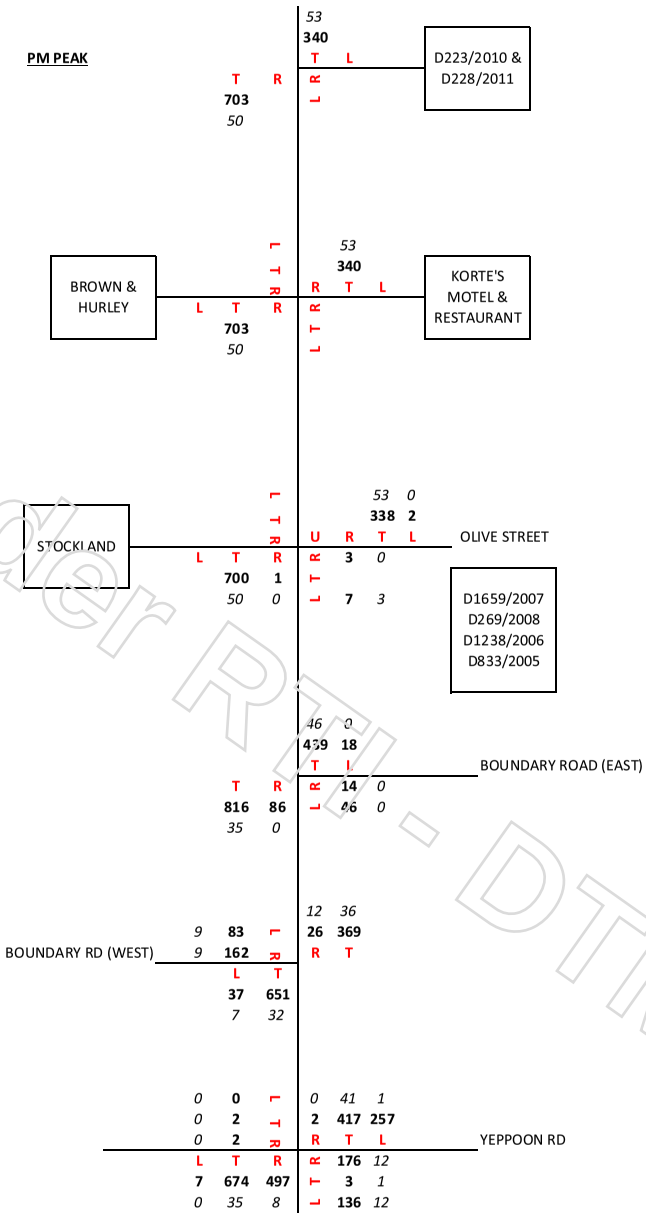
STO0111-01R - Stockland North Parkhurst

Background Road Network Volumes

Design Year - 2025





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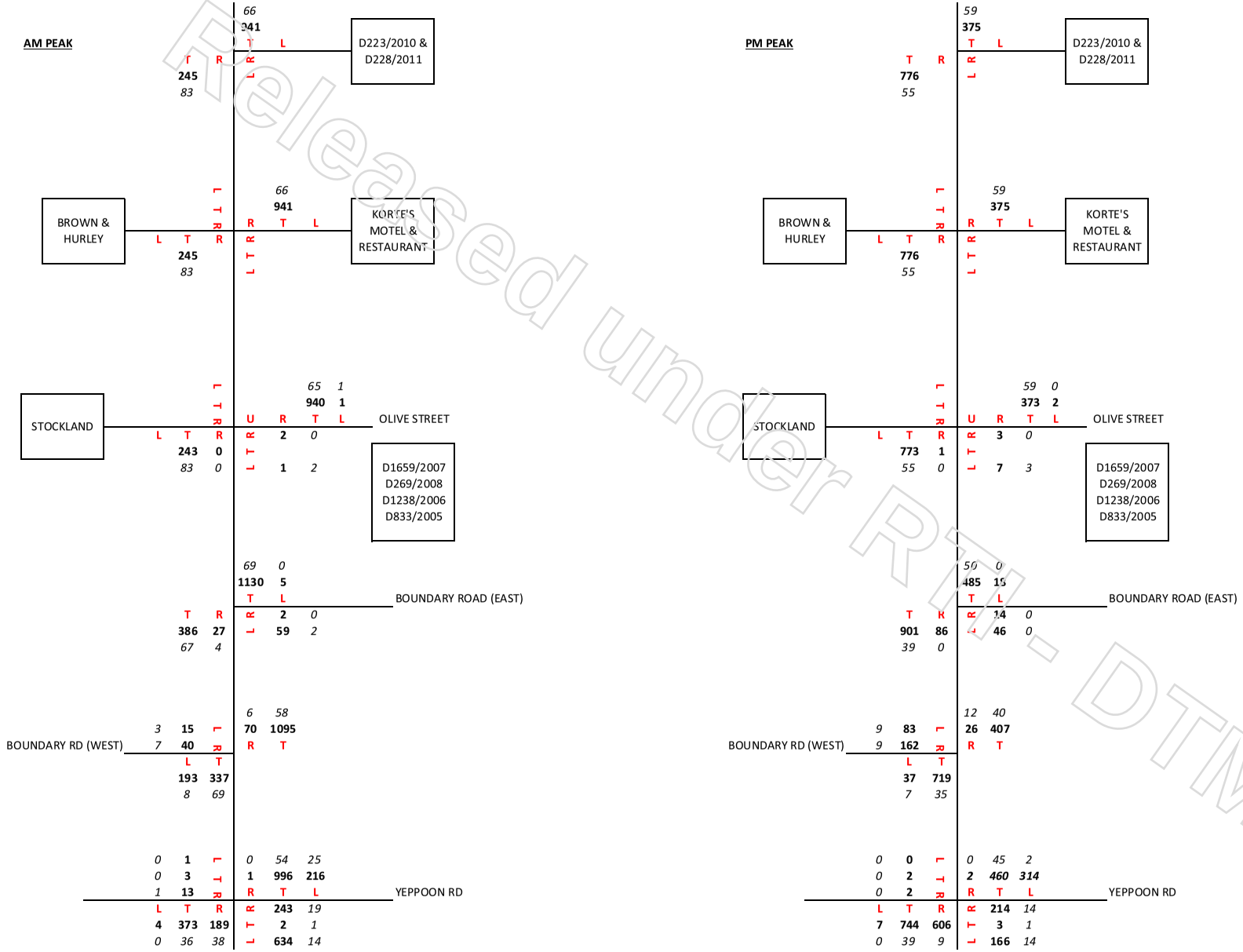
STO0111-01R - Stockland North Parkhurst

Background Road Network Volumes

Design Year - 2035



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APPENDIX J

Approved Development Calculations and Associated Bruce Highway Network Volumes

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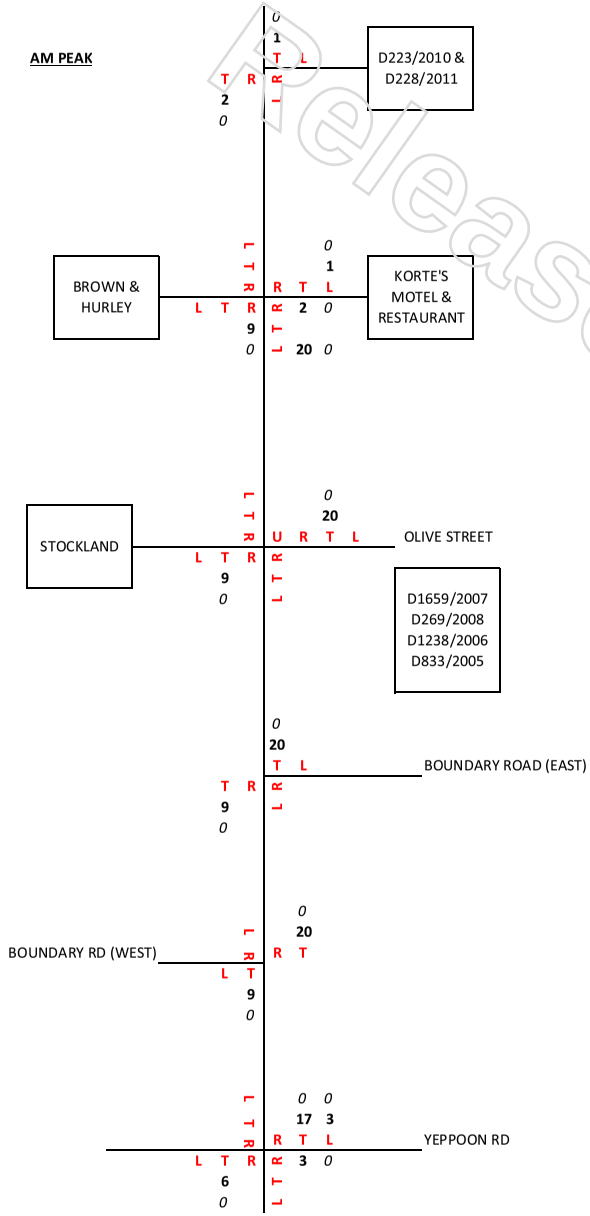
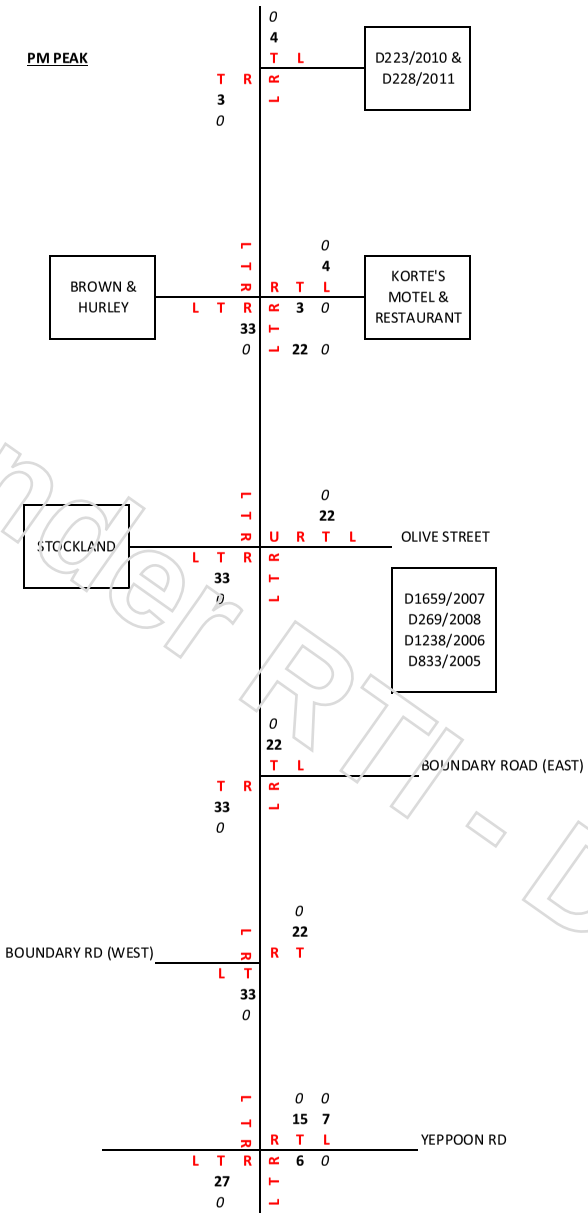
STO0111-01R - Stockland North Parkhurst

Road Network Volumes

Korte's Motel & Restaurant





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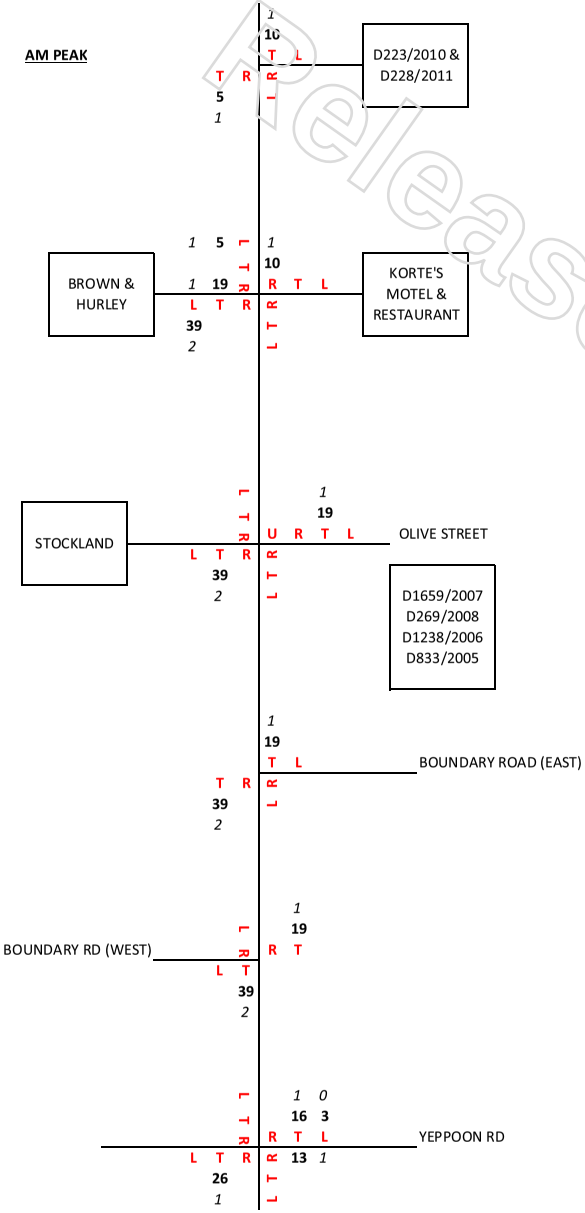
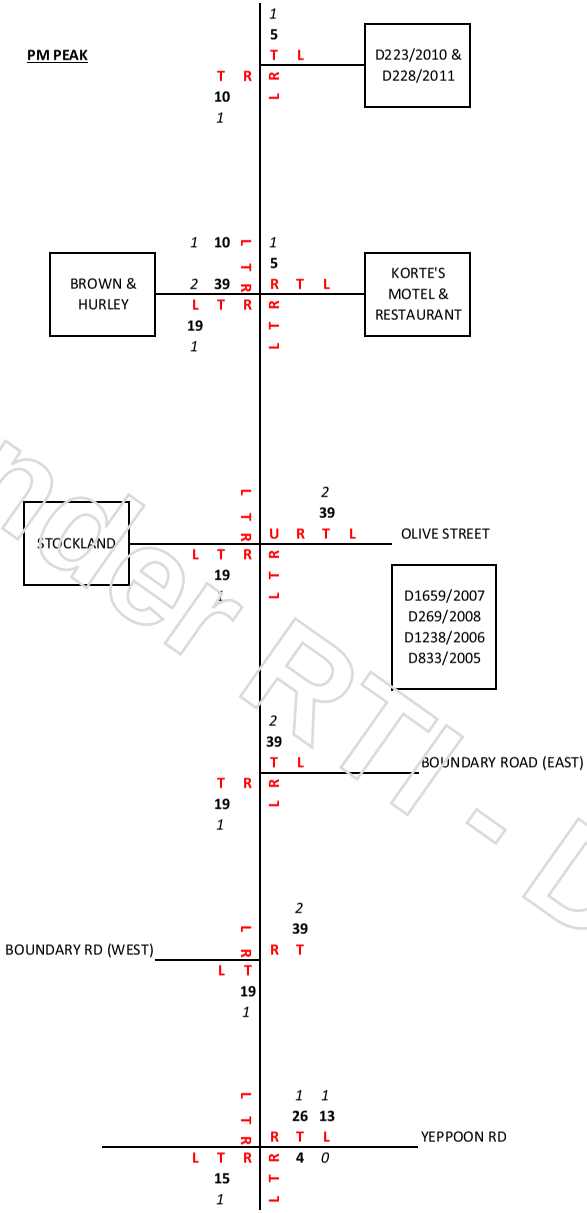
STO0111-01R - Stockland North Parkhurst

Road Network Volumes

Brown & Hurley Approved Development





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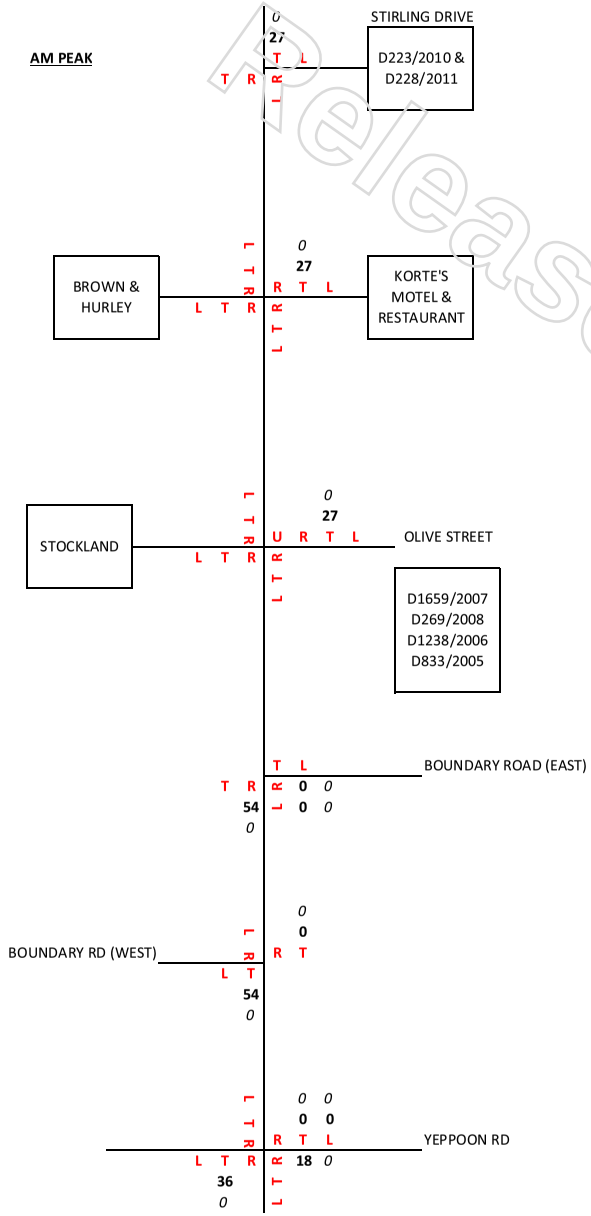
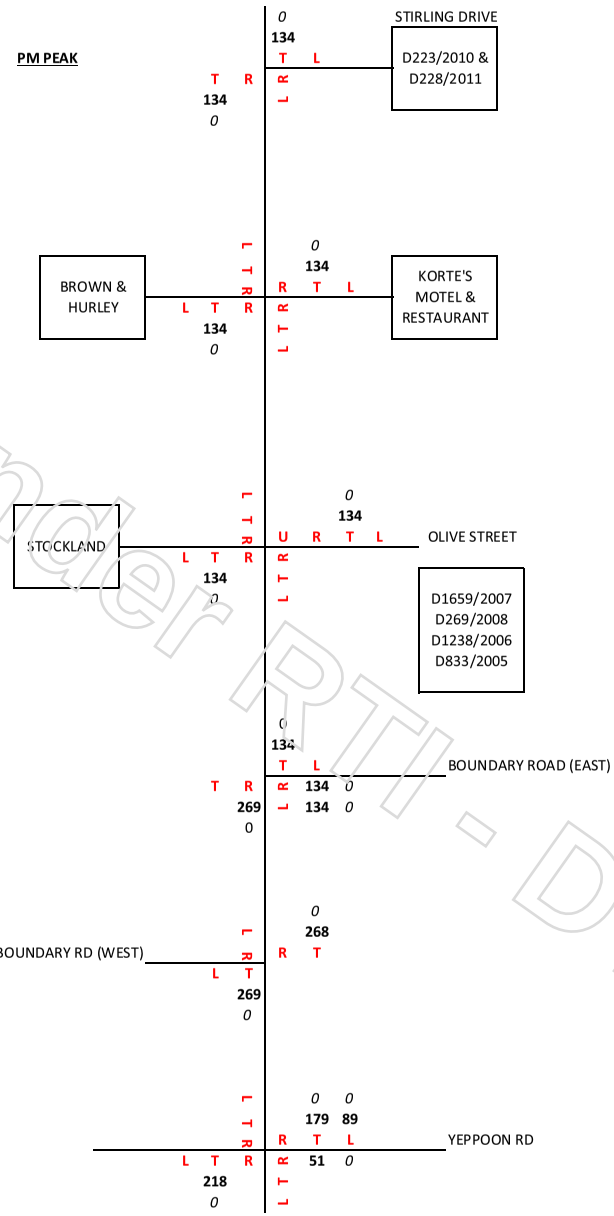
STO0111-01R - Stockland North Parkhurst

Road Network Volumes

Boundary Shopping Centre Development





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STO0111-01R - Stockland North Parkhurst

Background Road Network Calculations - 2025

Approved Eastern Development Parcels

D223/2010 & D228/2011 (TMR j)

Yield	=	72 lots	
Gen Rate	=	0.85 trips/lot (peak)	
Gen Traffic Volume	=	61 trips	
AM PEAK			
% Trips IN	=	30%	
Vol Trips IN	=	18 trips	
% Trips from S	=	90%	
Vol Trips from S	=	17 trips	
% Trips from S via Stirling	=	100%	
Vol Trips from S via Stirling	=	**17** trips	A
% Trips from N	=	10%	
Vol Trips from N	=	2 trips	
% Trips from N via Stirling	=	100%	
Vol Trips from N via Stirling	=	**2** trips	B
% Trips OUT	=	70%	
Vol Trips OUT	=	43 trips	
% Trips to S	=	90%	
Vol Trips to S	=	39 trips	
% Trips to S via Stirling	=	100%	
Vol Trips to S via Stirling	=	**39** trips	C
% Trips to N	=	10%	
Vol Trips to N	=	4 trips	
% Trips to N via Stirling	=	0%	
Vol Trips to N via Stirling	=	**0** trips	D
% Trips to N via Angela Rd	=	100%	
Vol Trips to N via Angela Rd	=	**4** trips	E
PM PEAK			
% Trips IN	=	60%	
Vol Trips IN	=	37 trips	
% Trips from S	=	90%	
Vol Trips from S	=	33 trips	
% Trips from S via Stirling	=	100%	
Vol Trips from S via Stirling	=	**33** trips	F
% Trips from N	=	10%	
Vol Trips from N	=	4 trips	
% Trips from N via Stirling	=	100%	
Vol Trips from N via Stirling	=	**4** trips	G
% Trips OUT	=	40%	
Vol Trips OUT	=	24 trips	
% Trips to S	=	90%	
Vol Trips to S	=	22 trips	
% Trips to S via Stirling	=	100%	
Vol Trips to S via Stirling	=	**22** trips	H
% Trips to N	=	10%	
Vol Trips to N	=	2 trips	
% Trips to N via Stirling	=	0%	
Vol Trips to N via Stirling	=	**0** trips	I
% Trips to N via Angela Rd	=	100%	
Vol Trips to N via Angela Rd	=	**2** trips	J

D1659/2007 & D269/2008 (TMR f)

Yield	=	114 lots	
Gen Rate	=	0.85 trips/lot (peak)	
Gen Traffic Volume	=	97 trips	
AM PEAK			
% Trips IN	=	30%	
Vol Trips IN	=	29 trips	
% Trips from S	=	90%	
Vol Trips from S	=	26 trips	
% Trips from S via Olive St	=	100%	
Vol Trips from S via Olive St	=	**26** trips	K
% Trips from S via Yeppoon Rd	=	0%	
Vol Trips from S via Yeppoon Rd	=	**0** trips	L
% Trips from S via Norman	=	0%	
Vol Trips from S via Norman	=	**0** trips	M
% Trips from S via R-Y Rd	=	0%	
Vol Trips from S via R-Y Rd	=	**0** trips	N
% Trips from N	=	10%	
Vol Trips from N	=	3 trips	
% Trips from N via Olive St	=	100%	
Vol Trips from N via Olive St	=	**3** trips	O
% Trips OUT	=	70%	
Vol Trips OUT	=	68 trips	
% Trips to S	=	90%	
Vol Trips to S	=	61 trips	
% Trips to S via Olive St	=	100%	
Vol Trips to S via Olive St	=	**61** trips	P
% Trips to S via Yeppoon Rd	=	0%	
Vol Trips to S via Yeppoon Rd	=	**0** trips	Q
% Trips to S via Norman	=	0%	
Vol Trips to S via Norman	=	**0** trips	R
% Trips to S via R-Y Rd	=	0%	
Vol Trips to S via R-Y Rd	=	**0** trips	S
% Trips to N	=	10%	
Vol Trips to N	=	7 trips	
% Trips to N via Olive St	=	100%	
Vol Trips to N via Olive St	=	**7** trips	T
PM PEAK			
% Trips IN	=	60%	
Vol Trips IN	=	58 trips	
% Trips from S	=	90%	
Vol Trips from S	=	52 trips	
% Trips from S via Olive St	=	100%	
Vol Trips from S via Olive St	=	**52** trips	U
% Trips from S via Yeppoon Rd	=	0%	
Vol Trips from S via Yeppoon Rd	=	**0** trips	V
% Trips from S via Norman	=	0%	
Vol Trips from S via Norman	=	**0** trips	W
% Trips from S via R-Y Rd	=	0%	
Vol Trips from S via R-Y Rd	=	**0** trips	X
% Trips from N	=	10%	
Vol Trips from N	=	6 trips	
% Trips from N via Olive St	=	100%	
Vol Trips from N via Olive St	=	**6** trips	Y
% Trips OUT	=	40%	
Vol Trips OUT	=	39 trips	
% Trips to S	=	90%	
Vol Trips to S	=	35 trips	
% Trips to S via Olive St	=	100%	
Vol Trips to S via Olive St	=	**35** trips	Z
% Trips to S via Yeppoon Rd	=	0%	
Vol Trips to S via Yeppoon Rd	=	**0** trips	AA
% Trips to S via Norman	=	0%	
Vol Trips to S via Norman	=	**0** trips	AB
% Trips to S via R-Y Rd	=	0%	
Vol Trips to S via R-Y Rd	=	**0** trips	AC
% Trips to N	=	10%	
Vol Trips to N	=	4 trips	
% Trips to N via Olive St	=	100%	
Vol Trips to N via Olive St	=	**4** trips	AD

D1238/2006 (TMR B)

Yield	=	47 lots	
Gen Rate	=	0.85 trips/lot (peak)	
Gen Traffic Volume	=	40 trips	
AM PEAK			
% Trips IN	=	30%	
Vol Trips IN	=	12 trips	
% Trips from S	=	90%	
Vol Trips from S	=	11 trips	
% Trips from S via Olive St	=	100%	
Vol Trips from S via Olive St	=	**11** trips	AE
% Trips from S via Yeppoon Rd	=	0%	
Vol Trips from S via Yeppoon Rd	=	**0** trips	AF
% Trips from S via Norman	=	0%	
Vol Trips from S via Norman	=	**0** trips	AG
% Trips from S via R-Y Rd	=	0%	
Vol Trips from S via R-Y Rd	=	**0** trips	AH
% Trips from N	=	10%	
Vol Trips from N	=	1 trips	
% Trips from N via Olive St	=	100%	
Vol Trips from N via Olive St	=	**1** trips	AI
% Trips OUT	=	70%	
Vol Trips OUT	=	28 trips	
% Trips to S	=	90%	
Vol Trips to S	=	25 trips	
% Trips to S via Olive St	=	100%	
Vol Trips to S via Olive St	=	**25** trips	AJ
% Trips to S via Yeppoon Rd	=	0%	
Vol Trips to S via Yeppoon Rd	=	**0** trips	AK
% Trips to S via Norman	=	0%	
Vol Trips to S via Norman	=	**0** trips	AL
% Trips to S via R-Y Rd	=	0%	
Vol Trips to S via R-Y Rd	=	**0** trips	AM
% Trips to N	=	10%	
Vol Trips to N	=	3 trips	
% Trips to N via Olive St	=	100%	
Vol Trips to N via Olive St	=	**3** trips	AN
PM PEAK			
% Trips IN	=	60%	
Vol Trips IN	=	24 trips	
% Trips from S	=	90%	
Vol Trips from S	=	22 trips	
% Trips from S via Olive St	=	100%	
Vol Trips from S via Olive St	=	**22** trips	AO
% Trips from S via Yeppoon Rd	=	0%	
Vol Trips from S via Yeppoon Rd	=	**0** trips	AP
% Trips from S via Norman	=	0%	
Vol Trips from S via Norman	=	**0** trips	AQ
% Trips from S via R-Y Rd	=	0%	
Vol Trips from S via R-Y Rd	=	**0** trips	AR
% Trips from N	=	10%	
Vol Trips from N	=	2 trips	
% Trips from N via Olive St	=	100%	
Vol Trips from N via Olive St	=	**2** trips	AS
% Trips OUT	=	40%	
Vol Trips OUT	=	16 trips	
% Trips to S	=	90%	
Vol Trips to S	=	14 trips	
% Trips to S via Olive St	=	100%	
Vol Trips to S via Olive St	=	**14** trips	AT
% Trips to S via Yeppoon Rd	=	0%	
Vol Trips to S via Yeppoon Rd	=	**0** trips	AU
% Trips to S via Norman	=	0%	
Vol Trips to S via Norman	=	**0** trips	AV
% Trips to S via R-Y Rd	=	0%	
Vol Trips to S via R-Y Rd	=	**0** trips	AW
% Trips to N	=	10%	
Vol Trips to N	=	2 trips	
% Trips to N via Olive St	=	100%	
Vol Trips to N via Olive St	=	**2** trips	AX

D833/2005 (TMR d)

Yield	=	102 lots	
Gen Rate	=	0.85 trips/lot (peak)	
Gen Traffic Volume	=	87 trips	
AM PEAK			
% Trips IN	=	30%	
Vol Trips IN	=	26 trips	
% Trips from S	=	90%	
Vol Trips from S	=	23 trips	
% Trips from S via Boundary	=	100%	
Vol Trips from S via Boundary	=	**23** trips	AY
% Trips from S via Yeppoon Rd	=	0%	
Vol Trips from S via Yeppoon Rd	=	**0** trips	AZ
% Trips from S via Norman	=	0%	
Vol Trips from S via Norman	=	**0** trips	BA
% Trips from S via R-Y Rd	=	0%	
Vol Trips from S via R-Y Rd	=	**0** trips	BB
% Trips from N	=	10%	
Vol Trips from N	=	3 trips	
% Trips from N via Olive St	=	75%	
Vol Trips from N via Olive St	=	**2** trips	BC
% Trips from N via Mason	=	25%	
Vol Trips from N via Mason	=	**1** trips	BD
% Trips OUT	=	70%	
Vol Trips OUT	=	61 trips	
% Trips to S	=	90%	
Vol Trips to S	=	55 trips	
% Trips to S via Boundary	=	75%	
Vol Trips to S via Boundary	=	**41** trips	BE
% Trips to S via Rachel Dr	=	25%	
Vol Trips to S via Rachel Dr	=	**14** trips	BF
% Trips to N	=	10%	
Vol Trips to N	=	6 trips	
% Trips to N via Olive St	=	100%	
Vol Trips to N via Olive St	=	**6** trips	BI
PM PEAK			
% Trips IN	=	60%	
Vol Trips IN	=	52 trips	
% Trips from S	=	90%	
Vol Trips from S	=	47 trips	
% Trips from S via Boundary	=	100%	
Vol Trips from S via Boundary	=	**47** trips	BJ
% Trips from S via Yeppoon Rd	=	0%	
Vol Trips from S via Yeppoon Rd	=	**0** trips	BK
% Trips from S via Norman	=	0%	
Vol Trips from S via Norman	=	**0** trips	BL
% Trips from S via R-Y Rd	=	0%	
Vol Trips from S via R-Y Rd	=	**0** trips	BM
% Trips from N	=	10%	
Vol Trips from N	=	5 trips	
% Trips from N via Olive St	=	75%	
Vol Trips from N via Olive St	=	**4** trips	BN
% Trips from N via Mason	=	25%	
Vol Trips from N via Mason	=	**1** trips	BO
% Trips OUT	=	40%	
Vol Trips OUT	=	35 trips	
% Trips to S	=	90%	
Vol Trips to S	=	31 trips	
% Trips to S via Boundary	=	75%	
Vol Trips to S via Boundary	=	**23** trips	BP
% Trips to S via Rachel Dr	=	25%	
Vol Trips to S via Rachel Dr	=	**8** trips	BQ
% Trips to N	=	10%	
Vol Trips to N	=	3 trips	
% Trips to N via Olive St	=	100%	
Vol Trips to N via Olive St	=	**3** trips	BT

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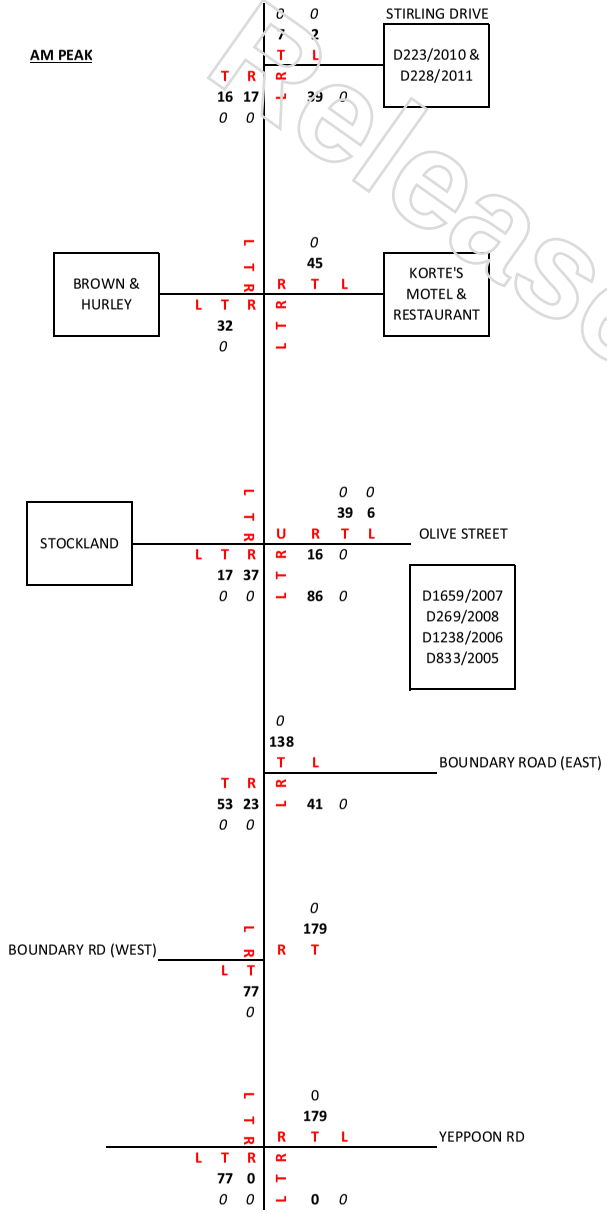
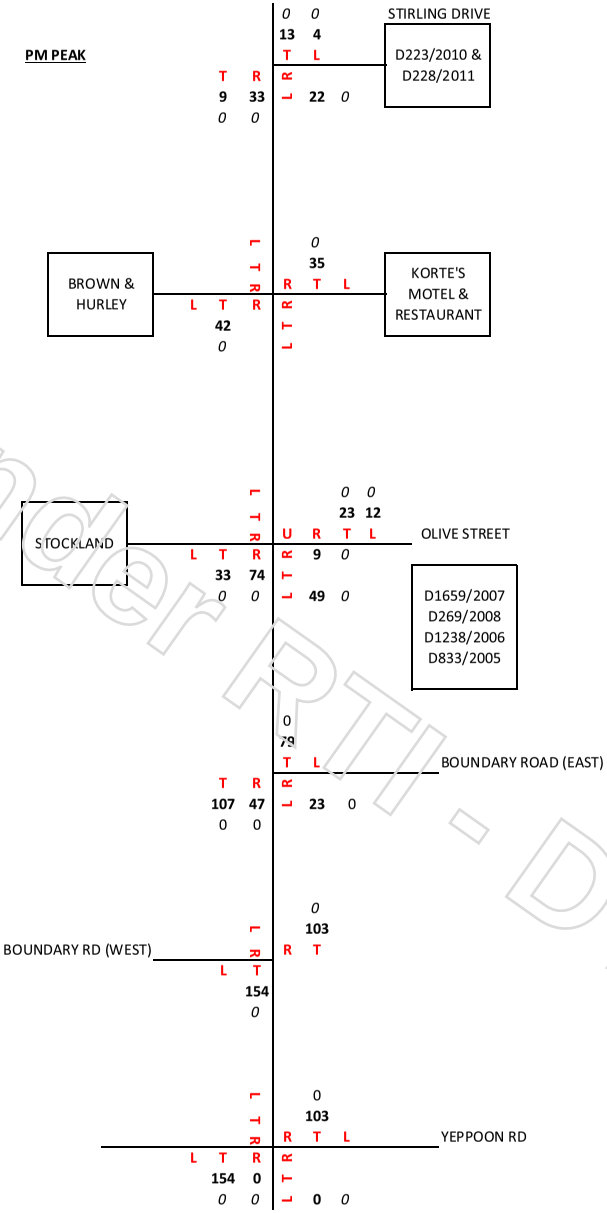
Road Network Volumes 2025

Approved Eastern Developments





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STO0111-01R - Stockland North Parkhurst

Background Road Network Calculations - 2035

Approved Eastern Development Parcels

D223/2010 & D228/2011 (TMR j)

Yield	=	72 lots	
Gen Rate	=	0.85 trips/lot (peak)	
Gen Traffic Volume	=	61 trips	
AM PEAK			
% Trips IN	=	30%	
Vol Trips IN	=	18 trips	
% Trips from S	=	90%	
Vol Trips from S	=	17 trips	
% Trips from S via Stirling	=	100%	
Vol Trips from S via Stirling	=	**17** trips	A
% Trips from N	=	10%	
Vol Trips from N	=	2 trips	
% Trips from N via Stirling	=	100%	
Vol Trips from N via Stirling	=	**2** trips	B
% Trips OUT	=	70%	
Vol Trips OUT	=	43 trips	
% Trips to S	=	90%	
Vol Trips to S	=	39 trips	
% Trips to S via Stirling	=	100%	
Vol Trips to S via Stirling	=	**39** trips	C
% Trips to N	=	10%	
Vol Trips to N	=	4 trips	
% Trips to N via Stirling	=	0%	
Vol Trips to N via Stirling	=	**0** trips	D
% Trips to N via Angela Rd	=	100%	
Vol Trips to N via Angela Rd	=	**4** trips	E
PM PEAK			
% Trips IN	=	60%	
Vol Trips IN	=	37 trips	
% Trips from S	=	90%	
Vol Trips from S	=	33 trips	
% Trips from S via Stirling	=	100%	
Vol Trips from S via Stirling	=	**33** trips	F
% Trips from N	=	10%	
Vol Trips from N	=	4 trips	
% Trips from N via Stirling	=	100%	
Vol Trips from N via Stirling	=	**4** trips	G
% Trips OUT	=	40%	
Vol Trips OUT	=	24 trips	
% Trips to S	=	90%	
Vol Trips to S	=	22 trips	
% Trips to S via Stirling	=	100%	
Vol Trips to S via Stirling	=	**22** trips	H
% Trips to N	=	10%	
Vol Trips to N	=	2 trips	
% Trips to N via Stirling	=	0%	
Vol Trips to N via Stirling	=	**0** trips	I
% Trips to N via Angela Rd	=	100%	
Vol Trips to N via Angela Rd	=	**2** trips	J

D1659/2007 & D269/2008 (TMR f)

Yield	=	114 lots	
Gen Rate	=	0.85 trips/lot (peak)	
Gen Traffic Volume	=	97 trips	
AM PEAK			
% Trips IN	=	30%	
Vol Trips IN	=	29 trips	
% Trips from S	=	90%	
Vol Trips from S	=	26 trips	
% Trips from S via Olive St	=	50%	
Vol Trips from S via Olive St	=	**13** trips	K
% Trips from S via Yeppoon Rd	=	10%	
Vol Trips from S via Yeppoon Rd	=	**3** trips	L
% Trips from S via Norman	=	30%	
Vol Trips from S via Norman	=	**8** trips	M
% Trips from S via R-Y Rd	=	10%	
Vol Trips from S via R-Y Rd	=	**3** trips	N
% Trips from N	=	10%	
Vol Trips from N	=	3 trips	
% Trips from N via Olive St	=	100%	
Vol Trips from N via Olive St	=	**3** trips	O
% Trips OUT	=	70%	
Vol Trips OUT	=	68 trips	
% Trips to S	=	90%	
Vol Trips to S	=	61 trips	
% Trips to S via Olive St	=	50%	
Vol Trips to S via Olive St	=	**31** trips	P
% Trips to S via Yeppoon Rd	=	10%	
Vol Trips to S via Yeppoon Rd	=	**6** trips	Q
% Trips to S via Norman	=	30%	
Vol Trips to S via Norman	=	**18** trips	R
% Trips to S via R-Y Rd	=	10%	
Vol Trips to S via R-Y Rd	=	**6** trips	S
% Trips to N	=	10%	
Vol Trips to N	=	7 trips	
% Trips to N via Olive St	=	100%	
Vol Trips to N via Olive St	=	**7** trips	T
PM PEAK			
% Trips IN	=	60%	
Vol Trips IN	=	58 trips	
% Trips from S	=	90%	
Vol Trips from S	=	52 trips	
% Trips from S via Olive St	=	50%	
Vol Trips from S via Olive St	=	**26** trips	U
% Trips from S via Yeppoon Rd	=	10%	
Vol Trips from S via Yeppoon Rd	=	**5** trips	V
% Trips from S via Norman	=	30%	
Vol Trips from S via Norman	=	**16** trips	W
% Trips from S via R-Y Rd	=	10%	
Vol Trips from S via R-Y Rd	=	**5** trips	X
% Trips from N	=	10%	
Vol Trips from N	=	6 trips	
% Trips from N via Olive St	=	100%	
Vol Trips from N via Olive St	=	**6** trips	Y
% Trips OUT	=	40%	
Vol Trips OUT	=	39 trips	
% Trips to S	=	90%	
Vol Trips to S	=	35 trips	
% Trips to S via Olive St	=	50%	
Vol Trips to S via Olive St	=	**17** trips	Z
% Trips to S via Yeppoon Rd	=	10%	
Vol Trips to S via Yeppoon Rd	=	**3** trips	AA
% Trips to S via Norman	=	30%	
Vol Trips to S via Norman	=	**10** trips	AB
% Trips to S via R-Y Rd	=	10%	
Vol Trips to S via R-Y Rd	=	**3** trips	AC
% Trips to N	=	10%	
Vol Trips to N	=	4 trips	
% Trips to N via Olive St	=	100%	
Vol Trips to N via Olive St	=	**4** trips	AD

D1238/2006 (TMR B)

Yield	=	47 lots	
Gen Rate	=	0.85 trips/lot (peak)	
Gen Traffic Volume	=	40 trips	
AM PEAK			
% Trips IN	=	30%	
Vol Trips IN	=	12 trips	
% Trips from S	=	90%	
Vol Trips from S	=	11 trips	
% Trips from S via Olive St	=	50%	
Vol Trips from S via Olive St	=	**5** trips	AE
% Trips from S via Yeppoon Rd	=	10%	
Vol Trips from S via Yeppoon Rd	=	**1** trips	AF
% Trips from S via Norman	=	30%	
Vol Trips from S via Norman	=	**3** trips	AG
% Trips from S via R-Y Rd	=	10%	
Vol Trips from S via R-Y Rd	=	**1** trips	AH
% Trips from N	=	10%	
Vol Trips from N	=	1 trips	
% Trips from N via Olive St	=	100%	
Vol Trips from N via Olive St	=	**1** trips	AI
% Trips OUT	=	70%	
Vol Trips OUT	=	28 trips	
% Trips to S	=	90%	
Vol Trips to S	=	25 trips	
% Trips to S via Olive St	=	50%	
Vol Trips to S via Olive St	=	**13** trips	AJ
% Trips to S via Yeppoon Rd	=	10%	
Vol Trips to S via Yeppoon Rd	=	**3** trips	AK
% Trips to S via Norman	=	30%	
Vol Trips to S via Norman	=	**8** trips	AL
% Trips to S via R-Y Rd	=	10%	
Vol Trips to S via R-Y Rd	=	**3** trips	AM
% Trips to N	=	10%	
Vol Trips to N	=	3 trips	
% Trips to N via Olive St	=	100%	
Vol Trips to N via Olive St	=	**3** trips	AN
PM PEAK			
% Trips IN	=	60%	
Vol Trips IN	=	24 trips	
% Trips from S	=	90%	
Vol Trips from S	=	22 trips	
% Trips from S via Olive St	=	50%	
Vol Trips from S via Olive St	=	**11** trips	AO
% Trips from S via Yeppoon Rd	=	10%	
Vol Trips from S via Yeppoon Rd	=	**2** trips	AP
% Trips from S via Norman	=	30%	
Vol Trips from S via Norman	=	**6** trips	AQ
% Trips from S via R-Y Rd	=	10%	
Vol Trips from S via R-Y Rd	=	**2** trips	AR
% Trips from N	=	10%	
Vol Trips from N	=	2 trips	
% Trips from N via Olive St	=	100%	
Vol Trips from N via Olive St	=	**2** trips	AS
% Trips OUT	=	40%	
Vol Trips OUT	=	16 trips	
% Trips to S	=	90%	
Vol Trips to S	=	14 trips	
% Trips to S via Olive St	=	50%	
Vol Trips to S via Olive St	=	**7** trips	AT
% Trips to S via Yeppoon Rd	=	10%	
Vol Trips to S via Yeppoon Rd	=	**1** trips	AU
% Trips to S via Norman	=	30%	
Vol Trips to S via Norman	=	**4** trips	AV
% Trips to S via R-Y Rd	=	10%	
Vol Trips to S via R-Y Rd	=	**1** trips	AW
% Trips to N	=	10%	
Vol Trips to N	=	2 trips	
% Trips to N via Olive St	=	100%	
Vol Trips to N via Olive St	=	**2** trips	AX

D833/2005 (TMR d)

Yield	=	102 lots	
Gen Rate	=	0.85 trips/lot (peak)	
Gen Traffic Volume	=	87 trips	
AM PEAK			
% Trips IN	=	30%	
Vol Trips IN	=	26 trips	
% Trips from S	=	90%	
Vol Trips from S	=	23 trips	
% Trips from S via Boundary	=	30%	
Vol Trips from S via Boundary	=	**7** trips	AY
% Trips from S via Yeppoon Rd	=	30%	
Vol Trips from S via Yeppoon Rd	=	**7** trips	AZ
% Trips from S via Norman	=	30%	
Vol Trips from S via Norman	=	**7** trips	BA
% Trips from S via R-Y Rd	=	10%	
Vol Trips from S via R-Y Rd	=	**2** trips	BB
% Trips from N	=	10%	
Vol Trips from N	=	3 trips	
% Trips from N via Olive St	=	75%	
Vol Trips from N via Olive St	=	**2** trips	BC
% Trips from N via Mason	=	25%	
Vol Trips from N via Mason	=	**1** trips	BD
% Trips OUT	=	70%	
Vol Trips OUT	=	61 trips	
% Trips to S	=	90%	
Vol Trips to S	=	55 trips	
% Trips to S via Boundary	=	30%	
Vol Trips to S via Boundary	=	**16** trips	BE
% Trips to S via Yeppoon Rd	=	30%	
Vol Trips to S via Yeppoon Rd	=	**16** trips	BF
% Trips to S via Norman	=	30%	
Vol Trips to S via Norman	=	**16** trips	BG
% Trips to S via R-Y Rd	=	10%	
Vol Trips to S via R-Y Rd	=	**5** trips	BH
% Trips to N	=	10%	
Vol Trips to N	=	6 trips	
% Trips to N via Olive St	=	100%	
Vol Trips to N via Olive St	=	**6** trips	BI
PM PEAK			
% Trips IN	=	60%	
Vol Trips IN	=	52 trips	
% Trips from S	=	90%	
Vol Trips from S	=	47 trips	
% Trips from S via Boundary	=	30%	
Vol Trips from S via Boundary	=	**14** trips	BJ
% Trips from S via Yeppoon Rd	=	30%	
Vol Trips from S via Yeppoon Rd	=	**14** trips	BK
% Trips from S via Norman	=	30%	
Vol Trips from S via Norman	=	**14** trips	BL
% Trips from S via R-Y Rd	=	10%	
Vol Trips from S via R-Y Rd	=	**5** trips	BM
% Trips from N	=	10%	
Vol Trips from N	=	5 trips	
% Trips from N via Olive St	=	75%	
Vol Trips from N via Olive St	=	**4** trips	BN
% Trips from N via Mason	=	25%	
Vol Trips from N via Mason	=	**1** trips	BO
% Trips OUT	=	40%	
Vol Trips OUT	=	35 trips	
% Trips to S	=	90%	
Vol Trips to S	=	31 trips	
% Trips to S via Boundary	=	30%	
Vol Trips to S via Boundary	=	**9** trips	BP
% Trips to S via Yeppoon Rd	=	30%	
Vol Trips to S via Yeppoon Rd	=	**9** trips	BQ
% Trips to S via Norman	=	30%	
Vol Trips to S via Norman	=	**9** trips	BR
% Trips to S via R-Y Rd	=	10%	
Vol Trips to S via R-Y Rd	=	**3** trips	BS
% Trips to N	=	10%	
Vol Trips to N	=	3 trips	
% Trips to N via Olive St	=	100%	
Vol Trips to N via Olive St	=	**3** trips	BT

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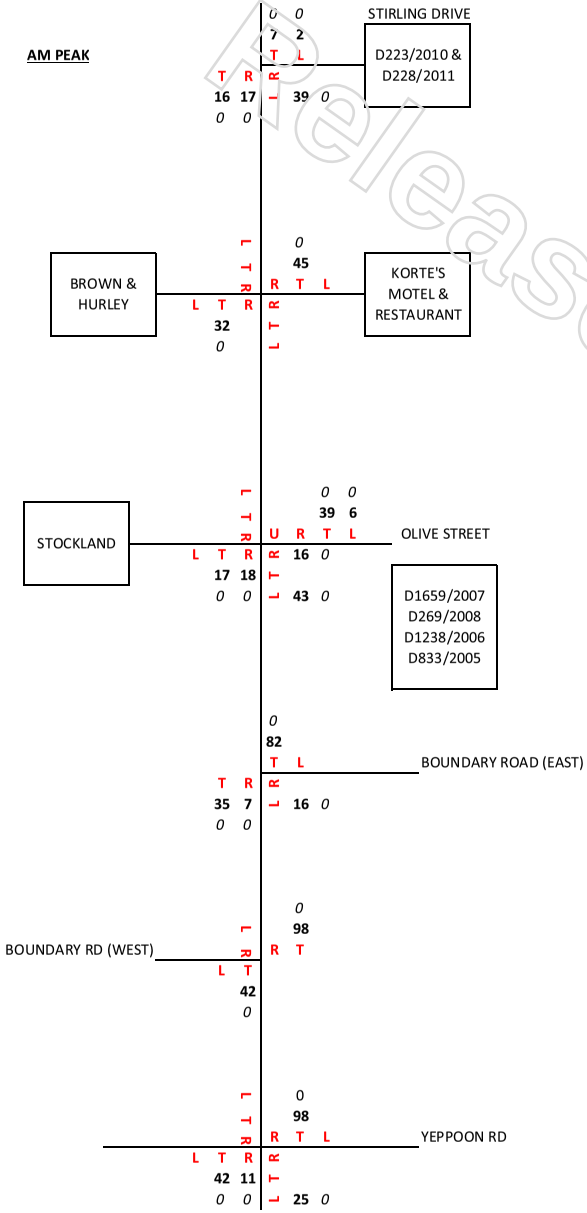
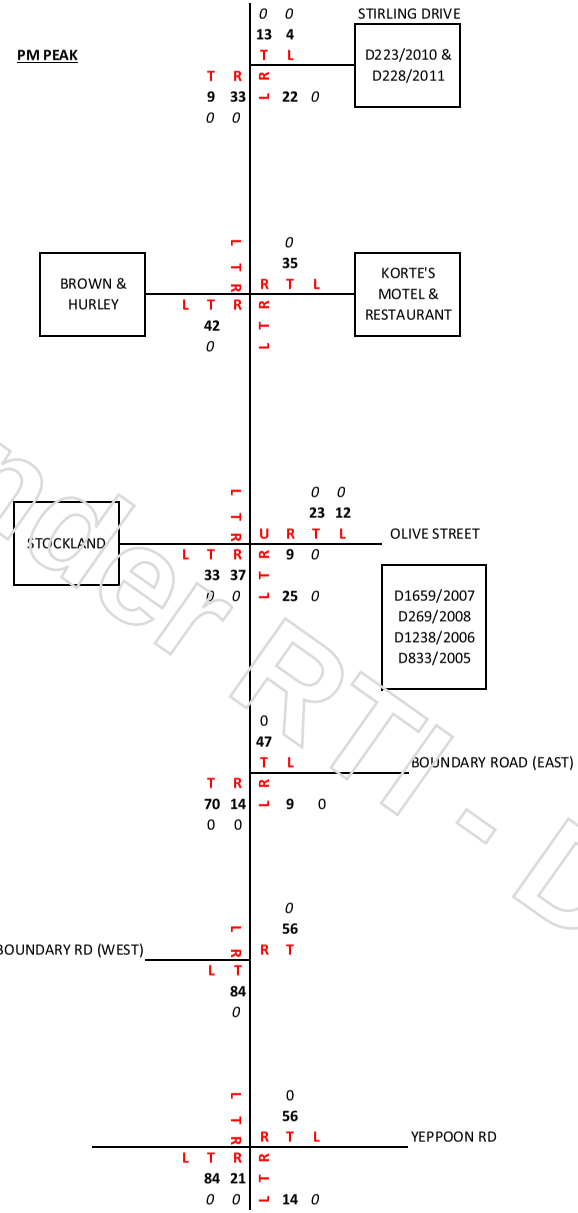
STO0111-01R - Stockland North Parkhurst

Road Network Volumes 2035

Approved Eastern Developments





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APPENDIX K

SIDRA Results

Bruce Highway / Olive Street

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LANE SUMMARY

Bruce Highway / Olive Street
Interim Intersection Configuration - 1275 Lots
POST DEVELOPMENT - 2035 AM Peak
Signals - Fixed Time Cycle Time = 100 seconds (Optimum Cycle Time - Shortest Queue)

Lane Use and Performance

	Demand Flows L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South: Bruce Highway (South)																
Lane 1	243	0	0	243	0.0	1182	0.206	100	9.7	LOS A	1.2	8.3	150	Turn Bay	0.0	0.0
Lane 2	0	196	0	196	21.7	570	0.344	100	26.3	LOS C	6.3	52.6	500	–	0.0	0.0
Lane 3	0	196	0	196	21.7	570	0.344	100	26.3	LOS C	6.3	52.6	500	–	0.0	0.0
Lane 4	0	0	18	18	0.0	113	0.160	100	59.1	LOS E	0.9	6.1	30	Turn Bay	0.0	0.0
Approach	243	392	18	653	13.0		0.344		21.0	LOS C	6.3	52.6				
East: Olive Street (East)																
Lane 1	46	50	18	114	1.8	132	0.861	100	63.6	LOS E	6.3	45.0	500	–	0.0	0.0
Approach	46	50	18	114	1.8		0.861		63.6	LOS E	6.3	45.0				
North: Bruce Highway (North)																
Lane 1	8	551	0	559	6.0	625	0.894	100	47.8	LOS D	31.7	233.2	500	–	0.0	0.0
Lane 2	0	560	0	560	5.9	626	0.894	100	47.7	LOS D	31.7	233.3	500	–	0.0	0.0
Lane 3	0	0	33	33	0.0	113	0.293	100	59.9	LOS E	1.6	11.5	70	Turn Bay	0.0	0.0
Approach	8	1111	33	1152	5.8		0.894		48.1	LOS D	31.7	233.3				
West: Olive Street (West)																
Lane 1	76	50	633	759	0.0	849[1]	0.894	100	24.5	LOS C	16.1	113.0	500	–	0.0	0.0
Approach	76	50	633	759	0.0		0.894		24.5	LOS C	16.1	113.0				
Intersection				2678	5.8		0.894		35.5	LOS D	31.7	233.3				

Level of Service (LOS) Method: Delay (HCM 2000).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model used.

1 Reduced capacity due to a short lane effect

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SIDRA INTERSECTION

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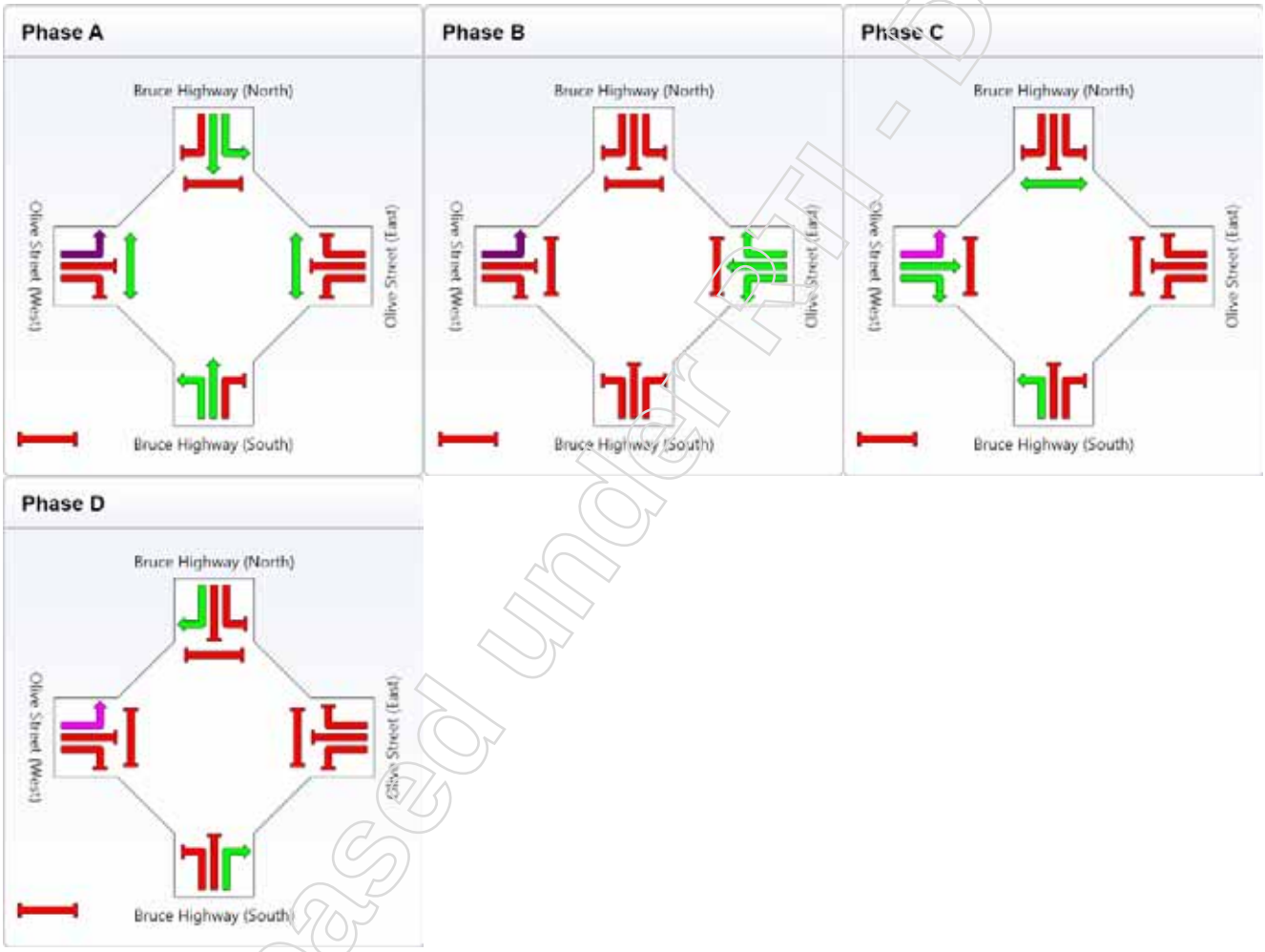
PHASING SUMMARY

Bruce Highway / Olive Street
Interim Intersection Configuration - 1275 Lots
POST DEVELOPMENT - 2035 AM Peak
Signals - Fixed Time Cycle Time = 100 seconds (Optimum Cycle Time - Shortest Queue)

Phase times determined by the program
Sequence: CAMBRAY 1
Input Sequence: A, B, C, D
Output Sequence: A, B, C, D

Phase Timing Results

Phase	A	B	C	D
Green Time (sec)	33	7	30	6
Yellow Time (sec)	4	4	4	4
All-Red Time (sec)	2	2	2	2
Phase Time (sec)	39	13	36	12
Phase Split	39 %	13 %	36 %	12 %





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LANE SUMMARY

Bruce Highway / Olive Street
Interim Intersection Configuration - 1275 Lots
POST DEVELOPMENT - 2035 PM Peak
Signals - Fixed Time Cycle Time = 100 seconds (Optimum Cycle Time - Shortest Queue)

Lane Use and Performance

	Demand Flows L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South: Bruce Highway (South)																
Lane 1	585	0	0	585	0.0	1201	0.487	100	10.0	LOS A	3.7	25.7	150	Turn Bay	0.0	0.0
Lane 2	0	525	0	525	5.3	781	0.672	100	22.8	LOS C	18.3	134.1	500	–	0.0	0.0
Lane 3	0	525	0	525	5.3	781	0.672	100	22.8	LOS C	18.3	134.1	500	–	0.0	0.0
Lane 4	0	0	38	38	0.0	113	0.338	100	60.1	LOS E	1.9	13.1	30	Turn Bay	0.0	0.0
Approach	585	1049	38	1672	3.3		0.672		19.2	LOS B	18.3	134.1				
East: Olive Street (East)																
Lane 1	35	10	12	57	5.3	109	0.521	100	59.9	LOS E	2.9	21.3	500	–	0.0	0.0
Approach	35	10	12	57	5.3		0.521		59.9	LOS E	2.9	21.3				
North: Bruce Highway (North)																
Lane 1	14	319	0	333	9.0	762	0.437	100	23.1	LOS C	11.6	87.8	500	–	0.0	0.0
Lane 2	0	333	0	333	9.4	762	0.437	100	22.8	LOS C	11.6	88.0	500	–	0.0	0.0
Lane 3	0	0	65	65	0.0	113	0.577	100	61.5	LOS E	3.3	23.4	70	Turn Bay	0.0	0.0
Approach	14	652	65	731	8.3		0.577		26.4	LOS C	11.6	88.0				
West: Olive Street (West)																
Lane 1	43	10	390	443	0.0	744[1]	0.595	100	11.3	LOS B	5.1	35.9	500	–	0.0	0.0
Approach	43	10	390	443	0.0		0.595		11.3	LOS B	5.1	35.9				
Intersection				2903	4.1		0.672		20.6	LOS C	18.3	134.1				

Level of Service (LOS) Method: Delay (HCM 2000).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model used.

1 Reduced capacity due to a short lane effect

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SIDRA INTERSECTION

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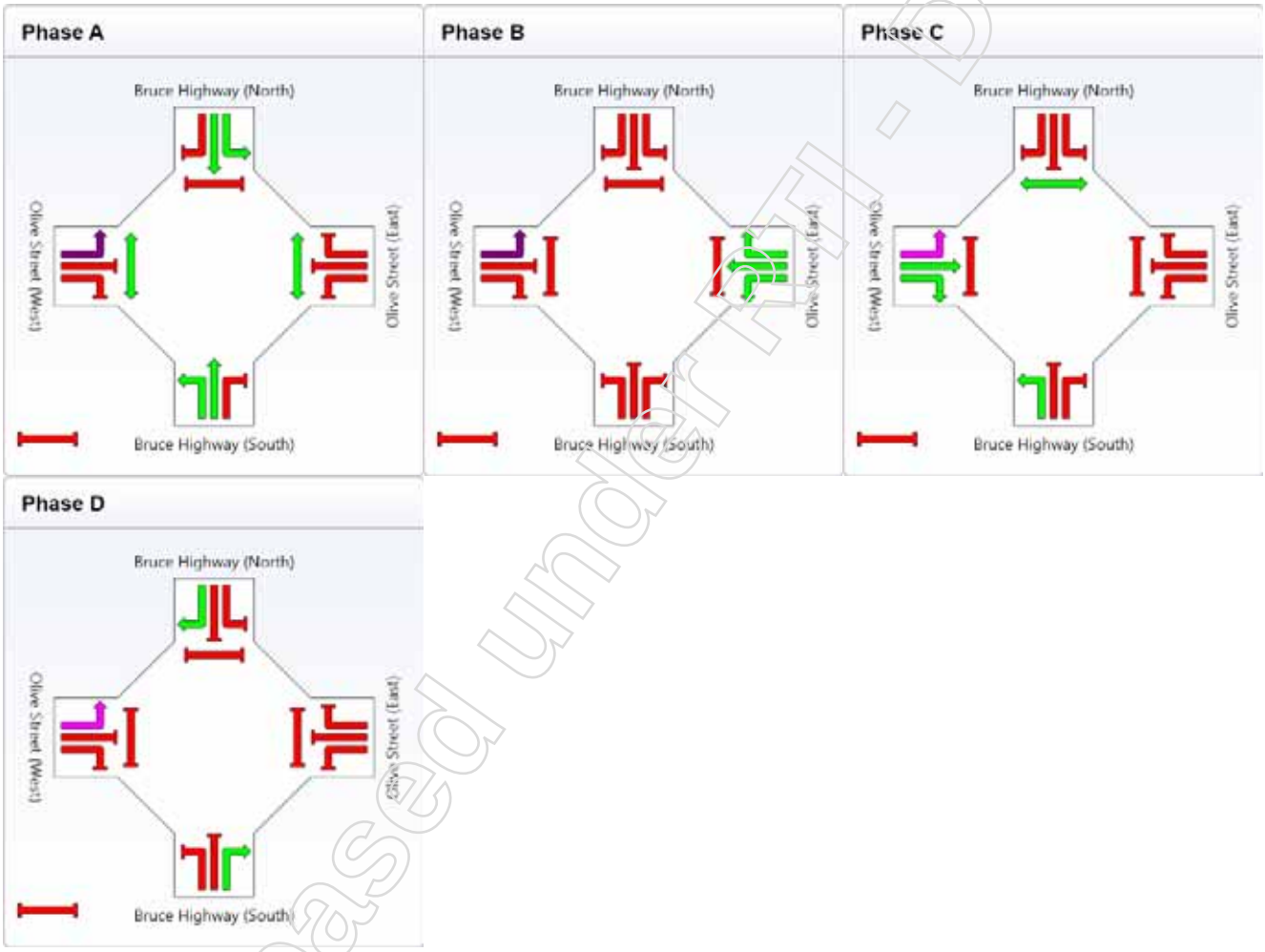
PHASING SUMMARY

Bruce Highway / Olive Street
Interim Intersection Configuration - 1275 Lots
POST DEVELOPMENT - 2035 PM Peak
Signals - Fixed Time Cycle Time = 100 seconds (Optimum Cycle Time - Shortest Queue)

Phase times determined by the program
Sequence: CAMBRAY 1
Input Sequence: A, B, C, D
Output Sequence: A, B, C, D

Phase Timing Results

Phase	A	B	C	D
Green Time (sec)	41	6	23	6
Yellow Time (sec)	4	4	4	4
All-Red Time (sec)	2	2	2	2
Phase Time (sec)	47	12	29	12
Phase Split	47 %	12 %	29 %	12 %





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LANE SUMMARY

Site: POST 2025 AM PEAK

Olive Street / Bruce Highway (Ultimate)
Post Development - Full Buildout (North Parkhurst and Edenbrook)
2025 AM Peak
Signals - Fixed Time Cycle Time = 140 seconds (Optimum Cycle Time - Minimum Degree of Saturation)

Lane Use and Performance

	Demand Flows L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South: Bruce Highway (South)																
Lane 1	198	0	0	198	0.0	1121[1]	0.177	100	13.5	LOS B	2.8	19.4	150	Turn Bay	0.0	0.0
Lane 2	198	0	0	198	0.0	1121[1]	0.177	100	13.5	LOS B	2.8	19.4	150	Turn Bay	0.0	0.0
Lane 3	0	181	0	181	21.3	556	0.325	100	38.5	LOS D	9.3	76.8	500	–	0.0	0.0
Lane 4	0	181	0	181	21.3	556	0.325	100	38.5	LOS D	9.3	76.8	500	–	0.0	0.0
Lane 5	0	0	37	37	0.0	100[1]	0.368	100	77.9	LOS E	2.5	17.4	30	Turn Bay	0.0	0.0
Approach	396	361	37	794	9.7		0.368		27.8	LOS C	9.3	76.8				
East: Olive Street (East)																
Lane 1	89	50	18	157	1.3	189	0.832	100	80.4	LOS F	11.5	81.5	500	–	0.0	0.0
Approach	89	50	18	157	1.3		0.832		80.4	LOS F	11.5	81.5				
North: Bruce Highway (North)																
Lane 1	8	504	0	512	6.0	609	0.840	100	52.5	LOS D	34.6	254.5	500	–	0.0	0.0
Lane 2	0	512	0	512	5.9	610	0.840	100	52.4	LOS D	34.6	254.6	500	–	0.0	0.0
Lane 3	0	0	50	50	0.0	134	0.373	100	78.4	LOS E	3.4	23.8	70	Turn Bay	0.0	0.0
Approach	8	1016	50	1074	5.7		0.840		53.7	LOS D	34.6	254.6				
West: Olive Street (West)																
Lane 1	116	0	0	116	0.0	888[1]	0.131	100	8.9	LOS A	0.3	2.3	30	Turn Bay	0.0	0.0
Lane 2	0	50	472	522	0.0	633	0.825	100	54.1	LOS D	32.3	226.3	500	–	0.0	0.0
Lane 3	0	0	520	520	0.0	630	0.825	100	55.0	LOS D	32.2	225.4	500	–	0.0	0.0
Approach	116	50	992	1158	0.0		0.825		50.0	LOS D	32.3	226.3				
Intersection				3183	4.4		0.840		47.2	LOS D	34.6	254.6				

Level of Service (LOS) Method: Delay (HCM 2000).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model used.

1 Reduced capacity due to a short lane effect

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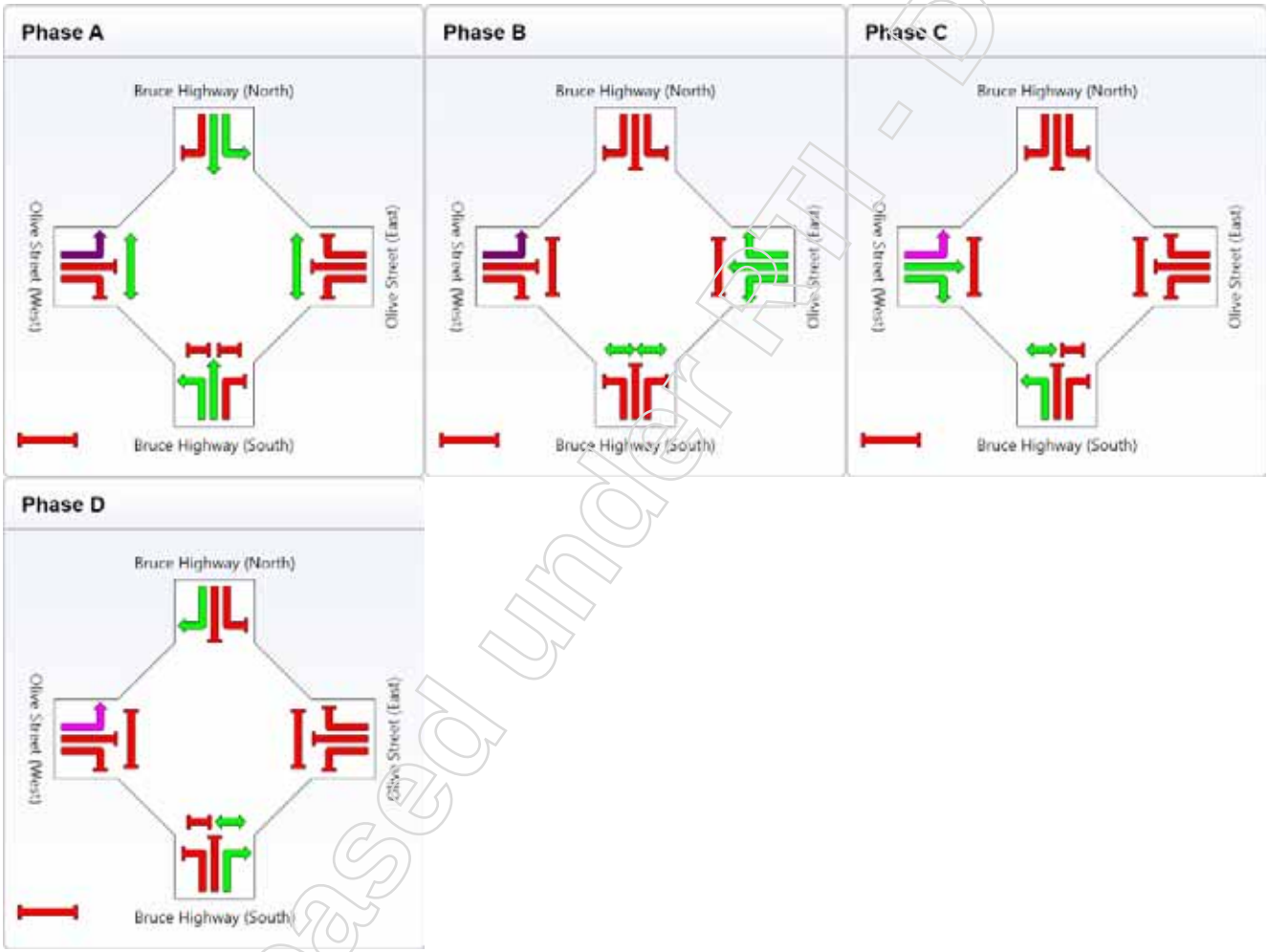
PHASING SUMMARY

Olive Street / Bruce Highway (Ultimate)
Post Development - Full Buildout (North Parkhurst and Edenbrook)
2025 AM Peak
Signals - Fixed Time Cycle Time = 140 seconds (Optimum Cycle Time - Minimum Degree of Saturation)

Phase times determined by the program
Sequence: CAMBRAY 1
Input Sequence: A, B, C, D
Output Sequence: A, B, C, D

Phase Timing Results

Phase	A	B	C	D
Green Time (sec)	45	14	47	10
Yellow Time (sec)	4	4	4	4
All-Red Time (sec)	2	2	2	2
Phase Time (sec)	51	20	53	16
Phase Split	36 %	14 %	38 %	11 %





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LANE SUMMARY

Site: POST 2025 PM PEAK

Olive Street / Bruce Highway (Ultimate)
Post Development - Full Buildout (North Parkhurst and Edenbrook)
2025 PM Peak
Signals - Fixed Time Cycle Time = 100 seconds (Optimum Cycle Time - Shortest Queue)

Lane Use and Performance

	Demand Flows L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South: Bruce Highway (South)																
Lane 1	447	0	0	447	0.0	1051	0.425	100	15.5	LOS B	6.4	45.1	150	Turn Bay	0.0	0.0
Lane 2	447	0	0	447	0.0	1051	0.425	100	15.5	LOS B	6.4	45.1	150	Turn Bay	0.0	0.0
Lane 3	0	486	0	486	5.3	648	0.749	100	32.6	LOS C	21.5	157.6	500	–	0.0	0.0
Lane 4	0	486	0	486	5.3	648	0.749	100	32.6	LOS C	21.5	157.6	500	–	0.0	0.0
Lane 5	0	0	75	75	0.0	141[1]	0.533	100	56.6	LOS E	3.6	25.2	30	Turn Bay	0.0	0.0
Approach	893	971	75	1939	2.6		0.749		25.7	LOS C	21.5	157.6				
East: Olive Street (East)																
Lane 1	59	10	12	81	3.7	184	0.441	100	55.8	LOS E	3.9	28.2	500	–	0.0	0.0
Approach	59	10	12	81	3.7		0.441		55.8	LOS E	3.9	28.2				
North: Bruce Highway (North)																
Lane 1	14	299	0	313	8.6	633	0.494	100	28.7	LOS C	12.1	91.2	500	–	0.0	0.0
Lane 2	0	312	0	312	9.0	633	0.494	100	28.3	LOS C	12.1	91.5	500	–	0.0	0.0
Lane 3	0	0	99	99	0.0	188	0.528	100	57.2	LOS E	4.8	33.7	70	Turn Bay	0.0	0.0
Approach	14	611	99	724	7.6		0.528		32.4	LOS C	12.1	91.5				
West: Olive Street (West)																
Lane 1	66	0	0	66	0.0	658[1]	0.100	100	10.3	LOS B	0.3	2.4	30	Turn Bay	0.0	0.0
Lane 2	0	10	293	303	0.0	413	0.732	100	49.1	LOS D	13.9	97.0	500	–	0.0	0.0
Lane 3	0	0	302	302	0.0	413	0.732	100	49.4	LOS D	13.8	96.9	500	–	0.0	0.0
Approach	66	10	595	671	0.0		0.732		45.4	LOS D	13.9	97.0				
Intersection				3415	3.2		0.749		31.7	LOS C	21.5	157.6				

Level of Service (LOS) Method: Delay (HCM 2000).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model used.

1 Reduced capacity due to a short lane effect

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Project: C:\Cambray\STO0111\01R\Working\Sidra\13-10-29\Bruce Highway-Olive Street.sip
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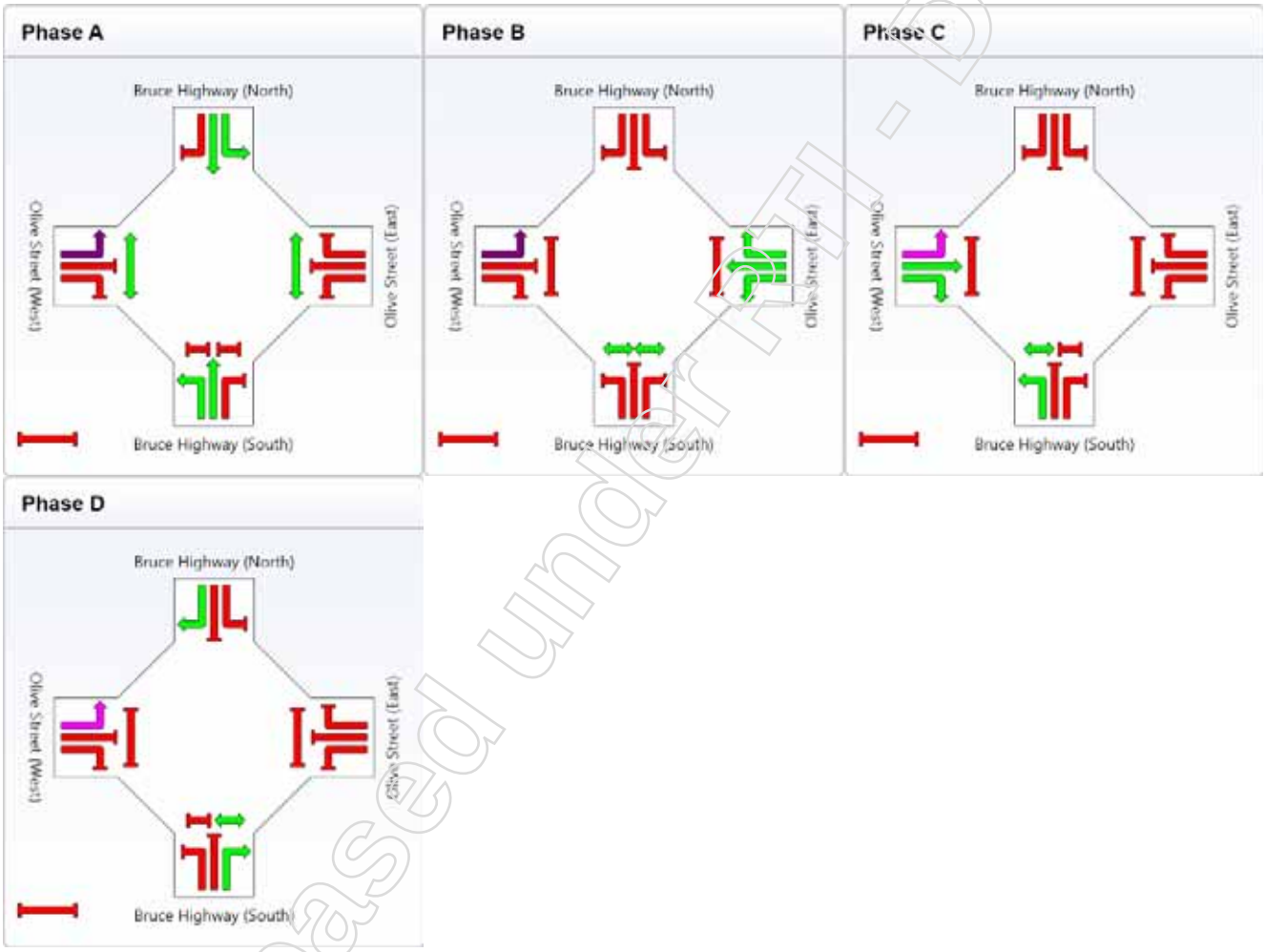
PHASING SUMMARY

Olive Street / Bruce Highway (Ultimate)
Post Development - Full Buildout (North Parkhurst and Edenbrook)
2025 PM Peak
Signals - Fixed Time Cycle Time = 100 seconds (Optimum Cycle Time - Shortest Queue)

Phase times determined by the program
Sequence: CAMBRAY 1
Input Sequence: A, B, C, D
Output Sequence: A, B, C, D

Phase Timing Results

Phase	A	B	C	D
Green Time (sec)	34	10	22	10
Yellow Time (sec)	4	4	4	4
All-Red Time (sec)	2	2	2	2
Phase Time (sec)	40	16	28	16
Phase Split	40 %	16 %	28 %	16 %





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LANE SUMMARY

Site: POST 2035 AM PEAK

Olive Street / Bruce Highway (Ultimate)
Post Development - Full Buildout (North Parkhurst and Edenbrook)
2035 AM Peak
Signals - Fixed Time Cycle Time = 140 seconds (Optimum Cycle Time - Minimum Delay)

Lane Use and Performance

	Demand Flows L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South: Bruce Highway (South)																
Lane 1	198	0	0	198	0.0	1195[1]	0.166	100	12.7	LOS B	2.4	16.5	150	Turn Bay	0.0	0.0
Lane 2	198	0	0	198	0.0	1195[1]	0.166	100	12.7	LOS B	2.4	16.5	150	Turn Bay	0.0	0.0
Lane 3	0	196	0	196	21.7	617	0.318	100	34.8	LOS C	9.6	79.8	500	–	0.0	0.0
Lane 4	0	196	0	196	21.7	617	0.318	100	34.8	LOS C	9.6	79.8	500	–	0.0	0.0
Lane 5	0	0	18	18	0.0	101[1]	0.178	100	76.7	LOS E	1.2	8.3	30	Turn Bay	0.0	0.0
Approach	396	392	18	806	10.5		0.318		24.9	LOS C	9.6	79.8				
East: Olive Street (East)																
Lane 1	46	50	18	114	1.8	135	0.843	100	83.2	LOS F	8.5	60.5	500	–	0.0	0.0
Approach	46	50	18	114	1.8		0.843		83.2	LOS F	8.5	60.5				
North: Bruce Highway (North)																
Lane 1	8	551	0	559	6.0	677	0.826	100	47.3	LOS D	36.2	266.7	500	–	0.0	0.0
Lane 2	0	560	0	560	5.9	678	0.826	100	47.1	LOS D	36.3	266.8	500	–	0.0	0.0
Lane 3	0	0	50	50	0.0	134	0.373	100	78.4	LOS E	3.4	23.8	70	Turn Bay	0.0	0.0
Approach	8	1111	50	1169	5.7		0.826		48.5	LOS D	36.3	266.8				
West: Olive Street (West)																
Lane 1	116	0	0	116	0.0	854[1]	0.136	100	8.9	LOS A	0.3	2.3	30	Turn Bay	0.0	0.0
Lane 2	0	50	472	522	0.0	619	0.843	100	56.7	LOS E	33.4	234.0	500	–	0.0	0.0
Lane 3	0	0	520	520	0.0	617	0.843	100	57.5	LOS E	33.3	233.0	500	–	0.0	0.0
Approach	116	50	992	1158	0.0		0.843		52.3	LOS D	33.4	234.0				
Intersection				3247	4.7		0.843		45.2	LOS D	36.3	266.8				

Level of Service (LOS) Method: Delay (HCM 2000).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model used.

1 Reduced capacity due to a short lane effect

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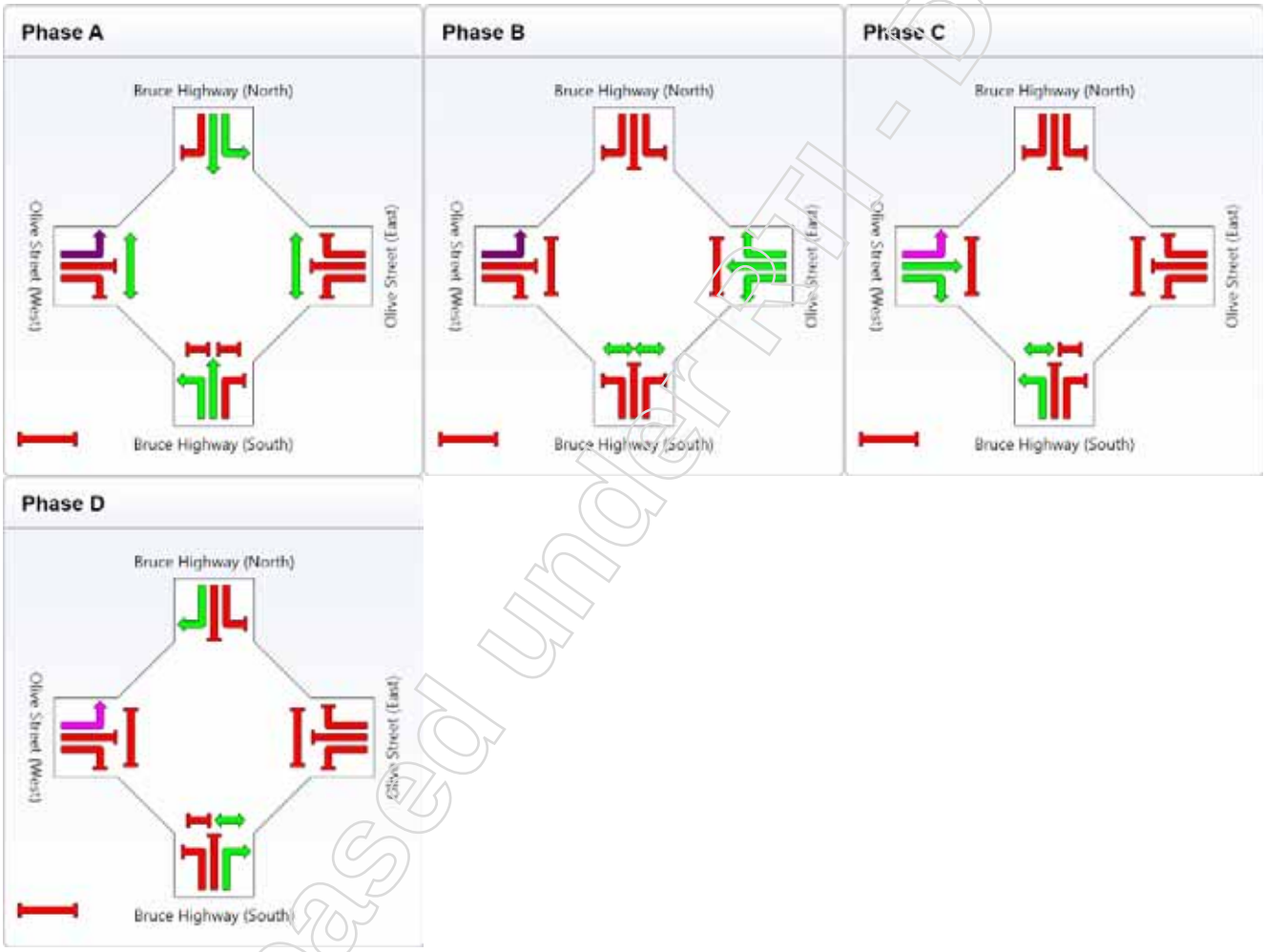
PHASING SUMMARY

Olive Street / Bruce Highway (Ultimate)
Post Development - Full Buildout (North Parkhurst and Edenbrook)
2035 AM Peak
Signals - Fixed Time Cycle Time = 140 seconds (Optimum Cycle Time - Minimum Delay)

Phase times determined by the program
Sequence: CAMBRAY 1
Input Sequence: A, B, C, D
Output Sequence: A, B, C, D

Phase Timing Results

Phase	A	B	C	D
Green Time (sec)	50	10	46	10
Yellow Time (sec)	4	4	4	4
All-Red Time (sec)	2	2	2	2
Phase Time (sec)	56	16	52	16
Phase Split	40 %	11 %	37 %	11 %





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LANE SUMMARY

Site: POST 2035 PM PEAK

Olive Street / Bruce Highway (Ultimate)
Post Development - Full Buildout (North Parkhurst and Edenbrook)
2035 AM Peak
Signals - Fixed Time Cycle Time = 110 seconds (Optimum Cycle Time - Shortest Queue)

Lane Use and Performance

	Demand Flows L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South: Bruce Highway (South)																
Lane 1	447	0	0	447	0.0	1100[1]	0.406	100	14.8	LOS B	6.4	44.9	150	Turn Bay	0.0	0.0
Lane 2	447	0	0	447	0.0	1100[1]	0.406	100	14.8	LOS B	6.4	44.9	150	Turn Bay	0.0	0.0
Lane 3	0	525	0	525	5.3	727	0.721	100	31.2	LOS C	24.0	175.5	500	–	0.0	0.0
Lane 4	0	525	0	525	5.3	727	0.721	100	31.2	LOS C	24.0	175.5	500	–	0.0	0.0
Lane 5	0	0	38	38	0.0	128[1]	0.296	100	60.9	LOS E	2.0	13.8	30	Turn Bay	0.0	0.0
Approach	893	1049	38	1980	2.8		0.721		24.4	LOS C	24.0	175.5				
East: Olive Street (East)																
Lane 1	35	10	12	57	5.3	166	0.344	100	60.3	LOS E	3.0	22.0	500	–	0.0	0.0
Approach	35	10	12	57	5.3		0.344		60.3	LOS E	3.0	22.0				
North: Bruce Highway (North)																
Lane 1	14	319	0	333	9.0	709	0.469	100	27.8	LOS C	13.4	101.1	500	–	0.0	0.0
Lane 2	0	333	0	333	9.4	709	0.469	100	27.5	LOS C	13.4	101.4	500	–	0.0	0.0
Lane 3	0	0	99	99	0.0	171	0.580	100	63.2	LOS E	5.4	37.6	70	Turn Bay	0.0	0.0
Approach	14	652	99	765	8.0		0.580		32.3	LOS C	13.4	101.4				
West: Olive Street (West)																
Lane 1	66	0	0	66	0.0	599[1]	0.110	100	10.5	LOS B	0.4	2.6	30	Turn Bay	0.0	0.0
Lane 2	0	10	293	303	0.0	410	0.738	100	53.2	LOS D	15.2	106.5	500	–	0.0	0.0
Lane 3	0	0	302	302	0.0	409	0.738	100	53.4	LOS D	15.2	106.4	500	–	0.0	0.0
Approach	66	10	595	671	0.0		0.738		49.1	LOS D	15.2	106.5				
Intersection				3473	3.5		0.738		31.5	LOS C	24.0	175.5				

Level of Service (LOS) Method: Delay (HCM 2000).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model used.

1 Reduced capacity due to a short lane effect

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SIDRA INTERSECTION 5.1.13.2093
Project: C:\Cambray\STO0111\01R\Working\Sidra\13-10-29\Bruce Highway-Olive Street.sip
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SIDRA INTERSECTION

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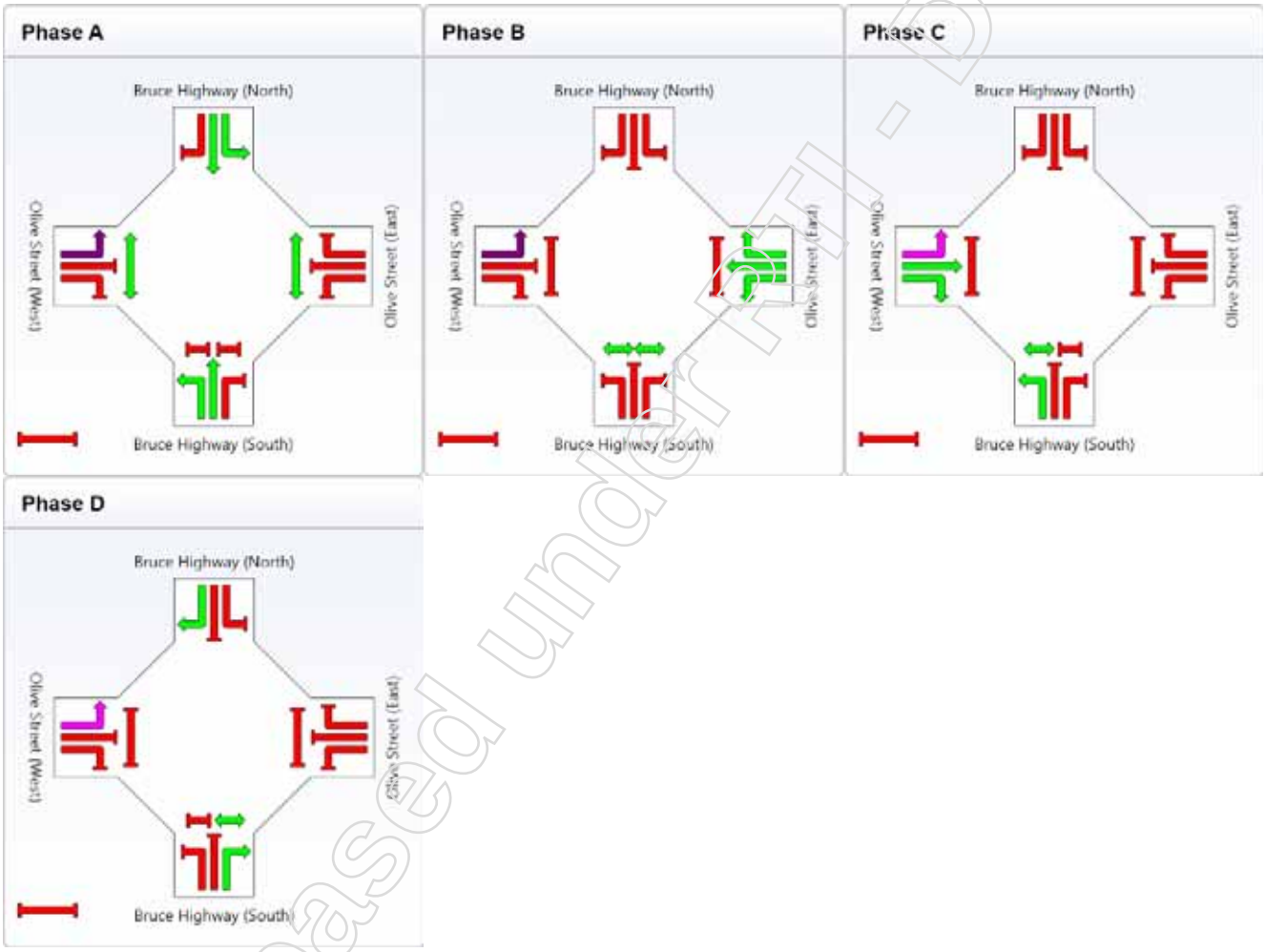
PHASING SUMMARY

Olive Street / Bruce Highway (Ultimate)
Post Development - Full Buildout (North Parkhurst and Edenbrook)
2035 AM Peak
Signals - Fixed Time Cycle Time = 110 seconds (Optimum Cycle Time - Shortest Queue)

Phase times determined by the program
Sequence: CAMBRAY 1
Input Sequence: A, B, C, D
Output Sequence: A, B, C, D

Phase Timing Results

Phase	A	B	C	D
Green Time (sec)	42	10	24	10
Yellow Time (sec)	4	4	4	4
All-Red Time (sec)	2	2	2	2
Phase Time (sec)	48	16	30	16
Phase Split	44 %	15 %	27 %	15 %





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APPENDIX L

SIDRA Results

Bruce Highway / Boundary Road (East)

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r_RTI-3295 file1 Release.pdf - Page Number: 527 of 672

LANE SUMMARY

Bruce Highway / Boundary Road (East) - 4 Lane Upgrade
Post Development - Full Buildout (North Parkhurst and Edenbrook)
2025 AM Peak
Signals - Fixed Time Cycle Time = 130 seconds (Optimum Cycle Time - Shortest Queue)

Lane Use and Performance

	Demand Flows L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South: Bruce Highway																
Lane 1	0	454	0	454	6.8	1524	0.298	100	1.0	LOS A	2.0	14.5	500	–	0.0	0.0
Lane 2	0	454	0	454	6.8	1524	0.298	100	1.0	LOS A	2.0	14.5	500	–	0.0	0.0
Lane 3	0	0	108	108	3.7	127	0.853	100	81.9	LOS F	7.5	54.0	125	Turn Bay	0.0	0.0
Approach	0	908	108	1016	6.5		0.853		9.6	LOS A	7.5	54.0				
East: Boundary Road																
Lane 1	102	0	0	102	2.0	185	0.551	100	71.2	LOS E	6.4	45.5	500	–	0.0	0.0
Lane 2	0	0	2	2	0.0	188	0.011	100	65.6	LOS E	0.1	0.8	50	Turn Bay	0.0	0.0
Approach	102	0	2	104	1.9		0.551		71.1	LOS E	6.4	45.5				
North: Bruce Highway																
Lane 1	5	1126	0	1131	2.8	1339	0.844	100	15.7	LOS B	52.1	373.3	500	–	0.0	0.0
Lane 2	0	1131	0	1131	2.8	1339	0.844	100	15.6	LOS B	52.1	373.4	500	–	0.0	0.0
Approach	5	2257	0	2262	2.8		0.844		15.6	LOS B	52.1	373.4				
Intersection				3382	3.9		0.853		15.5	LOS B	52.1	373.4				

Level of Service (LOS) Method: Delay (HCM 2000).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model used.

Processed: Thursday, 31 October 2013 11:32:19 AM
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Project: C:\Cambray\STO0111\01R\Working\Sidra\13-10-29\Bruce Highway-Boundary Road East.sip
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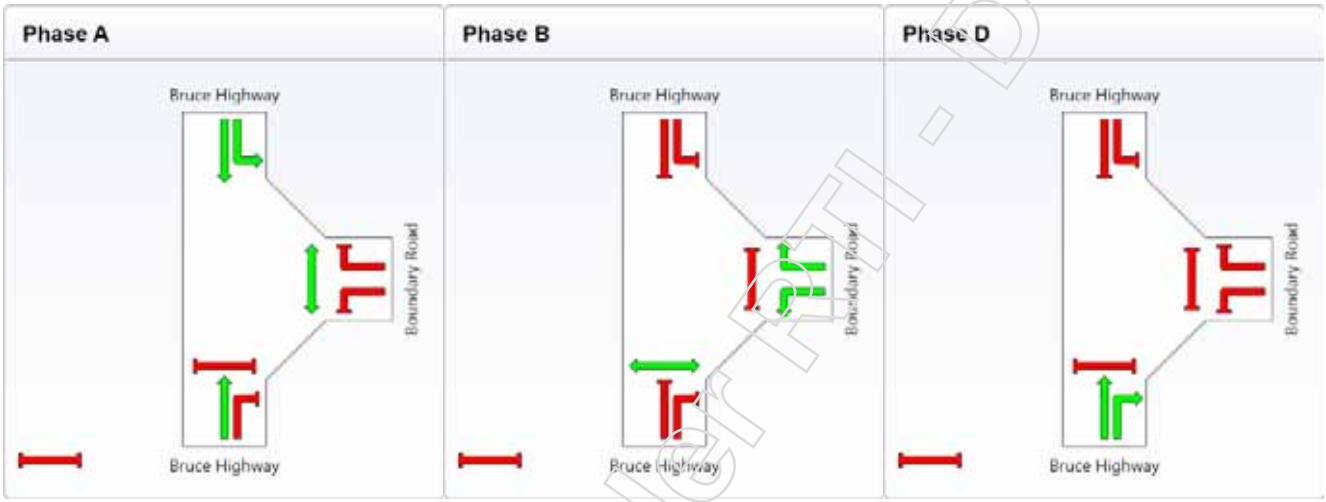
PHASING SUMMARY

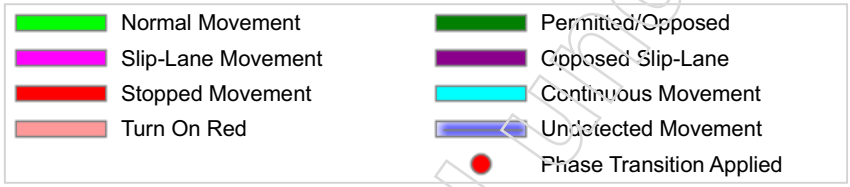
Bruce Highway / Boundary Road (East) - 4 Lane Upgrade
Post Development - Full Buildout (North Parkhurst and Edenbrook)
2025 AM Peak
Signals - Fixed Time Cycle Time = 130 seconds (Optimum Cycle Time - Shortest Queue)

Phase times determined by the program
Sequence: CAMBRAY
Input Sequence: A, B, D
Output Sequence: A, B, D

Phase Timing Results

Phase	A	B	D
Green Time (sec)	90	13	9
Yellow Time (sec)	4	4	4
All-Red Time (sec)	2	2	2
Phase Time (sec)	96	19	15
Phase Split	74 %	15 %	12 %





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LANE SUMMARY

Bruce Highway / Boundary Road (East) - 4 Lane Upgrade
Post Development - Full Buildout (North Parkhurst and Edenbrook)
2025 PM Peak
Signals - Fixed Time Cycle Time = 100 seconds (Optimum Cycle Time - Shortest Queue)

Lane Use and Performance

	Demand Flows L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South: Bruce Highway																
Lane 1	0	952	0	952	1.9	1460	0.652	100	1.5	LOS A	6.0	42.7	500	–	0.0	0.0
Lane 2	0	952	0	952	1.9	1460	0.652	100	1.5	LOS A	6.0	42.7	500	–	0.0	0.0
Lane 3	0	0	402	402	0.0	488	0.824	100	51.0	LOS D	19.5	136.4	125	Turn Bay	0.0	12.9
Approach	0	1904	402	2306	1.6		0.824		10.1	LOS B	19.5	136.4				
East: Boundary Road																
Lane 1	203	0	0	203	0.0	244	0.832	100	61.9	LOS E	10.9	76.0	500	–	0.0	0.0
Lane 2	0	0	148	148	0.0	244	0.607	100	54.9	LOS D	7.1	49.8	50	Turn Bay	0.0	4.6
Approach	203	0	148	351	0.0		0.832		58.9	LOS E	10.9	76.0				
North: Bruce Highway																
Lane 1	18	669	0	687	3.4	828	0.830	100	31.6	LOS C	32.2	231.9	500	–	0.0	0.0
Lane 2	0	687	0	687	3.5	828	0.830	100	31.4	LOS C	32.2	232.2	500	–	0.0	0.0
Approach	18	1356	0	1374	3.5		0.830		31.5	LOS C	32.2	232.2				
Intersection				4031	2.1		0.832		21.7	LOS C	32.2	232.2				

Level of Service (LOS) Method: Delay (HCM 2000).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model used.

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SIDRA INTERSECTION 5.1.13.2093
Project: C:\Cambray\STO0111\01R\Working\Sidra\13-10-29\Bruce Highway-Boundary Road East.sip
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SIDRA INTERSECTION

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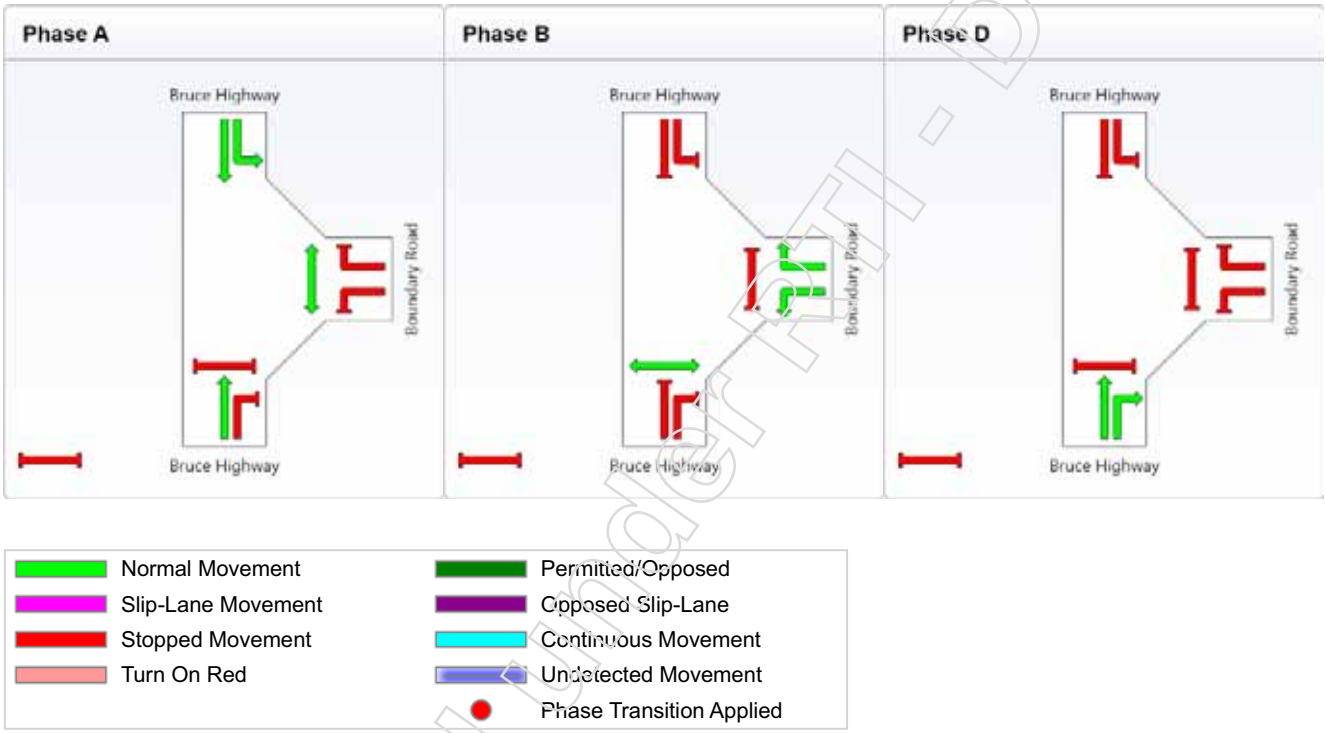
PHASING SUMMARY

Bruce Highway / Boundary Road (East) - 4 Lane Upgrade
Post Development - Full Buildout (North Parkhurst and Edenbrook)
2025 PM Peak
Signals - Fixed Time Cycle Time = 100 seconds (Optimum Cycle Time - Shortest Queue)

Phase times determined by the program
Sequence: CAMBRAY
Input Sequence: A, B, D
Output Sequence: A, B, D

Phase Timing Results

Phase	A	B	D
Green Time (sec)	43	13	26
Yellow Time (sec)	4	4	4
All-Red Time (sec)	2	2	2
Phase Time (sec)	49	19	32
Phase Split	49 %	19 %	32 %



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LANE SUMMARY

Bruce Highway / Boundary Road (East) - 4 Lane Upgrade
Post Development - Full Buildout (North Parkhurst and Edenbrook)
2035 AM Peak
Signals - Fixed Time Cycle Time = 135 seconds (Optimum Cycle Time - Shortest Queue)

Lane Use and Performance

	Demand Flows L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South: Bruce Highway																
Lane 1	0	467	0	467	7.4	1532	0.305	100	1.0	LOS A	2.1	15.7	500	–	0.0	0.0
Lane 2	0	467	0	467	7.4	1532	0.305	100	1.0	LOS A	2.1	15.7	500	–	0.0	0.0
Lane 3	0	0	92	92	4.3	108	0.853	100	85.7	LOS F	6.6	46.2	125	Turn Bay	0.0	0.0
Approach	0	934	92	1026	7.1		0.853		8.6	LOS A	6.6	46.2				
East: Boundary Road																
Lane 1	77	0	0	77	2.6	177	0.434	100	73.1	LOS E	4.9	35.4	500	–	0.0	0.0
Lane 2	0	0	2	2	0.0	181	0.011	100	68.3	LOS E	0.1	0.8	50	Turn Bay	0.0	0.0
Approach	77	0	2	79	2.5		0.434		72.9	LOS E	4.9	35.4				
North: Bruce Highway																
Lane 1	5	1154	0	1159	3.0	1374	0.844	100	14.9	LOS B	53.9	387.2	500	–	0.0	0.0
Lane 2	0	1159	0	1159	3.0	1374	0.844	100	14.8	LOS B	53.9	387.2	500	–	0.0	0.0
Approach	5	2313	0	2318	3.0		0.844		14.8	LOS B	53.9	387.2				
Intersection				3423	4.2		0.853		14.3	LOS B	53.9	387.2				

Level of Service (LOS) Method: Delay (HCM 2000).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model used.

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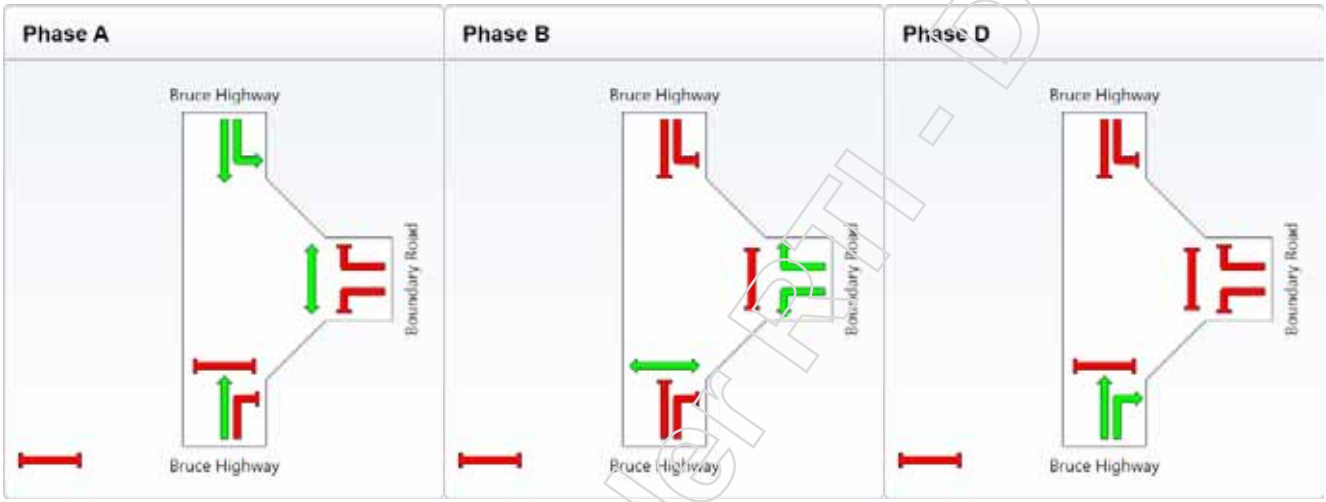
PHASING SUMMARY

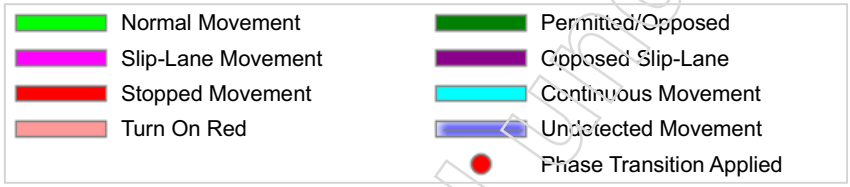
Bruce Highway / Boundary Road (East) - 4 Lane Upgrade
Post Development - Full Buildout (North Parkhurst and Edenbrook)
2035 AM Peak
Signals - Fixed Time Cycle Time = 135 seconds (Optimum Cycle Time - Shortest Queue)

Phase times determined by the program
Sequence: CAMBRAY
Input Sequence: A, B, D
Output Sequence: A, B, D

Phase Timing Results

Phase	A	B	D
Green Time (sec)	96	13	8
Yellow Time (sec)	4	4	4
All-Red Time (sec)	2	2	2
Phase Time (sec)	102	19	14
Phase Split	76 %	14 %	10 %





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LANE SUMMARY

Bruce Highway / Boundary Road (East) - 4 Lane Upgrade
Post Development - Full Buildout (North Parkhurst and Edenbrook)
2035 PM Peak
Signals - Fixed Time Cycle Time = 100 seconds (Optimum Cycle Time - Shortest Queue)

Lane Use and Performance

	Demand Flows L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South: Bruce Highway																
Lane 1	0	978	0	978	2.0	1458	0.671	100	1.5	LOS A	6.5	46.1	500	–	0.0	0.0
Lane 2	0	978	0	978	2.0	1458	0.671	100	1.5	LOS A	6.5	46.1	500	–	0.0	0.0
Lane 3	0	0	369	369	0.0	450	0.819	100	52.1	LOS D	18.0	126.0	125	Turn Bay	0.0	5.7
Approach	0	1956	369	2325	1.7		0.819		9.6	LOS A	18.0	126.0				
East: Boundary Road																
Lane 1	189	0	0	189	0.0	244	0.775	100	59.0	LOS E	9.7	68.0	500	–	0.0	0.0
Lane 2	0	0	148	148	0.0	244	0.607	100	54.9	LOS D	7.1	49.8	50	Turn Bay	0.0	4.6
Approach	189	0	148	337	0.0		0.775		57.2	LOS E	9.7	68.0				
North: Bruce Highway																
Lane 1	18	678	0	696	3.7	865	0.805	100	27.9	LOS C	30.6	221.1	500	–	0.0	0.0
Lane 2	0	696	0	696	3.8	865	0.805	100	27.7	LOS C	30.6	221.4	500	–	0.0	0.0
Approach	18	1374	0	1392	3.7		0.805		27.8	LOS C	30.6	221.4				
Intersection				4054	2.3		0.819		19.8	LOS B	30.6	221.4				

Level of Service (LOS) Method: Delay (HCM 2000).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model used.

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SIDRA INTERSECTION

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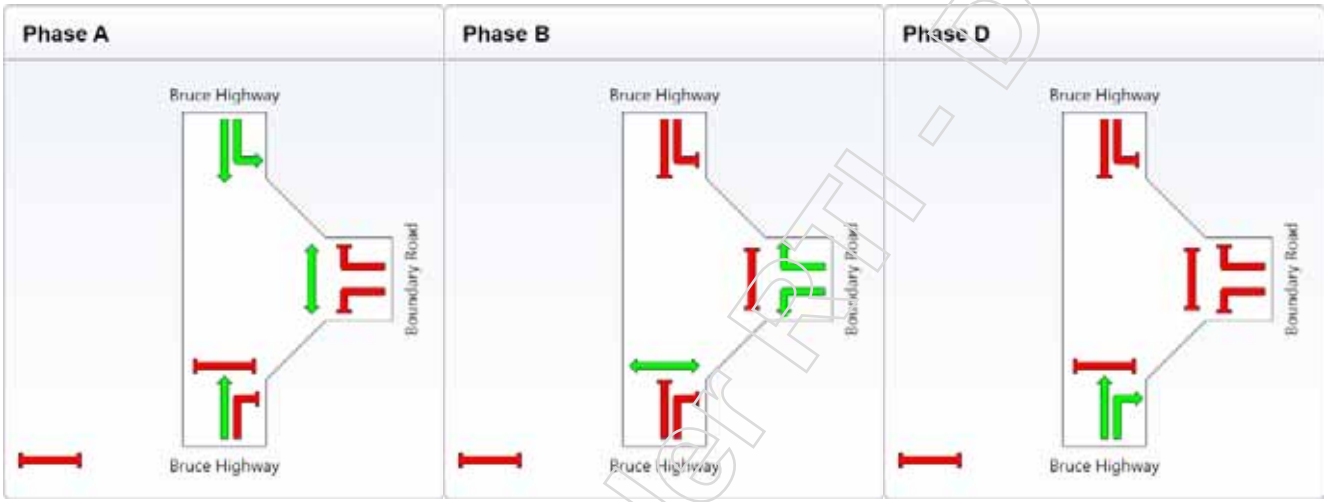
PHASING SUMMARY

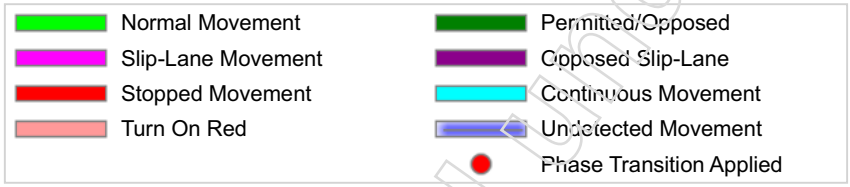
Bruce Highway / Boundary Road (East) - 4 Lane Upgrade
Post Development - Full Buildout (North Parkhurst and Edenbrook)
2035 PM Peak
Signals - Fixed Time Cycle Time = 100 seconds (Optimum Cycle Time - Shortest Queue)

Phase times determined by the program
Sequence: CAMBRAY
Input Sequence: A, B, D
Output Sequence: A, B, D

Phase Timing Results

Phase	A	B	D
Green Time (sec)	45	13	24
Yellow Time (sec)	4	4	4
All-Red Time (sec)	2	2	2
Phase Time (sec)	51	19	30
Phase Split	51 %	19 %	30 %





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APPENDIX M

SIDRA Results

Bruce Highway / Boundary Road (West)

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r_RTI-3295 file1 Release.pdf - Page Number: 536 of 672

LANE SUMMARY

Bruce Highway / Boundary Road (West) - 4 Lane Upgrade
Post Development - Full Buildout (North Parkhurst and Edenbrook)
2025 AM Peak
Signals - Fixed Time Cycle Time = 150 seconds (Optimum Cycle Time - Minimum Delay)

Lane Use and Performance

	Demand Flows L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South: Bruce Highway																
Lane 1	201	0	0	201	4.0	822[1]	0.245	100	15.0	LOS B	2.6	18.8	75	Turn Bay	0.0	0.0
Lane 2	0	473	0	473	6.9	1194	0.396	100	6.9	LOS A	7.9	58.4	500	–	0.0	0.0
Lane 3	0	473	0	473	6.9	1194	0.396	100	6.9	LOS A	7.9	58.4	500	–	0.0	0.0
Approach	201	945	0	1146	6.4		0.396		8.3	LOS A	7.9	58.4				
North: Bruce Highway																
Lane 1	0	1128	0	1128	2.4	1514	0.745	100	2.4	LOS A	13.7	98.1	500	–	0.0	0.0
Lane 2	0	1128	0	1128	2.4	1514	0.745	100	2.4	LOS A	13.7	98.1	500	–	0.0	0.0
Lane 3	0	0	76	76	7.9	190	0.399	100	78.2	LOS E	5.2	38.8	95	Turn Bay	0.0	0.0
Approach	0	2255	76	2331	2.5		0.745		4.8	LOS A	13.7	98.1				
West: Boundary Road																
Lane 1	18	0	0	18	16.7	147[1]	0.123	100	70.4	LOS E	1.2	9.2	50	Turn Bay	0.0	0.0
Lane 2	0	0	47	47	14.9	231	0.203	100	71.3	LOS E	3.1	24.3	500	–	0.0	0.0
Approach	18	0	47	65	15.4		0.203		71.1	LOS E	3.1	24.3				
Intersection				3542	4.0		0.745		7.2	LOS A	13.7	98.1				

Level of Service (LOS) Method: Delay (HCM 2000).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model used.

1 Reduced capacity due to a short lane effect

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PHASING SUMMARY

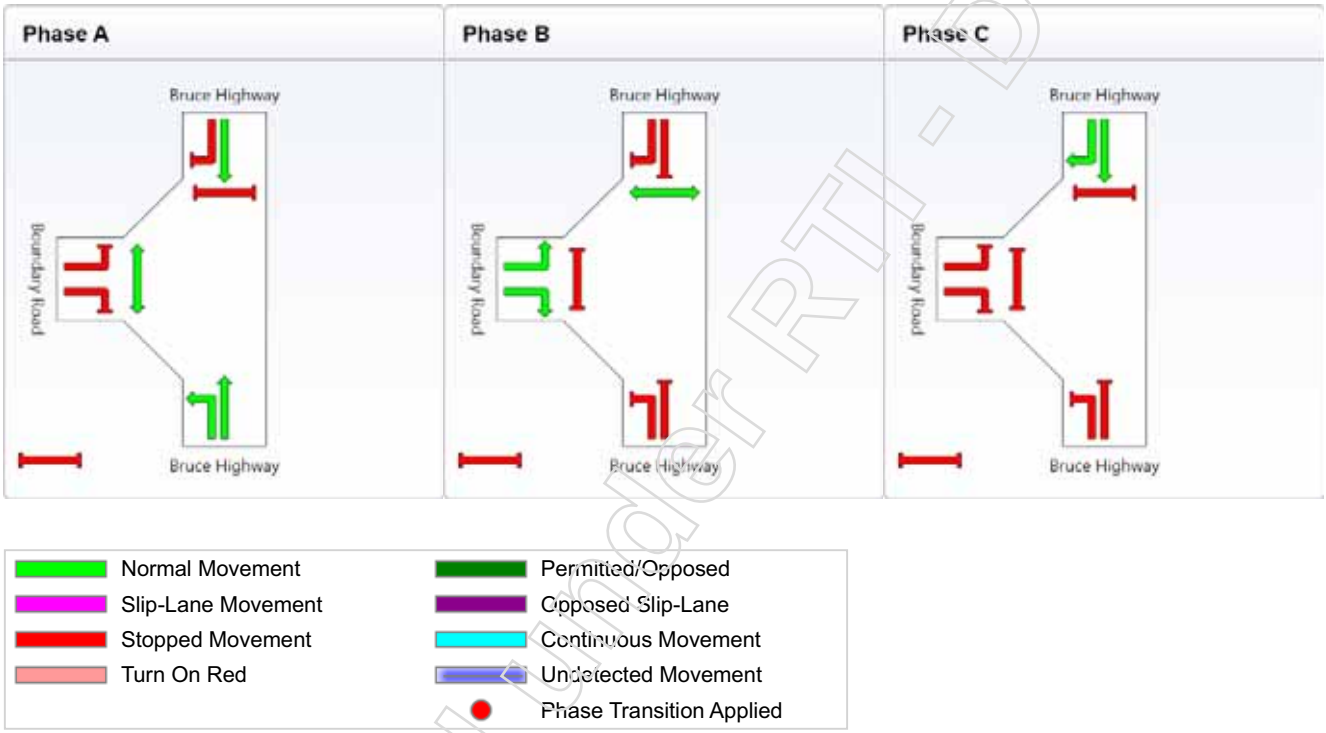
Site: 2025 AM PEAK

Bruce Highway / Boundary Road (West) - 4 Lane Upgrade
Post Development - Full Buildout (North Parkhurst and Edenbrook)
2025 AM Peak
Signals - Fixed Time Cycle Time = 150 seconds (Optimum Cycle Time - Minimum Delay)

Phase times determined by the program
Sequence: CAMBRAY
Input Sequence: A, B, C
Output Sequence: A, B, C

Phase Timing Results

Phase	A	B	C
Green Time (sec)	95	21	16
Yellow Time (sec)	4	4	4
All-Red Time (sec)	2	2	2
Phase Time (sec)	101	27	22
Phase Split	67 %	18 %	15 %



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LANE SUMMARY

Bruce Highway / Boundary Road (West) - 4 Lane Upgrade
Post Development - Full Buildout (North Parkhurst and Edenbrook)
2025 PM Peak
Signals - Fixed Time Cycle Time = 150 seconds (Optimum Cycle Time - Minimum Delay)

Lane Use and Performance

	Demand Flows L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South: Bruce Highway																
Lane 1	44	0	0	44	15.9	1126[1]	0.039	100	11.5	LOS B	0.2	1.7	75	Turn Bay	0.0	0.0
Lane 2	0	1026	0	1026	1.6	1365	0.752	100	3.8	LOS A	16.4	116.4	500	–	0.0	0.0
Lane 3	0	1026	0	1026	1.6	1365	0.752	100	3.8	LOS A	16.4	116.4	500	–	0.0	0.0
Approach	44	2052	0	2096	1.9		0.752		4.0	LOS A	16.4	116.4				
North: Bruce Highway																
Lane 1	0	717	0	717	2.7	1511	0.474	100	1.6	LOS A	4.6	33.2	500	–	0.0	0.0
Lane 2	0	717	0	717	2.7	1511	0.474	100	1.6	LOS A	4.6	33.2	500	–	0.0	0.0
Lane 3	0	0	38	38	31.6	62	0.617	100	93.7	LOS F	3.0	26.5	95	Turn Bay	0.0	0.0
Approach	0	1433	38	1471	3.4		0.617		4.0	LOS A	4.6	33.2				
West: Boundary Road																
Lane 1	92	0	0	92	9.8	153[1]	0.601	100	73.8	LOS E	6.2	47.4	50	Turn Bay	0.0	0.2
Lane 2	0	0	171	171	5.3	247	0.693	100	77.1	LOS E	12.3	90.0	500	–	0.0	0.0
Approach	92	0	171	263	6.8		0.693		76.0	LOS E	12.3	90.0				
Intersection				3830	2.8		0.752		8.9	LOS A	16.4	116.4				

Level of Service (LOS) Method: Delay (HCM 2000).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model used.

1 Reduced capacity due to a short lane effect

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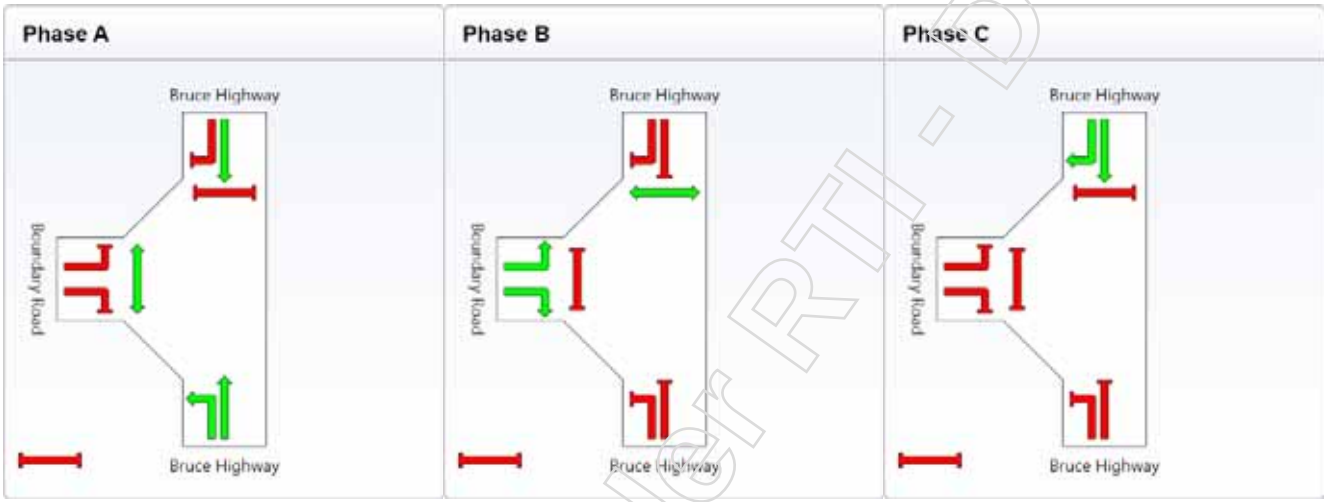
PHASING SUMMARY

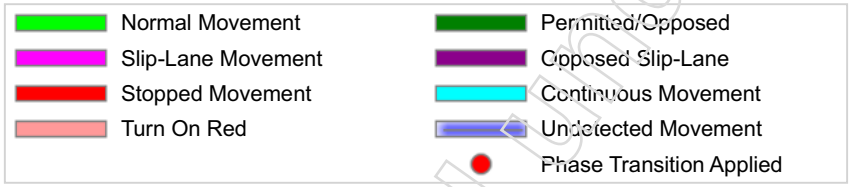
Bruce Highway / Boundary Road (West) - 4 Lane Upgrade
Post Development - Full Buildout (North Parkhurst and Edenbrook)
2025 PM Peak
Signals - Fixed Time Cycle Time = 150 seconds (Optimum Cycle Time - Minimum Delay)

Phase times determined by the program
Sequence: CAMBRAY
Input Sequence: A, B, C
Output Sequence: A, B, C

Phase Timing Results

Phase	A	B	C
Green Time (sec)	105	21	6
Yellow Time (sec)	4	4	4
All-Red Time (sec)	2	2	2
Phase Time (sec)	111	27	12
Phase Split	74 %	18 %	8 %





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LANE SUMMARY

Site: 2035 AM PEAK

Bruce Highway / Boundary Road (West) - 4 Lane Upgrade
Post Development - Full Buildout (North Parkhurst and Edenbrook)
2035 AM Peak
Signals - Fixed Time Cycle Time = 150 seconds (Optimum Cycle Time - Minimum Delay)

Lane Use and Performance

	Demand Flows L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South: Bruce Highway																
Lane 1	201	0	0	201	4.0	822[1]	0.245	100	15.0	LOS B	2.6	18.8	75	Turn Bay	0.0	0.0
Lane 2	0	474	0	474	7.5	1190	0.398	100	6.9	LOS A	7.9	59.1	500	–	0.0	0.0
Lane 3	0	474	0	474	7.5	1190	0.398	100	6.9	LOS A	7.9	59.1	500	–	0.0	0.0
Approach	201	948	0	1149	6.9		0.398		8.3	LOS A	7.9	59.1				
North: Bruce Highway																
Lane 1	0	1142	0	1142	2.6	1511	0.755	100	2.4	LOS A	14.4	103.0	500	–	0.0	0.0
Lane 2	0	1142	0	1142	2.6	1511	0.755	100	2.4	LOS A	14.4	103.0	500	–	0.0	0.0
Lane 3	0	0	76	76	7.9	190	0.399	100	78.2	LOS E	5.2	38.8	95	Turn Bay	0.0	0.0
Approach	0	2283	76	2359	2.8		0.755		4.9	LOS A	14.4	103.0				
West: Boundary Road																
Lane 1	18	0	0	18	16.7	147[1]	0.123	100	70.4	LOS E	1.2	9.2	50	Turn Bay	0.0	0.0
Lane 2	0	0	47	47	14.9	231	0.203	100	71.3	LOS E	3.1	24.3	500	–	0.0	0.0
Approach	18	0	47	65	15.4		0.203		71.1	LOS E	3.1	24.3				
Intersection				3573	4.3		0.755		7.2	LOS A	14.4	103.0				

Level of Service (LOS) Method: Delay (HCM 2000).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model used.

1 Reduced capacity due to a short lane effect

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PHASING SUMMARY

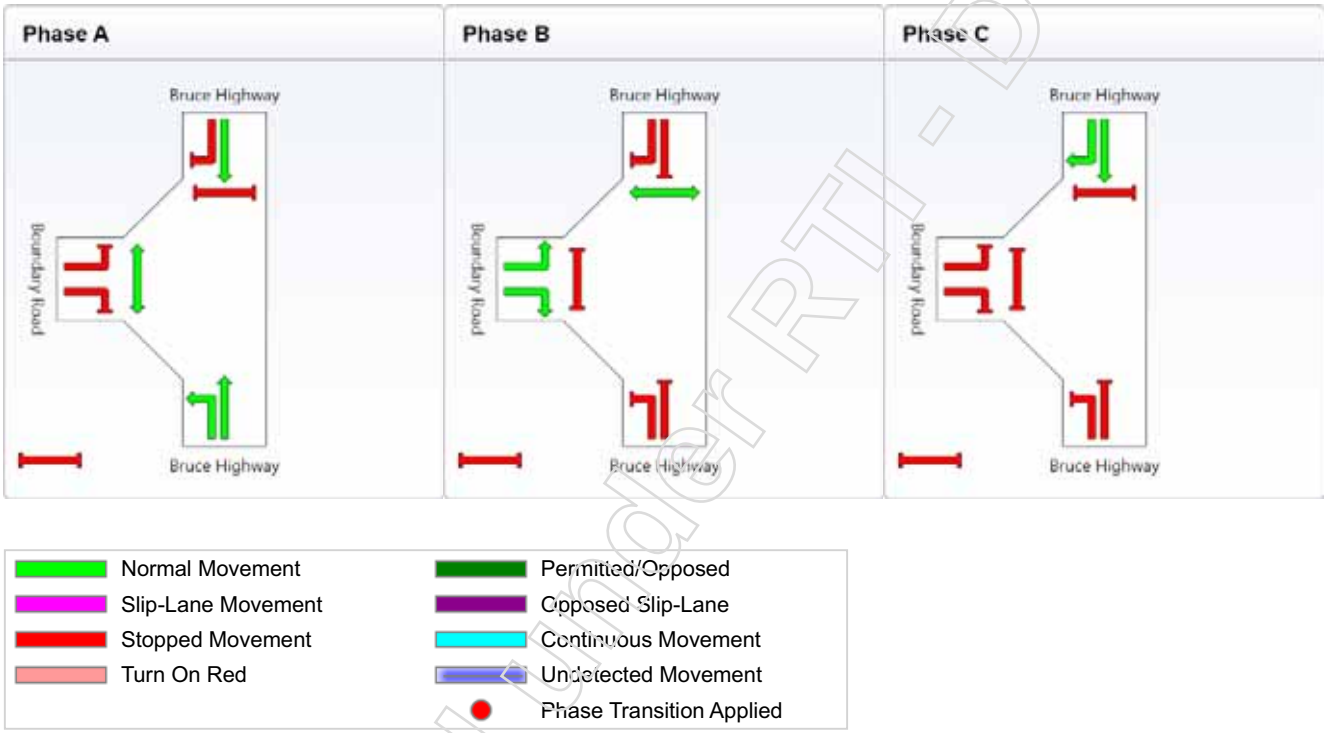
Site: 2035 AM PEAK

Bruce Highway / Boundary Road (West) - 4 Lane Upgrade
Post Development - Full Buildout (North Parkhurst and Edenbrook)
2035 AM Peak
Signals - Fixed Time Cycle Time = 150 seconds (Optimum Cycle Time - Minimum Delay)

Phase times determined by the program
Sequence: CAMBRAY
Input Sequence: A, B, C
Output Sequence: A, B, C

Phase Timing Results

Phase	A	B	C
Green Time (sec)	95	21	16
Yellow Time (sec)	4	4	4
All-Red Time (sec)	2	2	2
Phase Time (sec)	101	27	22
Phase Split	67 %	18 %	15 %



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LANE SUMMARY

Site: 2035 PM PEAK

Bruce Highway / Boundary Road (West) - 4 Lane Upgrade
Post Development - Full Buildout (North Parkhurst and Edenbrook)
2035 PM Peak
Signals - Fixed Time Cycle Time = 150 seconds (Optimum Cycle Time - Minimum Delay)

Lane Use and Performance

	Demand Flows L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South: Bruce Highway																
Lane 1	44	0	0	44	15.9	1126[1]	0.039	100	11.5	LOS B	0.2	1.7	75	Turn Bay	0.0	0.0
Lane 2	0	1027	0	1027	1.8	1364	0.753	100	3.8	LOS A	16.5	117.2	500	–	0.0	0.0
Lane 3	0	1027	0	1027	1.8	1364	0.753	100	3.8	LOS A	16.5	117.2	500	–	0.0	0.0
Approach	44	2054	0	2098	2.0		0.753		4.0	LOS A	16.5	117.2				
North: Bruce Highway																
Lane 1	0	720	0	720	2.9	1508	0.477	100	1.6	LOS A	4.7	33.6	500	–	0.0	0.0
Lane 2	0	720	0	720	2.9	1508	0.477	100	1.6	LOS A	4.7	33.6	500	–	0.0	0.0
Lane 3	0	0	38	38	31.6	62	0.617	100	93.7	LOS F	3.0	26.5	95	Turn Bay	0.0	0.0
Approach	0	1439	38	1477	3.7		0.617		3.9	LOS A	4.7	33.6				
West: Boundary Road																
Lane 1	92	0	0	92	9.8	153[1]	0.601	100	73.8	LOS E	6.2	47.4	50	Turn Bay	0.0	0.2
Lane 2	0	0	171	171	5.3	247	0.693	100	77.1	LOS E	12.3	90.0	500	–	0.0	0.0
Approach	92	0	171	263	6.8		0.693		76.0	LOS E	12.3	90.0				
Intersection				3838	3.0		0.753		8.9	LOS A	16.5	117.2				

Level of Service (LOS) Method: Delay (HCM 2000).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model used.

1 Reduced capacity due to a short lane effect

Processed: Thursday, 31 October 2013 11:40:45 AM
SIDRA INTERSECTION 5.1.13.2093
Project: C:\Cambray\STO0111\01R\Working\Sidra\13-10-29\Bruce Highway-Boundary Road West.sip
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SIDRA INTERSECTION

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PHASING SUMMARY

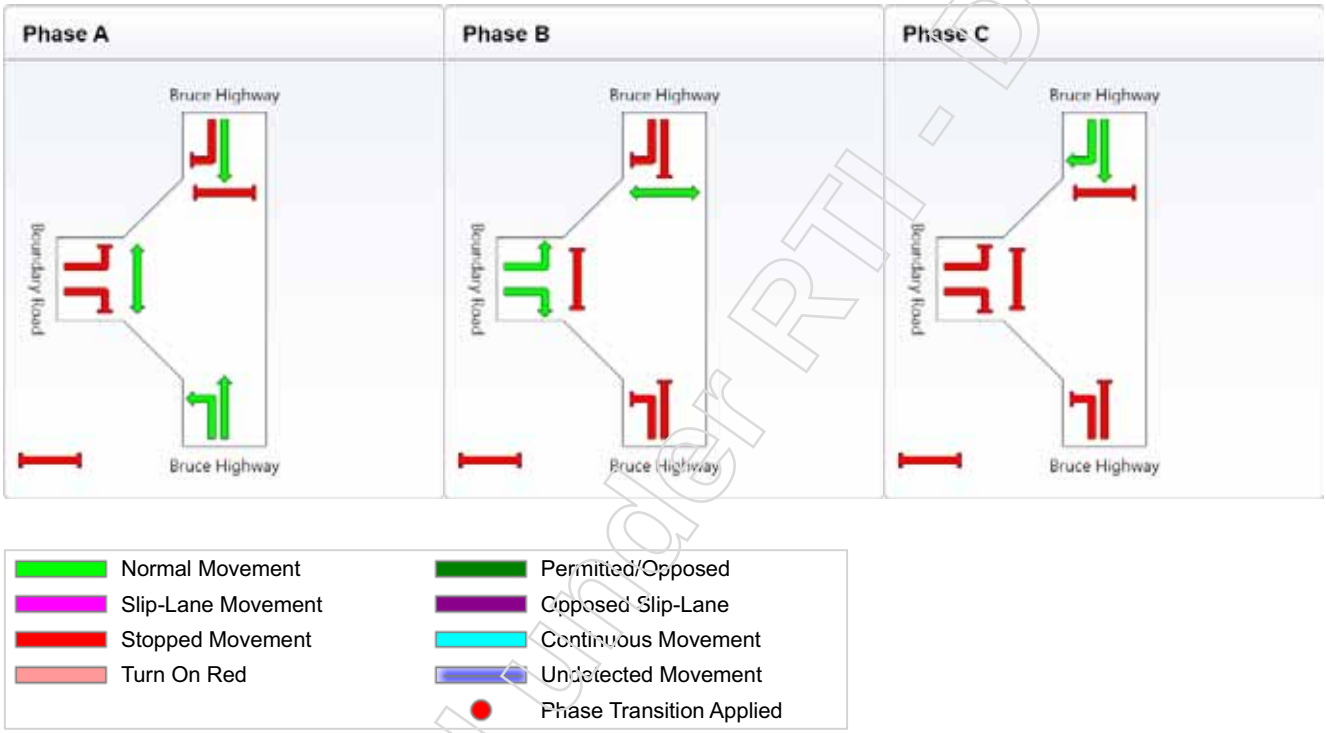
Site: 2035 PM PEAK

Bruce Highway / Boundary Road (West) - 4 Lane Upgrade
Post Development - Full Buildout (North Parkhurst and Edenbrook)
2035 PM Peak
Signals - Fixed Time Cycle Time = 150 seconds (Optimum Cycle Time - Minimum Delay)

Phase times determined by the program
Sequence: CAMBRAY
Input Sequence: A, B, C
Output Sequence: A, B, C

Phase Timing Results

Phase	A	B	C
Green Time (sec)	105	21	6
Yellow Time (sec)	4	4	4
All-Red Time (sec)	2	2	2
Phase Time (sec)	111	27	12
Phase Split	74 %	18 %	8 %



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APPENDIX N

SIDRA Results

Bruce Highway / Yeppoon Road

r_RTI-3295 file1 Release.pdf - Page Number: 545 of 672

LANE SUMMARY

Site: PRE 2013 AM PEAK

Bruce Highway / Yeppoon Road
Existing Configuration - Utimate Development
PRE DEV - 2013 AM Peak
Signals - Fixed Time Cycle Time = 145 seconds (Optimum Cycle Time - Minimum Delay)

Lane Use and Performance

	Demand Flows L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South: Bruce Highway (South)																
Lane 1	4	0	0	4	0.0	332[1]	0.012	100	28.7	LOS C	0.1	1.0	60	Turn Bay	0.0	0.0
Lane 2	0	176	0	176	6.3	927	0.190	59[6]	21.9	LOS C	6.9	50.5	500	–	0.0	0.0
Lane 3	0	299	0	299	6.3	927	0.322	100	23.6	LOS C	12.6	92.6	500	–	0.0	0.0
Lane 4	0	0	146	146	16.4	194	0.753	100	81.7	LOS F	10.6	83.0	100	Turn Bay	0.0	0.0
Approach	4	475	146	625	8.6		0.753		36.7	LOS D	12.6	92.6				
East: Yeppoon Road																
Lane 1	419	0	0	419	2.1	1848	0.227	100	9.5	X	X	X	500	–	0.0	X
Lane 2	0	3	204	207	6.8	334	0.620	100	68.7	LOS E	13.2	97.4	500	–	0.0	0.0
Approach	419	3	204	626	3.7		0.620		29.1	LOS C	13.2	97.4				
North: Bruce Highway (North)																
Lane 1	162	0	0	162	9.9	1753	0.092	100	9.8	X	X	X	100	Turn Bay	0.0	X
Lane 2	0	356	0	356	4.2	478[1]	0.746	100	26.7	LOS C	15.9	115.4	100	Turn Bay	0.0	18.0
Lane 3	0	701	0	701	4.2	939	0.746	100	31.5	LOS C	39.2	284.2	500	–	0.0	0.0
Lane 4	0	0	1	1	0.0	90[1]	0.011	100	69.1	LOS E	0.1	0.4	25	Turn Bay	0.0	0.0
Approach	162	1057	1	1220	4.9		0.746		27.2	LOS C	39.2	284.2				
West: Cultural Centre Access																
Lane 1	1	3	14	18	5.6	81	0.222	100	83.9	LOS F	1.3	9.6	500	–	0.0	0.0
Approach	1	3	14	18	5.6		0.222		83.9	LOS F	1.3	9.6				
Intersection				2489	5.5		0.753		30.5	LOS C	39.2	284.2				

X: Not applicable for Continuous lane.

Level of Service (LOS) Method: Delay (HCM 2000).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model used.

1 Reduced capacity due to a short lane effect
6 Lane underutilisation due to downstream effects

Processed: Tuesday, 2 July 2013 4:30:59 PM
SIDRA INTERSECTION 5.1.13.2093
Project: C:\Cambray Projects\STO0111\01R\Working\Sidra\13-06-19\Prelim Approval\Bruce Highway-Yeppoon Road.sip
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SIDRA INTERSECTION

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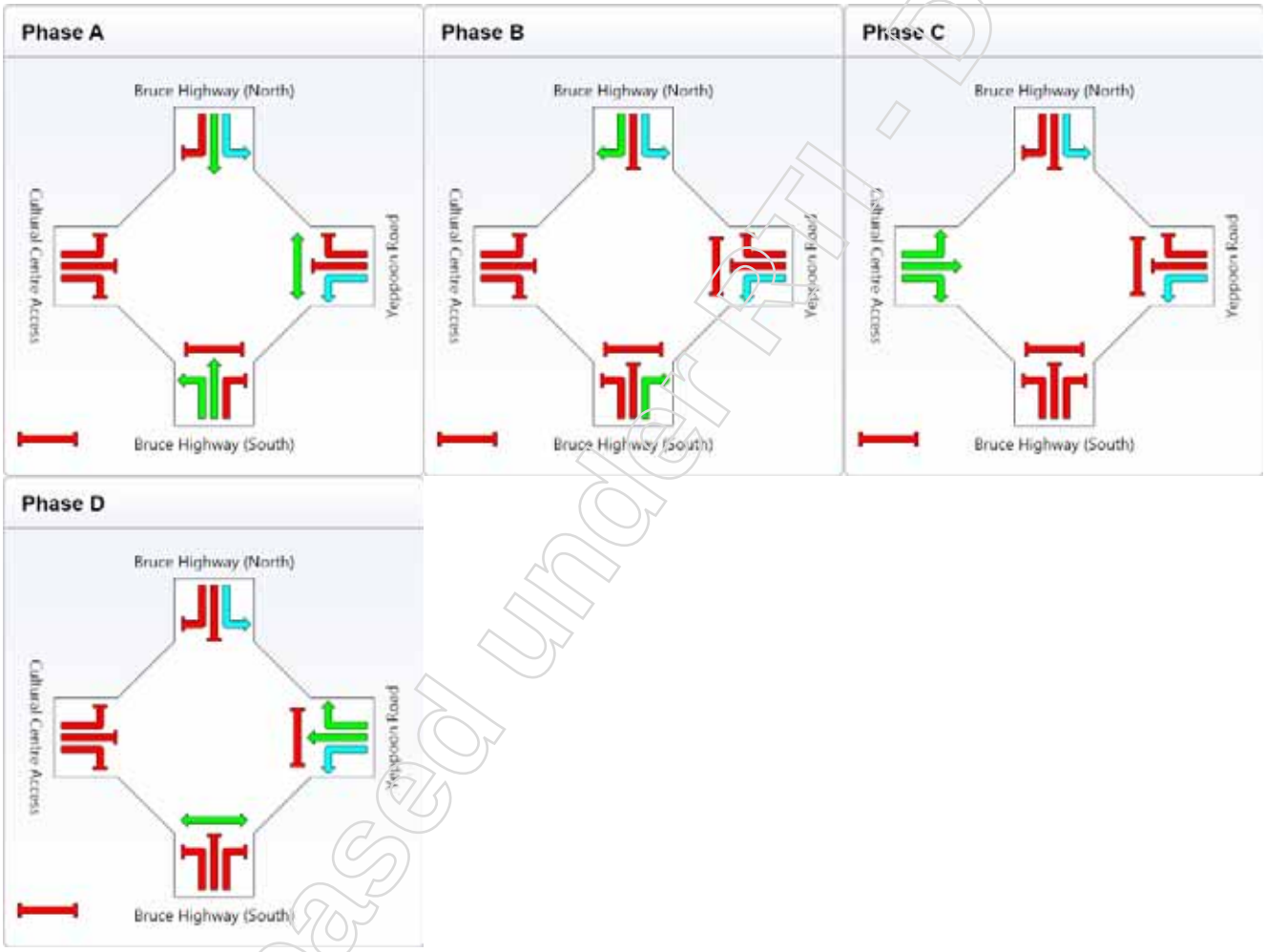
PHASING SUMMARY

Bruce Highway / Yeppoon Road
Existing Configuration - Utimate Development
PRE DEV - 2013 AM Peak
Signals - Fixed Time Cycle Time = 145 seconds (Optimum Cycle Time - Minimum Delay)

Phase times determined by the program
Sequence: CAMBRAY
Input Sequence: A, B, C, D
Output Sequence: A, B, C, D

Phase Timing Results

Phase	A	B	C	D
Green Time (sec)	71	17	6	27
Yellow Time (sec)	4	4	4	4
All-Red Time (sec)	2	2	2	2
Phase Time (sec)	77	23	12	33
Phase Split	53 %	16 %	8 %	23 %





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LANE SUMMARY

Bruce Highway / Yeppoon Road
Existing Configuration - Ultimate Development
PRE DEV - 2013 PM Peak
Signals - Fixed Time Cycle Time = 135 seconds (Optimum Cycle Time - Minimum Delay)

Lane Use and Performance

	Demand Flows L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South: Bruce Highway (South)																
Lane 1	7	0	0	7	0.0	284[1]	0.025	100	39.2	LOS D	0.3	2.1	60	Turn Bay	0.0	0.0
Lane 2	0	401	0	401	3.1	673	0.597	59[6]	38.7	LOS D	21.6	155.1	500	–	0.0	0.0
Lane 3	0	643	37[0]	680	3.1	671	1.013	100	132.2	LOS F	76.4	548.6	500	–	0.0	13.4
Lane 4	0	0	361	361	1.5	361[1]	1.000[3]	100	63.8[8]	LOS E[8]	23.0[8]	163.2[8]	100	Turn Bay	0.0	50.0
Approach	7	1044	398	1449	2.6		1.013		88.8	LOS F	76.4	548.6				
East: Yeppoon Road																
Lane 1	116	0	0	116	7.8	1778	0.065	100	9.7	X	X	X	500	–	0.0	X
Lane 2	0	4	209	213	4.7	364	0.586	100	62.7	LOS E	12.3	89.7	500	–	0.0	0.0
Approach	116	4	209	329	5.8		0.586		44.0	LOS D	12.3	89.7				
North: Bruce Highway (North)																
Lane 1	315	0	0	315	0.6	1868	0.169	100	9.4	X	X	X	100	Turn Bay	0.0	X
Lane 2	0	279	0	279	5.1	412[1]	0.678	100	35.8	LOS D	13.9	101.6	100	Turn Bay	0.0	6.4
Lane 3	0	450	0	450	5.1	664	0.678	100	40.1	LOS D	25.1	183.5	500	–	0.0	0.0
Lane 4	0	0	2	2	0.0	111[1]	0.018	100	51.1	LOS D	0.1	0.7	25	Turn Bay	0.0	0.0
Approach	315	729	2	1046	3.7		0.678		29.8	LOS C	25.1	183.5				
West: Cultural Centre Access																
Lane 1	1	2	2	5	0.0	92	0.055	100	74.3	LOS E	0.3	2.3	500	–	0.0	0.0
Approach	1	2	2	5	0.0		0.055		74.3	LOS E	0.3	2.3				
Intersection				2829	3.4		1.013		61.7	LOS E	76.4	548.6				

X: Not applicable for Continuous lane.

Level of Service (LOS) Method: Delay (HCM 2000).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model used.

0 Excess flow from back of an adjacent short lane
1 Reduced capacity due to a short lane effect
3 x = 1.00 due to short lane.
6 Lane underutilisation due to downstream effects
8 Delay, queue length and stops for the short lane have been cut down to fit in the queuing space. You may wish to change the short lane to a full lane to investigate the effect on the adjacent lane performance.

Processed: Tuesday, 2 July 2013 4:30:59 PM
SIDRA INTERSECTION 5.1.13.2093
Project: C:\Cambray Projects\STO0111\01R\Working\Sidra\13-06-19\Prelim Approval\Bruce Highway-Yeppoon Road.sip
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SIDRA INTERSECTION

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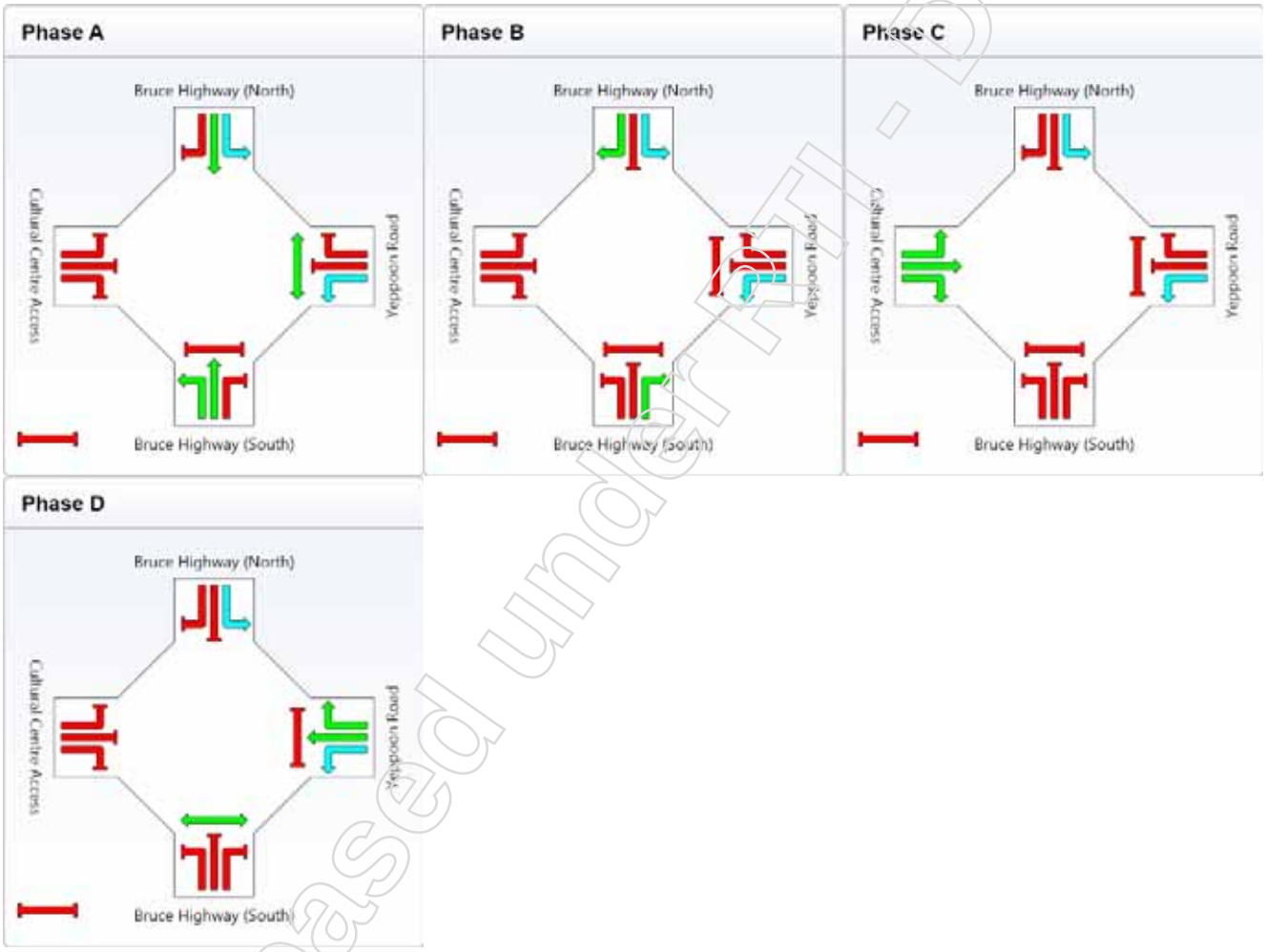
PHASING SUMMARY

Bruce Highway / Yeppoon Road
Existing Configuration - Ultimate Development
PRE DEV - 2013 PM Peak
Signals - Fixed Time Cycle Time = 135 seconds (Optimum Cycle Time - Minimum Delay)

Phase times determined by the program
Sequence: CAMBRAY
Input Sequence: A, B, C, D
Output Sequence: A, B, C, D

Phase Timing Results

Phase	A	B	C	D
Green Time (sec)	47	31	6	27
Yellow Time (sec)	4	4	4	4
All-Red Time (sec)	2	2	2	2
Phase Time (sec)	53	37	12	33
Phase Split	39 %	27 %	9 %	24 %





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LANE SUMMARY

Bruce Highway / Yeppoon Road
Proposed Intersection Upgrade - Utimate Development
PRE DEV - 2013 AM Peak
Signals - Fixed Time Cycle Time = 115 seconds (Optimum Cycle Time - Minimum Delay)

Lane Use and Performance

	Demand Flows L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South: Bruce Highway (South)																
Lane 1	4	0	0	4	0.0	340[1]	0.012	100	32.0	LOS C	0.1	0.9	60	Turn Bay	0.0	0.0
Lane 2	0	238	0	238	6.3	724	0.328	100	26.8	LOS C	9.3	68.9	500	–	0.0	0.0
Lane 3	0	238	0	238	6.3	724	0.328	100	26.8	LOS C	9.3	68.9	500	–	0.0	0.0
Lane 4	0	0	146	146	16.4	201	0.725	100	66.7	LOS E	8.5	67.6	250	Turn Bay	0.0	0.0
Approach	4	475	146	625	8.6		0.725		36.1	LOS D	9.3	68.9				
East: Yeppoon Road																
Lane 1	419	0	0	419	2.1	1848	0.227	100	9.5	X	X	X	500	–	0.0	X
Lane 2	0	3	204	207	6.8	421	0.492	100	51.0	LOS D	9.5	70.6	500	–	0.0	0.0
Approach	419	3	204	626	3.7		0.492		23.2	LOS C	9.5	70.6				
North: Bruce Highway (North)																
Lane 1	162	0	0	162	9.9	1753	0.092	100	9.8	X	X	X	100	Turn Bay	0.0	X
Lane 2	0	529	0	529	4.2	734	0.720	100	32.4	LOS C	25.2	182.6	500	–	0.0	0.0
Lane 3	0	529	0	529	4.2	734	0.720	100	32.4	LOS C	25.2	182.6	500	–	0.0	0.0
Lane 4	0	0	1	1	0.0	112[1]	0.009	100	56.4	LOS E	0.0	0.3	25	Turn Bay	0.0	0.0
Approach	162	1057	1	1220	4.9		0.720		29.5	LOS C	25.2	182.6				
West: Cultural Centre Access																
Lane 1	1	3	14	18	5.6	102	0.176	100	66.7	LOS E	1.0	7.5	500	–	0.0	0.0
Approach	1	3	14	18	5.6		0.176		66.7	LOS E	1.0	7.5				
Intersection				2489	5.5		0.725		29.8	LOS C	25.2	182.6				

X: Not applicable for Continuous lane.

Level of Service (LOS) Method: Delay (HCM 2000).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model used.

1 Reduced capacity due to a short lane effect

Processed: Tuesday, 2 July 2013 4:31:00 PM
SIDRA INTERSECTION 5.1.13.2093
Project: C:\Cambray Projects\STO0111\01R\Working\Sidra\13-06-19\Prelim Approval\Bruce Highway-Yeppoon Road.sip
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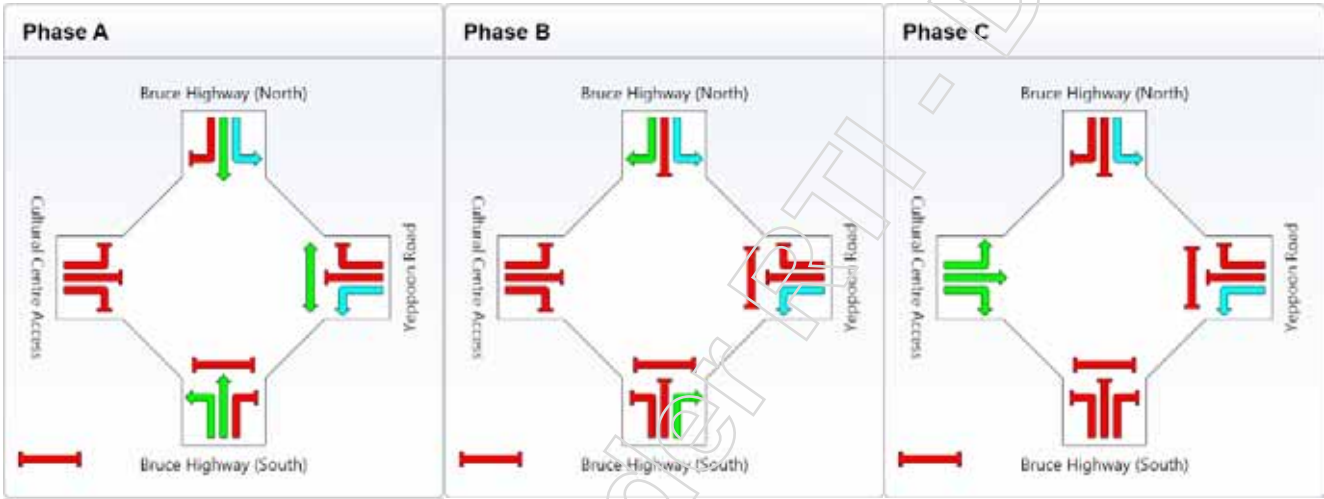
PHASING SUMMARY

Bruce Highway / Yeppoon Road
Proposed Intersection Upgrade - Utimate Development
PRE DEV - 2013 AM Peak
Signals - Fixed Time Cycle Time = 115 seconds (Optimum Cycle Time - Minimum Delay)

Phase times determined by the program
Sequence: CAMBRAY
Input Sequence: A, B, C, D
Output Sequence: A, B, C, D

Phase Timing Results

Phase	A	B	C	D
Green Time (sec)	44	14	6	27
Yellow Time (sec)	4	4	4	4
All-Red Time (sec)	2	2	2	2
Phase Time (sec)	50	20	12	33
Phase Split	43 %	17 %	10 %	29 %





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LANE SUMMARY

Bruce Highway / Yeppoon Road
Proposed Intersection Upgrade - Ultimate Development
PRE DEV - 2013 PM Peak
Signals - Fixed Time Cycle Time = 145 seconds (Optimum Cycle Time - Minimum Delay)

Lane Use and Performance

	Demand Flows L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South: Bruce Highway (South)																
Lane 1	7	0	0	7	0.0	264[1]	0.026	100	42.4	LOS D	0.3	2.2	60	Turn Bay	0.0	0.0
Lane 2	0	522	0	522	3.1	653	0.800	100	48.0	LOS D	34.0	243.9	500	–	0.0	0.0
Lane 3	0	522	0	522	3.1	653	0.800	100	48.0	LOS D	34.0	243.9	500	–	0.0	0.0
Lane 4	0	0	398	398	1.5	492	0.810	100	66.5	LOS E	27.6	195.4	250	Turn Bay	0.0	0.0
Approach	7	1044	398	1449	2.6		0.810		53.0	LOS D	34.0	243.9				
East: Yeppoon Road																
Lane 1	116	0	0	116	7.8	1778	0.065	100	9.7	X	X	X	500	–	0.0	X
Lane 2	0	4	209	213	4.7	339	0.629	100	68.6	LOS E	13.6	98.8	500	–	0.0	0.0
Approach	116	4	209	329	5.8		0.629		47.8	LOS D	13.6	98.8				
North: Bruce Highway (North)																
Lane 1	315	0	0	315	0.6	1868	0.169	100	9.4	X	X	X	100	Turn Bay	0.0	X
Lane 2	0	365	0	365	5.1	645	0.566	100	41.9	LOS D	20.9	152.8	500	–	0.0	0.0
Lane 3	0	365	0	365	5.1	645	0.566	100	41.9	LOS D	20.9	152.8	500	–	0.0	0.0
Lane 4	0	0	2	2	0.0	109[1]	0.018	100	49.5	LOS D	0.1	0.7	25	Turn Bay	0.0	0.0
Approach	315	729	2	1046	3.7		0.566		32.1	LOS C	20.9	152.8				
West: Cultural Centre Access																
Lane 1	1	2	2	5	0.0	85	0.059	100	79.9	LOS E	0.4	2.5	500	–	0.0	0.0
Approach	1	2	2	5	0.0		0.059		79.9	LOS E	0.4	2.5				
Intersection				2829	3.4		0.810		44.7	LOS D	34.0	243.9				

X: Not applicable for Continuous lane.

Level of Service (LOS) Method: Delay (HCM 2000).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model used.

1 Reduced capacity due to a short lane effect

Processed: Tuesday, 2 July 2013 4:31:00 PM
SIDRA INTERSECTION 5.1.13.2093
Project: C:\Cambray Projects\STO0111\01R\Working\Sidra\13-06-19\Prelim Approval\Bruce Highway-Yeppoon Road.sip
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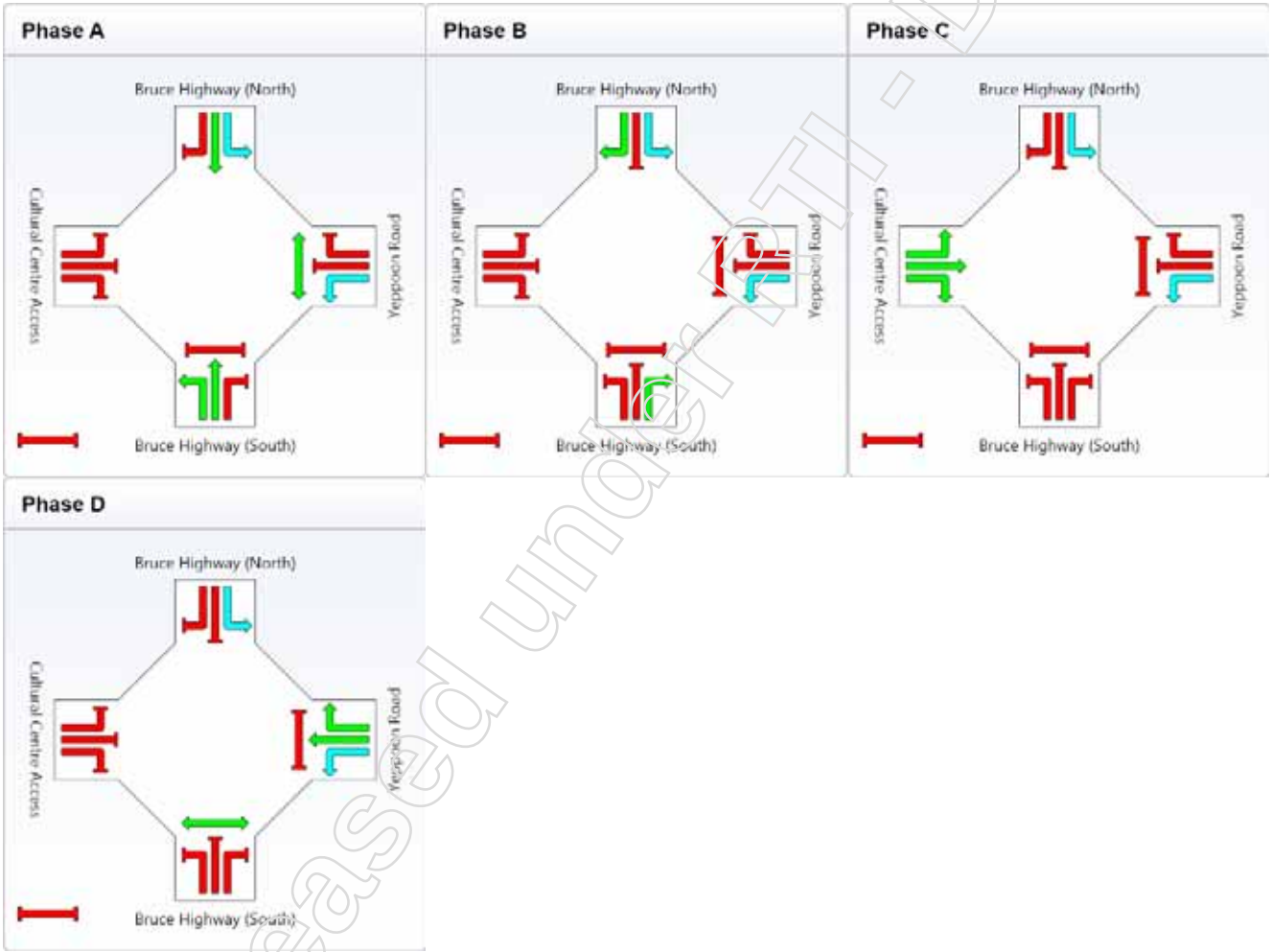
PHASING SUMMARY

Bruce Highway / Yeppoon Road
Proposed Intersection Upgrade - Ultimate Development
PRE DEV - 2013 PM Peak
Signals - Fixed Time Cycle Time = 145 seconds (Optimum Cycle Time - Minimum Delay)

Phase times determined by the program
Sequence: CAMBRAY
Input Sequence: A, B, C, D
Output Sequence: A, B, C, D

Phase Timing Results

Phase	A	B	C	D
Green Time (sec)	49	39	6	27
Yellow Time (sec)	4	4	4	4
All-Red Time (sec)	2	2	2	2
Phase Time (sec)	55	45	12	33
Phase Split	38 %	31 %	8 %	23 %





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LANE SUMMARY

Bruce Highway / Yeppoon Road
Proposed Intersection Upgrade - Utimate Development
PRE DEV - 2025 AM Peak
Signals - Fixed Time Cycle Time = 135 seconds (Optimum Cycle Time - Minimum Delay)

Lane Use and Performance

	Demand Flows L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South: Bruce Highway (South)																
Lane 1	4	0	0	4	0.0	316[1]	0.013	100	32.5	LOS C	0.1	1.0	60	Turn Bay	0.0	0.0
Lane 2	0	259	0	259	6.6	798	0.324	100	27.7	LOS C	11.2	83.0	500	–	0.0	0.0
Lane 3	0	259	0	259	6.6	798	0.324	100	27.7	LOS C	11.2	83.0	500	–	0.0	0.0
Lane 4	0	0	186	186	16.7	257	0.724	100	71.7	LOS E	12.2	97.8	250	Turn Bay	0.0	0.0
Approach	4	517	186	707	9.2		0.724		39.3	LOS D	12.2	97.8				
East: Yeppoon Road																
Lane 1	532	0	0	532	2.3	1847	0.288	100	9.5	X	X	X	500	–	0.0	X
Lane 2	0	3	250	253	7.1	357	0.708	100	65.0	LOS E	15.4	114.2	500	–	0.0	0.0
Approach	532	3	250	785	3.8		0.708		27.4	LOS C	15.4	114.2				
North: Bruce Highway (North)																
Lane 1	204	0	0	204	10.3	1748	0.117	100	9.8	X	X	X	100	Turn Bay	0.0	X
Lane 2	0	582	0	582	4.3	809	0.719	100	30.0	LOS C	27.8	202.1	500	–	0.0	0.0
Lane 3	0	582	0	582	4.3	809	0.719	100	30.0	LOS C	27.8	202.1	500	–	0.0	0.0
Lane 4	0	0	1	1	0.0	107[1]	0.009	100	59.9	LOS E	0.1	0.4	25	Turn Bay	0.0	0.0
Approach	204	1164	1	1369	5.2		0.719		27.0	LOS C	27.8	202.1				
West: Cultural Centre Access																
Lane 1	1	3	14	18	5.6	87	0.207	100	78.2	LOS E	1.2	8.9	500	–	0.0	0.0
Approach	1	3	14	18	5.6		0.207		78.2	LOS E	1.2	8.9				
Intersection				2879	5.8		0.724		30.4	LOS C	27.8	202.1				

X: Not applicable for Continuous lane.

Level of Service (LOS) Method: Delay (HCM 2000).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model used.

1 Reduced capacity due to a short lane effect

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Project: C:\Cambray Projects\STO0111\01R\Working\Sidra\13-06-19\Prelim Approval\Bruce Highway-Yeppoon Road.sip
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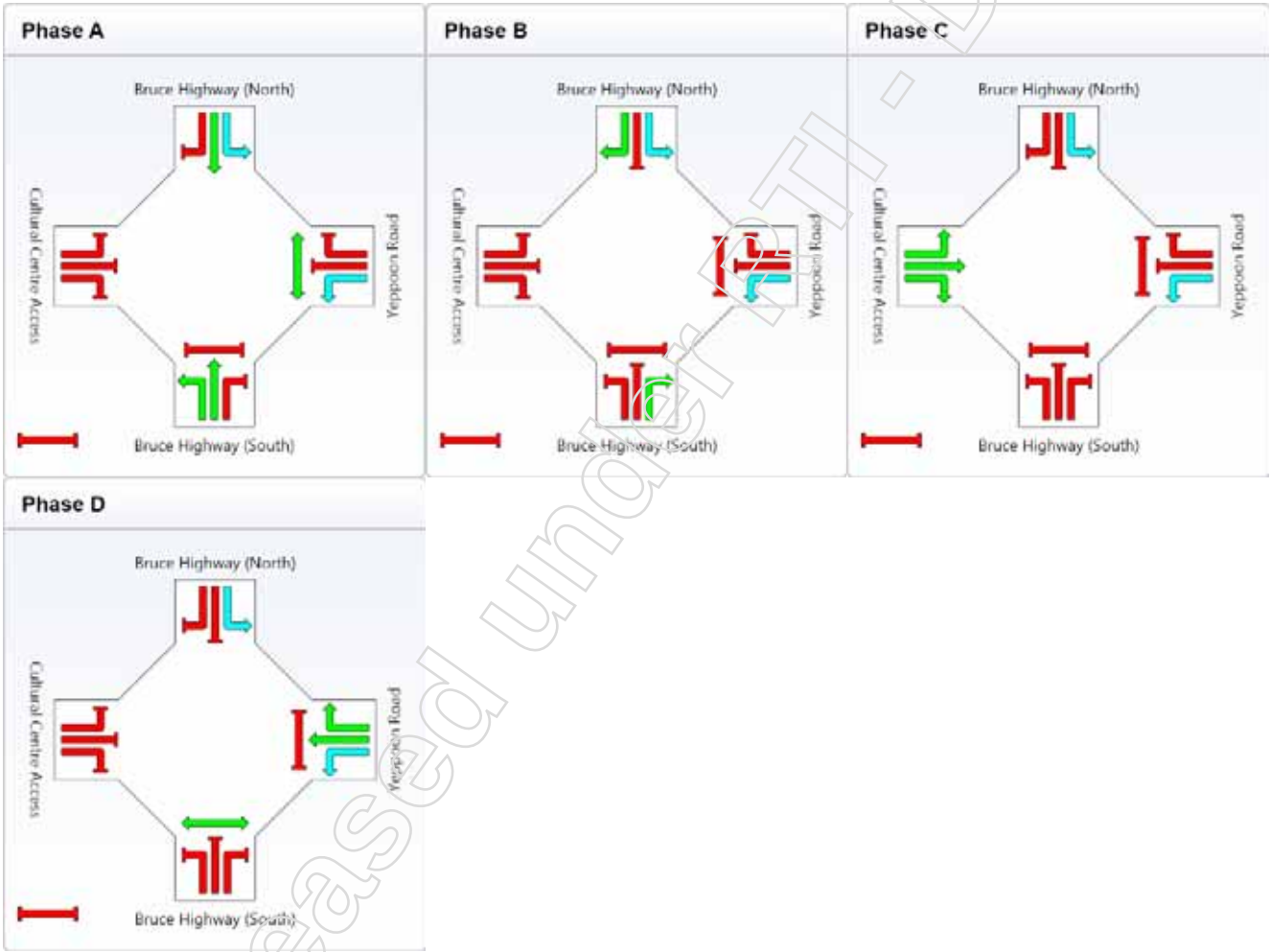
PHASING SUMMARY

Bruce Highway / Yeppoon Road
Proposed Intersection Upgrade - Utimate Development
PRE DEV - 2025 AM Peak
Signals - Fixed Time Cycle Time = 135 seconds (Optimum Cycle Time - Minimum Delay)

Phase times determined by the program
Sequence: CAMBRAY
Input Sequence: A, B, C, D
Output Sequence: A, B, C, D

Phase Timing Results

Phase	A	B	C	D
Green Time (sec)	57	21	6	27
Yellow Time (sec)	4	4	4	4
All-Red Time (sec)	2	2	2	2
Phase Time (sec)	63	27	12	33
Phase Split	47 %	20 %	9 %	24 %





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LANE SUMMARY

Bruce Highway / Yeppoon Road
Proposed Intersection Upgrade - Ultimate Development
PRE DEV - 2025 PM Peak
Signals - Fixed Time Cycle Time = 150 seconds (Optimum Cycle Time - Minimum Delay)

Lane Use and Performance

	Demand Flows L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South: Bruce Highway (South)																
Lane 1	7	0	0	7	0.0	251[1]	0.028	100	45.5	LOS D	0.3	2.4	60	Turn Bay	0.0	0.0
Lane 2	0	562	0	562	3.2	618	0.910	100	67.9	LOS E	46.0	330.7	500	–	0.0	0.0
Lane 3	0	562	0	562	3.2	618	0.910	100	67.9	LOS E	46.0	330.7	500	–	0.0	0.0
Lane 4	0	0	505	505	1.6	548	0.921	100	84.3	LOS F	43.2	306.6	250	Turn Bay	0.0	23.5
Approach	7	1124	505	1636	2.7		0.921		72.9	LOS E	46.0	330.7				
East: Yeppoon Road																
Lane 1	148	0	0	148	8.1	1774	0.083	100	9.7	X	X	X	500	–	0.0	X
Lane 2	0	4	249	253	5.1	326	0.776	100	75.4	LOS E	17.9	131.1	500	–	0.0	0.0
Approach	148	4	249	401	6.2		0.776		51.2	LOS D	17.9	131.1				
North: Bruce Highway (North)																
Lane 1	369	0	0	369	0.5	1869	0.197	100	9.4	X	X	X	100	Turn Bay	0.0	X
Lane 2	0	391	0	391	5.4	609	0.641	100	45.2	LOS D	22.4	163.9	500	–	0.0	0.0
Lane 3	0	391	0	391	5.4	609	0.641	100	45.2	LOS D	22.4	163.9	500	–	0.0	0.0
Lane 4	0	0	2	2	0.0	127[1]	0.016	100	46.7	LOS D	0.1	0.6	25	Turn Bay	0.0	0.0
Approach	369	781	2	1152	3.8		0.641		33.7	LOS C	22.4	163.9				
West: Cultural Centre Access																
Lane 1	1	2	2	5	0.0	82	0.061	100	82.7	LOS F	0.4	2.6	500	–	0.0	0.0
Approach	1	2	2	5	0.0		0.061		82.7	LOS F	0.4	2.6				
Intersection				3194	3.5		0.921		56.0	LOS E	46.0	330.7				

X: Not applicable for Continuous lane.

Level of Service (LOS) Method: Delay (HCM 2000).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model used.

1 Reduced capacity due to a short lane effect

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Project: C:\Cambray Projects\STO0111\01R\Working\Sidra\13-06-19\Prelim Approval\Bruce Highway-Yeppoon Road.sip
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SIDRA INTERSECTION

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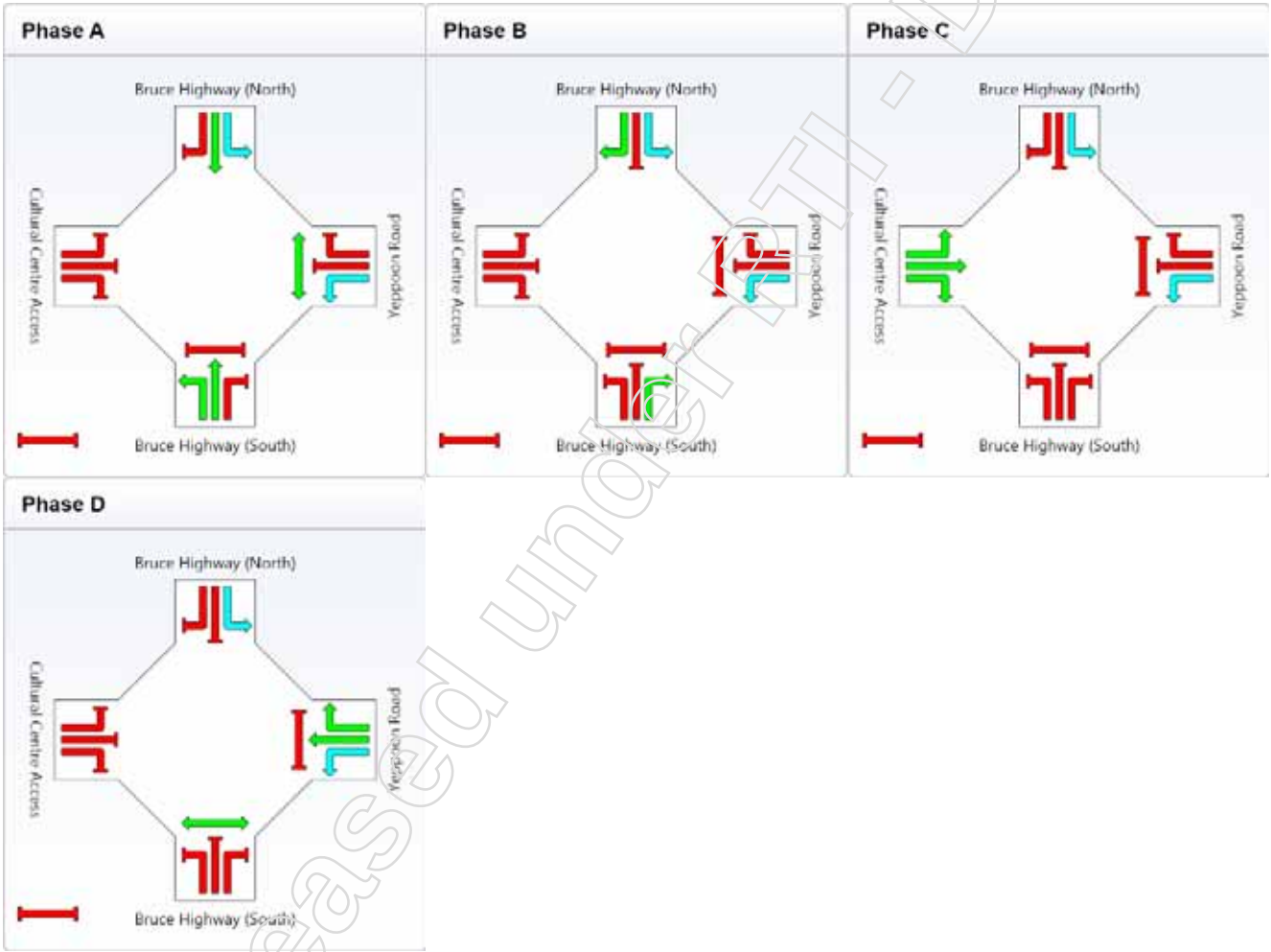
PHASING SUMMARY

Bruce Highway / Yeppoon Road
Proposed Intersection Upgrade - Ultimate Development
PRE DEV - 2025 PM Peak
Signals - Fixed Time Cycle Time = 150 seconds (Optimum Cycle Time - Minimum Delay)

Phase times determined by the program
Sequence: CAMBRAY
Input Sequence: A, B, C, D
Output Sequence: A, B, C, D

Phase Timing Results

Phase	A	B	C	D
Green Time (sec)	48	45	6	27
Yellow Time (sec)	4	4	4	4
All-Red Time (sec)	2	2	2	2
Phase Time (sec)	54	51	12	33
Phase Split	36 %	34 %	8 %	22 %



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LANE SUMMARY

Site: PRE 2035 AM PEAK - UPGRADE

Bruce Highway / Yeppoon Road
Proposed Intersection Upgrade - Utimate Development
PRE DEV - 2035 AM Peak
Signals - Fixed Time Cycle Time = 130 seconds (Optimum Cycle Time - Minimum Delay)

Lane Use and Performance

	Demand Flows L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South: Bruce Highway (South)																
Lane 1	4	0	0	4	0.0	309[1]	0.013	100	34.8	LOS C	0.2	1.1	60	Turn Bay	0.0	0.0
Lane 2	0	260	0	260	7.1	724	0.359	100	30.4	LOS C	11.6	86.5	500	–	0.0	0.0
Lane 3	0	260	0	260	7.1	724	0.359	100	30.4	LOS C	11.6	86.5	500	–	0.0	0.0
Lane 4	0	0	238	238	16.0	293	0.811	100	71.8	LOS E	15.8	125.7	250	Turn Bay	0.0	0.0
Approach	4	520	238	762	9.8		0.811		43.4	LOS D	15.8	125.7				
East: Yeppoon Road																
Lane 1	673	0	0	673	2.1	1849	0.364	100	9.5	X	X	X	500	–	0.0	X
Lane 2	0	3	297	300	7.0	371	0.808	100	66.4	LOS E	18.8	139.4	500	–	0.0	0.0
Approach	673	3	297	973	3.6		0.808		27.1	LOS C	18.8	139.4				
North: Bruce Highway (North)																
Lane 1	247	0	0	247	10.1	1750	0.141	100	9.8	X	X	X	100	Turn Bay	0.0	X
Lane 2	0	591	0	591	4.7	736	0.803	100	35.9	LOS D	31.5	229.4	500	–	0.0	0.0
Lane 3	0	591	0	591	4.7	736	0.803	100	35.9	LOS D	31.5	229.4	500	–	0.0	0.0
Lane 4	0	0	1	1	0.0	115[1]	0.009	100	55.4	LOS E	0.0	0.3	25	Turn Bay	0.0	0.0
Approach	247	1182	1	1430	5.6		0.803		31.4	LOS C	31.5	229.4				
West: Cultural Centre Access																
Lane 1	1	3	14	18	5.6	90	0.199	100	75.3	LOS E	1.2	8.5	500	–	0.0	0.0
Approach	1	3	14	18	5.6		0.199		75.3	LOS E	1.2	8.5				
Intersection				3183	6.0		0.811		33.2	LOS C	31.5	229.4				

X: Not applicable for Continuous lane.

Level of Service (LOS) Method: Delay (HCM 2000).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model used.

1 Reduced capacity due to a short lane effect

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Project: C:\Cambray Projects\STO0111\01R\Working\Sidra\13-06-19\Prelim Approval\Bruce Highway-Yeppoon Road.sip
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SIDRA INTERSECTION

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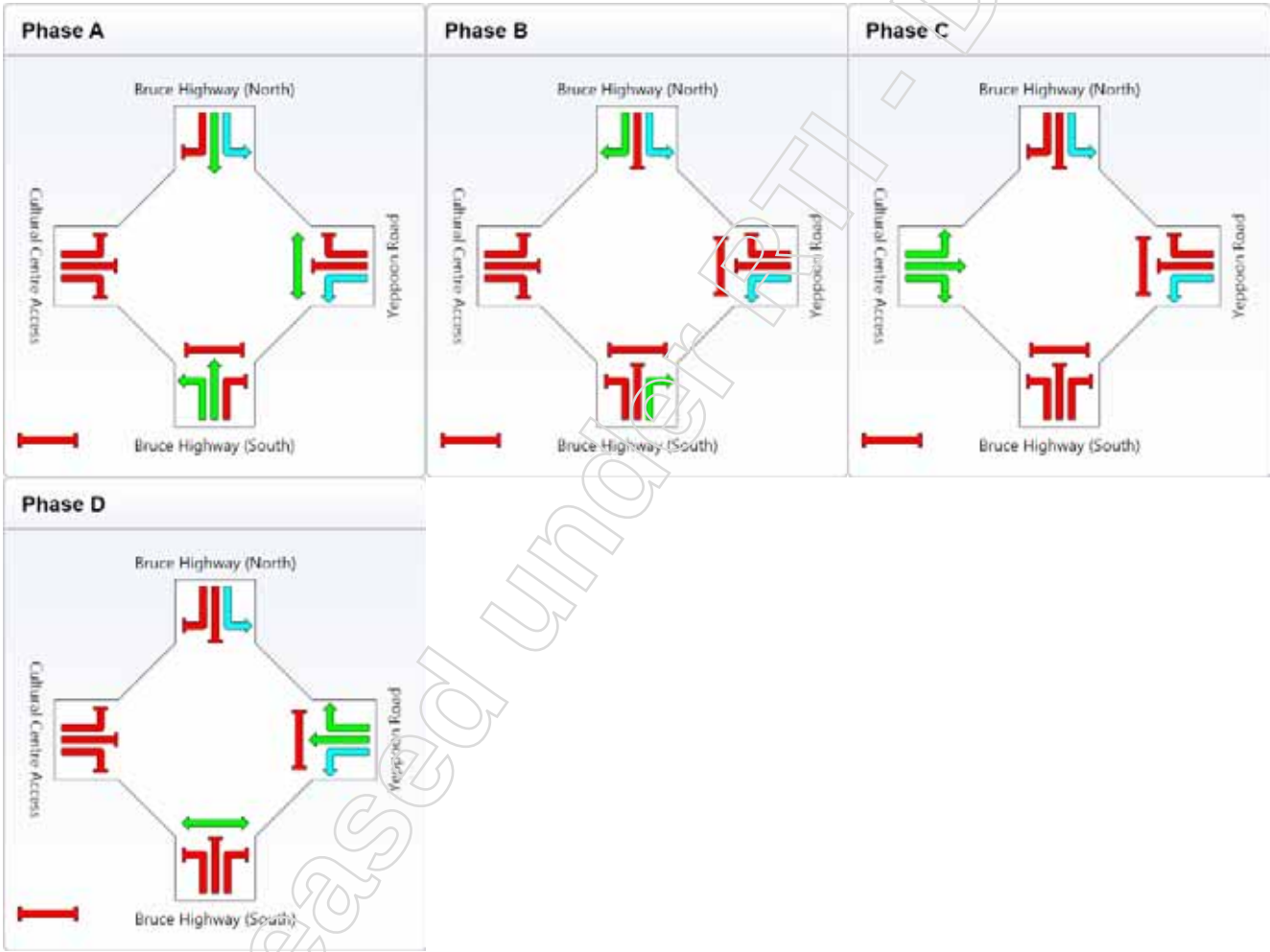
PHASING SUMMARY

Bruce Highway / Yeppoon Road
Proposed Intersection Upgrade - Utimate Development
PRE DEV - 2035 AM Peak
Signals - Fixed Time Cycle Time = 130 seconds (Optimum Cycle Time - Minimum Delay)

Phase times determined by the program
Sequence: CAMBRAY
Input Sequence: A, B, C, D
Output Sequence: A, B, C, D

Phase Timing Results

Phase	A	B	C	D
Green Time (sec)	50	23	6	27
Yellow Time (sec)	4	4	4	4
All-Red Time (sec)	2	2	2	2
Phase Time (sec)	56	29	12	33
Phase Split	43 %	22 %	9 %	25 %





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LANE SUMMARY

Site: PRE 2035 PM PEAK - UPGRADE

Bruce Highway / Yeppoon Road
Proposed Intersection Upgrade - Ultimate Development
PRE DEV - 2035 PM Peak
Signals - Fixed Time Cycle Time = 150 seconds (Optimum Cycle Time - Minimum Delay)

Lane Use and Performance

	Demand Flows L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South: Bruce Highway (South)																
Lane 1	7	0	0	7	0.0	244[1]	0.029	100	47.7	LOS D	0.4	2.5	60	Turn Bay	0.0	0.0
Lane 2	0	590	0	590	3.5	578	1.022	100	152.3	LOS F	73.3	528.4	500	–	0.0	10.0
Lane 3	0	538	51[0]	588	3.5	576	1.022	100	152.4	LOS F	73.1	526.1	500	–	0.0	9.6
Lane 4	0	0	585	585	1.4	585	1.000[3]	100	108.5[8]	LOS F[8]	57.6[8]	408.0[8]	250	Turn Bay	0.0	50.0
Approach	7	1128	636	1771	2.8		1.022		137.4	LOS F	73.3	528.4				
East: Yeppoon Road																
Lane 1	194	0	0	194	7.2	1784	0.109	100	9.7	X	X	X	500	–	0.0	X
Lane 2	0	4	289	293	5.1	326	0.898	100	86.0	LOS F	23.4	170.7	500	–	0.0	0.0
Approach	194	4	289	487	6.0		0.898		55.6	LOS E	23.4	170.7				
North: Bruce Highway (North)																
Lane 1	427	0	0	427	0.7	1867	0.229	100	9.4	X	X	X	100	Turn Bay	0.0	X
Lane 2	0	391	0	391	5.9	569	0.686	100	48.8	LOS D	23.5	172.8	500	–	0.0	0.0
Lane 3	0	391	0	391	5.9	569	0.686	100	48.8	LOS D	23.5	172.8	500	–	0.0	0.0
Lane 4	0	0	2	2	0.0	133[1]	0.015	100	44.0	LOS D	0.1	0.6	25	Turn Bay	0.0	0.0
Approach	427	781	2	1210	4.0		0.686		34.9	LOS C	23.5	172.8				
West: Cultural Centre Access																
Lane 1	1	2	2	5	0.0	82	0.061	100	82.7	LOS F	0.4	2.6	500	–	0.0	0.0
Approach	1	2	2	5	0.0		0.061		82.7	LOS F	0.4	2.6				
Intersection				3473	3.7		1.022		90.2	LOS F	73.3	528.4				

X: Not applicable for Continuous lane.

Level of Service (LOS) Method: Delay (HCM 2000).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model used.

0 Excess flow from back of an adjacent short lane
1 Reduced capacity due to a short lane effect
3 x = 1.00 due to short lane.
8 Delay, queue length and stops for the short lane have been cut down to fit in the queuing space. You may wish to change the short lane to a full lane to investigate the effect on the adjacent lane performance.

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SIDRA INTERSECTION

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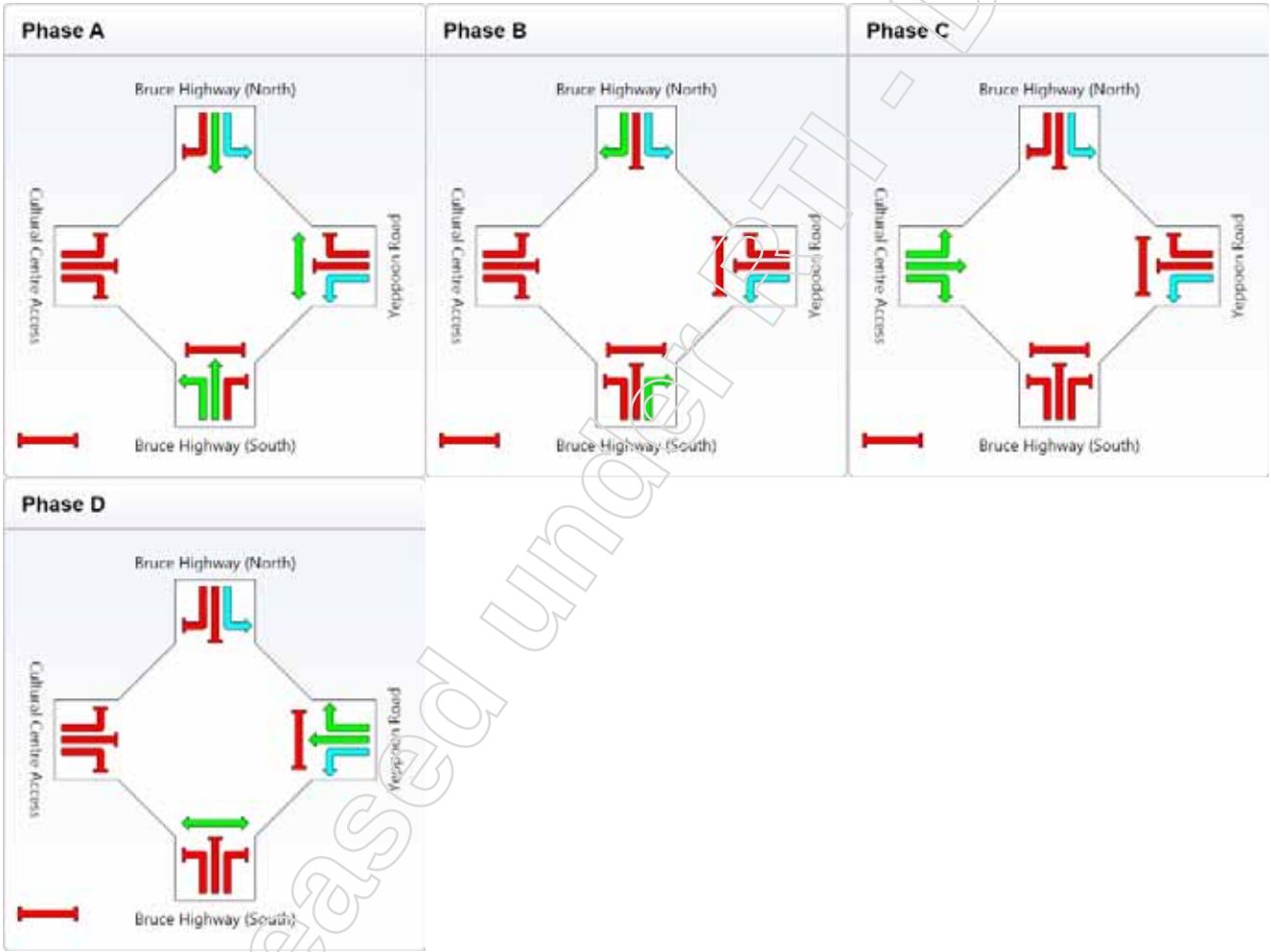
PHASING SUMMARY

Bruce Highway / Yeppoon Road
Proposed Intersection Upgrade - Ultimate Development
PRE DEV - 2035 PM Peak
Signals - Fixed Time Cycle Time = 150 seconds (Optimum Cycle Time - Minimum Delay)

Phase times determined by the program
Sequence: CAMBRAY
Input Sequence: A, B, C, D
Output Sequence: A, B, C, D

Phase Timing Results

Phase	A	B	C	D
Green Time (sec)	45	48	6	27
Yellow Time (sec)	4	4	4	4
All-Red Time (sec)	2	2	2	2
Phase Time (sec)	51	54	12	33
Phase Split	34 %	36 %	8 %	22 %





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LANE SUMMARY

Bruce Highway / Yeppoon Road
Proposed Intersection Upgrade 2 - Utimate Development
PRE DEV - 2025 AM Peak
Signals - Fixed Time Cycle Time = 125 seconds (Optimum Cycle Time - Minimum Delay)

Lane Use and Performance

	Demand Flows L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South: Bruce Highway (South)																
Lane 1	4	256	0	260	6.5	862	0.302	100	22.9	LOS C	9.9	72.9	500	–	0.0	0.0
Lane 2	0	261	0	261	6.6	862	0.302	100	22.7	LOS C	9.9	73.0	500	–	0.0	0.0
Lane 3	0	0	94	94	16.7	148	0.635	100	73.1	LOS E	5.9	46.9	150	Turn Bay	0.0	0.0
Lane 4	0	0	92	92	16.7	145	0.635	100	73.2	LOS E	5.8	46.2	150	Turn Bay	0.0	0.0
Approach	4	517	186	707	9.2		0.635		36.1	LOS D	9.9	73.0				
East: Yeppoon Road																
Lane 1	532	0	0	532	2.3	1847	0.288	100	9.5	X	X	X	500	–	0.0	X
Lane 2	0	3	250	253	7.1	386	0.655	100	58.4	LOS E	13.7	101.8	500	–	0.0	0.0
Approach	532	3	250	785	3.8		0.655		25.3	LOS C	13.7	101.8				
North: Bruce Highway (North)																
Lane 1	204	0	0	204	10.3	1414[1]	0.144	100	10.1	LOS B	0.5	3.6	100	Turn Bay	0.0	0.0
Lane 2	0	582	0	582	4.3	874	0.666	100	23.4	LOS C	23.1	167.8	500	–	0.0	0.0
Lane 3	0	582	0	582	4.3	874	0.666	100	23.4	LOS C	23.1	167.8	500	–	0.0	0.0
Lane 4	0	0	1	1	0.0	102[1]	0.010	100	65.1	LOS E	0.1	0.4	25	Turn Bay	0.0	0.0
Approach	204	1164	1	1369	5.2		0.666		21.5	LOS C	23.1	167.8				
West: Cultural Centre Access																
Lane 1	1	3	14	18	5.6	94	0.191	100	72.5	LOS E	1.1	8.2	500	–	0.0	0.0
Approach	1	3	14	18	5.6		0.191		72.5	LOS E	1.1	8.2				
Intersection				2879	5.8		0.666		26.4	LOS C	23.1	167.8				

X: Not applicable for Continuous lane.

Level of Service (LOS) Method: Delay (HCM 2000).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model used.

1 Reduced capacity due to a short lane effect

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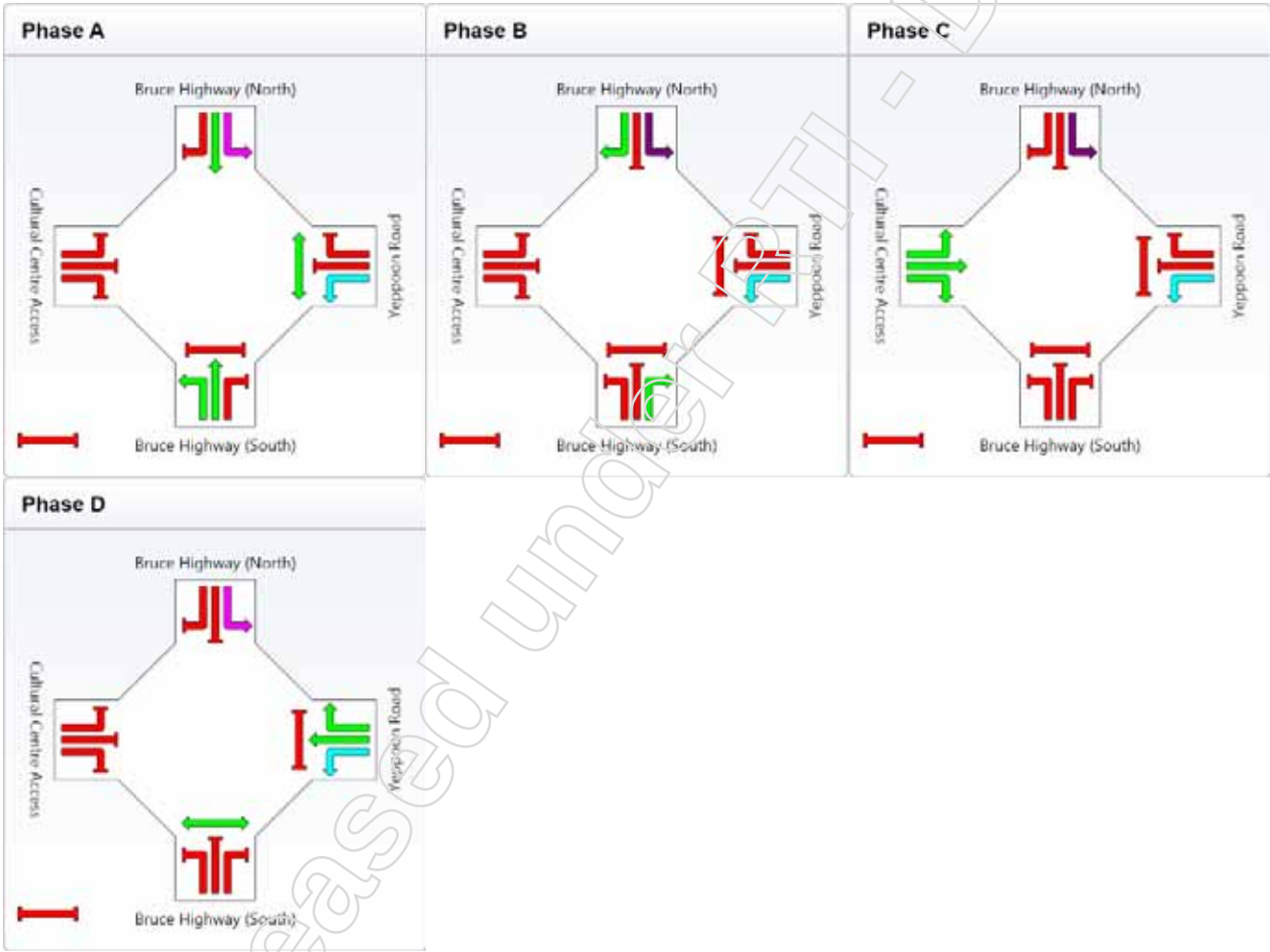
PHASING SUMMARY

Bruce Highway / Yeppoon Road
Proposed Intersection Upgrade 2 - Utimate Development
PRE DEV - 2025 AM Peak
Signals - Fixed Time Cycle Time = 125 seconds (Optimum Cycle Time - Minimum Delay)

Phase times determined by the program
Sequence: CAMBRAY
Input Sequence: A, B, C, D
Output Sequence: A, B, C, D

Phase Timing Results

Phase	A	B	C	D
Green Time (sec)	57	11	6	27
Yellow Time (sec)	4	4	4	4
All-Red Time (sec)	2	2	2	2
Phase Time (sec)	63	17	12	33
Phase Split	50 %	14 %	10 %	26 %





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LANE SUMMARY

Bruce Highway / Yeppoon Road
Proposed Intersection Upgrade 2 - Ultimate Development
PRE DEV - 2025 PM Peak
Signals - Fixed Time Cycle Time = 130 seconds (Optimum Cycle Time - Minimum Delay)

Lane Use and Performance

	Demand Flows L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South: Bruce Highway (South)																
Lane 1	7	558	0	565	3.2	742	0.762	100	37.3	LOS D	31.0	222.8	500	–	0.0	0.0
Lane 2	0	566	0	566	3.2	742	0.762	100	37.2	LOS D	31.0	222.9	500	–	0.0	0.0
Lane 3	0	0	254	254	1.6	328	0.775	100	68.3	LOS E	16.3	113.4	150	Turn Bay	0.0	0.0
Lane 4	0	0	251	251	1.6	323	0.775	100	68.4	LOS E	16.0	113.8	150	Turn Bay	0.0	0.0
Approach	7	1124	505	1636	2.7		0.775		46.8	LOS D	31.0	222.9				
East: Yeppoon Road																
Lane 1	148	0	0	148	8.1	1774	0.083	100	9.7	X	X	X	500	–	0.0	X
Lane 2	0	4	249	253	5.1	376	0.672	100	61.2	LOS E	14.4	105.4	500	–	0.0	0.0
Approach	148	4	249	401	6.2		0.672		42.2	LOS D	14.4	105.4				
North: Bruce Highway (North)																
Lane 1	369	0	0	369	0.5	1337[1]	0.276	100	10.2	LOS B	1.2	8.7	100	Turn Bay	0.0	0.0
Lane 2	0	391	0	391	5.4	732	0.533	100	30.1	LOS C	16.5	120.5	500	–	0.0	0.0
Lane 3	0	391	0	391	5.4	732	0.533	100	30.1	LOS C	16.5	120.5	500	–	0.0	0.0
Lane 4	0	0	2	2	0.0	114[1]	0.017	100	55.6	LOS E	0.1	0.7	25	Turn Bay	0.0	0.0
Approach	369	781	2	1152	3.8		0.533		23.7	LOS C	16.5	120.5				
West: Cultural Centre Access																
Lane 1	1	2	2	5	0.0	95	0.053	100	71.5	LOS E	0.3	2.2	500	–	0.0	0.0
Approach	1	2	2	5	0.0		0.053		71.5	LOS E	0.3	2.2				
Intersection				3194	3.5		0.775		38.0	LOS D	31.0	222.9				

X: Not applicable for Continuous lane.

Level of Service (LOS) Method: Delay (HCM 2000).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model used.

1 Reduced capacity due to a short lane effect

Processed: Tuesday, 2 July 2013 4:31:03 PM
SIDRA INTERSECTION 5.1.13.2093
Project: C:\Cambray Projects\STO0111\01R\Working\Sidra\13-06-19\Prelim Approval\Bruce Highway-Yeppoon Road.sip
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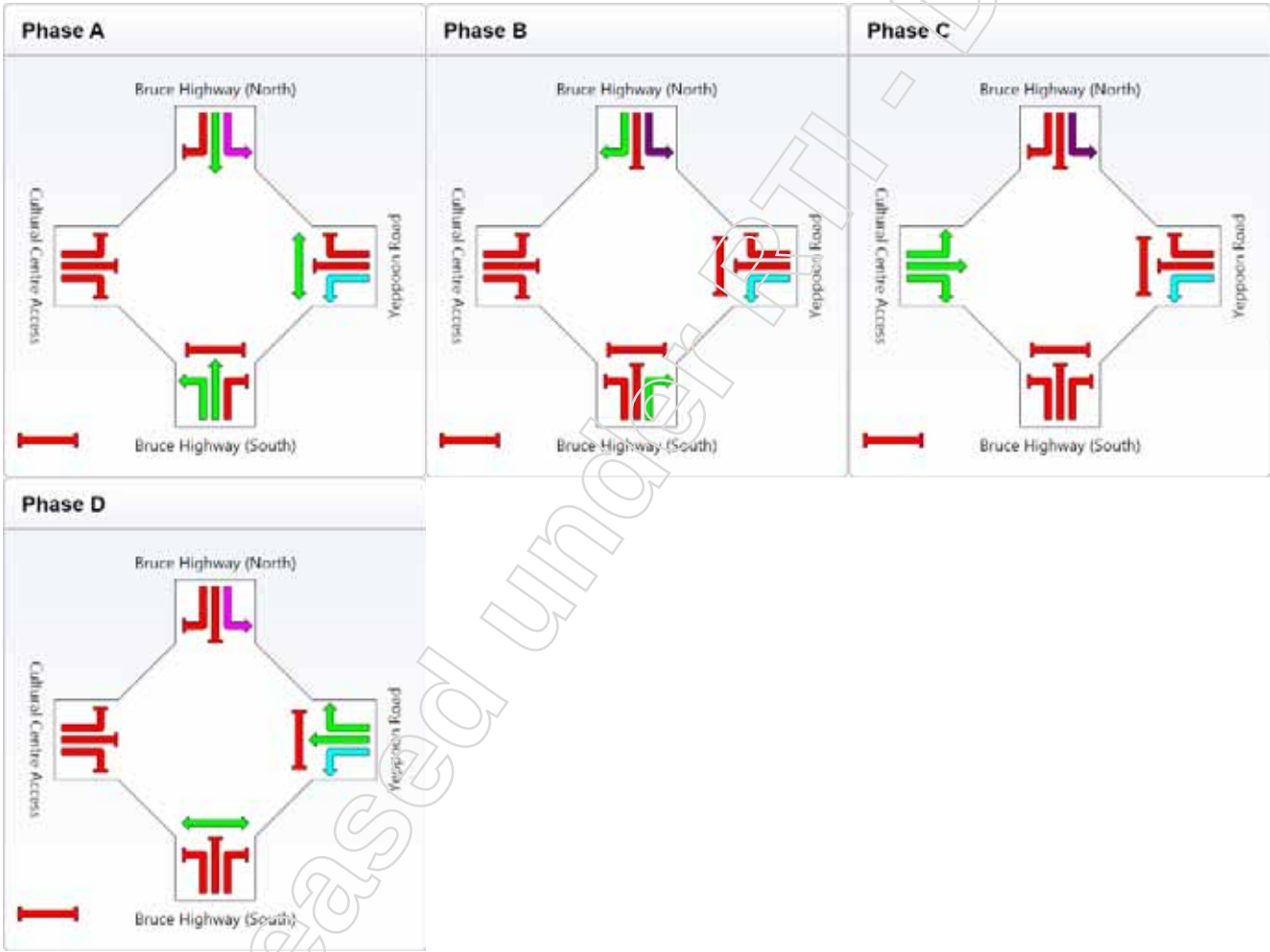
PHASING SUMMARY

Bruce Highway / Yeppoon Road
Proposed Intersection Upgrade 2 - Ultimate Development
PRE DEV - 2025 PM Peak
Signals - Fixed Time Cycle Time = 130 seconds (Optimum Cycle Time - Minimum Delay)

Phase times determined by the program
Sequence: CAMBRAY
Input Sequence: A, B, C, D
Output Sequence: A, B, C, D

Phase Timing Results

Phase	A	B	C	D
Green Time (sec)	50	23	6	27
Yellow Time (sec)	4	4	4	4
All-Red Time (sec)	2	2	2	2
Phase Time (sec)	56	29	12	33
Phase Split	43 %	22 %	9 %	25 %





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LANE SUMMARY

Bruce Highway / Yeppoon Road
Proposed Intersection Upgrade 2 - Ultimate Development
PRE DEV - 2035 AM Peak
Signals - Fixed Time Cycle Time = 115 seconds (Optimum Cycle Time - Minimum Delay)

Lane Use and Performance

	Demand Flows L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South: Bruce Highway (South)																
Lane 1	4	258	0	262	7.0	770	0.340	100	25.0	LOS C	10.0	74.2	500	–	0.0	0.0
Lane 2	0	262	0	262	7.1	770	0.340	100	24.9	LOS C	10.0	74.3	500	–	0.0	0.0
Lane 3	0	0	120	120	16.0	161	0.744	100	69.9	LOS E	7.1	53.6	150	Turn Bay	0.0	0.0
Lane 4	0	0	118	118	16.0	159	0.744	100	70.0	LOS E	7.0	53.8	150	Turn Bay	0.0	0.0
Approach	4	520	238	762	9.8		0.744		39.0	LOS D	10.0	74.3				
East: Yeppoon Road																
Lane 1	673	0	0	673	2.1	1849	0.364	100	9.5	X	X	X	500	–	0.0	X
Lane 2	0	3	297	300	7.0	420	0.714	100	54.4	LOS D	15.3	113.3	500	–	0.0	0.0
Approach	673	3	297	973	3.6		0.714		23.4	LOS C	15.3	113.3				
North: Bruce Highway (North)																
Lane 1	247	0	0	247	10.1	1413[1]	0.175	100	10.2	LOS B	0.6	4.4	100	Turn Bay	0.0	0.0
Lane 2	0	591	0	591	4.7	782	0.756	100	27.6	LOS C	25.5	186.0	500	–	0.0	0.0
Lane 3	0	591	0	591	4.7	782	0.756	100	27.6	LOS C	25.5	186.0	500	–	0.0	0.0
Lane 4	0	0	1	1	0.0	111[1]	0.009	100	59.7	LOS E	0.0	0.3	25	Turn Bay	0.0	0.0
Approach	247	1182	1	1430	5.6		0.756		24.6	LOS C	25.5	186.0				
West: Cultural Centre Access																
Lane 1	1	3	14	18	5.6	102	0.176	100	66.7	LOS E	1.0	7.5	500	–	0.0	0.0
Approach	1	3	14	18	5.6		0.176		66.7	LOS E	1.0	7.5				
Intersection				3183	6.0		0.756		27.9	LOS C	25.5	186.0				

X: Not applicable for Continuous lane.

Level of Service (LOS) Method: Delay (HCM 2000).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model used.

1 Reduced capacity due to a short lane effect

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SIDRA INTERSECTION 5.1.13.2093
Project: C:\Cambray Projects\STO0111\01R\Working\Sidra\13-06-19\Prelim Approval\Bruce Highway-Yeppoon Road.sip
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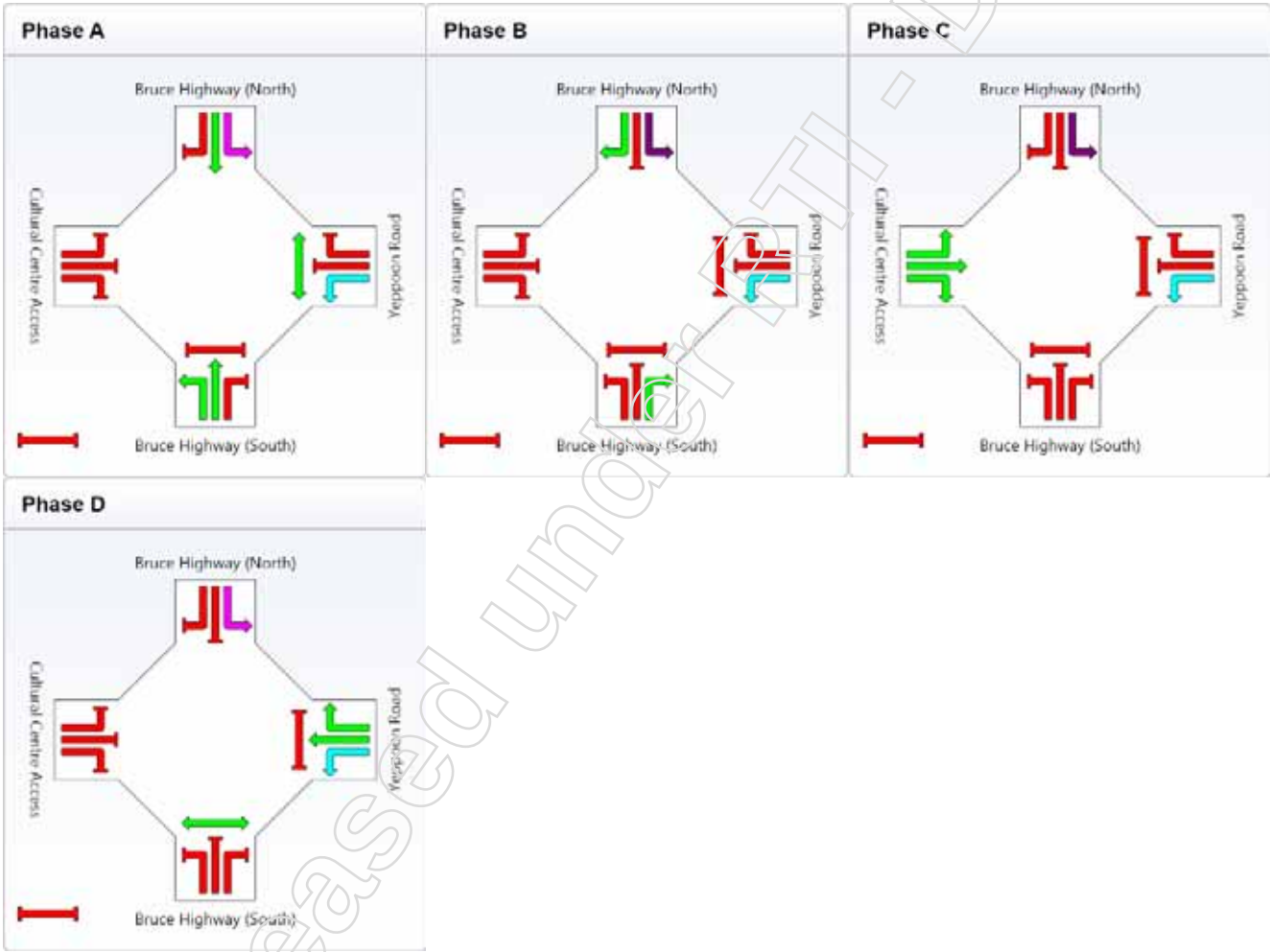
PHASING SUMMARY

Bruce Highway / Yeppoon Road
Proposed Intersection Upgrade 2 - Ultimate Development
PRE DEV - 2035 AM Peak
Signals - Fixed Time Cycle Time = 115 seconds (Optimum Cycle Time - Minimum Delay)

Phase times determined by the program
Sequence: CAMBRAY
Input Sequence: A, B, C, D
Output Sequence: A, B, C, D

Phase Timing Results

Phase	A	B	C	D
Green Time (sec)	47	11	6	27
Yellow Time (sec)	4	4	4	4
All-Red Time (sec)	2	2	2	2
Phase Time (sec)	53	17	12	33
Phase Split	46 %	15 %	10 %	29 %





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LANE SUMMARY

Bruce Highway / Yeppoon Road
Proposed Intersection Upgrade 2 - Ultimate Development
PRE DEV - 2035 PM Peak
Signals - Fixed Time Cycle Time = 135 seconds (Optimum Cycle Time - Minimum Delay)

Lane Use and Performance

	Demand Flows L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South: Bruce Highway (South)																
Lane 1	7	560	0	567	3.5	699	0.812	100	43.9	LOS D	34.7	250.0	500	–	0.0	0.0
Lane 2	0	568	0	568	3.5	699	0.812	100	43.7	LOS D	34.7	250.2	500	–	0.0	0.0
Lane 3	0	0	320	320	1.4	399	0.803	100	68.0	LOS E	21.2	150.5	150	Turn Bay	0.0	5.3
Lane 4	0	0	316	316	1.4	393	0.803	100	68.2	LOS E	21.0	148.4	150	Turn Bay	0.0	4.1
Approach	7	1128	636	1771	2.8		0.812		52.5	LOS D	34.7	250.2				
East: Yeppoon Road																
Lane 1	194	0	0	194	7.2	1784	0.109	100	9.7	X	X	X	500	–	0.0	X
Lane 2	0	4	289	293	5.1	362	0.809	100	69.0	LOS E	19.1	139.3	500	–	0.0	0.0
Approach	194	4	289	487	6.0		0.809		45.4	LOS D	19.1	139.3				
North: Bruce Highway (North)																
Lane 1	427	0	0	427	0.7	1255[1]	0.340	100	10.4	LOS B	1.7	11.7	100	Turn Bay	0.0	0.0
Lane 2	0	391	0	391	5.9	689	0.567	100	34.3	LOS C	18.1	133.4	500	–	0.0	0.0
Lane 3	0	391	0	391	5.9	689	0.567	100	34.3	LOS C	18.1	133.4	500	–	0.0	0.0
Lane 4	0	0	2	2	0.0	119[1]	0.017	100	52.8	LOS D	0.1	0.6	25	Turn Bay	0.0	0.0
Approach	427	781	2	1210	4.0		0.567		25.9	LOS C	18.1	133.4				
West: Cultural Centre Access																
Lane 1	1	2	2	5	0.0	92	0.055	100	74.3	LOS E	0.3	2.3	500	–	0.0	0.0
Approach	1	2	2	5	0.0		0.055		74.3	LOS E	0.3	2.3				
Intersection				3473	3.7		0.812		42.3	LOS D	34.7	250.2				

X: Not applicable for Continuous lane.

Level of Service (LOS) Method: Delay (HCM 2000).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model used.

1 Reduced capacity due to a short lane effect

Processed: Tuesday, 2 July 2013 4:31:04 PM
SIDRA INTERSECTION 5.1.13.2093
Project: C:\Cambray Projects\STO0111\01R\Working\Sidra\13-06-19\Prelim Approval\Bruce Highway-Yeppoon Road.sip
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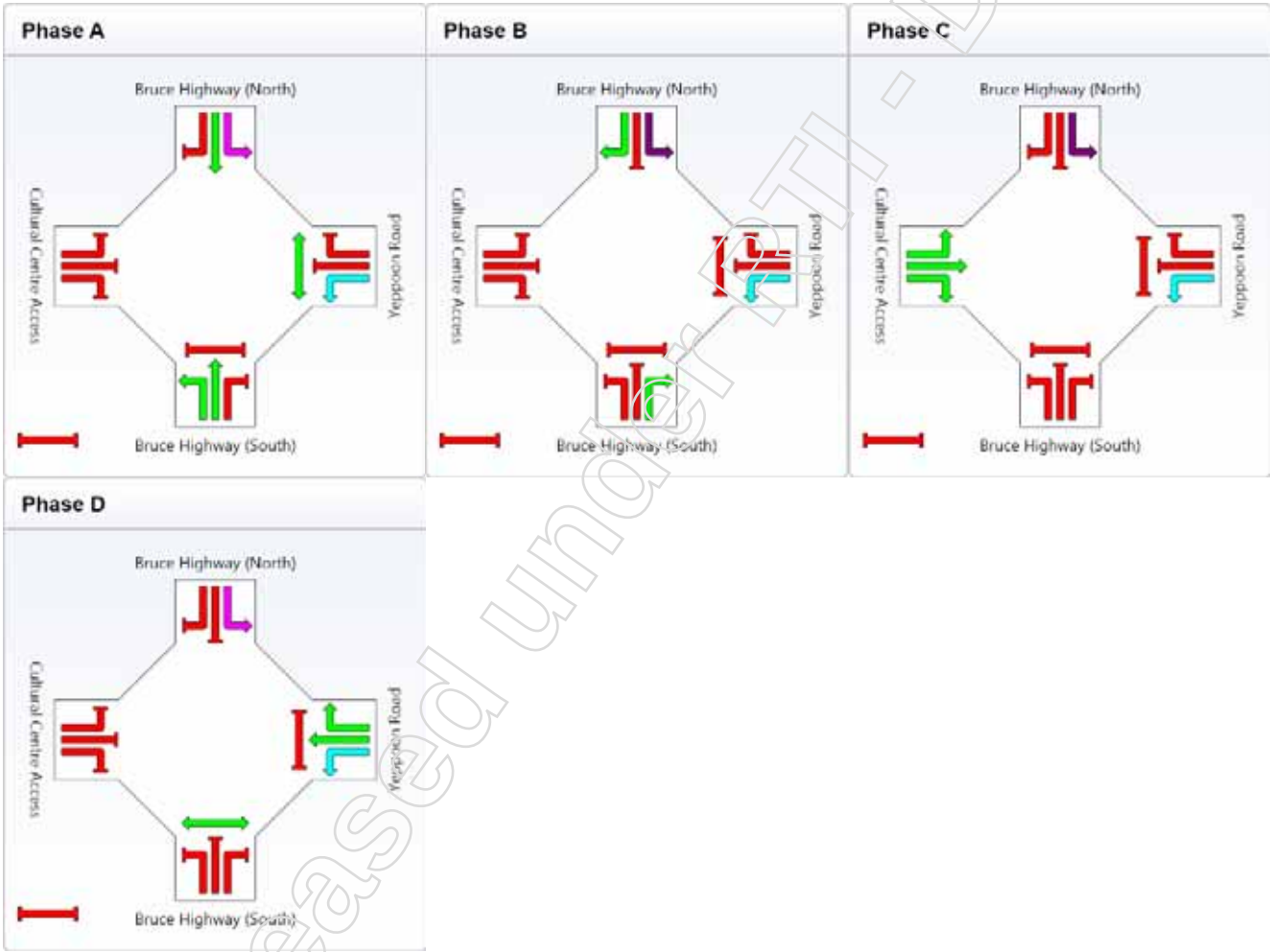
PHASING SUMMARY

Bruce Highway / Yeppoon Road
Proposed Intersection Upgrade 2 - Ultimate Development
PRE DEV - 2035 PM Peak
Signals - Fixed Time Cycle Time = 135 seconds (Optimum Cycle Time - Minimum Delay)

Phase times determined by the program
Sequence: CAMBRAY
Input Sequence: A, B, C, D
Output Sequence: A, B, C, D

Phase Timing Results

Phase	A	B	C	D
Green Time (sec)	49	29	6	27
Yellow Time (sec)	4	4	4	4
All-Red Time (sec)	2	2	2	2
Phase Time (sec)	55	35	12	33
Phase Split	41 %	26 %	9 %	24 %



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LANE SUMMARY

Bruce Highway / Yeppoon Road
Proposed Intersection Upgrade 2 - Ultimate Development
POST DEV - 2025 AM Peak
Signals - Fixed Time Cycle Time = 150 seconds (Optimum Cycle Time - Minimum Delay)

Lane Use and Performance

	Demand Flows L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South: Bruce Highway (South)																
Lane 1	4	388	0	392	4.3	1009	0.389	100	22.3	LOS C	16.7	121.4	500	–	0.0	0.0
Lane 2	0	393	0	393	4.4	1009	0.389	100	22.2	LOS C	16.7	121.5	500	–	0.0	0.0
Lane 3	0	0	94	94	16.7	101	0.932	100	107.2	LOS F	8.2	65.5	150	Turn Bay	0.0	0.0
Lane 4	0	0	92	92	16.7	99	0.932	100	107.4	LOS F	8.1	64.6	150	Turn Bay	0.0	0.0
Approach	4	781	186	971	6.7		0.932		38.6	LOS D	16.7	121.5				
East: Yeppoon Road																
Lane 1	532	0	0	532	2.3	1847	0.288	100	9.5	X	X	X	500	–	0.0	X
Lane 2	0	3	382	385	4.7	388	0.993	100	126.7	LOS F	40.1	291.8	500	–	0.0	0.0
Approach	532	3	382	917	3.3		0.993		58.7	LOS E	40.1	291.8				
North: Bruce Highway (North)																
Lane 1	353	0	0	353	5.9	1411[1]	0.250	100	10.1	LOS B	1.2	8.5	100	Turn Bay	0.0	0.0
Lane 2	0	1004	0	1004	2.5	1021	0.983	100	68.6	LOS E	96.8	692.4	500	–	0.0	34.7
Lane 3	0	1004	0	1004	2.5	1021	0.983	100	68.6	LOS E	96.8	692.4	500	–	0.0	34.7
Lane 4	0	0	1	1	0.0	82[1]	0.012	100	81.1	LOS F	0.1	0.5	25	Turn Bay	0.0	0.0
Approach	353	2007	1	2361	3.0		0.983		59.9	LOS E	96.8	692.4				
West: Cultural Centre Access																
Lane 1	1	3	14	18	5.6	78	0.230	100	86.8	LOS F	1.4	9.9	500	–	0.0	0.0
Approach	1	3	14	18	5.6		0.230		86.8	LOS F	1.4	9.9				
Intersection				4267	3.9		0.993		54.9	LOS D	96.8	692.4				

X: Not applicable for Continuous lane.

Level of Service (LOS) Method: Delay (HCM 2000).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model used.

1 Reduced capacity due to a short lane effect

Processed: Thursday, 31 October 2013 11:45:25 AM
SIDRA INTERSECTION 5.1.13.2093
Project: C:\Cambray\STO0111\01R\Working\Sidra\13-10-29\Bruce Highway-Yeppoon Road.sip
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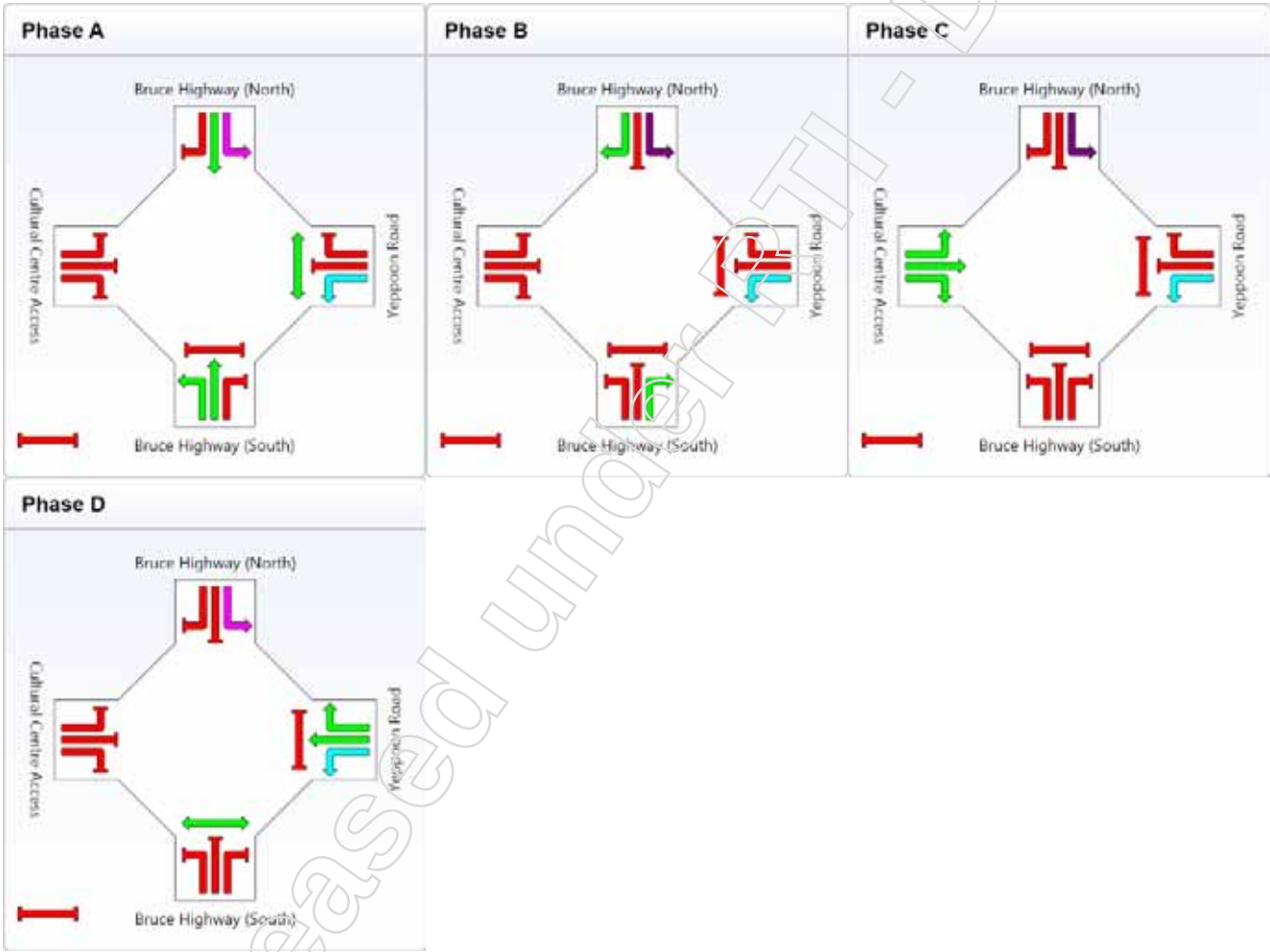
PHASING SUMMARY

Bruce Highway / Yeppoon Road
Proposed Intersection Upgrade 2 - Ultimate Development
POST DEV - 2025 AM Peak
Signals - Fixed Time Cycle Time = 150 seconds (Optimum Cycle Time - Minimum Delay)

Phase times determined by the program
Sequence: CAMBRAY
Input Sequence: A, B, C, D
Output Sequence: A, B, C, D

Phase Timing Results

Phase	A	B	C	D
Green Time (sec)	79	9	6	32
Yellow Time (sec)	4	4	4	4
All-Red Time (sec)	2	2	2	2
Phase Time (sec)	85	15	12	38
Phase Split	57 %	10 %	8 %	25 %





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LANE SUMMARY

Bruce Highway / Yeppoon Road
Proposed Intersection Upgrade 2 - Ultimate Development
POST DEV - 2025 PM Peak
Signals - Fixed Time Cycle Time = 150 seconds (Optimum Cycle Time - Minimum Delay)

Lane Use and Performance

	Demand Flows L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South: Bruce Highway (South)																
Lane 1	7	920	0	927	1.9	869	1.067	100	207.9	LOS F	140.1	997.1	500	–	0.0	69.1
Lane 2	0	927	0	927	1.9	869	1.067	100	207.8	LOS F	140.2	997.4	500	–	0.0	69.1
Lane 3	0	0	254	254	1.6	247	1.029	100	178.4	LOS F	31.3	222.1	150	Turn Bay	0.0	40.9
Lane 4	0	0	251	251	1.6	244	1.029	100	178.7	LOS F	30.9	219.0	150	Turn Bay	0.0	39.6
Approach	7	1847	505	2359	1.9		1.067		201.6	LOS F	140.2	997.4				
East: Yeppoon Road																
Lane 1	148	0	0	148	8.1	1774	0.083	100	9.7	X	X	X	500	–	0.0	X
Lane 2	0	4	419	423	3.1	404	1.046	100	192.7	LOS F	55.6	399.5	500	–	0.0	0.0
Approach	148	4	419	571	4.4		1.046		145.3	LOS F	55.6	399.5				
North: Bruce Highway (North)																
Lane 1	567	0	0	567	0.4	1300[1]	0.436	100	10.4	LOS B	2.7	19.0	100	Turn Bay	0.0	0.0
Lane 2	0	589	0	589	3.6	860	0.684	100	29.5	LOS C	28.9	208.8	500	–	0.0	0.0
Lane 3	0	589	0	589	3.6	860	0.684	100	29.5	LOS C	28.9	208.8	500	–	0.0	0.0
Lane 4	0	0	2	2	0.0	93[1]	0.022	100	68.9	LOS E	0.1	0.8	25	Turn Bay	0.0	0.0
Approach	567	1177	2	1746	2.5		0.684		23.3	LOS C	28.9	208.8				
West: Cultural Centre Access																
Lane 1	1	2	2	5	0.0	82	0.061	100	82.7	LOS F	0.4	2.6	500	–	0.0	0.0
Approach	1	2	2	5	0.0		0.061		82.7	LOS F	0.4	2.6				
Intersection				4681	2.4		1.067		128.1	LOS F	140.2	997.4				

X: Not applicable for Continuous lane.

Level of Service (LOS) Method: Delay (HCM 2000).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model used.

1 Reduced capacity due to a short lane effect

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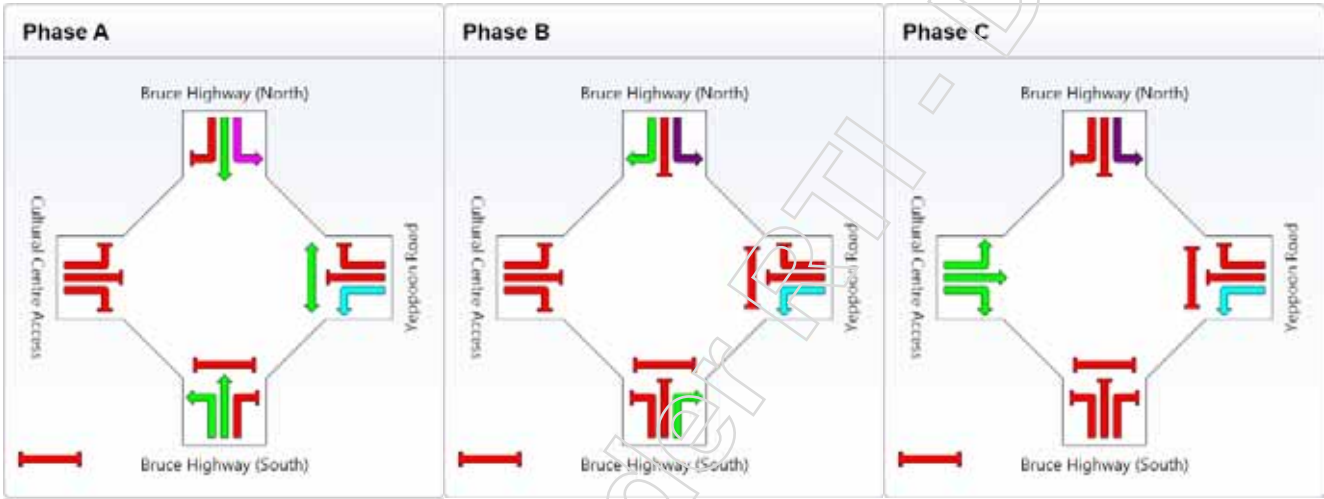
PHASING SUMMARY

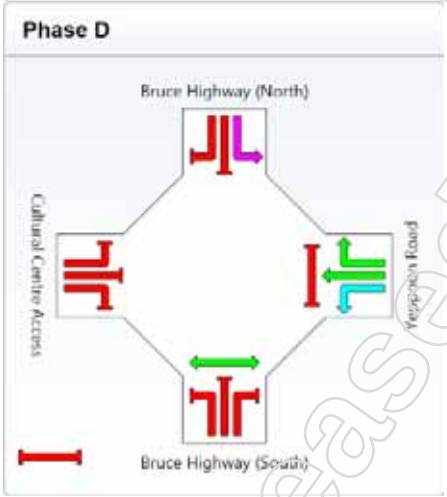
Bruce Highway / Yeppoon Road
Proposed Intersection Upgrade 2 - Ultimate Development
POST DEV - 2025 PM Peak
Signals - Fixed Time Cycle Time = 150 seconds (Optimum Cycle Time - Minimum Delay)

Phase times determined by the program
Sequence: CAMBRAY
Input Sequence: A, B, C, D
Output Sequence: A, B, C, D

Phase Timing Results

Phase	A	B	C	D
Green Time (sec)	67	20	6	33
Yellow Time (sec)	4	4	4	4
All-Red Time (sec)	2	2	2	2
Phase Time (sec)	73	26	12	39
Phase Split	49 %	17 %	8 %	26 %







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LANE SUMMARY

Bruce Highway / Yeppoon Road
Proposed Intersection Upgrade 2 - Ultimate Development
POST DEV - 2035 AM Peak
Signals - Fixed Time Cycle Time = 150 seconds (Optimum Cycle Time - Minimum Delay)

Lane Use and Performance

	Demand Flows L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South: Bruce Highway (South)																
Lane 1	4	390	0	394	4.7	956	0.412	100	25.0	LOS C	17.8	129.5	500	–	0.0	0.0
Lane 2	0	394	0	394	4.7	956	0.412	100	24.9	LOS C	17.8	129.6	500	–	0.0	0.0
Lane 3	0	0	120	120	16.0	124	0.971	100	122.8	LOS F	11.5	91.5	150	Turn Bay	0.0	0.0
Lane 4	0	0	118	118	16.0	122	0.971	100	123.0	LOS F	11.3	90.2	150	Turn Bay	0.0	0.0
Approach	4	784	238	1026	7.3		0.971		47.7	LOS D	17.8	129.6				
East: Yeppoon Road																
Lane 1	673	0	0	673	2.1	1849	0.364	100	9.5	X	X	X	500	–	0.0	X
Lane 2	0	3	429	432	4.9	411	1.050	100	198.7	LOS F	57.9	422.1	500	–	0.0	0.0
Approach	673	3	429	1105	3.2		1.050		83.5	LOS F	57.9	422.1				
North: Bruce Highway (North)																
Lane 1	396	0	0	396	6.3	1377[1]	0.288	100	10.2	LOS B	1.4	10.4	100	Turn Bay	0.0	0.0
Lane 2	0	1013	0	1013	2.7	968	1.046	100	153.3	LOS F	135.5	970.3	500	–	0.0	66.4
Lane 3	0	1013	0	1013	2.7	968	1.046	100	153.3	LOS F	135.5	970.3	500	–	0.0	66.4
Lane 4	0	0	1	1	0.0	84[1]	0.012	100	78.5	LOS E	0.1	0.5	25	Turn Bay	0.0	0.0
Approach	396	2026	1	2423	3.3		1.046		129.9	LOS F	135.5	970.3				
West: Cultural Centre Access																
Lane 1	1	3	14	18	5.6	78	0.230	100	86.8	LOS F	1.4	9.9	500	–	0.0	0.0
Approach	1	3	14	18	5.6		0.230		86.8	LOS F	1.4	9.9				
Intersection				4572	4.2		1.050		100.0	LOS F	135.5	970.3				

X: Not applicable for Continuous lane.

Level of Service (LOS) Method: Delay (HCM 2000).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model used.

1 Reduced capacity due to a short lane effect

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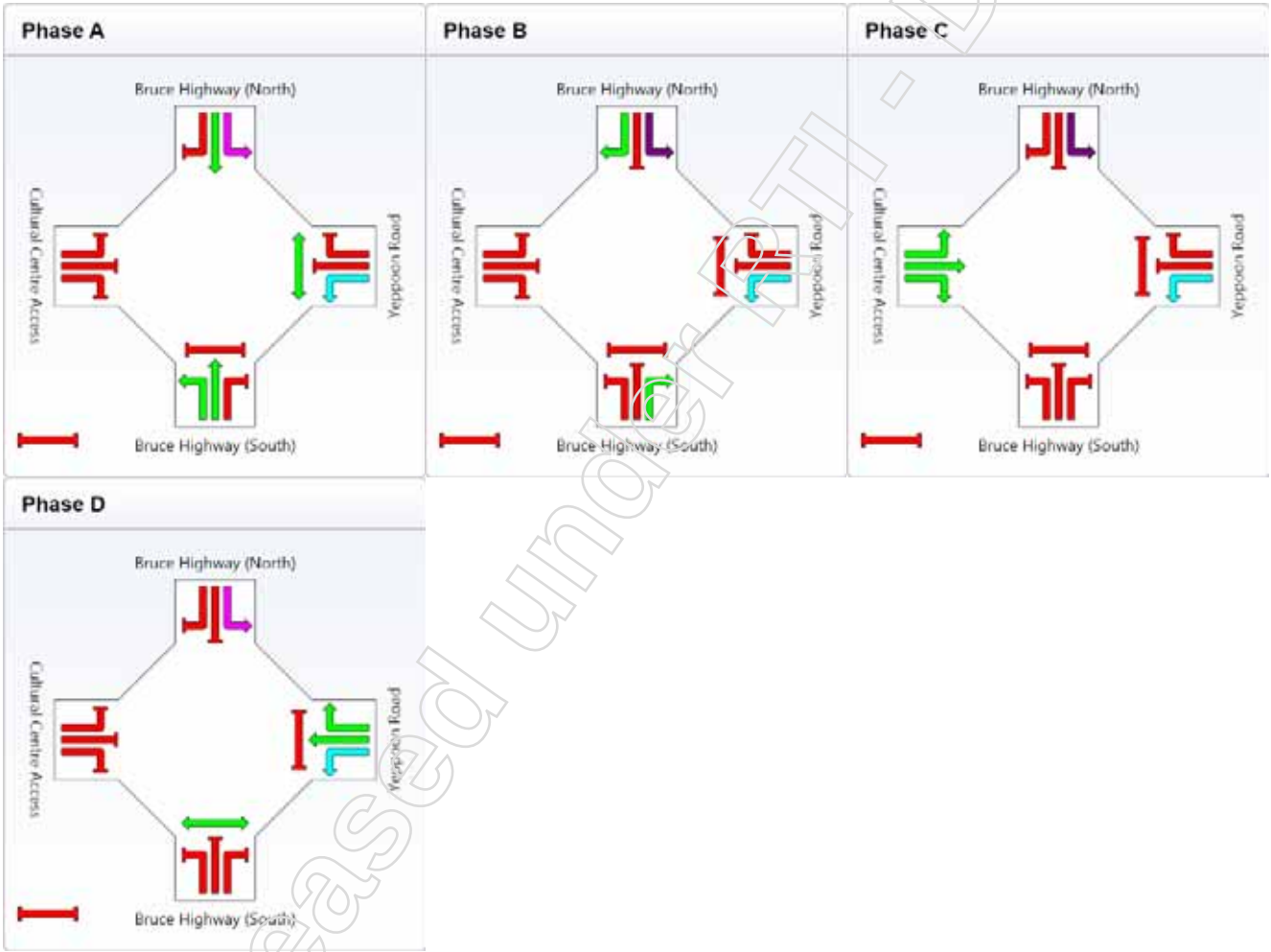
PHASING SUMMARY

Bruce Highway / Yeppoon Road
Proposed Intersection Upgrade 2 - Ultimate Development
POST DEV - 2035 AM Peak
Signals - Fixed Time Cycle Time = 150 seconds (Optimum Cycle Time - Minimum Delay)

Phase times determined by the program
Sequence: CAMBRAY
Input Sequence: A, B, C, D
Output Sequence: A, B, C, D

Phase Timing Results

Phase	A	B	C	D
Green Time (sec)	75	11	6	34
Yellow Time (sec)	4	4	4	4
All-Red Time (sec)	2	2	2	2
Phase Time (sec)	81	17	12	40
Phase Split	54 %	11 %	8 %	27 %





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LANE SUMMARY

Bruce Highway / Yeppoon Road
Proposed Intersection Upgrade 2 - Ultimate Development
POST DEV - 2035 PM Peak
Signals - Fixed Time Cycle Time = 150 seconds (Optimum Cycle Time - Minimum Delay)

Lane Use and Performance

	Demand Flows L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South: Bruce Highway (South)																
Lane 1	7	1007	0	1014	2.1	881	1.152	100	350.9	LOS F	204.1	1455.0	500	–	0.0	100.0
Lane 2	0	845	163[0]	1007	2.2	874	1.152	100	351.0	LOS F	202.7	1444.0	500	–	0.0	100.0
Lane 3	0	0	238	238	1.4	223	1.068	100	237.2	LOS F	34.5	244.6	150	Turn Bay	0.0	49.9
Lane 4	0	0	235	235	1.4	219	1.071	100	242.1	LOS F	34.5	244.7	150	Turn Bay	0.0	50.0
Approach	7	1852	636	2495	2.0		1.152		329.9	LOS F	204.1	1455.0				
East: Yeppoon Road																
Lane 1	194	0	0	194	7.2	1784	0.109	100	9.7	X	X	X	500	–	0.0	X
Lane 2	0	4	459	463	3.2	416	1.113	100	300.4	LOS F	79.2	570.0	500	–	0.0	16.9
Approach	194	4	459	657	4.4		1.113		214.5	LOS F	79.2	570.0				
North: Bruce Highway (North)																
Lane 1	625	0	0	625	0.5	1326[1]	0.471	100	10.4	LOS B	3.1	21.8	100	Turn Bay	0.0	0.0
Lane 2	0	589	0	589	3.9	871	0.676	100	28.5	LOS C	28.4	205.3	500	–	0.0	0.0
Lane 3	0	589	0	589	3.9	871	0.676	100	28.5	LOS C	28.4	205.3	500	–	0.0	0.0
Lane 4	0	0	2	2	0.0	91[1]	0.022	100	71.0	LOS E	0.1	0.9	25	Turn Bay	0.0	0.0
Approach	625	1178	2	1805	2.7		0.676		22.3	LOS C	28.4	205.3				
West: Cultural Centre Access																
Lane 1	1	2	2	5	0.0	82	0.061	100	82.7	LOS F	0.4	2.6	500	–	0.0	0.0
Approach	1	2	2	5	0.0		0.061		82.7	LOS F	0.4	2.6				
Intersection				4962	2.6		1.152		202.4	LOS F	204.1	1455.0				

X: Not applicable for Continuous lane.

Level of Service (LOS) Method: Delay (HCM 2000).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model used.

0 Excess flow from back of an adjacent short lane
1 Reduced capacity due to a short lane effect

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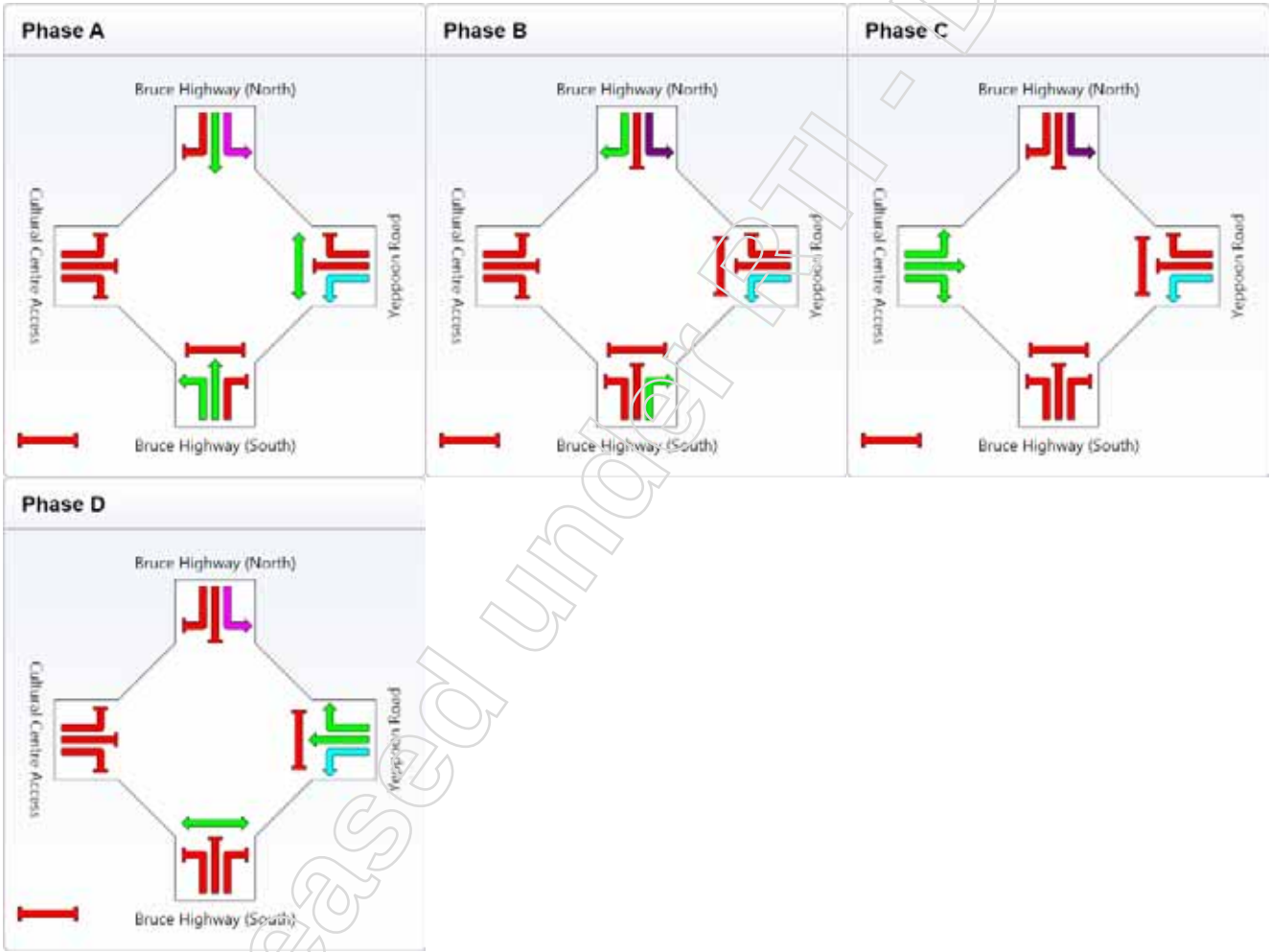
PHASING SUMMARY

Bruce Highway / Yeppoon Road
Proposed Intersection Upgrade 2 - Ultimate Development
POST DEV - 2035 PM Peak
Signals - Fixed Time Cycle Time = 150 seconds (Optimum Cycle Time - Minimum Delay)

Phase times determined by the program
Sequence: CAMBRAY
Input Sequence: A, B, C, D
Output Sequence: A, B, C, D

Phase Timing Results

Phase	A	B	C	D
Green Time (sec)	68	18	6	34
Yellow Time (sec)	4	4	4	4
All-Red Time (sec)	2	2	2	2
Phase Time (sec)	74	24	12	40
Phase Split	49 %	16 %	8 %	27 %





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LANE SUMMARY

Site: POST 2025 AM PEAK - FINAL UPGRADE

Bruce Highway / Yeppoon Road
Proposed Intersection Upgrade (Final) - Ultimate Development
POST DEV - 2025 AM Peak
Signals - Fixed Time Cycle Time = 150 seconds (Optimum Cycle Time - Shortest Queue)

Lane Use and Performance

	Demand Flows L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South: Bruce Highway (South)																
Lane 1	4	388	0	392	4.3	1111	0.353	100	17.6	LOS B	14.8	107.5	500	–	0.0	0.0
Lane 2	0	393	0	393	4.4	1111	0.353	100	17.5	LOS B	14.8	107.5	500	–	0.0	0.0
Lane 3	0	0	94	94	16.7	145	0.645	100	85.1	LOS F	7.0	55.7	150	Turn Bay	0.0	0.0
Lane 4	0	0	92	92	16.7	143	0.645	100	85.1	LOS F	6.9	54.9	150	Turn Bay	0.0	0.0
Approach	4	781	186	971	6.7		0.645		30.5	LOS C	14.8	107.5				
East: Yeppoon Road																
Lane 1	266	0	0	266	2.3	480	0.554	100	61.0	LOS E	15.7	112.1	150	Turn Bay	0.0	0.0
Lane 2	266	0	0	266	2.3	480	0.554	100	61.0	LOS E	15.7	112.1	500	–	0.0	0.0
Lane 3	0	3	189	192	4.9	242	0.795	100	81.8	LOS F	14.2	103.7	500	–	0.0	0.0
Lane 4	0	0	193	193	4.5	242	0.795	100	81.9	LOS F	14.2	103.5	150	Turn Bay	0.0	0.0
Approach	532	3	382	917	3.3		0.795		69.7	LOS E	15.7	112.1				
North: Bruce Highway (North)																
Lane 1	353	222	0	575	4.6	832[1]	0.691	87[6]	13.9	LOS B	11.5	84.0	100	Turn Bay	0.0	0.0
Lane 2	0	892	0	892	2.5	1125	0.794	100	16.0	LOS B	37.5	268.4	500	–	0.0	0.0
Lane 3	0	892	0	892	2.5	1125	0.794	100	16.0	LOS B	37.5	268.4	500	–	0.0	0.0
Lane 4	0	0	1	1	0.0	86[1]	0.012	100	76.1	LOS E	0.1	0.5	25	Turn Bay	0.0	0.0
Approach	353	2007	1	2361	3.0		0.794		15.6	LOS B	37.5	268.4				
West: Cultural Centre Access																
Lane 1	1	3	14	18	5.6	78	0.230	100	86.8	LOS F	1.4	9.9	500	–	0.0	0.0
Approach	1	3	14	18	5.6		0.230		86.8	LOS F	1.4	9.9				
Intersection				4267	3.9		0.795		30.9	LOS C	37.5	268.4				

Level of Service (LOS) Method: Delay (HCM 2000).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model used.

1 Reduced capacity due to a short lane effect
6 Lane underutilisation due to downstream effects

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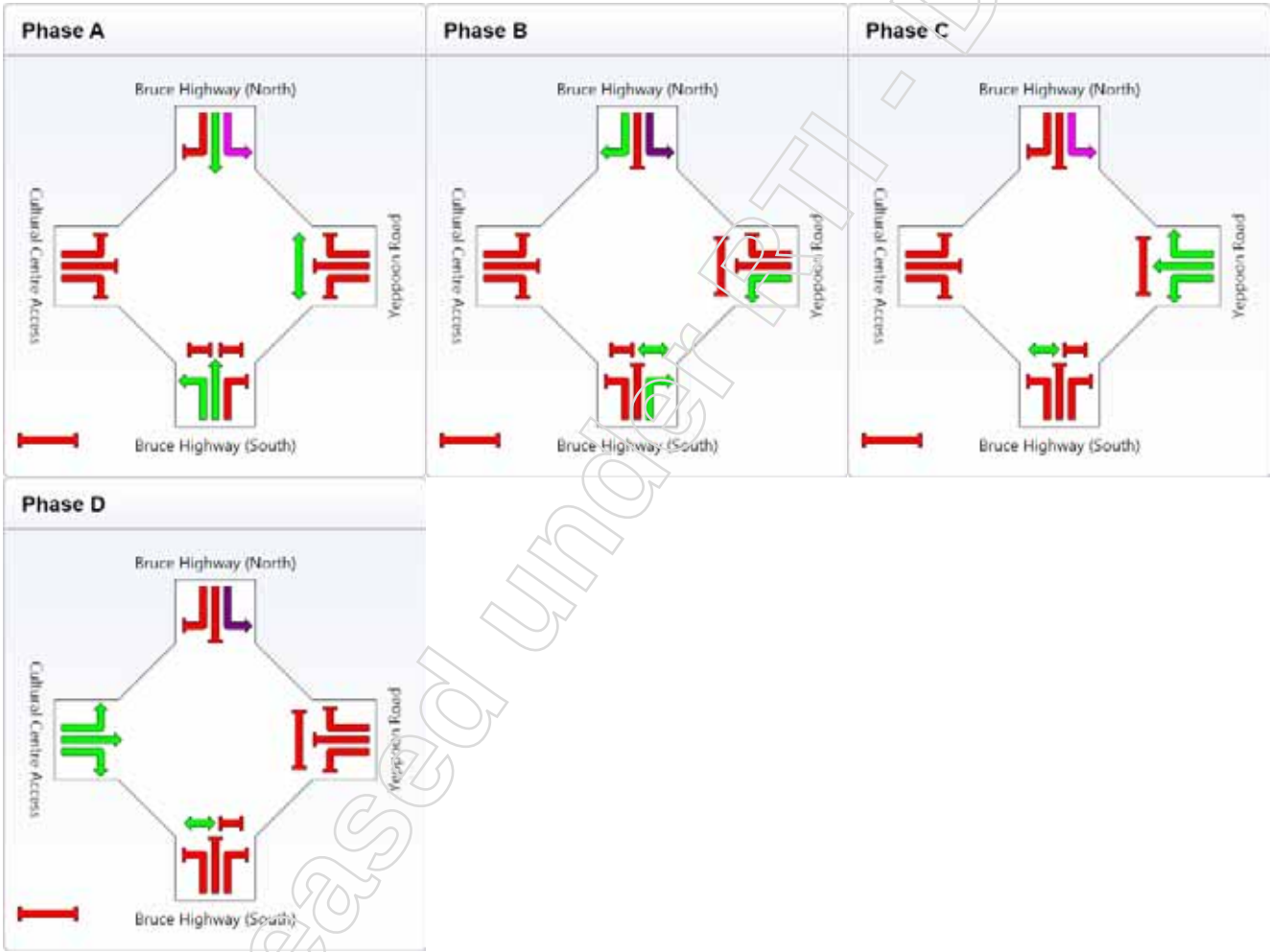
PHASING SUMMARY

Bruce Highway / Yeppoon Road
Proposed Intersection Upgrade (Final) - Ultimate Development
POST DEV - 2025 AM Peak
Signals - Fixed Time Cycle Time = 150 seconds (Optimum Cycle Time - Shortest Queue)

Phase times determined by the program
Sequence: CAMBRAY
Input Sequence: A, B, C, D
Output Sequence: A, B, C, D

Phase Timing Results

Phase	A	B	C	D
Green Time (sec)	87	13	20	6
Yellow Time (sec)	4	4	4	4
All-Red Time (sec)	2	2	2	2
Phase Time (sec)	93	19	26	12
Phase Split	62 %	13 %	17 %	8 %





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LANE SUMMARY

Bruce Highway / Yeppoon Road
Proposed Intersection Upgrade (Final) - Ultimate Development
POST DEV - 2025 AM Peak
Signals - Fixed Time Cycle Time = 125 seconds (Optimum Cycle Time - Shortest Queue)

Lane Use and Performance

	Demand Flows L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South: Bruce Highway (South)																
Lane 1	7	917	0	924	1.9	1113	0.830	100	22.9	LOS C	45.1	320.7	500	–	0.0	0.0
Lane 2	0	930	0	930	1.9	1121	0.830	100	22.8	LOS C	45.4	323.0	500	–	0.0	0.0
Lane 3	0	0	254	254	1.6	312	0.816	100	69.5	LOS E	16.3	113.3	150	Turn Bay	0.0	0.0
Lane 4	0	0	251	251	1.6	307	0.816	100	69.6	LOS E	16.0	113.7	150	Turn Bay	0.0	0.0
Approach	7	1847	505	2359	1.9		0.830		32.8	LOS C	45.4	323.0				
East: Yeppoon Road																
Lane 1	74	0	0	74	8.1	624	0.119	100	37.1	LOS D	2.5	18.7	150	Turn Bay	0.0	0.0
Lane 2	74	0	0	74	8.1	624	0.119	100	37.1	LOS D	2.5	18.7	500	–	0.0	0.0
Lane 3	0	4	207	211	3.3	250	0.846	100	73.1	LOS E	13.6	98.2	500	–	0.0	0.0
Lane 4	0	0	212	212	2.9	250	0.846	100	73.2	LOS E	13.7	98.0	150	Turn Bay	0.0	0.0
Approach	148	4	419	571	4.4		0.846		63.8	LOS E	13.7	98.2				
North: Bruce Highway (North)																
Lane 1	567	123	0	690	0.9	1319[1]	0.523	87[6]	8.8	LOS A	3.1	22.2	100	Turn Bay	0.0	0.0
Lane 2	0	527	0	527	3.6	878	0.600	100	22.5	LOS C	19.6	141.5	500	–	0.0	0.0
Lane 3	0	527	0	527	3.6	878	0.600	100	22.5	LOS C	19.6	141.5	500	–	0.0	0.0
Lane 4	0	0	2	2	0.0	88	0.023	100	72.2	LOS E	0.1	0.8	25	Turn Bay	0.0	0.0
Approach	567	1177	2	1746	2.5		0.600		17.1	LOS B	19.6	141.5				
West: Cultural Centre Access																
Lane 1	1	2	2	5	0.0	99	0.051	100	68.7	LOS E	0.3	2.1	500	–	0.0	0.0
Approach	1	2	2	5	0.0		0.051		68.7	LOS E	0.3	2.1				
Intersection				4681	2.4		0.846		30.8	LOS C	45.4	323.0				

Level of Service (LOS) Method: Delay (HCM 2000).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model used.

1 Reduced capacity due to a short lane effect
6 Lane underutilisation due to downstream effects

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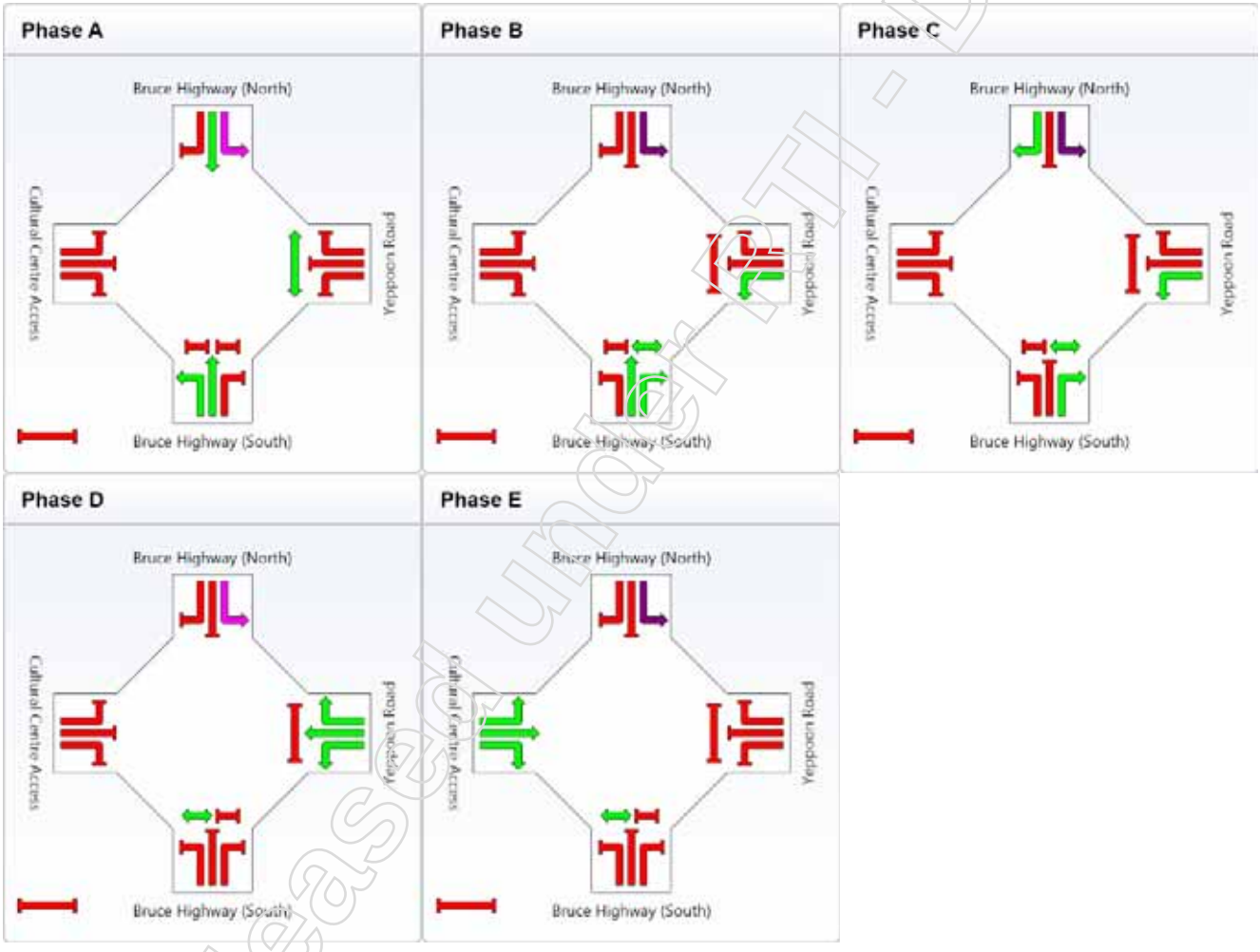
PHASING SUMMARY

Bruce Highway / Yeppoon Road
Proposed Intersection Upgrade (Final) - Ultimate Development
POST DEV - 2025 AM Peak
Signals - Fixed Time Cycle Time = 125 seconds (Optimum Cycle Time - Shortest Queue)

Phase times determined by the program
Sequence: CAMBRAY
Input Sequence: A, B , C, D, E
Output Sequence: A, B , C, D, E

Phase Timing Results

Phase	A	B	C	D	E
Green Time (sec)	57	9	6	17	6
Yellow Time (sec)	4	4	4	4	4
All-Red Time (sec)	2	2	2	2	2
Phase Time (sec)	63	15	12	23	12
Phase Split	50 %	12 %	10 %	18 %	10 %



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LANE SUMMARY

Bruce Highway / Yeppoon Road
Proposed Intersection Upgrade (Final) - Ultimate Development
POST DEV - 2035 AM Peak
Signals - Fixed Time Cycle Time = 150 seconds (Optimum Cycle Time - Shortest Queue)

Lane Use and Performance

	Demand Flows L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South: Bruce Highway (South)																
Lane 1	4	390	0	394	4.7	1083	0.364	100	18.7	LOS B	15.4	111.9	500	–	0.0	0.0
Lane 2	0	394	0	394	4.7	1083	0.364	100	18.6	LOS B	15.4	111.9	500	–	0.0	0.0
Lane 3	0	0	120	120	16.0	146	0.822	100	90.9	LOS F	9.5	73.3	150	Turn Bay	0.0	0.0
Lane 4	0	0	118	118	16.0	144	0.822	100	91.1	LOS F	9.3	74.2	150	Turn Bay	0.0	0.0
Approach	4	784	238	1026	7.3		0.822		35.5	LOS D	15.4	111.9				
East: Yeppoon Road																
Lane 1	335	0	0	335	2.1	500[1]	0.669	100	61.4	LOS E	20.5	145.9	150	Turn Bay	0.0	2.5
Lane 2	338	0	0	338	2.1	505	0.669	100	61.5	LOS E	20.8	147.9	500	–	0.0	0.0
Lane 3	0	3	213	216	5.1	266	0.812	100	81.1	LOS F	16.0	116.8	500	–	0.0	0.0
Lane 4	0	0	216	216	4.7	266	0.812	100	81.2	LOS F	16.0	116.6	150	Turn Bay	0.0	0.0
Approach	673	3	429	1105	3.2		0.812		69.2	LOS E	20.8	147.9				
North: Bruce Highway (North)																
Lane 1	396	195	0	591	5.1	814[1]	0.726	87[6]	14.8	LOS B	12.3	90.2	100	Turn Bay	0.0	0.0
Lane 2	0	915	0	915	2.7	1097	0.834	100	18.3	LOS B	43.4	311.0	500	–	0.0	0.0
Lane 3	0	915	0	915	2.7	1097	0.834	100	18.3	LOS B	43.4	311.0	500	–	0.0	0.0
Lane 4	0	0	1	1	0.0	86[1]	0.012	100	76.1	LOS E	0.1	0.5	25	Turn Bay	0.0	0.0
Approach	396	2026	1	2423	3.3		0.834		17.5	LOS B	43.4	311.0				
West: Cultural Centre Access																
Lane 1	1	3	14	18	5.6	78	0.230	100	86.8	LOS F	1.4	9.9	500	–	0.0	0.0
Approach	1	3	14	18	5.6		0.230		86.8	LOS F	1.4	9.9				
Intersection				4572	4.2		0.834		34.3	LOS C	43.4	311.0				

Level of Service (LOS) Method: Delay (HCM 2000).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model used.

1 Reduced capacity due to a short lane effect
6 Lane underutilisation due to downstream effects

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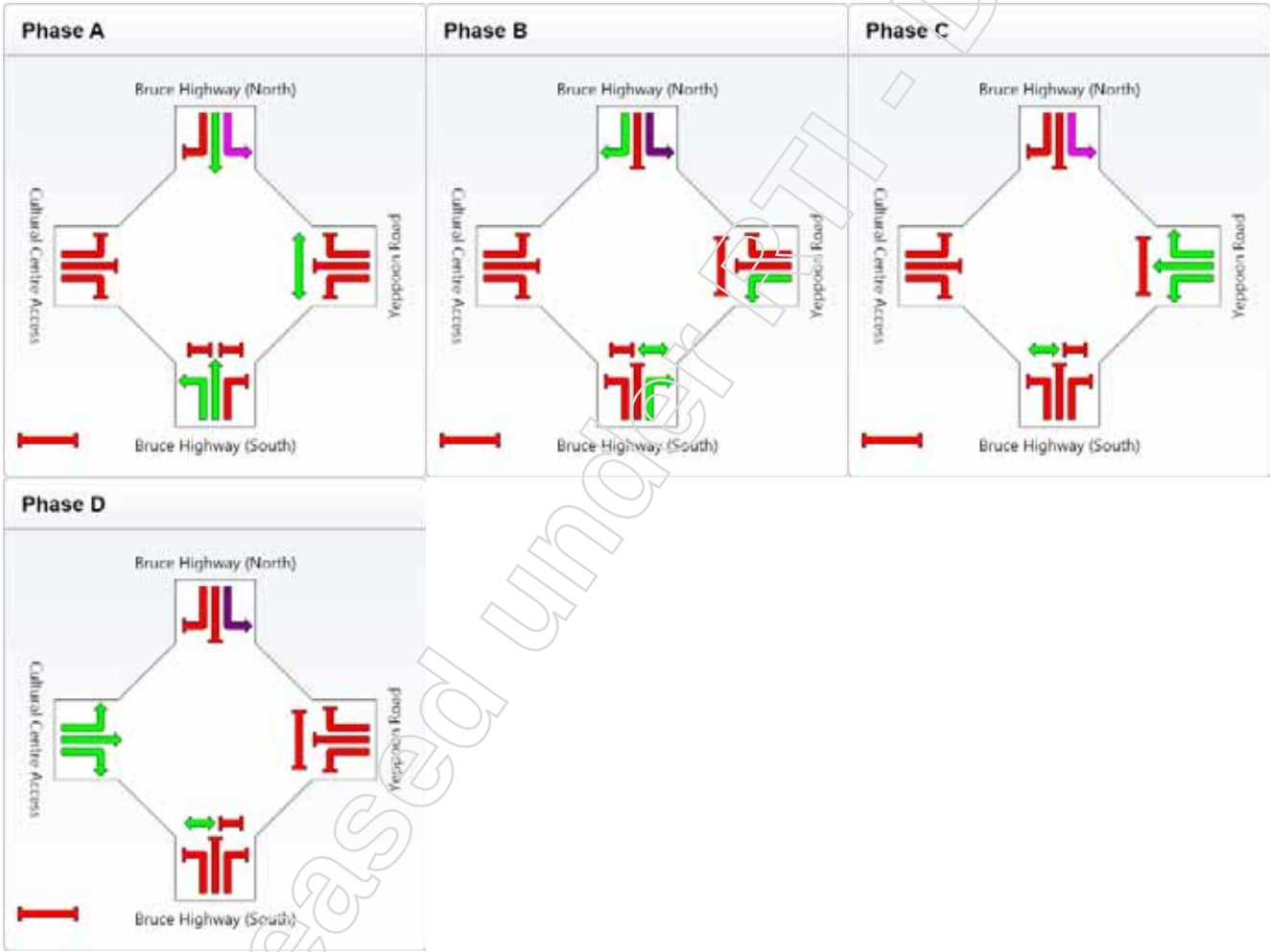
PHASING SUMMARY

Bruce Highway / Yeppoon Road
Proposed Intersection Upgrade (Final) - Ultimate Development
POST DEV - 2035 AM Peak
Signals - Fixed Time Cycle Time = 150 seconds (Optimum Cycle Time - Shortest Queue)

Phase times determined by the program
Sequence: CAMBRAY
Input Sequence: A, B, C, D
Output Sequence: A, B, C, D

Phase Timing Results

Phase	A	B	C	D
Green Time (sec)	85	13	22	6
Yellow Time (sec)	4	4	4	4
All-Red Time (sec)	2	2	2	2
Phase Time (sec)	91	19	28	12
Phase Split	61 %	13 %	19 %	8 %





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LANE SUMMARY

Site: POST 2035 PM PEAK - FINAL UPGRADE

Bruce Highway / Yeppoon Road
Proposed Intersection Upgrade (Final) - Ultimate Development
POST DEV - 2035 AM Peak
Signals - Fixed Time Cycle Time = 130 seconds (Optimum Cycle Time - Shortest Queue)

Lane Use and Performance

	Demand Flows L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South: Bruce Highway (South)																
Lane 1	7	917	0	924	2.1	1108	0.834	100	23.8	LOS C	47.0	335.2	500	–	0.0	0.0
Lane 2	0	935	0	935	2.2	1121	0.834	100	23.7	LOS C	47.6	339.1	500	–	0.0	0.0
Lane 3	0	0	320	320	1.4	372	0.863	100	73.0	LOS E	22.0	156.2	150	Turn Bay	0.0	8.6
Lane 4	0	0	316	316	1.4	366	0.863	100	73.2	LOS E	21.7	154.0	150	Turn Bay	0.0	7.4
Approach	7	1852	636	2495	2.0		0.863		36.3	LOS D	47.6	339.1				
East: Yeppoon Road																
Lane 1	95	0	0	95	7.2	675[1]	0.141	100	33.9	LOS C	3.1	22.7	150	Turn Bay	0.0	0.0
Lane 2	99	0	0	99	7.2	700	0.141	100	34.0	LOS C	3.2	23.6	500	–	0.0	0.0
Lane 3	0	4	227	231	3.4	268	0.863	100	75.8	LOS E	15.7	112.8	500	–	0.0	0.0
Lane 4	0	0	232	232	3.1	268	0.863	100	75.9	LOS E	15.7	112.6	150	Turn Bay	0.0	0.0
Approach	194	4	459	657	4.4		0.863		63.5	LOS E	15.7	112.8				
North: Bruce Highway (North)																
Lane 1	625	99	0	724	0.9	1253[1]	0.578	87[6]	9.5	LOS A	3.9	27.5	100	Turn Bay	0.0	0.0
Lane 2	0	539	0	539	3.9	813	0.664	100	27.8	LOS C	23.6	170.7	500	–	0.0	0.0
Lane 3	0	539	0	539	3.9	813	0.664	100	27.8	LOS C	23.6	170.7	500	–	0.0	0.0
Lane 4	0	0	2	2	0.0	84	0.024	100	75.0	LOS E	0.1	0.9	25	Turn Bay	0.0	0.0
Approach	625	1178	2	1805	2.7		0.664		20.5	LOS C	23.6	170.7				
West: Cultural Centre Access																
Lane 1	1	2	2	5	0.0	95	0.053	100	71.5	LOS E	0.3	2.2	500	–	0.0	0.0
Approach	1	2	2	5	0.0		0.053		71.5	LOS E	0.3	2.2				
Intersection				4962	2.6		0.863		34.2	LOS C	47.6	339.1				

Level of Service (LOS) Method: Delay (HCM 2000).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model used.

1 Reduced capacity due to a short lane effect
6 Lane underutilisation due to downstream effects

Processed: Thursday, 31 October 2013 11:45:30 AM
SIDRA INTERSECTION 5.1.13.2093
Project: C:\Cambray\STO0111\01R\Working\Sidra\13-10-29\Bruce Highway-Yeppoon Road.sip
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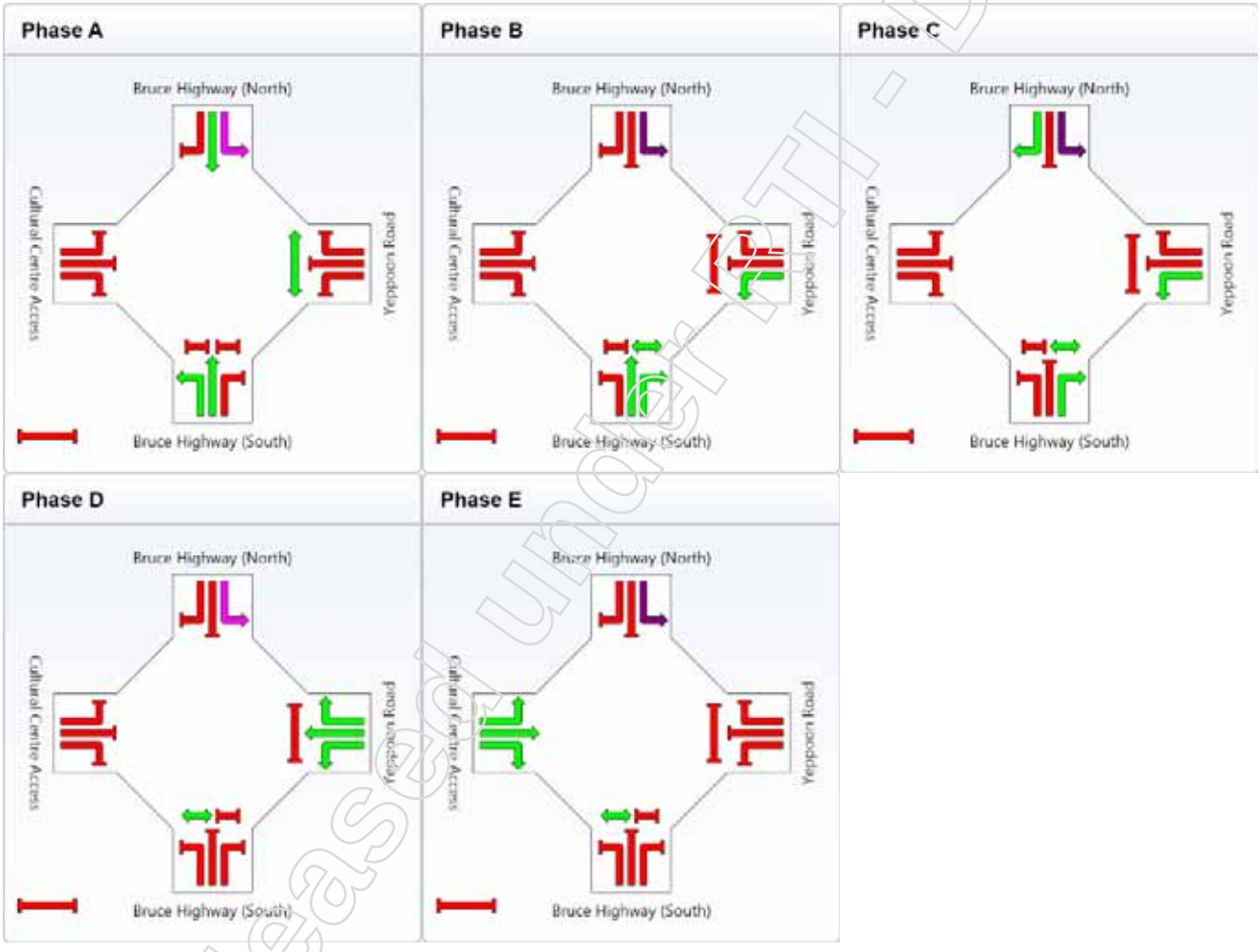
PHASING SUMMARY

Bruce Highway / Yeppoon Road
Proposed Intersection Upgrade (Final) - Ultimate Development
POST DEV - 2035 AM Peak
Signals - Fixed Time Cycle Time = 130 seconds (Optimum Cycle Time - Shortest Queue)

Phase times determined by the program
Sequence: CAMBRAY
Input Sequence: A, B , C, D, E
Output Sequence: A, B , C, D, E

Phase Timing Results

Phase	A	B	C	D	E
Green Time (sec)	55	14	6	19	6
Yellow Time (sec)	4	4	4	4	4
All-Red Time (sec)	2	2	2	2	2
Phase Time (sec)	61	20	12	25	12
Phase Split	47 %	15 %	9 %	19 %	9 %



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APPENDIX O

Internal Road Network – Forecast Daily Traffic Volumes

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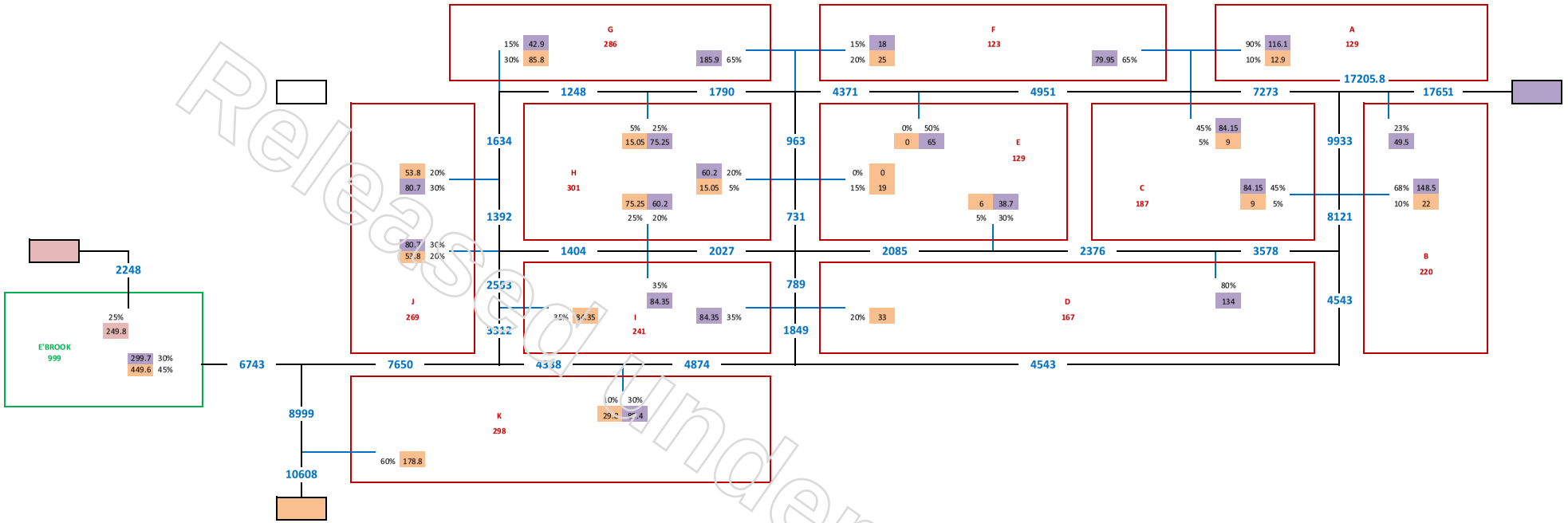
STO0111-01R | Stockland North Parkhurst

Proposed Internal Road Network Model - Daily Traffic Volumes



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APPENDIX P

SIDRA Results

William Palfrey Road / McLaughlin Street

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LANE SUMMARY

William Palfrey Road / McLaughlin Street
Post Development - Full Buildout (North Parkhurst and Edenbrook)
AM Peak
Roundabout

Lane Use and Performance

	Demand Flows L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South: McLaughlin Street																
Lane 1	121	0	149	270	2.0	1346	0.201	100	9.1	LOS A	1.2	8.7	500	–	0.0	0.0
Approach	121	0	149	270	2.0		0.201		9.1	LOS A	1.2	8.7				
East: William Palfrey Road																
Lane 1	347	0	81	428	2.0	1087	0.394	100	9.2	LOS A	2.7	19.0	500	–	0.0	0.0
Approach	347	0	81	428	2.0		0.394		9.2	LOS A	2.7	19.0				
North West: William Palfrey Road																
Lane 1	189	0	283	472	2.0	1274	0.370	100	9.3	LOS A	2.5	17.5	500	–	0.0	0.0
Approach	189	0	283	472	2.0		0.370		9.3	LOS A	2.5	17.5				
Intersection				1170	2.0		0.394		9.2	LOS A	2.7	19.0				

Level of Service (LOS) Method: Delay (HCM 2000).
Roundabout LOS Method: Same as Signalised Intersections.
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model used.

Processed: Thursday, 31 October 2013 2:38:38 PM
SIDRA INTERSECTION 5.1.13.2093
Project: C:\Cambray\STO0111\01R\Working\Sidra\13-10-29\William Palfrey-McLaughlin.sip
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LANE SUMMARY

William Palfrey Road / McLaughlin Street
Post Development - Full Buildout (North Parkhurst and Edenbrook)
PM Peak
Roundabout

Lane Use and Performance

	Demand Flows L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South: McLaughlin Street																
Lane 1	242	0	297	539	2.0	1257	0.429	100	9.8	LOS A	3.1	22.3	500	–	0.0	0.0
Approach	242	0	297	539	2.0		0.429		9.8	LOS A	3.1	22.3				
East: William Palfrey Road																
Lane 1	198	0	162	360	2.0	1224	0.294	100	9.1	LOS A	1.9	13.5	500	–	0.0	0.0
Approach	198	0	162	360	2.0		0.294		9.1	LOS A	1.9	13.5				
North West: William Palfrey Road																
Lane 1	108	0	162	270	2.0	1056	0.256	100	10.1	LOS B	1.5	11.0	500	–	0.0	0.0
Approach	108	0	162	270	2.0		0.256		10.1	LOS B	1.5	11.0				
Intersection				1169	2.0		0.429		9.7	LOS A	3.1	22.3				

Level of Service (LOS) Method: Delay (HCM 2000).
Roundabout LOS Method: Same as Signalised Intersections.
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model used.

Processed: Thursday, 31 October 2013 2:38:39 PM
SIDRA INTERSECTION 5.1.13.2093
Project: C:\Cambray\STO0111\01R\Working\Sidra\13-10-29\William Palfrey-McLaughlin.sip
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APPENDIX Q

SIDRA Results

Proposed Internal Signals

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LANE SUMMARY

Site: AM PEAK

Proposed Internal Signals
Post Development - Full Buildout (North Parkhurst and Edenbrook)
AM Peak
Signals - Fixed Time Cycle Time = 60 seconds (Optimum Cycle Time - Minimum Delay)

Lane Use and Performance

	Demand Flows L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South: William Palfrey																
Lane 1	50	0	328	378	2.0	635	0.596	100	28.4	LOS C	9.0	64.4	500	–	0.0	0.0
Lane 2	0	0	368	368	2.0	617	0.596	100	26.5	LOS C	9.2	65.5	100	Turn Bay	0.0	0.0
Approach	50	0	696	746	2.0		0.596		27.5	LOS C	9.2	65.5				
East: Arterial Access																
Lane 1	298	0	0	298	2.0	1481	0.201	100	8.6	LOS A	1.3	9.2	500	–	0.0	0.0
Lane 2	0	218	0	218	2.0	519	0.420	100	20.2	LOS C	5.4	38.7	500	–	0.0	0.0
Approach	298	218	0	516	2.0		0.420		13.5	LOS B	5.4	38.7				
West: Major Collector																
Lane 1	0	509	0	509	2.0	908	0.561	100	12.6	LOS B	10.9	77.6	500	–	0.0	0.0
Lane 2	0	0	50	50	2.0	185	0.270	100	37.1	LOS D	1.5	10.4	100	Turn Bay	0.0	0.0
Approach	0	509	50	559	2.0		0.561		14.8	LOS B	10.9	77.6				
Intersection				1821	2.0		0.596		19.6	LOS B	10.9	77.6				

Level of Service (LOS) Method: Delay (HCM 2000).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model used.

Processed: Thursday, 31 October 2013 2:41:53 PM
SIDRA INTERSECTION 5.1.13.2093
Project: C:\Cambray\STO0111\01R\Working\Sidra\13-10-29\Internal Signals.sip
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PHASING SUMMARY

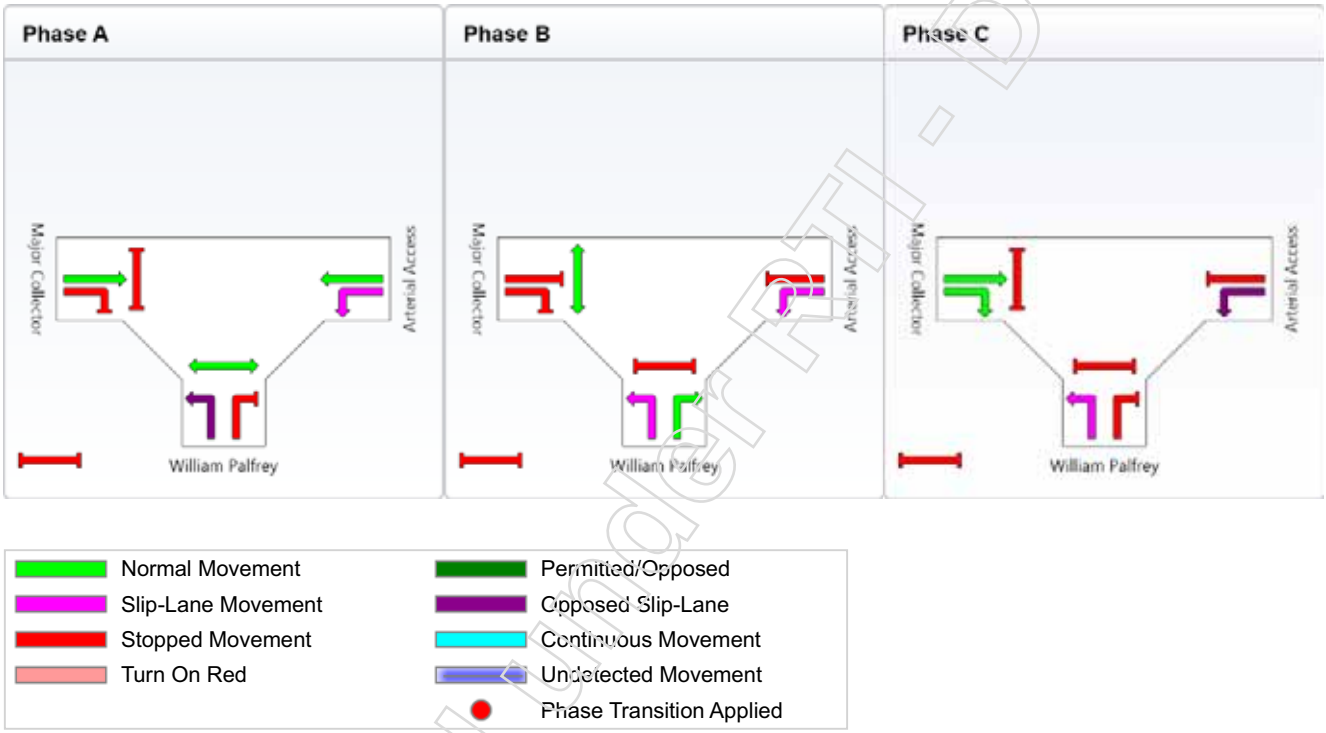
Site: AM PEAK

Proposed Internal Signals
Post Development - Full Buildout (North Parkhurst and Edenbrook)
AM Peak
Signals - Fixed Time Cycle Time = 60 seconds (Optimum Cycle Time - Minimum Delay)

Phase times determined by the program
Sequence: CAMBRAY
Input Sequence: A, B, C
Output Sequence: A, B, C

Phase Timing Results

Phase	A	B	C
Green Time (sec)	16	20	6
Yellow Time (sec)	4	4	4
All-Red Time (sec)	2	2	2
Phase Time (sec)	22	26	12
Phase Split	37 %	43 %	20 %



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LANE SUMMARY

Proposed Internal Signals
Post Development - Full Buildout (North Parkhurst and Edenbrook)
PM Peak
Signals - Fixed Time Cycle Time = 60 seconds (Optimum Cycle Time - Minimum Delay)

Lane Use and Performance

	Demand Flows L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South: William Palfrey																
Lane 1	50	0	181	231	2.0	526	0.438	100	29.9	LOS C	5.2	36.8	500	–	0.0	0.0
Lane 2	0	0	216	216	2.0	493	0.438	100	28.4	LOS C	5.4	38.7	100	Turn Bay	0.0	0.0
Approach	50	0	397	447	2.0		0.438		29.2	LOS C	5.4	38.7				
East: Arterial Access																
Lane 1	597	0	0	597	2.0	1481	0.403	100	8.8	LOS A	3.1	22.1	500	–	0.0	0.0
Lane 2	0	436	0	436	2.0	648	0.672	100	19.3	LOS B	11.4	81.2	500	–	0.0	0.0
Approach	597	436	0	1033	2.0		0.672		13.2	LOS B	11.4	81.2				
West: Major Collector																
Lane 1	0	291	0	291	2.0	1037	0.281	100	8.3	LOS A	4.7	33.4	500	–	0.0	0.0
Lane 2	0	0	50	50	2.0	185	0.270	100	37.1	LOS D	1.5	10.4	100	Turn Bay	0.0	0.0
Approach	0	291	50	341	2.0		0.281		12.5	LOS B	4.7	33.4				
Intersection				1821	2.0		0.672		17.0	LOS B	11.4	81.2				

Level of Service (LOS) Method: Delay (HCM 2000).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model used.

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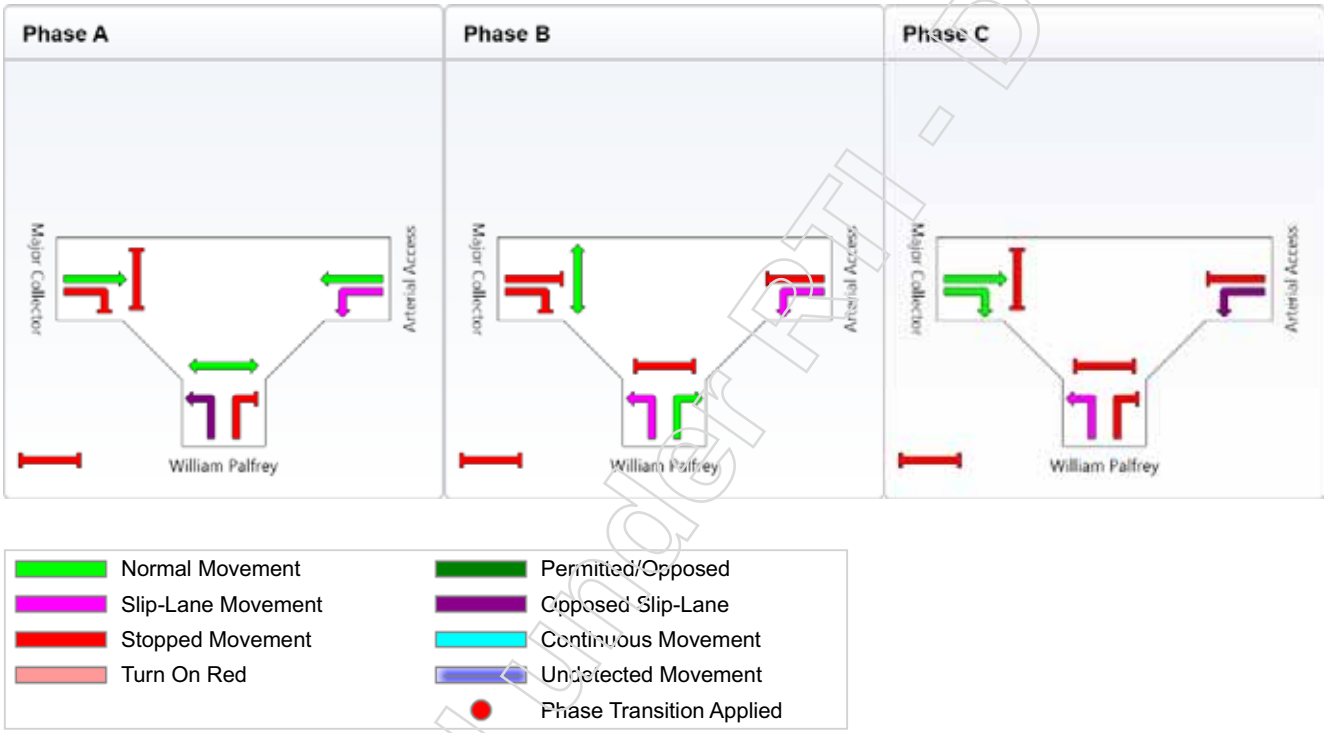
PHASING SUMMARY

Proposed Internal Signals
Post Development - Full Buildout (North Parkhurst and Edenbrook)
PM Peak
Signals - Fixed Time Cycle Time = 60 seconds (Optimum Cycle Time - Minimum Delay)

Phase times determined by the program
Sequence: CAMBRAY
Input Sequence: A, B, C
Output Sequence: A, B, C

Phase Timing Results

Phase	A	B	C
Green Time (sec)	20	16	6
Yellow Time (sec)	4	4	4
All-Red Time (sec)	2	2	2
Phase Time (sec)	26	22	12
Phase Split	43 %	37 %	20 %



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APPENDIX R

Count Data
Alexandra Street / Belmont Road / Birkbeck Drive
(Prepared by Austraffic)

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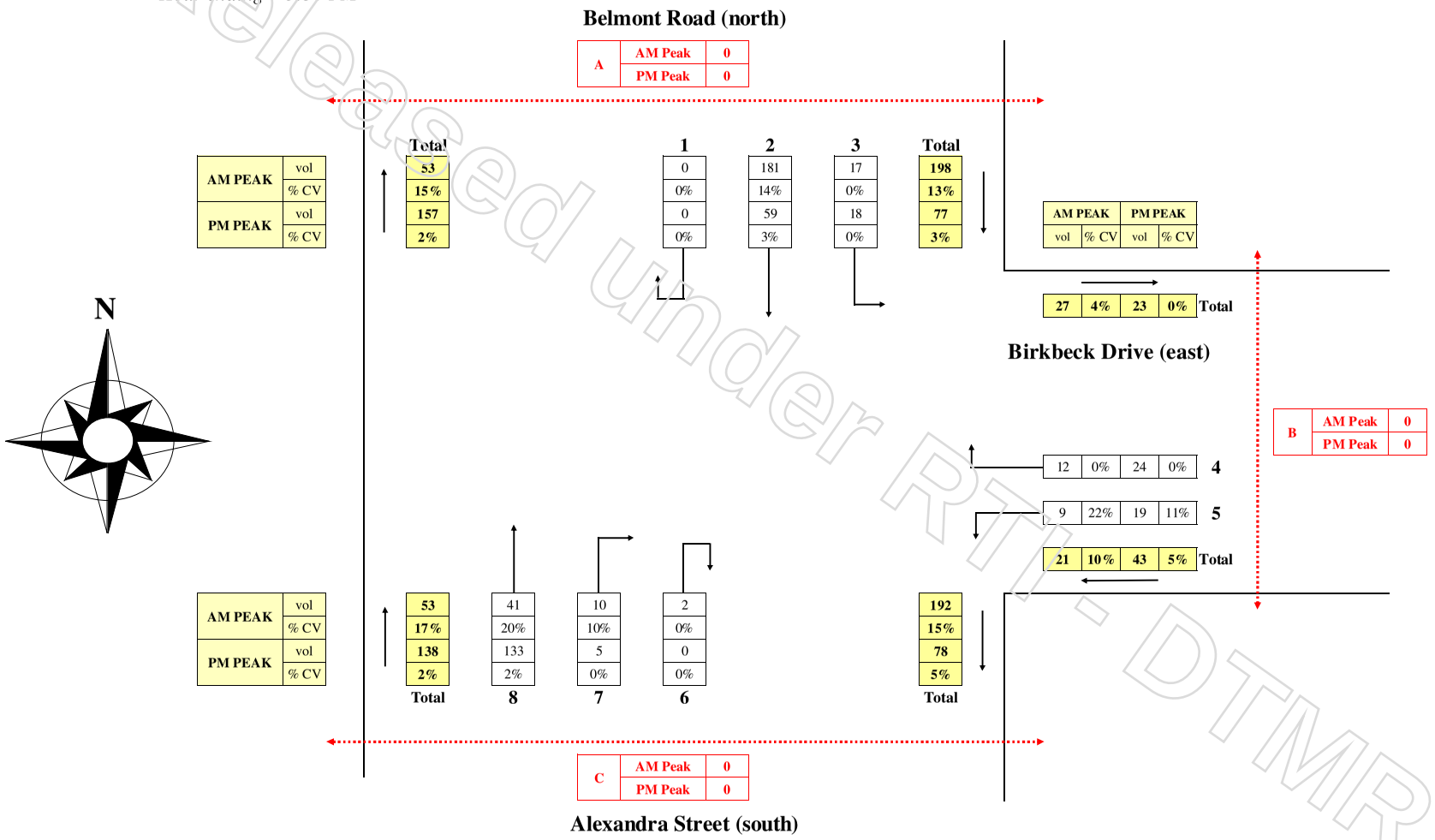
AUSTRAFFIC MANUAL INTERSECTION COUNT

Site No.: 1
Location: Alexandra Street/Belmont Road/Birkbeck Drive, Rockhampton
Day/Date: Tuesday 28 May 2013
Summary: AM Peak : *Hour ending - 8:30 AM*
PM Peak : *Hour ending - 5:30 PM*



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Legend
vol = total vehicle volume
% CV = percentage of commercial vehicles (trucks and buses)





APPENDIX S

SIDRA Results

Alexandra Street / Belmont Road / Birkbeck Drive

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LANE SUMMARY

Alexandra Street / Belmont Road / Birkbeck Drive
Post Development - Full Buildout (North Parkhurst and Edenbrook)
AM Peak
Giveway / Yield (Two-Way)

Lane Use and Performance

	Demand Flows L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South: Alexandra Street																
Lane 1	0	138	0	138	6.9	1867	0.074	100	0.0	LOS A	0.0	0.0	500	–	0.0	0.0
Lane 2	0	0	312	312	2.2	1828	0.171	100	8.5	LOS A	0.0	0.0	100	Turn Bay	0.0	0.0
Approach	0	138	312	450	3.7		0.171		5.9	NA	0.0	0.0				
East: Birkbeck Drive																
Lane 1	675	0	13	688	2.3	1778	0.387	100	13.1	LOS B	5.9	42.1	500	–	0.0	0.0
Approach	675	0	13	688	2.3		0.387		13.1	LOS B	5.9	42.1				
North: Belmont Road																
Lane 1	18	0	0	18	0.0	847	0.021	100	9.8	LOS A	0.1	0.5	50	Turn Bay	0.0	0.0
Lane 2	0	408	0	408	7.5	1860	0.220	100	7.2	LOS A	0.0	0.0	500	–	0.0	0.0
Approach	18	408	0	426	7.2		0.220		7.3	LOS A	0.1	0.5				
Intersection				1564	4.0		0.387		9.4	NA	5.9	42.1				

Level of Service (LOS) Method: Delay (HCM 2000).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road lanes.
SIDRA Standard Delay Model used.

Processed: Thursday, 31 October 2013 3:36:33 PM
SIDRA INTERSECTION 5.1.13.2093
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LANE SUMMARY

Alexandra Street / Belmont Road / Birkbeck Drive
Post Development - Full Buildout (North Parkhurst and Edenbrook)
PM Peak
Giveway / Yield (Two-Way)

Lane Use and Performance

	Demand Flows L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South: Alexandra Street																
Lane 1	0	327	0	327	2.3	1922	0.170	100	0.0	LOS A	0.0	0.0	500	–	0.0	0.0
Lane 2	0	0	608	608	2.0	1831	0.332	100	8.5	LOS A	0.0	0.0	100	Turn Bay	0.0	0.0
Approach	0	327	608	935	2.1		0.332		5.5	NA	0.0	0.0				
East: Birkbeck Drive																
Lane 1	421	0	25	446	2.2	1518	0.294	100	20.0	LOS C	5.7	40.5	500	–	0.0	0.0
Approach	421	0	25	446	2.2		0.294		20.0	LOS C	5.7	40.5				
North: Belmont Road																
Lane 1	19	0	0	19	0.0	546	0.035	100	12.6	LOS B	0.1	0.8	50	Turn Bay	0.0	0.0
Lane 2	0	187	0	187	2.8	1915	0.098	100	7.0	LOS A	0.0	0.0	500	–	0.0	0.0
Approach	19	187	0	206	2.6		0.098		7.5	LOS A	0.1	0.8				
Intersection				1588	2.2		0.332		9.9	NA	5.7	40.5				

Level of Service (LOS) Method: Delay (HCM 2000).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road lanes.
SIDRA Standard Delay Model used.

Processed: Thursday, 31 October 2013 3:36:34 PM
SIDRA INTERSECTION 5.1.13.2093
Project: C:\Cambray\STO0111\01R\Working\Sidra\13-10-29\Alexandra-Belmont-Birkbeck.sip
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In the Planning and Environment Court
Held at: Townsville

No 154 of 2014

Between:	**EDENBROOK LAND PTY LTD A.C.N 112 588 183**	Appellant
And:	**ROCKHAMPTON REGIONAL COUNCIL**	Respondent
And:	**STOCKLAND DEVELOPMENT PTY LTD A.C.N 000 064 835**	Co-Respondent
And:	**ERGON ENERGY CORPORATION LIMITED A.C.N 087 646 062**	First Co-Respondent by Election
And:	**CHIEF EXECUTIVE ADMINISTERING THE TRANSPORT INFRASTRUCTURE ACT 1994 AND THE TRANSPORT PLANNING AND COORDINATION ACT 1994**	Second Co-Respondent by Election

Judgment

Before His Honour Judge Durward SC

Date of Hearing: 30/04/2015
Date of Order: 30/04/2015

THIS MATTER HAVING been heard in the Planning and Environment Court on 30 April 2015 by way of an appeal against the decision by the Respondent to issue a preliminary approval to the Co-Respondent's application for a material change of use for a master planned community and a development permit for reconfiguring a lot (five lots into 127 lots, public use and balance lots) ("the Development Application") with respect to land located at 23-27 William Palfrey Road, 23A William Palfrey Road, 923-947 Yaamba Road and 985-1005 Yaamba Road, Parkhurst;

AND UPON HEARING the solicitors for the Appellant, Respondent, Co-Respondent, First Co-Respondent by Election and Second Co-Respondent by Election;

AND UPON READING the Notice of Appeal filed herein on 23 April 2014, the Application in Pending Proceeding filed by the Appellant on 20 March 2014 and the Application in Pending Proceeding filed by the Co-Respondent on 17 April 2015;

IT IS ADJUDGED THAT:

Clayton Utz, Lawyers
Level 28, Riparian Plaza, 71 Eagle Street, Brisbane Qld 4001
Phone no. 07 3292 7000
Fax no. 07 3221 9669
Email NR @claytonutz.com

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1. The appeal be allowed on the limited basis that the Co-Respondent is no longer proceeding with the Development Application;

2. The Application in Pending Proceeding filed by the Appellant on 20 March 2014, is dismissed;

3. The Application in Pending Proceeding filed by the Co-Respondent on 17 April 2015, is dismissed; and

4. Each party bears its owns costs of the appeal.

Filed on

Filed by: Clayton Utz
Service Address: Level 28
71 Eagle Street
Brisbane Qld 4000
Telephone: (07) 3232 7000
Facsimile: (07) 3221 9669
Email NR @claytonutz.com

DEPUTY Registra NR .....

THE PLANNING AND ENVIRONMENT COURT TOWNSVILLE

THE PLANNING AND ENVIRONMENT COURT TOWNSVILLE

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Queensland Government

Briefing N[redacted]

[redacted] 5/3/13

Discussed with Minister at Post-Cab. Minister supports level crossing based on proceeding advice that replaces existing crossing and is assessed at medium risk.

Our ref
Your ref
Date 1 March 2013

To Mark Cridland
Deputy Director General
Policy Planning and Investment

Copy to Ryan Huelin
General Manager
Policy and Planning

[redacted]

Subject **New Rail Level Crossing at Parkhurst North Rockhampton for Stocklands residential development**

Background

- Stocklands Development proposes to develop 278 hectare Greenfield site for a Master Planned Community located at Parkhurst 10km north of Rockhampton on William Palfrey Road. The development will comprise 2,000 to 2,500 residential allotments and include low density residential, local community retail facilities, open space, neighbourhood centre and potentially a school.
- Residential lot sizes are proposed to be 450m2-800m2 developed over 15 to 20 year time period.
- The project was endorsed as major project by Department of State Development Infrastructure Planning (DSDIP) Industry Support Unit (ISU) in November 2012, due to complexities of access over the railway line. DSDIP's role is to facilitate State agency requirements with Stockland in preparation for the development application expected to be lodged with Council March 2013.
- Rockhampton City Council has within the Rockhampton Planning Scheme and North Parkhurst Planning Area zoned the site as 'Future Residential' and within their Parkhurst and Yeppoon Road Corridor Study identified an urban arterial across the railway to connect with the Bruce Highway and Olive Street.

Department of Transport and Main Roads
Development Leadership
Development Facilitation
Level 12, Terrica Placer, 140 Creek Street

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- Stocklands and DSDIP have indicated that Council are encouraging development in Parkhurst and North Rockhampton due to its flood immunity and demand for housing from mining and resources sectors.
- The site is adjacent to the North Cost Railway and Bruce Highway, both located on the eastern side of the site.

Existing Rail Level Crossing

- A local 2-lane rural road traverses the existing William Palfrey Road rail level crossing, controlled by flashing lights and vehicle warning signage. The local road connects to the Bruce Highway via a low grade 3-way intersection.
- In March 2002 an audit of William Palfrey Road level crossing (crossing ID 5412) by Queensland Rail (QR) using their Risk Scoring Matrix available at that time showed traffic volumes at 100 vehicles per day. The audit deemed the existing controls of flashing lights to be adequate for the volume of traffic. Some minor issues were noted including the repair of bitumen surface and absence of advance warning signage.
- In 2004 the Risk Scoring Matrix was improved and developed into the Australian Level Crossing Assessment Model (ALCAM).
- An audit by QR in February 2007 noted that the crossing surface and road approaches had been repaired and resealed and road markings and advance warning signage had been installed. It was noted that Incident Reporting signage was required and subsequently installed in October 2010.
- Between 1 January 2007 and 7 December 2012 there were 2 incidents reported at the William Palfrey Road crossing with a train running over a wheelie bin and a near miss of a person running in front of the train across the level crossing.

Previous Meetings with Stockland

- Prior to the projects nomination through DSDIP, Stockland met with TMR and QR on a number of occasions over the last 12-18 months. TMR and QR advised that department's position is for no new level crossings due to rail safety concerns and that grade separation would be required to mitigate the risks associated with a rail level crossing.
- Stockland subsequently assessed the merits of grade separation at a location north-east of the subject site (south of Ramsey Creek) on privately held land. The site was chosen to accommodate the engineering requirements of the bridge structure over the railway line to provide at-grade access to the Bruce Highway. Stockland advised that build costs in excess of $20M for the bridge would make the development economically unviable where development yield could not return full cost recovery.
- Stockland indicated a willingness to contribute to a proportion of the cost for a grade separated access however there is currently no planning or funds within either the State or Local government planning projects for this infrastructure.

Access Options Assessment

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- Stocklands provided a 'Traffic Report (Access Options) dated 16 November 2012 by Cambray Consulting' that analysed four options for accessing the site. The preferred option is for a 4-lane roadway to an at-grade rail crossing at Olive Street connecting to a 4-way intersection with Bruce Highway. The option aligns with Councils strategic corridor planning for an urban arterial at this location.
- Stocklands indicated that without their development, the existing William Palfrey Road rail crossing will experience some traffic growth from the Edenbrook development to the west of the site approved for 750 lots. The department was not a referral agency to this approved development therefore could not condition an upgrade of the crossing.
- To overcome the Government's position of 'no new level crossings' Stockland propose to relocate the William Palfrey Road (approx 700m north) to a new location at Olive Street. The William Palfrey Road crossing would initially be used for Stage 1 comprising 300 lots or 3,000 vehicles per day to enable immediate access to the site and then bring the ultimate Olive Street option online to accommodate 18,000 vehicles per day, as subsequent stages are developed. Olive Street will also serve as an urban arterial to the Edenbrook development.

Rockhampton Ring Road

- The Rockhampton Ring Road was a recommendation from the Fitzroy River Floodplain and Road Planning Study and is included in the Bruce Highway Upgrade Strategy (Project No 23). The proposed corridor traverses south of the site and along the eastern boundary across the railway. This project is at early concept planning stage.

Queensland Level Crossing Strategy

- The Queensland Government released the 'Queensland Level Crossing Safety Strategy 2012-13' detailing a 10-year strategy to improve road and rail safety for Queensland.
- Of the 12 key strategy areas to improve level crossing safety, key area number 9 is relevant to this development as it seeks to
  - 'eliminate level crossings where appropriate'. It further states 'the need to explore opportunities for grade separation or closing level crossing and seek to minimise any proposals to construct a public level crossing on a greenfield site, with a clear objective to add no further open level crossings to the network'.
- Stockland responded to the Level Crossing Strategy by;
  - determining that grade separation would be cost prohibitive for the development and full cost recovery could not be realised from this development, and
  - the proposed Olive Street rail crossing will be a relocated and upgraded from the existing William Palfrey Road crossing location.

ALCAM Assessment

- QR carried out an ALCAM assessment February 2013 of the existing and proposed William Palfrey Road rail crossing and the proposed ultimate rail crossing at Olive Street. An ALCAM risk score in the Low Risk Band range is considered acceptable to QR. A summary of the results are

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- William Palfrey Road ALCAM assessed three scenarios for the crossing. The first two scenarios resulted in a Medium Risk score while the third resulted in Low Risk score.

    i. The first scenario assessed the existing crossing arrangement of flashing lights and signage with no development traffic resulting in a Medium Risk Band score.

    ii. The second scenario assessed the proposed Stage 1 works for 300 lots or 3,000 vehicles per day with no improvement to the rail crossing controls resulting in a Medium Risk Band score.

    iii. The third scenario assessed the proposed Stage 1 works with upgrades to the existing crossing controls to include boom gates that resulted in Low Risk Band score.

- Olive Street ALCAM assessed two potential scenarios for the ultimate crossing. Model inputs included the ultimate design solution flashing lights and boom gates that could accommodate a 4-lane urban arterial plus 2 cycle lanes, coordination with signals at Bruce Highway, traffic volumes of 18,000 vehicles per day and heavy vehicles up to 19m in length. Possible future increased train volumes and train lengths of 1500m were not included in the modelling.

    i. The first scenario assessed the ultimate crossing arrangement for a non-bus route, as buses introduce a significant increase to incident/ consequence exposure. The results demonstrated a Medium Risk Band score.

    ii. The second scenario assessed the ultimate crossing arrangement with a bus route. This showed a 400% increase in the incident/ consequence exposure resulting in a Medium Risk Band score.

Examples of Similar Cases

- Stocklands Northshore development Townsville is a 15,000 residential / mixed use scheme with an upgraded rail level crossing containing signals and boom gates for a 4-lane roadway coordinated with a signalised intersection to the Bruce Highway. QR has no record of an ALCAM assessment being done for this crossing to determine the risk levels at the time of the DA. However, QR records show that since the upgraded crossing was installed in early 2008 there have been two reported incidences on the crossing including boom gates that descended on a commercial vehicle and a truck damaging the boom gates causing the train to collide with damaged gates. An infrastructure agreement dated 25 September 2006 was agreed to with the former Main Roads department primarily agreeing to road works with some minor reference to potential grade separation.
- Pregno development Edmonton a large scale mixed use development proposal requiring access over the rail at Thomson Road and Swallow Road. It was initially refused on grounds the proponent did not asses the risks of the railway crossings. As part of the appeal process TMR and Pregno negotiated an infrastructure agreement that required the proponent to construct a cyclone proof signalised railway crossing across six lanes at Swallow Road along with intersection works to Bruce Highway. Thomson Road crossing had recently been upgraded by QR with full crossing controls. The agreement was signed off as part of a Ministerial brief MBN16513 dated 21 January 2013.

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Comment

- Rockhampton Regional Council within the Rockhampton Planning Scheme has zoned the site for future residential and within the local Road Corridor Study identifying the Olive Street road connection as an urban arterial The subject site and surrounding areas of North Rockhampton has a high level of flood immunity that can comfortably accommodate future development.
- The department has undertaken concept planning for Bruce Highway upgrades adjacent to the site and preliminary concept planning for the Rockhampton Ring Road. However no funding or approvals have been provided for detailed planning and design of these projects. There is also no planning or funding from Local or State government for grade separation in this area.
- The 'Queensland Level Crossing Safety Strategy 2012-13' details a 10-year strategy to improve road and rail safety for Queensland. The intent within key strategy area no.9 is 'to minimise any proposals to construct a public level crossing on a Greenfield site'. Stockland responded to this by relocating and upgrading an existing rail crossing at this location.
- The ALCAM assessment by QR determined the risk profile of the proposed Olive Street crossing to be in the Medium Risk Band. The assessment adopted a range of mitigation treatments and controls to reduce the risk and exposure for the scale of development proposed. The assessment was carried out in consultation with the Stockland through a course of meetings and workshops.

Options for Consideration

- The options available to respond to Stockland Development are

  Option 1 - Condition the development to provide grade separated access

  - The department condition the development to provide a grade separated access at full cost, estimated by Stockland to be in excess of $20M, over the railway line to mitigate the risks associated with level crossings. The developer would be responsible for locating, designing and constructing the bridge structure to connect with the Bruce Highway. Approving the development accepts the responsibility of Low (ALCAM risk score) risk and exposure for crossing the railway. The risk to the department is an appeal challenging the conditions that could be agreed to or overturned by the courts. Through the appeal there is a financial risk the department may be responsible for funding or contributing towards this infrastructure. This option may be seen as gold plating the development while attempting to uphold the intent of rail level crossing strategy.

  Option 2 – Condition the development to provide an at-grade rail level crossing at Olive Street for the ultimate development

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- The department condition the development to upgrade at full cost to the developer the William Palfrey Road rail crossing with boom gates and road improvement works to enable Stage 1 to occur for 300 lots and condition the relocation and upgrade of this crossing post-300 lots to Olive Street at full cost to the developer. The highest level of rail level crossing controls would be required in accordance with QR standards including flashing lights, boom gates and coordination with signals to Bruce Highway. The crossing would accommodate 4-lanes plus 2 cycle lanes roadway, 18,000 vehicles per day plus passenger and school buses, pedestrians and cyclists. Approving the development accepts the responsibility of Medium (ALCAM risk score) risk and exposure at the rail level crossings to enable the growth and development of this regional area.

Option 3 - Refuse the development on grounds of railway safety

- The department refuse the development based on railway safety of the existing William Palfrey Road and proposed Olive Street level crossing. Refusing the development accepts the responsibility of Low (ALCAM risk score) risk and exposure to the crossings. However, the department may be subject to an appeal through the courts challenging this decision that could be agreed to or overturned by the courts. Through the appeal process there is potential the department may be responsible for funding or contributing to the upgrade of these crossings. The department may also be seen to be impeding this and any future development of the area to uphold the intent of the rail level crossing strategy.

Recommendation

- Of the 3 options identified the options 1 & 2 would enable the development to proceed. Key considerations have been identified under these two options.
- Option 1 considerations
  - Is consistent with the message the department and QR have been providing to Stockland over the past 12-18 months and is in line with the 'Queensland Level Crossing Strategy'.
  - This decision carries a Low Level of risk for railway crossing safety and is the most comfortable option based on; the government's policy, the information provided to date of the development and technical results from the ALCAM assessment.
  - Grade separation has been explored and determined to work for this site, however the cost of the infrastructure is too significant for the developer to achieve full cost recovery and the State has no funds to construct. The developer has indicated a willingness to contribute to the infrastructure.
  - The potential location of the grade separation north of the subject site is some distance from the departments strategic planning for the Rockhampton Ring Road where a railway crossing maybe required south of the site, although the type of crossing (at-grade/grade separated) has not been identified
- Option 2 considerations
  - This option challenges the intent of the 'Queensland Level Crossing Strategy' in that a rail level crossing would not be eliminated as part of this greenfield development.

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- QRs ALCAM assessment demonstrated, despite taking into account all available mitigation strategies and techniques, a risk score in the Medium Risk range. QR requires a risk score in the Low Risk range.
- This decision means the department will carry the responsibility and risk for railway level crossing safety in the Medium Risk band range, for a 4-lane roadway plus 2-cycle lanes to carry 18,000 vehicles, passenger and school buses, and cyclists / pedestrians.
- The types of mitigation strategies and techniques considered within ALCAM included ; flashing lights, boom gates, road / pavement treatment, signalised coordination with traffic lights on Bruce Highway. These were not enough to bring the risk range down to the Low Risk band.
- This option aligns with Council's planning scheme and strategic corridor planning for the area that unlocks the development potential of this site.
- It is considered this option sits outside of the policy position of the 'Queensland Level Crossing Strategy' that the Minister is accountable for.

Darren McDonald
Principal Planner

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QueenslandRail

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NR @qr.com.au
www.queenslandrail.com.au

28 August 2013

Stockland Development Division
Attention: Not Relevant
PO Box 10160
BRISBANE QLD 4000

RE: OLIVE STREET, PARKHURST CROSSING PROPOSAL
IN-PRINCIPLE APPROVAL
PARKHURST MASTERPLANNED COMMUNITY

Dear Not Relevant

We wish to confirm that Queensland Rail Limited (Queensland Rail) provide their in-principle approval for the rail crossing at the proposed Olive Street Intersection, and the temporary construction use (and removal) of the existing William Palfrey Street intersection as conceptually detailed in *Brown Consulting's* plans described as *Interim Scenario:* ***N12081 – SK11 Rev C*** and *Ultimate Scenario:* ***N12081-SK10 Rev C.***

It must also be confirmed that this in-principle approval is provided subject to the previously advised conditions noted in correspondence provided by Queensland Rail on 13th April 2013 and the detailed design of both crossings.

Should you have any questions, please feel free to contact me on 3072 1229 or via email, NR @qr.com.au.

Kind Regards

NR

Senior Property Planner
Queensland Rail

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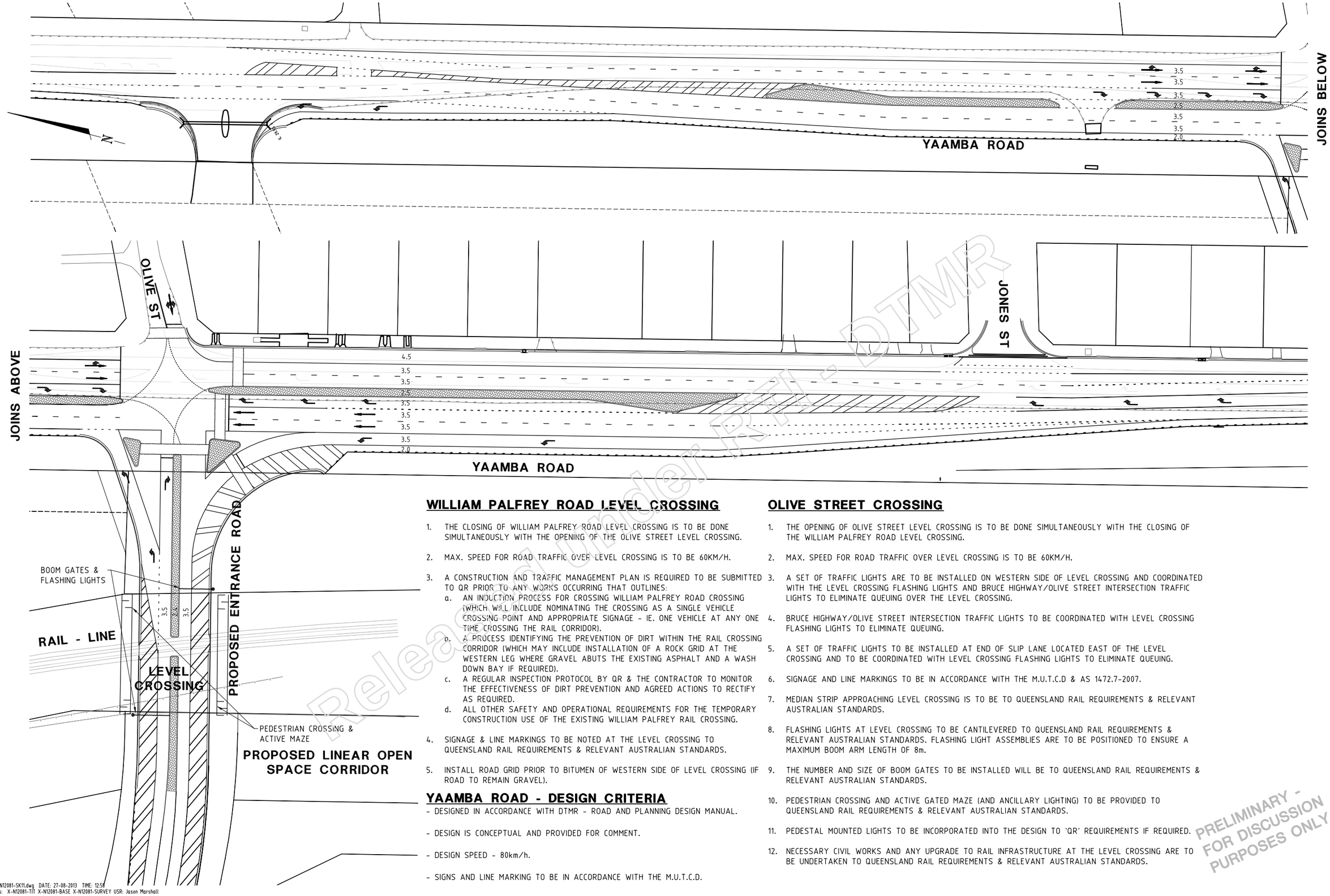

WILLIAM PALFREY ROAD LEVEL CROSSING

1. THE CLOSING OF WILLIAM PALFREY ROAD LEVEL CROSSING IS TO BE DONE SIMULTANEOUSLY WITH THE OPENING OF THE OLIVE STREET LEVEL CROSSING.
2. MAX. SPEED FOR ROAD TRAFFIC OVER LEVEL CROSSING IS TO BE 60KM/H.
3. A CONSTRUCTION AND TRAFFIC MANAGEMENT PLAN IS REQUIRED TO BE SUBMITTED TO QR PRIOR TO ANY WORKS OCCURRING THAT OUTLINES:
   a. AN INDUCTION PROCESS FOR CROSSING WILLIAM PALFREY ROAD CROSSING (WHICH WILL INCLUDE NOMINATING THE CROSSING AS A SINGLE VEHICLE CROSSING POINT AND APPROPRIATE SIGNAGE - IE. ONE VEHICLE AT ANY ONE TIME CROSSING THE RAIL CORRIDOR).
   b. A PROCESS IDENTIFYING THE PREVENTION OF DIRT WITHIN THE RAIL CROSSING CORRIDOR (WHICH MAY INCLUDE INSTALLATION OF A ROCK GRID AT THE WESTERN LEG WHERE GRAVEL ABUTS THE EXISTING ASPHALT AND A WASH DOWN BAY IF REQUIRED).
   c. A REGULAR INSPECTION PROTOCOL BY QR & THE CONTRACTOR TO MONITOR THE EFFECTIVENESS OF DIRT PREVENTION AND AGREED ACTIONS TO RECTIFY AS REQUIRED.
   d. ALL OTHER SAFETY AND OPERATIONAL REQUIREMENTS FOR THE TEMPORARY CONSTRUCTION USE OF THE EXISTING WILLIAM PALFREY RAIL CROSSING.
4. SIGNAGE & LINE MARKINGS TO BE NOTED AT THE LEVEL CROSSING TO QUEENSLAND RAIL REQUIREMENTS & RELEVANT AUSTRALIAN STANDARDS.
5. INSTALL ROAD GRID PRIOR TO BITUMEN OF WESTERN SIDE OF LEVEL CROSSING (IF ROAD TO REMAIN GRAVEL).

YAAMBA ROAD - DESIGN CRITERIA

- DESIGNED IN ACCORDANCE WITH DTMR - ROAD AND PLANNING DESIGN MANUAL.
- DESIGN IS CONCEPTUAL AND PROVIDED FOR COMMENT.
- DESIGN SPEED - 80km/h.
- SIGNS AND LINE MARKING TO BE IN ACCORDANCE WITH THE M.U.T.C.D.

OLIVE STREET CROSSING

1. THE OPENING OF OLIVE STREET LEVEL CROSSING IS TO BE DONE SIMULTANEOUSLY WITH THE CLOSING OF THE WILLIAM PALFREY ROAD LEVEL CROSSING.
2. MAX. SPEED FOR ROAD TRAFFIC OVER LEVEL CROSSING IS TO BE 60KM/H.
3. A SET OF TRAFFIC LIGHTS ARE TO BE INSTALLED ON WESTERN SIDE OF LEVEL CROSSING AND COORDINATED WITH THE LEVEL CROSSING FLASHING LIGHTS AND BRUCE HIGHWAY/OLIVE STREET INTERSECTION TRAFFIC LIGHTS TO ELIMINATE QUEUING OVER THE LEVEL CROSSING.
4. BRUCE HIGHWAY/OLIVE STREET INTERSECTION TRAFFIC LIGHTS TO BE COORDINATED WITH LEVEL CROSSING FLASHING LIGHTS TO ELIMINATE QUEUING.
5. A SET OF TRAFFIC LIGHTS TO BE INSTALLED AT END OF SLIP LANE LOCATED EAST OF THE LEVEL CROSSING AND TO BE COORDINATED WITH LEVEL CROSSING FLASHING LIGHTS TO ELIMINATE QUEUING.
6. SIGNAGE AND LINE MARKINGS TO BE IN ACCORDANCE WITH THE M.U.T.C.D & AS 1472.7-2007.
7. MEDIAN STRIP APPROACHING LEVEL CROSSING IS TO BE TO QUEENSLAND RAIL REQUIREMENTS & RELEVANT AUSTRALIAN STANDARDS.
8. FLASHING LIGHTS AT LEVEL CROSSING TO BE CANTILEVERED TO QUEENSLAND RAIL REQUIREMENTS & RELEVANT AUSTRALIAN STANDARDS. FLASHING LIGHT ASSEMBLIES ARE TO BE POSITIONED TO ENSURE A MAXIMUM BOOM ARM LENGTH OF 8m.
9. THE NUMBER AND SIZE OF BOOM GATES TO BE INSTALLED WILL BE TO QUEENSLAND RAIL REQUIREMENTS & RELEVANT AUSTRALIAN STANDARDS.
10. PEDESTRIAN CROSSING AND ACTIVE GATED MAZE (AND ANCILLARY LIGHTING) TO BE PROVIDED TO QUEENSLAND RAIL REQUIREMENTS & RELEVANT AUSTRALIAN STANDARDS.
11. PEDESTAL MOUNTED LIGHTS TO BE INCORPORATED INTO THE DESIGN TO 'QR' REQUIREMENTS IF REQUIRED.
12. NECESSARY CIVIL WORKS AND ANY UPGRADE TO RAIL INFRASTRUCTURE AT THE LEVEL CROSSING ARE TO BE UNDERTAKEN TO QUEENSLAND RAIL REQUIREMENTS & RELEVANT AUSTRALIAN STANDARDS.

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PRELIMINARY - FOR DISCUSSION PURPOSES ONLY

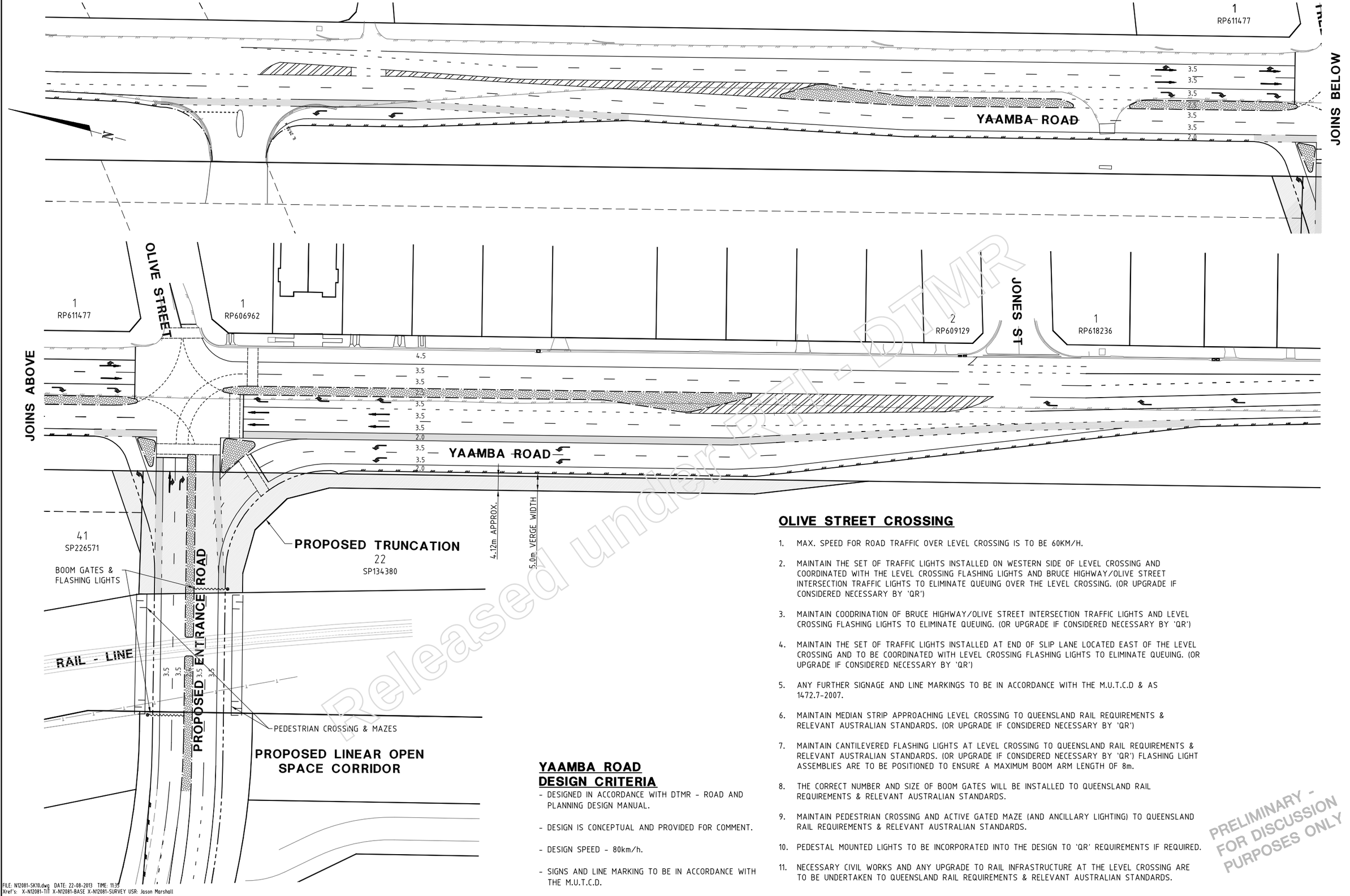
FILE: N12081-SK11.dwg DATE: 27-08-2013 TIME: 12:58
Xref's: X-N12081-TIT X-N12081-BASE X-N12081-SURVEY USR: Jason Marshall

AMENDMENTS	FIRST ISSUE	CALCS	DRAWN	DATE	AMENDMENT DETAILS
	A	JM	JM	26.7.13	NOTES REVISED PER QR'S REQUEST
	B	JM	JM	6.8.13	NOTE 3 REVISED, LINEAR OPEN SPACE CORRIDOR SHOWN
	C	JM	JM	27.8.13	GEOMETRY REVISED TO SUIT FUTURE ULTIMATE DESIGN
	D				
	E				
	F				

DESIGN CHECK
DRAWN CHECK
SCALE (METRES) 1:500 1:1000 10 5 0 10 20 A1 A3
MICROFILM No.
PROJECT No. N12081
CLIENT STOCKLAND PTY LTD
PROJECT PARKHURST DEVELOPMENT APPLICATION
APPROVED NR
FOR & ON BEHALF OF BROWN CONSULTING (QLD) PTY LTD

BROWN Smart Consulting
CONSULT AUSTRALIA
Brown Consulting (QLD) Pty Ltd
Level 3, 16 Innovation Parkway, Birtinya QLD Australia 4575
Telephone 07 5470 9260 Facsimile 07 5470 9262
Brisbane Canberra Melbourne Sydney Singapore Sunshine Coast
Quality Endorsed Company ISO 9001 Lic-4084

DRAWING TITLE: YAAMBA ROAD INTERSECTION INTERIM DESIGN GEOMETRY
DRAWING NUMBER: N12081-SK11
ISSUE: C



YAAMBA ROAD DESIGN CRITERIA

- DESIGNED IN ACCORDANCE WITH DTMR - ROAD AND PLANNING DESIGN MANUAL.
- DESIGN IS CONCEPTUAL AND PROVIDED FOR COMMENT.
- DESIGN SPEED - 80km/h.
- SIGNS AND LINE MARKING TO BE IN ACCORDANCE WITH THE M.U.T.C.D.

OLIVE STREET CROSSING

1. MAX. SPEED FOR ROAD TRAFFIC OVER LEVEL CROSSING IS TO BE 60KM/H.
2. MAINTAIN THE SET OF TRAFFIC LIGHTS INSTALLED ON WESTERN SIDE OF LEVEL CROSSING AND COORDINATED WITH THE LEVEL CROSSING FLASHING LIGHTS AND BRUCE HIGHWAY/OLIVE STREET INTERSECTION TRAFFIC LIGHTS TO ELIMINATE QUEUING OVER THE LEVEL CROSSING. (OR UPGRADE IF CONSIDERED NECESSARY BY 'QR')
3. MAINTAIN COODRINATION OF BRUCE HIGHWAY/OLIVE STREET INTERSECTION TRAFFIC LIGHTS AND LEVEL CROSSING FLASHING LIGHTS TO ELIMINATE QUEUING. (OR UPGRADE IF CONSIDERED NECESSARY BY 'QR')
4. MAINTAIN THE SET OF TRAFFIC LIGHTS INSTALLED AT END OF SLIP LANE LOCATED EAST OF THE LEVEL CROSSING AND TO BE COORDINATED WITH LEVEL CROSSING FLASHING LIGHTS TO ELIMINATE QUEUING. (OR UPGRADE IF CONSIDERED NECESSARY BY 'QR')
5. ANY FURTHER SIGNAGE AND LINE MARKINGS TO BE IN ACCORDANCE WITH THE M.U.T.C.D & AS 1472.7-2007.
6. MAINTAIN MEDIAN STRIP APPROACHING LEVEL CROSSING TO QUEENSLAND RAIL REQUIREMENTS & RELEVANT AUSTRALIAN STANDARDS. (OR UPGRADE IF CONSIDERED NECESSARY BY 'QR')
7. MAINTAIN CANTILEVERED FLASHING LIGHTS AT LEVEL CROSSING TO QUEENSLAND RAIL REQUIREMENTS & RELEVANT AUSTRALIAN STANDARDS. (OR UPGRADE IF CONSIDERED NECESSARY BY 'QR') FLASHING LIGHT ASSEMBLIES ARE TO BE POSITIONED TO ENSURE A MAXIMUM BOOM ARM LENGTH OF 8m.
8. THE CORRECT NUMBER AND SIZE OF BOOM GATES WILL BE INSTALLED TO QUEENSLAND RAIL REQUIREMENTS & RELEVANT AUSTRALIAN STANDARDS.
9. MAINTAIN PEDESTRIAN CROSSING AND ACTIVE GATED MAZE (AND ANCILLARY LIGHTING) TO QUEENSLAND RAIL REQUIREMENTS & RELEVANT AUSTRALIAN STANDARDS.
10. PEDESTAL MOUNTED LIGHTS TO BE INCORPORATED INTO THE DESIGN TO 'QR' REQUIREMENTS IF REQUIRED.
11. NECESSARY CIVIL WORKS AND ANY UPGRADE TO RAIL INFRASTRUCTURE AT THE LEVEL CROSSING ARE TO BE UNDERTAKEN TO QUEENSLAND RAIL REQUIREMENTS & RELEVANT AUSTRALIAN STANDARDS.

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FILE: N12081-SK10.dwg DATE: 22-08-2013 TIME: 11:35
Xref's: X-N12081-TIT X-N12081-BASE X-N12081-SURVEY USR: Jason Marshall

	FIRST ISSUE	CALCS	DRAWN	DATE	AMENDMENT DETAILS
AMENDMENTS	A	JM	JM	18.3.13	
	B	JM	JM	26.7.13	NOTES REVISED PER QR'S REQUEST
	C	JM	JM	6.8.13	LINEAR OPEN SPACE CORRIDOR SHOWN
	D	JM	JM	22.8.13	PROPOSED TRUNCATION ADDED
	E				
	F				

DESIGN CHECK
DRAWN CHECK
SCALE (METRES) 1:500 10 5 0 10 20 A1; 1:1000 A3
MICROFILM No.
PROJECT No. N12081
APPROVED NR
FOR & ON BEHALF OF BROWN CONSULTING (QLD) PTY LTD
CLIENT STOCKLAND PTY LTD
PROJECT PARKHURST DEVELOPMENT APPLICATION
BROWN Smart Consulting
CONSULT AUSTRALIA
Brown Consulting (QLD) Pty Ltd
Level 3, 16 Innovation Parkway, Birtinya QLD Australia 4575
Telephone 07 5470 9260 Facsimile 07 5470 9262
Brisbane Canberra Melbourne Sydney Singapore Sunshine Coast
Quality Endorsed Company ISO 9001 Lic 4084
DRAWING TITLE YAAMBA ROAD INTERSECTION ULTIMATE DESIGN GEOMETRY
DRAWING NUMBER N12081-SK10
ISSUE C



4.0 Proposed Masterplan

As detailed in Section 3 of this report, the proposed development site has been identified for several years as an area for future residential development growth, by both Council and Main Roads. Stockland plans to develop the subject site as a master planned residential community, generally consistent with the future planning intents of both Council and TMR.

The application seeks preliminary approval to ultimately create a 2,000+ lot residential and mixed use development aimed at providing a benchmark for master planned communities within Rockhampton. For the purpose of the traffic assessment we have assumed a maximum development yield equivalent to 2,350 detached residential dwellings. The plan of development for the proposed master planned community prepared by RPS can be seen in **Appendix E**.

4.1 Access Strategy

The development will be serviced by two (2) major access points:

- the principal access will be via the Bruce Highway at the existing Olive Street intersection; and
- the secondary access will be via the Alexandra Street / McLaughlin Street corridor.

Consistent with the transport planning intent of both Council and TMR, the masterplan makes allowance for a future Urban Arterial Road which would provide connectivity between the Bruce Highway and the existing/planned residential catchments to the west (e.g. Edenbrook). This Urban Arterial Road is proposed to connect to the Bruce Highway at Olive Street, creating a fourth western leg of a new signalised intersection which would also incorporate an at-grade crossing of the adjacent North Coast rail line.

The rail crossing would essentially be a relocation of the existing rail crossing on William Palfrey Road, which would ultimately be closed as part of the planned residential development. This would also include re-diverting the traffic that currently utilises the existing at grade crossing to the new crossing and providing an alternative connection for this traffic to William Palfrey Road.

This access strategy is consistent with both TMR's planning intent for the Bruce Highway corridor and the local government road network identified in Council planning studies. In addition it is understood that as part of the construction of the initial stage of the development access for the construction vehicles will be sought via William Palfrey Road, utilising both the current rail crossing and intersection with the Bruce Highway.

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4.2 Rail Crossing

The proposed development site is bounded by the North Coast Rail Line along its eastern edge. Queensland Rail identifies the North Coast Line as *"the principle freight and passenger line within the Queensland Rail network, running the length of coastal Queensland between Brisbane in the south and Cairns in the north".*

The relevant section of the North Coast Line runs parallel to the Bruce Highway throughout the Parkhurst corridor and is primarily used by containerised freight services, high speed tilt trains, single commodity trains and cattle trains. The line also travels throughout the city of Rockhampton and has several at grade crossings with various levels of treatment (lights, boom gates etc.) at the interface with both Council and state controlled roads, as shown in **Figure 4.2a** below.

NORTH COAST LINE

403	639.342	Stanley Street	Public Level	Signs	X S	Open	LGA
403	639.574	Derby Street	Public Level	Signs	X S	Open	LGA
403	639.805	William Street	Public Level	Signs	X S	Open	LGA
403	640.040	Denham Street	Public Level	Signs	X S	Open	LGA
403	640.270	Fitzroy Street	Public Level	Half Boomgates		Open	MRD
403	640.499	Archer Street	Public Level	Signs	X S	Open	LGA
403	640.730	Cambridge Street	Public Level	Signs	X S	Open	LGA
403	640.963	Albert Street (Bruce Highway)	Public Level	Half Boomgates		Open	MRD
403	641.205	North Street	Public Level	Signs	X S	Open	LGA
403	641.441	Bolsover Street	Public Level	Half Boomgates		Open	LGA
831	641.998	Glenmore Road	Public Level	Half Boomgates		Open	LGA
831	643.246	Main Street	Public Level	Half Boomgates		Open	LGA
831	643.588	Taylor Street Pedestrian Access	Pedestrian			Open	LGA
831	644.161	Richardson Road	Public Level	Half Boomgates		Open	LGA
831	645.060	Farm Street	Public Level	Half Boomgates		Open	LGA
831	647.960	Boundary Road	Public Level	Flashing Lights		Open	LGA
832	649.855	William Palfrey Road	Public Level	Flashing Lights		Open	LGA

Figure 4.2a: Existing Rail Crossings of North Coast Line in Rockhampton and Current Treatments

Discussions with officers from Queensland Rail has identified that the section of line in the vicinity of the proposed development carries in the order of two (2) trains (one in either direction) in both the AM and PM peak periods, that train speeds are approximately 60-80km/h and that the largest freight services are approximately 650m in length.

Due to the location of the proposed development in relation to the current alignment of the North Coast rail line, the site generated traffic is required to cross the rail line at some point when travelling south regardless of the proposed access location for the development, whether this be at:

- the existing at-grade crossing at William Palfrey Road; or
- the existing at-grade crossing at Boundary Road West;
- the existing at-grade crossing at Farm Street; or
- the proposed at-grade crossing on the new western leg of Olive Street.

Consideration was given to the provision of a grade separated crossing of the rail line as part of the proposed development, however due to a number of issues including the cost of this infrastructure, the requirement for an additional intersection on the Highway, construction and land ownership hurdles and the departure from both Council's and TMR's ultimate planning intent for the local road network this option was not deemed to be viable.

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As such the following access strategy is proposed:

i. A four-way signalised intersection on the Bruce Highway at Olive Street; and
ii. An at-grade crossing of the rail corridor on the proposed western fourth leg of this intersection.

The operation of the proposed four-way signalised intersection on the Bruce Highway is discussed in detail in section 5 of this report. The detail that follows addresses the proposed configuration and operation of the at-grade crossing. Specifically the co-ordination of the traffic signals with the rail signals.

It is also important to note that no additional rail crossings are proposed as part of the proposed access strategy. To clarify, the existing rail crossing on William Palfrey Road is proposed to be relocated to align with the proposed access to the planned residential development. This includes diverting the traffic that currently utilises the existing at grade crossing to the new crossing which then provides an alternative connection for this traffic to William Palfrey Road.

The provision of this alternate access via Olive Street (West) will also alleviate any future requirement for the adjacent intersection of William Palfrey Road with the Bruce Highway to be upgraded to accommodate the use of traffic travelling to/from the west. This is deemed to be desirable as constraints anticipated to be imposed by the adjacent properties (in particular the access/egress locations for the existing shop/service station opposite William Palfrey) are expected to impact on the ability for traffic signals to effectively be provided at this location. Furthermore it is noted that the provision of a signalised access at William Palfrey Road would not be in line with TMR's current planning intent for the Bruce Highway corridor.

The relocation of the existing at-grade crossing from William Palfrey Road is expected to improve the safety for traffic in the area to the benefit of the community, as the current crossing has minimal safety treatments, with only flashing signals provided (as seen in **Figure 4.2b** and **Figure 4.2c** below), whilst the relocated crossing is proposed to provide full active protection (e.g. flashing signals, boom gate barriers, advance warning signs, gated pedestrian enclosures etc.) as well as providing an opportunity for the use of new technology or approaches to the treatment of level crossings.



Figure 4.2b: Existing At-Grade Crossing at William Palfrey Road



Figure 4.2c: Existing At-Grade Crossing at William Palfrey Road

In addition to the active protection at the relocated crossing, measures are proposed to manage the impact of vehicle queuing from the proposed traffic signals at Bruce Highway / Olive Street. They include:

- Implementation of a "Keep Clear" zone on the development road approach to the proposed Olive Street signalised intersection to minimise the occurrence of vehicles queuing on the crossing;
- The co-ordination of the rail crossing with the proposed traffic signals on the Bruce Highway, including:
  - A special "clearance phase", as shown in **Figure 4.2d** below, which is to be called at the proposed Olive Street signals when a train is on the approach to the crossing. This clearance phase will provide "green time" to the development road approach to the intersection to allow the vehicles queued between the

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rail corridor and the Highway to clear. This is expected to limit the potential for queuing across the rail corridor; and

- As the train passes through the crossing, a second phase, as shown in **Figure 4.2e** below, is run which continues to hold traffic back from entering the development road and therefore the crossing (i.e. no left-turn or right turn movements from the Highway into the site will be allowed) and gives priority to the through movements on the Bruce Highway.

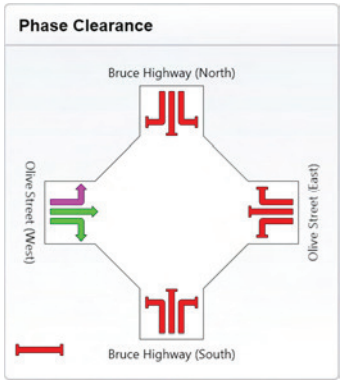

Figure 4.2d: Proposed Clearance Phase at Access Intersection

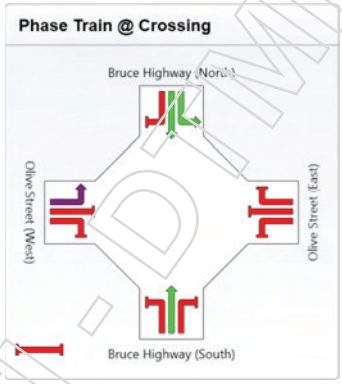

Figure 4.2e: Proposed Train Phase at Access Intersection

This proposed co-ordination of the crossing control measures and the traffic signals at Olive Street with train movements is expected to ensure that appropriate stop measures, including boom gates and red lights for certain traffic movements, are triggered to stop conflicts between trains and vehicular traffic.

In addition, the design of the signalised intersection at Olive Street is proposed to include adequate storage length in the proposed auxiliary turn lanes on the Bruce Highway approaches to accommodate the queuing that will occur if a train arrives coincident with the AM or PM road peak. This is expected to ensure that vehicle queues formed in these auxiliary lanes during a train crossing of the development access road will not impede the through vehicle movements and therefor the operational efficiency of the Bruce Highway. Refer to section 5 of this report for further detail on the geometry of the Bruce Highway / Olive Street traffic signals.

In summary, the combination of the proposed active protection measures at the relocated crossing, and the co-ordination of the rail crossing signals with the adjacent signalised access intersection on the Bruce Highway to both restrict vehicular traffic from conflicting with train movements and manage vehicle queues is expected to provide a functional rail crossing which allows access to the proposed development consistent with the planning intent of both Council and TMR.

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6.0 Conclusion and Recommendations

The proposed development site has been identified for several years as an area for future residential development growth, by both Council and Main Roads. This can be seen by its inclusion in such planning documents as

- Council's Parkhurst and Yeppoon Road Corridor Structure Plan (GHD 2007);
- Rockhampton Traffic Study (Arup 2008);
- RRC Priority Infrastructure Plan Planning Assumptions Report (GHD 2011), and
- TMR's draft Parkhurst Forward Planning Traffic Analysis Study (2010).

All of these planning documents envisaged a large residential development (i.e. > 2,000 lots) with the primary access from the Bruce Highway and secondary access via McLaughlin Street and the Alexandra Street corridor. Common to each study was an Urban Arterial Road providing connectivity between the Bruce Highway and the planned residential catchments to the west of the Highway. Several of these planning documents identify this proposed Urban Arterial Road joining the Bruce Highway at Olive Street, creating a fourth (western) leg to the existing intersection. It was also identified that this intersection would require signalisation and would incorporate an at-grade crossing of the adjacent rail corridor on the proposed development access road approach to the intersection.

The masterplan that has been submitted as part of the application for preliminary approval is consistent with the above planning intent.

6.1 Rail Crossing, Internal Road Network and Staging

A series of meetings have been held with Queensland Rail and other stakeholders wherein an assessment of the proposed at grade rail crossing has been carried out. This report provides detail on the proposed co-ordination of the traffic signals at the proposed Olive Street intersection with the rail signals at the relocated at grade crossing to enable the proposed rail crossing to operate in a safe and efficient manner.

The internal road network has been developed generally in accordance with Rockhampton City Council's Planning Policy No. 13 *Road Hierarchy* and the Capricorn Municipal Development Guidelines (CMDG). The road layout seeks to achieve a safe, efficient and convenient road system. Some minor amendments are proposed to the standard cross sections to address site specific aspects (e.g. roads adjacent to the esplanade and roads split by drainage corridors). We are also seeking to activate the major collector streets by providing direct property access which aligns with current industry standards.

The applicant intends staging the development from east to west. Access to the development under the early stages will be via the Bruce Highway only. This will require the construction of traffic signals at the Bruce Highway / Olive Street intersection and a part of the urban arterial road (2 lanes initially). It will not be until the later stages of the development that the western part of the site will be developed and connection provided to McLaughlin Street. The transport infrastructure will be delivered based on trigger volumes. This report provides detail on the trigger volumes and staging which can be summarised as follows:

	Stage 1	Trigger 1	Trigger 2	Trigger 3
Number detached dwellings	**1**	**1,000**	**1,450**	**1,895**
Interim Traffic Signals Bruce Hwy / Olive Street. Construct at-grade rail crossing 2-lane	✓			
Upgrade Bruce Hwy / Olive Street traffic signals to ultimate geometry. Duplicate the at grade crossing of the rail corridor (i.e. 4-lanes)		✓		
Upgrade the north-eastern part of the Urban Arterial to 4-lanes			✓	
Provide a secondary point of access to the site via McLaughlin Street. This will be achieved by constructing the balance of the Urban Arterial.				✓

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6.2 Traffic Impact

Analysis was completed to determine the impact of the proposed master planned community on both the state and local government controlled external road networks. The investigation into the operation of the state controlled road network focused on the impact on the relevant section of the Parkhurst Bruce Highway corridor, including the major intersections, whilst the assessment of the impact on the local government controlled network focused on the impact on the Alexandra Street corridor.

An investigation into the impacts of the proposed development on the relevant section of the Bruce Highway (Yeppoon Road to Olive Street) including an assessment of the expected mid-block volumes and the operation of the major intersections of Olive Street, Boundary Road (East), Boundary Road (West) and Yeppoon Road. For the purpose of this analysis it has been assumed that full build-out of proposed master planned community development would occur by 2025, with a 10 year design horizon for the development of 2035.

From the analysis in to the mid-block volumes on the each relevant section of the Bruce Highway between Yeppoon Road and Olive Street it was identified that expected pre development daily volumes exceeded the TMR specified trigger volume of 15,000 vehicles per day in 2013. As such it is considered that the requirement to upgrade of the Highway from two to four lanes, including the provision of additional through lanes at existing intersections is an existing deficiency and would be required regardless of the development of the proposed Stockland North Parkhurst site. Therefore it would be unreasonable to attribute the upgrade of the Bruce Highway (Yeppoon Road to Olive Street) from two lanes to four to the proposed Stockland North Parkhurst development.

Analysis of the Bruce Highway / Olive Street intersection identified that the ultimate intersection configuration required the provision of a four lane cross section for the Highway which was identified to be required regardless of the development due to the forecast pre development mid-block volumes exceeding 15,000 vehicles per day. This existing deficiency triggers the need for TMR to four-lane the Bruce Highway between Yeppoon Road and Olive Street, which would include the southern approach to this intersection.

As a consequence, it is considered unreasonable to attribute the full upgrade of the Bruce Highway / Olive Street intersection (as shown in the figure above) to the Stockland North Parkhurst development.

Analysis of the Bruce Highway / Boundary Road (East) intersection identified that the ultimate intersection configuration requires the provision of a four lane cross section for the Highway which was identified to be required regardless of the development due to the forecast pre development mid-block volumes exceeding 15,000 vehicles per da. This exising deficiency triggers the need for DTMR to four-lane the Bruce Highway between Yeppoon Road and Olive Street, which would include the both the northern and southern approaches to the Bruce Highway / Boundary Road (East) intersection.

Analysis of the Bruce Highway / Boundary Road (West) intersection identified that the ultimate intersection configuration requires signalisation of the existing intersection and the provision of a four lane cross section for the Highway, which as identified in Section 5.4.1.1 is needed regardless of the development due to the forecast pre development mid-block volumes exceeding 15,000 vehicles per day. This existing deficiency triggers the requirement for TMR to four-lane the Bruce Highway between Yeppoon Road and Olive Street, which would include the both the northern and southern approaches to the Bruce Highway / Boundary Road (West) intersection.

Analysis of the Bruce Highway / Yeppoon Road intersection identified that major upgrades from the existing intersection configuration would have been required before the assumed year of completion (2025) for the proposed development regardless of the addition of traffic generated by the Stockland site. Therefore it is considered unreasonable to attribute the full upgrade of the Bruce Highway / Yeppoon Road intersection to the proposed Stockland North Parkhurst development.

Notwithstanding this, it is acknowledged that the inclusion of traffic from the proposed development site will require additional upgrades over and above those required to address deficiencies unrelated to Stockland. As such, a contribution towards the cost of the upgrade of the intersection based on the provision of attributable infrastructure is deemed appropriate.

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To simplify the analysis of the impacts of the proposed development on the local government road network and to avoid duplicating the assessment already completed during the RTS (2008), it is proposed that the additional road works requirements attributed to the PAG scenario (above those identified in the City Plan scenario) be adopted as the transport infrastructure requirements of the North Parkhurst and Edenbrook developments combined.

Council's *Adopted Infrastructure Charges Resolution No. 2 (2012)* assists in determining the transport infrastructure that can be expected to be provided by future development within the Priority Infrastructure Area (PIA). It is noted that all of the Edenbrook site is contained within the boundaries of the PIA, whilst only the easternmost portion of the North Parkhurst site is included, the yield of which is understood to be approximately 400 lots.

Works identified in the resolution will be solely provided by the identified infrastructure charges applied to future development within the PIA and that the only contribution of the North Parkhurst site to delivery this transport infrastructure would be via the relevant transport infrastructure charges collected from the development within the PIA.

It is understood that the construction of the Alexandra Street extension to William Palfrey Road (McLaughlin Street realignment) has been conditioned on the adjacent Edenbrook development as part of a previous Infrastructre Agreement, and as such its construction should not be attributable to the proposed Stockland North Parkhurst development.

The William Palfrey connection shown on the masterplan is identified as an Urban Arterial Road, which once connected to the west (McLaughlin Street) will join the Alexandra Street and Bruce Highway corridors and service a catchment which extends well beyond the subject site. As such we believe that the William Palfrey should be classified as trunk infrastructure. As a consequence, any physical works carried out by Stockland to deliver the arterial road should be offset against the infrastructure charges paid by the applicant.

We therefore consider that the proposal is satisfactory from a traffic operations perspective, and recommend that the development application be approved from a traffic engineering viewpoint.

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Queensland Government

Our ref TMR13-005882
Your ref
Enquiries Byron Jones

Department of Transport and Main Roads

7 May 2013

Stockland Development Pt Ltd
c/- RPS Australia East Pty Ltd
PO Box 10160
Brisbane QLD 4000

Attention: NR

Dear Madam

CONCURRENCE AGENCY INFORMATION REQUEST

Proposed Development:	Preliminary Approval to vary the effect of the Planning Scheme for a Material Change of Use for a Master Planned Community and a Development Permit for Reconfiguring a Lot (five lots into 199 lots, public use land and balance lots)
Real Property Description:	Lot 1RP602376, 22SP134380, 23SP134380, 2RP608099, 37RP600698, 38RP600698, 41SP226571, 49SP129857, 5SP238731, 6SP238731
Street Address:	Yaamba Road, Parkhurst QLD 4702
Assessment Manager ref.:	D/36-2013
Local Government Area:	Rockhampton Regional Council

Reference is made to the referral agency material for the development application described above which was received by the Department of Transport and Main Roads (the department) under section 272 of the *Sustainable Planning Act 2009* (SPA) on 8 April 2013.

The department has carried out an initial review of the development application. This review has identified that further information is required to fully assess the proposal against the department's jurisdiction namely the purposes of the *Transport Infrastructure Act 1994* for state-controlled roads, the purpose mentioned in section 258(2) of the *Transport Infrastructure Act 1994* for railways and land use and transport coordination under the *Transport Planning and Coordination Act 1994*.

Information Request

Program Delivery and Operations
Fitzroy Region
31 Knight Street North Rockhampton Queensland 4701
PO Box 5096 Red Hill Rockhampton Queensland 4701

Telephone +61 7 4931 1706
Facsimile +61 7 4927 5020
Website www.tmr.qld.gov.au
Email cmo.rockhampton@tmr.qld.gov.au
ABN: 29139 407 690

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In accordance with section 276 of the SPA, the applicant is requested to provide the following information and, where applicable, to consider the information request advice given about how the applicant may change the application:

Road Traffic

1. Please provide a copy of the Traffic Impact Assessment (TIA) report signed by an RPEQ;
2. Section 4.2 of the TIA (Stages 1 - 3) refers to Figure 4.2(d) however, this figure does not appear in the report, please clarify;
3. Section 4.3 of the TIA (Stages 1 - 3) assumes that the full development of stage 1 – 3 (198 Lots) will be completed by 2015 and as such adopts a design horizon of 2025 for the 10 year post-development assessment. TMR has concerns that this development timeframe is overly optimistic which may result in less than a 10 year design horizon for these stages of development. Please provide further justification or evidence supporting the assumption that stages 1 – 3 will be completed by 2015;
4. Please provide clarification/justification for the 1% per annum compound growth adopted in the analysis as indicated in section 4.3 of the TIA (Stage 1 – 3);
5. Section 4.5.1.2 of the TIA (Stage 1 – 3) states that the intersection of the Bruce Highway / Olive St includes the provision of a four lane cross section for the Bruce Highway, which was identified to be required irrespective of the development due to the forecast mid-block volumes exceeding 15,000 vehicles per day. TMR has no committed concept, design or funds for this work and as such, the applicant should not assume that these works will necessarily be in place. Further consideration, analysis and recommendations should be carried out for this intersection on the assumption that TMR are not in a position to upgrade the Bruce Highway within the design horizons currently investigated;
6. Section 4.5.1.2 of the TIA (Stage 1 – 3) states that storage lengths were calculated assuming a two and a half minute delay to vehicles at the level crossing. Please provide further evidence to justify this assumption and explain how this figure was arrived at. In addition, what consideration (if any) has been given to the effect on the signalised intersection if the train lengths increase in the future or if the assumed speed of the trains through the level crossing is lowered;
7. The proposed intersection layout indicated in Figure 4.5.1.2a does not adequately cater for what is anticipated to be a significant pedestrian demand from the estate to the existing Parkhurst School on Mason Avenue on the eastern side of the Bruce Highway. It is suggested the provision of an additional pedestrian crossing at the signals on the Olive St (East) leg or the relocation of the pedestrian crossing from the Bruce Highway (North) leg to the Bruce Highway (South) leg may resolve this issue. Your further consideration and advice as to how this matter will be addressed is sought;
8. Section 4.5.1.3 of the TIA (Stage 1 – 3) includes analysis of an upgraded intersection at Bruce Highway / Boundary Road (East) rather than the existing intersection form. Similarly to item 5 above, TMR has no committed concept, design or funds for this work and as such, the applicant should not assume that these works will necessarily be in place. Further consideration, analysis and recommendations should be carried out for this intersection on the assumption that TMR are not in a position to upgrade the Bruce Highway / Boundary Road (East) within the design horizons currently investigated;
9. Section 4.5.1.4 of the TIA (Stage 1 – 3) indicates that the analysis added another lane to the Boundary Road approach to simulate left turning vehicles propping next to right

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turning vehicles. With respect, this is not considered appropriate at unsignalised intersections for sight visibility reasons. Further explanation is provided in the department's "Road Planning and Design Manual" (RPDM) section 13.3.1.3 and Figure 13.6;

10. Section 4.5.1.4 of the TIA (Stage 1 – 3) includes analysis of an upgraded intersection at Bruce Highway / Boundary Road (West) rather than the existing intersection form. Similarly to items 5 and 8 above, TMR has no committed concept, design or funds for this work and as such, the applicant should not assume that these works will necessarily be in place. Further consideration, analysis and recommendations should be carried out for this intersection on the assumption that TMR are not in a position to upgrade the Bruce Highway / Boundary Road (West) within the design horizons currently investigated;
11. TMR has no committed concept, design or funding for the upgrade of this section of the Bruce Highway. The applicant is requested to provide a mitigation strategy to address the developments impacts on the state-controlled network.

Railway

Rail level crossing

12. The Department of Transport and Main Roads (the department), Queensland Rail (QR) and Stockland have collaboratively worked to develop a solution that enables access for the development across the North Coast Line. Correspondence from the department, dated 15 April 2013, provided written endorsement to Stockland for the proposed level crossing solution to Olive Street, subject to QR's conditions and at no cost to the state. This proposal will ensure no further crossings are added to the network through the closure of the existing William Palfrey Road crossing and its relocation and upgrade to Olive Street in accordance with the *Queensland Level Crossing Safety Strategy 2012-2021*.

    The submitted Traffic Impact Assessment reports prepared by Cambray Consulting, for the proposed master planned community and reconfiguration stages 1 to 3, indicate that Olive Street will form the main access road to the proposed development from the Bruce Highway and is intended to be constructed in two stages. Stages 1 to 3 of the proposed development will entail the initial construction of a two lane entry road configuration, with this being upgraded to a four lane entry once traffic volumes exceed 13,000 vehicles per day or approximately 1,450 detached dwellings.

    The staged development of the Olive Street level crossing must be appropriately designed to ensure the safety and operational integrity of the North Coast Line. The applicant is therefore requested to provide conceptual engineering plans and associated documents for the Olive Street level crossing for both the initial and ultimate designs of the Olive Street/Bruce Highway intersection. These conceptual engineering designs must:

    - be developed in collaboration with the department, QR and Rockhampton City Council to deliver an integrated solution that considers all relevant state and local government requirements;
    - address the conditions and requirements set out in the attached correspondence from QR dated 12 April 2013; and

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- give consideration to the potential for future bus movements through the intersection and over the level crossing.

As part of the information request response the applicant is required to provide a written agreement (or in principle agreement) from QR as to the conceptual design of both stages of the Olive Street level crossing. Please contact NR of QR on 3235 1229 or NR @qr.com.au in relation to this matter.

Advice:
Please be advised that once constructed, the Olive Street level crossing will become a public crossing under section 253 of the *Transport Infrastructure Act 1994*. This requires the local government to take responsibility for maintaining the road and crossing over the North Coast Line. As per the *Memorandum of Understanding between the Local Government Association of Queensland and Queensland Rail and the Department of Transport and Main Roads with respect to the Management and Funding Responsibility for Level Crossing Safety,* the local government will be responsible for any safety upgrades to the level crossing in the future if the change in risk to the level crossing is due to changes in nearby land uses which have been authorised by local government. This is managed by an Interface Agreement between QR and the local government in accordance with the *Transport (Rail Safety) Act 2010*.

Rail Noise Assessment

13. The applicant has submitted a Noise Amenity Assessment report prepared by MWA Environmental and dated 27 February 2013 for stages 1 to 3 of the proposed development. However, section 2.2.2 of this report states that internal railway noise amenity is regulated by the Queensland Development Code Mandatory Part 4.4 – *Buildings in a Transport Noise Corridor*, assumes that this matter will be dealt with at the building works stage and references an outdated 'QT Planning for Rail noise document'. The report's recommendations concerning railway noise also refer to an optional acoustic barrier, however, there is no certainty provided regarding the height of the barrier and the altered acoustic attenuation requirements that would result for future residential dwellings within the development.

    Consequently, the applicant is required to submit an amended Noise Amenity Assessment report for stages 1 to 3 addressing the following:

(a) The transport chief executive has not yet gazetted land as transport noise corridors for railways under section 246Z (Designation of transport noise corridor – transport chief executive) of the *Building Act 1975*. This means that new sensitive land uses impacted on by railway noise will be addressed at the material change of use and reconfiguring a lot stages of the development;

(b) The department's current environmental emission criteria for noise are set out in the *Department of Transport and Main Roads Policy Position Statement: Development on Land Affected by Environmental Emissions from Transport and Transport Infrastructure*; Version 1.0 dated 31 March 2011, which is available at: http://www.tmr.qld.gov.au/Community-and-environment/Planning-and-development/Planning-policy/Policy-statements-guidelines-and-development-codes/Development-on-Land-Affect

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ed-by-Environmental-Emissions.aspx. In particular, the relevant noise criteria for all accommodation activities and residential care facilities exposed to railway noise are:

- external noise criteria of ≤ 65 dB(A) L_{eq} (24hr) facade corrected,
- external noise criteria of ≤ 87 dB(A) (single event maximum sound pressure level) facade corrected,
- internal noise criteria for sleeping areas of ≤ 45 dB(A) single event maximum sound pressure level, and
- internal noise criteria for habitable rooms of ≤ 50 dB(A) single event maximum sound pressure level.

The amended Noise Amenity Assessment should address the relevant noise criteria for all new sensitive land uses that may be developed within stages 1 to 3 of the development. It should also address the relevant internal noise criteria as well as the external noise criteria for railways.

(c) The recommended mitigation measures for railway noise should adequately address the internal noise criteria for railways by:
- clearly specifying the recommended building attenuation treatments required for future noise sensitive uses both with and without a barrier, including maps specifying the areas of the development where building attenuation of different types is required and detailing what the required attenuation treatments include in each of these areas. It is noted that if the applicant wishes to pursue the optional noise barrier, sufficient details will need to be provided regarding the associated building attenuation and noise barrier specifications;
- address the technical requirement CIVIL-SR-014 (Design of noise barriers adjacent to railways) which is available in the *Guide for Development in a Railway Environment* which is available at: http://www.tmr.qld.gov.au/Business-industry/Technical-standards-publications.aspx and demonstrate the required height of the optional noise barrier.

The applicant is also requested to amend the proposed Ellida Local Plan in accordance with the findings of the amended Noise Amenity Assessment, the *Department of Transport and Main Roads Policy Position Statement: Development on Land Affected by Environmental Emissions from Transport and Transport Infrastructure* and QR technical requirements for noise barriers.

Pursuant to section 278 of the SPA, the applicant must respond to this information request by giving the requesting authority (the department) –

(a) All of the information requested; or

(b) Part of the information requested together with a written notice asking the requesting authority to proceed with the assessment of the application; or

(c) A written notice –
  (i) Stating that the applicant does not intend to supply any of the information requested; and
  (ii) Asking the requesting authority to proceed with the assessment of the application.

A pro forma is attached to this correspondence to assist you in providing an information request response which complies with the requirements of the SPA.

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The application will be assessed on the basis of the information provided. It is therefore in the applicant's best interests to address all of the information requested by the department.

As the requesting authority is a concurrence agency, the applicant must also give a copy of the information request response to the assessment manager under section 278(2) of the SPA.

Please be advised that pursuant to section 276(3) of the SPA the application will lapse unless the applicant gives the department a response under section 278 of the SPA.

Please be further advised that pursuant to section 279 of the SPA, your application will lapse unless compliance with section 278 of the Act is achieved within 6 months after receiving this information request or any further period agreed between the applicant and the department. This timeframe is however reduced to 3 months, or any further period agreed to between the applicant and department, for an application required by an enforcement notice or show cause notice. Further details regarding the information request response period and the lapsing of development applications are set out in sections 279 and 280 of the SPA which is available at: www.legislation.qld.gov.au.

Should you have any queries in relation to this information request, please do not hesitate to contact Byron Jones, Principal Development Assessment Officer, Corridor Management and Operations on 07 4931 1706.

A copy of this information request has been sent to the assessment manager.

Yours sincerely

Not Relevant

Byron Jones
Principal Development Assessment Officer, Corridor Management and Operations

Enc. (Pro forma – Response to Department of Transport and Main Roads Information Request and Queensland Rail letter dated 12 April 2013)

C/c The Chief Executive Officer
Rockhampton Regional Council
PO Box 1860
Rockhampton QLD 4700

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Queensland Government

Our ref.: TMR13-005882
Your ref.: D/36-2013

Department of Transport and Main Roads

C/c The Chief Executive Officer
Rockhampton Regional Council
PO Box 1860
Rockhampton QLD 4700

Attention: Rebecca De Vries/Erin McCabe

Please find attached correspondence for your information and action as required. Should you wish to discuss this correspondence, please contact Byron Jones, Principal Development Assessment Officer, Corridor Management and Operations on 07 4931 1706.

Yours sincerely

Not Relevant

Byron Jones
Principal Development Assessment Officer, Corridor Management and Operations

7 May 2013

Enc. (Pro forma – Response to Department of Transport and Main Roads Information Request and Queensland Rail letter dated 12 April 2013)

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RESPONSE TO DEPARTMENT OF TRANSPORT AND MAIN ROADS INFORMATION REQUEST

Proposed Development:	Preliminary Approval to vary the effect of the Planning Scheme for a Material Change of Use for a Master Planned Community and a Development Permit for Reconfiguring a Lot (five lots into 199 lots, public use land and balance lots)
Real Property Description:	Lot 1RP602376, 22SP134380, 23SP134380, 2RP608099, 37RP600698, 38RP600698, 41SP226571, 49SP129857, 5SP238731, 6SP238731
Street Address:	Yaamba Road, Parkhurst QLD 4702
Department ref.:	TMR13-005882
Assessment Manager ref.:	D/36-2013
Local Government Area:	Rockhampton Regional Council

_____, as the applicant for the abovementioned development application, make reference to the Department of Transport and Main Roads information request dated 7 May 2013.

In accordance with section 278(1) of the *Sustainable Planning Act 2009*, I wish to advise:

☐ I have supplied all of the information requested.

OR

☐ I have supplied part of the information requested and do not intend to supply any further information. Please proceed with your assessment of the application

OR

☐ I do not intend to supply any of the information requested. Please proceed with your assessment of the application.

Name of Applicant _____

Signature of Applicant _____

Date _____

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Queensland Government

Our ref TMR13-005882
Your ref D/36-2013
Enquiries Byron Jones

Department of Transport and Main Roads

17 October 2013

The Chief Executive Officer
Rockhampton Regional Council
PO Box 1860
Rockhampton QLD 4700

Attention: Rebecca De Vries/Erin McCabe

Dear Madam

CONCURRENCE AGENCY RESPONSE – CONDITIONS

Proposed Development:	Preliminary Approval to vary the effect of the Planning Scheme for a Material Change of Use for a Master Planned Community and a Development Permit for Reconfiguring a Lot (five lots into 199 lots, public use land and balance lots
Real Property Description:	Lot 1RP602376, 22SP134380, 23SP134380, 2RP608099, 37RP600698, 38RP600698, 41SP226571, 49SP129857, 5SP238731, 6SP238731
Street Address:	Yaamba Road, Parkhurst QLD 4702
Assessment Manager ref.:	D/36-2013
Local Government Area:	Rockhampton Regional Council

Reference is made to the referral agency material for the development application described above which was received by the Department of Transport and Main Roads (the department) under section 272 of the *Sustainable Planning Act 2009* (SPA) on 8 April 2013.

An assessment of the proposed development has been undertaken against the purposes of the *Transport Infrastructure Act 1994* for state-controlled roads, the purpose mentioned in section 258(2) of the *Transport Infrastructure Act 1994* for railways and land use and transport coordination under the *Transport Planning and Coordination Act 1994*. Based on this jurisdiction, the department provides this concurrence agency response under section 285 of the SPA.

Program Delivery and Operations
Fitzroy Region
31 Knight Street North Rockhampton Queensland 4701
PO Box 5096 Red Hill Rockhampton Queensland 4701

Telephone +61 7 4931 1706
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Email cmo.rockhampton@tmr.qld.gov.au
ABN: 39 407 690 291

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The department advises the assessment manager that it requires conditions to attach to any development approval for the application. The department would also like to provide advice about the application to the assessment manager under section 287(6) of the SPA.

Under section 325(1) of the SPA, the assessment manager must therefore attach this response, including the enclosed Department of Transport and Main Roads Concurrence Agency Conditions and Statement of Reasons, to any approval for the application.

The department may change its concurrence agency response in accordance with section 290(1)(b) of the SPA.

The department must be provided with a copy of the assessment manager's decision notice regarding the application within five (5) business days after the day the decision is made in accordance with section 334 of the SPA.

A copy of this response has been sent to the applicant for their information.

If you have any questions or wish to seek clarification about any of the details in this response, please contact Byron Jones, Principal Development Assessment Officer, Corridor Management and Operations on 07 4931 1706.

Yours sincerely

Not Relevant

Chris Hewitt
Manager (Corridor Management & Operations)

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Enc. (Department of Transport and Main Roads Agency Conditions and Statement of Reasons, Ellida Local Plan, prepared by RPS and dated August 2013, Brown Consulting (Qld) Pty Ltd's Flood Management Report, Issue D, dated 27 Septemeber 2013 (Report Number B11007.W.-01D) (Stormwater Quantity), DesignFlow's Stormwater Quality Management Plan – Masterplan, dated July 2013 (Stormwater Quality), Cambray Consulting Pty Ltd's Traffic Impact Assessment (Application for Preliminary Approval), Report Revision B, dated 8 August 2013, Correspondence entitled "Olive Street, Parkhurst Crossing Proposal In-Principle Approval Parkhurst Masterplanned Community", from Queensland Rail to Stockland Development Division dated 28/08/2013, Yaamba Road Intersection Interim Design Geometry, Drawing Number N12081-SK11, Issue C, prepared by Brown Smart Consulting and dated 27/08/2013, Yaamba Road Intersection Ultimate Design Geometry, Drawing Number N12081-SK10, Issue C, prepared by Brown Smart Consulting and dated 22/08/2013, Correspondence entitled "Response to Queensland Department of Transport and Main Roads Information Request – Noise Impact Assessment for Proposed Master Planned Community – 'Ellida' – Parkhurst North", from MWA Environmental to Stockland Development Pty Ltd, Reference Number L15713/BH/11-007 and dated 7/08/2013, Masterplan Environmental Amenity Assessment – Proposed Master Planned Community – 'Ellida' – Parkhurst North, Job Number 11-007, prepared by MWA Environmental and dated 27 February 2013, Road Hierarchy, Project Number 109116-93a, dated August 2013 and prepared by RPS, Proposal Plan (Plan Reference 109116-82, Revision I) dated 29 July 2013 prepared by RPS, Balance Lot Plan (Plan Reference 109116-86, Revision D), dated 29 July 2013 prepared by RPS, DesignFlow's Stormwater Quality Management Plan – Stages 1 – 3, dated July 2013, Cambray Consulting Pty Ltd's Traffic Impact Assessment (Stage 1 - 3 Reconfiguration of Lot), dated 7 August 2013)

C/c Stockland Development Pt Ltd
c/- RPS Australia East Pty Ltd
PO Box 10160
Brisbane QLD 4000

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Queensland Government

Department of Transport and Main Roads

Our ref TMR13-005882
Your ref

C/c Stockland Development Pt Ltd
c/- RPS Australia East Pty Ltd
PO Box 10160
Brisbane QLD 4000

Attention: Not Relevant

Please find attached correspondence for your information and action as required. Should you wish to discuss this correspondence, please contact Byron Jones, Principal Development Assessment Officer, Corridor Management and Operations on 07 4931 1706.

Yours sincerely

Not Relevant

Chris Hewitt
Manager (Corridor Management & Operations)

17 October 2013

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Enc. (Department of Transport and Main Roads Agency Conditions and Statement of Reasons, Ellida Local Plan, prepared by RPS and dated August 2013, Brown Consulting (Qld) Pty Ltd's Flood Management Report, Issue D, dated 27 September 2013 (Report Number B11007.W.-01D) (Stormwater Quantity), DesignFlow's Stormwater Quality Management Plan – Masterplan, dated July 2013 (Stormwater Quality), Cambray Consulting Pty Ltd's Traffic Impact Assessment (Application for Preliminary Approval), Report Revision B, dated 8 August 2013, Brown Consulting Concept Layout Plan No. N13041-SK1, Correspondence entitled "Olive Street, Parkhurst Crossing Proposal In-Principle Approval Parkhurst Masterplanned Community", from Queensland Rail to Stockland Development Division dated 28/08/2013, Yaamba Road Intersection Interim Design Geometry, Drawing Number N12081-SK11, Issue C, prepared by Brown Smart Consulting and dated 27/08/2013, Yaamba Road Intersection Ultimate Design Geometry, Drawing Number N12081-SK10, Issue C, prepared by Brown Smart Consulting and dated 22/08/2013, Correspondence entitled "Response to Queensland Department of Transport and Main Roads Information Request – Noise Impact Assessment for Proposed Master Planned Community – 'Ellida' – Parkhurst North", from MWA Environmental to Stockland Development Pty Ltd, Reference Number L15713/BH/11-007 and dated 7/08/2013, Masterplan Environmental Amenity Assessment – Proposed Master Planned Community – 'Ellida' – Parkhurst North, Job Number 11-007, prepared by MWA Environmental and dated 27 February 2013, Road Hierarchy, Project Number 109116-93a, dated August 2013 and prepared by RPS, Proposal Plan (Plan Reference 109116-82, Revision I) dated 29 July 2013 prepared by RPS, Balance Lot Plan (Plan Reference 109116-86, Revision D), dated 29 July 2013 prepared by RPS, DesignFlow's Stormwater Quality Management Plan – Stages 1 – 3, dated July 2013, Cambray Consulting Pty Ltd's Traffic Impact Assessment (Stage 1 - 3 Reconfiguration of Lot), dated 7 August 2013)

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Department of Transport and Main Roads
Concurrence Agency Conditions and Statement of Reasons

Proposed Development: Preliminary Approval to vary the effect of the Planning Scheme for a Material Change of Use for a Master Planned Community and a Development Permit for Reconfiguring a Lot (five lots into 199 lots, public use land and balance lots)
Real Property Description: Lot 1RP602376, 22SP134380, 23SP134380, 2RP608099, 37RP600698, 38RP600698, 41SP226571, 49SP129857, 5SP238731, 6SP238731
Street Address: Yaamba Road, Parkhurst QLD 4702
Our ref.: TMR13-005882
Assessment Manager ref.: D/36-2013
Local Government Area: Rockhampton Regional Council

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No.	Conditions of Development	Condition Timing	Jurisdiction and Reasons
Preliminary Approval to vary the effect of the Planning Scheme for a Material Change of Use for a Master Planned Community			
1	The development must be carried out generally in accordance with the Ellida Local Plan, prepared by RPS and dated August 2013, except as modified by these concurrence agency conditions. In particular, Section 4.5 Levels of Assessment – Material Change of Use, Table 4.5.1 – General Residential Zone is amended as follows for self assessable development in relation to Business Activity and Community Activity: Use | Level of assessment | Assessment criteria	Prior to the commencement of use and to be maintained at all times for the relevant stage	The purposes of the Transport Infrastructure Act 1994. Land Use and Transport Coordination under the *Transport Planning and Coordination Act 1994* (TPCA). The Department of Transport and Main Roads' assessment of the development application was undertaken on the basis of the cited document which depicts how

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No.	Conditions of Development			Condition Timing	Jurisdiction and Reasons
	Business Activity	Self assessment			the proposed development will be carried out. The way the object of s.8A of the TPCA is to be achieved includes ensuring as far as practicable that public passenger transport offers an attractive alternative to private transport. It also seeks to promote urban development that maximises the use of public passenger transport. Comments or additional information: Future development meeting the thresholds set out in Schedule 9 of the *Sustainable Planning Regulation 2009* may impact on public passenger transport.
		▪ Market ▪ Where located within the Mixed Use Lot: - Food and drink outlet less than 600m² GFA; - Office less than 4,500m² GFA; - Shop less than 3,500m² GFA; or - Shopping Centre less than 4,500m² GFA ▪ Where identified on an Approved Subdivision Plan and equal to or less than 250m² GFA: - Shop; - Shopping Centre; or - Food and drink outlet (where not including a drive-through)	▪ Ellida Built Form and Density Code ▪ Ellida Landscape Code		

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No.	Conditions of Development			Condition Timing	Jurisdiction and Reasons
	Community Activity	Self assessment			

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No.	Conditions of Development			Condition Timing	Jurisdiction and Reasons
		▪ Where the use is for the reuse of existing community activity premises where not resulting in additional GFA ▪ Where located within the District Park as identified on the Ellida Master Plan: - Club less than 4,000m² GFA or seating capacity for less than 1,500 people - Community Use ▪ Where located within the Mixed Use Lot: - Child Care Centre - Club less than 4,000m² GFA or seating capacity for less than 1,500 people; - Community Care Centre - Community Use - Educational Establishment for less than an additional 100 students or 4 classrooms (all new establishments and extensions to existing	▪ Ellida Built Form and Density Code ▪ Ellida Landscape Code		

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No.	Conditions of Development	Condition Timing	Jurisdiction and Reasons
	establishments); - Health Care Services less than 1200m² GFA		
2	The applicant must prepare and submit a Traffic Impact Assessment (TIA) report to the Department of Transport and Main Roads for approval under the following circumstances. • For each future stage where referral to the Department of Transport and Main Roads is triggered; OR • For Impact Assessable Applications. The applicant shall be responsible for designing, constructing and implementing the recommendations of the Traffic Impact Assessment (TIA) reports for each future stage of the development, as required, to the satisfaction of the Department of Transport and Main Roads.	As identified in the condition triggers.	The purposes of the Transport infrastructure Act 1994 (TIA). Infrastructure works should be provided as a consequence of the development and its associated traffic impacts to ensure the safety and efficiency of the state-controlled road network.
3	(a) The development must be generally in accordance with the Stormwater Management Plan Brown Consulting (Qld) Pty Ltd's Flood Management Report, Issue D, dated 27 September 2013 (Report Number B11007.W.-01D) (Stormwater Quantity) and DesignFlow's Stormwater Quality Management Plan – Masterplan, dated July 2013 (Stormwater Quality). Stormwater management for the development must ensure no worsening or actionable nuisance to the state-controlled road network caused by peak discharges, flood levels, frequency/duration of flooding, flow velocities, water quality, sedimentation and scour effects.	(a) & (b) Prior to the commencement of use and to be maintained at all times (c) Prior to obtaining a final inspection certificate or certificate of classification, whichever is applicable, or prior	The purposes of the Transport Infrastructure Act 1994. The safety and efficiency of state-controlled roads can be adversely affected by changes to stormwater runoff as a result of development. Additional comments or information: Please refer to the Department of

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No.	Conditions of Development	Condition Timing	Jurisdiction and Reasons
	AND (b) Any excavation, filling, paving, landscaping, construction or any other works to the land must not: i. create any new discharge points for stormwater runoff onto the state-controlled road; ii. adversely interfere with and/or cause damage to the existing stormwater drainage on the state-controlled road; iii. surcharge any existing culvert or drain on the state-controlled road; iv. reduce the quality of stormwater discharge onto the state-controlled road. AND (c) The applicant must provide RPEQ certification to the Department of Transport and Main Roads that the development has been designed and constructed in accordance with parts (a) and (b) of this condition.	to the commencement of use, whichever occurs first for each relevant stage	Transport and Main Roads' Road Drainage Manual which can be accessed at http://www.tmr.qld.gov.au/Business-industry/Technical-standards-publications.aspx. Further guidance regarding stormwater management is also provided in the Queensland Urban Drainage Manual available at www.derm.qld.gov.au and in the Environmental Protection Act 1994 and Environmental Protection (Water) Policy 2009 which are available at www.legislation.qld.gov.au In accordance with Section 33 of the TIA, you must have written approval to carry out road works, including road access works on a state-controlled road. These development conditions do not constitute such approval. You will need to contact the Department of Transport and Main Roads on (07) 4931 1500 to make an application for approval under section 33 of the TIA to carry out road works.

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No.	Conditions of Development	Condition Timing	Jurisdiction and Reasons
4	(a) The Bruce Highway and Olive Street intersection must be upgraded to a 4-way signalised intersection configuration. Subject to further detailed designs, the intersection must be designed and constructed generally in accordance with the Department of Transport and Main Roads' Road Planning and Design Manual including the Interim Guide to Road Planning and Design Practice, Figure 4.4.1a of Cambray Consulting Pty Ltd's Traffic Impact Assessment (Application for Preliminary Approval), Report Revision B, dated 8 August 2013. (b) The intersection upgrade must be designed and constructed to include: • The installation of lighting at the intersection of Bruce Highway and Olive Street in accordance with Chapter 17 of the Department of Transport and Main Roads' Road Planning and Design Manual including the Interim Guide to Road Planning and Design Practice and AS/NZS1158. • Appropriate diverge/deceleration distances in accordance with the requirements of the Department of Transport and Main Roads' Road Planning and Design Manual as well as the storage distances indicated in the analysis contained in the Cambray Consulting Pty Ltd's Traffic Impact Assessment (Application for Preliminary Approval), Report Revision B, dated 8 August 2013. AND (c) The intersection must be provided by the applicant at no cost to the Department of Transport and Main Roads.	(a) – (d) Prior to the commencement of use for the 1276th lot of the development	The purposes of the Transport Infrastructure Act 1994 (TIA). The intersection upgrade is required as a result of the development and its associated traffic impacts to ensure the safety and efficiency of the state-controlled road network. Comments or additional information: In accordance with Section 33 of the TIA, you must have written approval to carry out road works, including road access works on a state-controlled road. These development conditions do not constitute such approval. You will need to contact the Department of Transport and Main Roads on (07) 4931 1500 to make an application for approval under section 33 of the TIA to carry out road works. The Department of Transport and Main Roads' technical standards and publications can be accessed at http://www.tmr.qld.gov.au/Business-indu

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No.	Conditions of Development	Condition Timing	Jurisdiction and Reasons
	AND (d) All adjustments and/or relocations to existing services within the state-controlled road as a result of the development are at the applicant's expense.		stry/Technical-standards-publications.aspx. Where services within the state-controlled road reserve will be impacted by the development, the applicant will need to contact the relevant service provider.
5	The applicant shall ensure that the urban arterial connection road between the Bruce Highway and through to McLaughlin Street as shown in section 4.4.3 of Cambray Consulting Pty Ltd's Traffic Impact Assessment (Application for Preliminary Approval), Report Revision B, dated 8 August 2013 is constructed and operational.	Prior to the commencement of use for the 1901st lot of the development.	The purposes of the Transport Infrastructure Act 1994 (TIA). The works are required as a consequence of the development and its associated traffic impacts to ensure the safety and efficiency of the state-controlled road network.
6	WORKS WITHIN STATE-CONTROLLED ROAD RESERVE (WSCRR) Preparation of plans (in accordance with RPCD-0101) and submission of these plans to the Rockhampton office of the Department of Transport and Main Roads for approval. No works (including installation of services) are to commence within the State-controlled road reserve until approval of the plan/s showing the proposed works is issued by the department. This approval may be	Plans are required to be submitted to the department to demonstrate the any works proposed to be constructed within the State-controlled road reserve. Amendments may be required to the plans showing the works prior to the issuing of the approval to construct.	This Department has the power under section 33 of the *Transport Infrastructure Act 1994* to require plans of proposed works to be submitted for review and acceptance prior to the works commencing.

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No.	Conditions of Development	Condition Timing	Jurisdiction and Reasons
	subject to conditions related to the works construction process. All works in State-controlled road reserves are required to be completed and accepted by the Department of Transport and Main Roads prior to the commencement of the use on the site.		
7	Where services required to serve this development are proposed be laid/placed within the boundaries of the State-controlled road reserve, they shall be laid/placed in accordance with the Department of Transport and Main Roads requirements.		The Department of Transport and Main Roads has the power under section 33 of the *Transport Infrastructure Act 1994.* The department is concerned that the placement of services by developers in the State-controlled road reserve may restrict future upgrading works in the reserve.
8	(a) All conditions stated above are required to be completed prior to the issue of certificate of classification for building works by Council or private certifier or prior to the commencement of use (whichever is the earliest) for the development unless otherwise stated within the condition. (b) Bonding of any of the conditions not completed prior to the issue of the certificate of classification for the building works by Council or private certifier or prior to the commencement of use (whichever is earlier) for the development or other requisite date as stated in the particular condition will not be permitted unless the Department of Transport and Main Roads has given written agreement to the bonding of the condition.	Prior to the commencement of use	The Department of Transport and Main Roads has authority under Section 2 of the Transport Infrastructure Act 1994. The department is concerned the non-fulfilment of its conditions and the bonding of the conditions without the department's agreement can compromise the safety and efficiency objectives of the state-controlled road.

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No.	Conditions of Development	Condition Timing	Jurisdiction and Reasons
	(c) All works associated with the development must be at no expense to the department.		
9	(a) The Works Within State-controlled Road Reserve (WSCRR) application referred to in condition (6) shall be accompanied by written consent from each affected landowner agreeing to any changes to any existing direct access arrangements proposed (i.e. if the direct access point is moved or the standard of access is altered) as a result of the Bruce Highway and Olive Street 4 way signalised intersection configuration upgrade referred to in condition (4) to the satisfaction of the Department of Transport and Main Roads. (b) The applicant shall notify all landowners where access arrangements are proposed to be indirectly affected (i.e. existing all movements access reduced to a left-in left out arrangement) as a result of the Bruce Highway and Olive Street 4 way signalised intersection configuration upgrade referred to in condition (4) to the satisfaction of the Department of Transport and Main Roads.	(a) and (b) Plans are required to be submitted to the department to demonstrate the any works proposed to be constructed within the State-controlled road reserve. Amendments may be required to the plans showing the works prior to the issuing of the approval to construct.	This Department has the power under section 33 of the *Transport Infrastructure Act 1994* to require plans of proposed works to be submitted for review and acceptance prior to the works commencing. It is the expectation of TMR that the applicant use its best endeavours to obtain any necessary consents, without any involvement from the department during any required third party negations.
10	(a) The proposed replacement rail level crossing located on Olive Street must be designed and constructed at the applicant's expense generally in accordance with the following: • Correspondence entitled "Olive Street, Parkhurst Crossing Proposal In-Principle Approval Parkhurst Masterplanned Community", from Queensland Rail to Stockland Development Division dated 28/08/2013;	(a) and (b) Upon decommissioning the existing rail level crossing located on William Palfrey Drive and prior to the commencement of use for stage 1 (c)	Land use and transport coordination under the Transport Planning and Coordination Act 1994 and the purpose mentioned in the Transport Infrastructure Act 1994, section 258(2). The way the object of s.8A of the TPCA is to be achieved includes ensuring, as

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No.	Conditions of Development	Condition Timing	Jurisdiction and Reasons
	• Yaamba Road Intersection Interim Design Geometry, Drawing Number N12081-SK11, Issue C, prepared by Brown Smart Consulting and dated 27/08/2013; and • Yaamba Road Intersection Ultimate Design Geometry, Drawing Number N12081-SK10, Issue C, prepared by Brown Smart Consulting and dated 22/08/2013. (b) The replacement rail level crossing must be designed and constructed generally in accordance with AS1742.7–2007 *Manual of uniform traffic control devices, Part 7: Railway crossings* and must include the following at a minimum: • active control devices and treatments (RX-5 railway crossing flashing signal assemblies and boom gates) on each side of the crossing for each vehicle lane and overhead flashing signal assemblies, including signage, to cover multiple traffic lanes. The active controls must be coordinated with the proposed traffic light system at the intersection of Olive Street and the Bruce Highway; • advanced warning signage; • railway crossing signage and pavement markings; and • pedestrian crossings with active protection controls and mazes on each side of the crossing. (c) The applicant must provide to the Department of Transport and Main Roads written evidence from the railway manager that the development has been designed and constructed in accordance with parts (a) and (b) of this condition.	Prior to obtaining a final inspection certificate or certificate of classification, whichever is applicable, or prior to the commencement of use, whichever occurs first, for stage 1	far as practicable, development does not have a significant adverse impact on public passenger transport and future public passenger transport infrastructure. The development is required to ensure the safety and operational integrity of railways and future railways. Comments or additional information: Pursuant to section 255 of the *Transport Infrastructure Act 1994*, the railway manager's written approval is required to carry out works in or on a railway corridor or otherwise interfere with the railway or its operations. The applicant is responsible for obtaining any necessary approvals and/or other agreements from the railway manager (Queensland Rail) for the detailed design and construction of the rail level crossing.

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No.	Conditions of Development	Condition Timing	Jurisdiction and Reasons
11	(a) The existing rail level crossing of the North Coast Line at William Palfrey Drive (ID: 5412) must be decommissioned and closed. The existing level crossing is situated within private property (Lease Lot 49 on SP129857). The closure of the level crossing is subject to agreement and / or consent being provided by the State of Queensland. (b) The applicant must provide to the Department of Transport and Main Roads written evidence from the railway manager that the rail level crossing has been decommissioned and closed.	(a) Prior to the commencement of use for stage 1 and prior to the opening of the replacement rail level crossing located on Olive Street (b) Prior to obtaining a final inspection certificate or certificate of classification, whichever is applicable, or prior to the commencement of use, whichever occurs first, for stage 1	Land use and transport coordination under the Transport Planning and Coordination Act 1994 and the purpose mentioned in the Transport Infrastructure Act 1994, section 258(2). The way the object of s.8A of the TPCA is to be achieved includes ensuring, as far as practicable, development does not have a significant adverse impact on public passenger transport and future public passenger transport infrastructure. The development is required to ensure the safety and operational integrity of railways and future railways. In particular, the development must ensure no further crossings are added to the rail network in accordance with the *Queensland Level Crossing Safety Strategy 2012-2021.* Comments or additional information: The existing rail level crossing must be decommissioned and closed in

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No.	Conditions of Development	Condition Timing	Jurisdiction and Reasons
			accordance with the requirements of the railway manager (Queensland Rail). The applicant is responsible for obtaining any necessary approvals and/or other agreements from Queensland Rail for the decommissioning and closing of the rail level crossing. Queensland Rail will need to verify that the rail level crossing has been appropriately decommissioned and closed in accordance with their standards and requirements.
12	(a) The development must provide noise attenuation measures generally as detailed in the following, except where modified by these concurrence agency conditions: • Correspondence entitled "Response to Queensland Department of Transport and Main Roads Information Request – Noise Impact Assessment for Proposed Master Planned Community – 'Ellida' – Parkhurst North", from MWA Environmental to Stockland Development Pty Ltd, Reference Number L15713/BH/11-007 and dated 7/08/2013; and • Masterplan Environmental Amenity Assessment – Proposed Master Planned Community – 'Ellida' – Parkhurst North, Job Number 11-007, prepared by MWA Environmental and dated 27 February 2013.	(a) Prior to the commencement of use and to be maintained at all times for the relevant stage (b) Prior to obtaining a final inspection certificate or certificate of classification, whichever is applicable, or prior to the commencement of use, whichever occurs first for the relevant stage	Land use and transport coordination under the Transport Planning and Coordination Act 1994 and the purpose mentioned in the Transport Infrastructure Act 1994, section 258(2). The development will be impacted on by environmental emissions generated by public passenger transport, public passenger transport infrastructure and/or railways and is required to address these impacts. Comments or additional information:

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No.	Conditions of Development	Condition Timing	Jurisdiction and Reasons
	(b) The applicant must provide RPEQ certification to the Department of Transport and Main Roads that the development has been designed and constructed in accordance with parts (a) and (b) of this condition.		Further information regarding development in a railway environment can be obtained from the Guide for Development in a Railway Environment which is available at: http://www.tmr.qld.gov.au/Business-industry/Technical-standards-publications.aspx.
13	(a) Where not otherwise regulated under the Queensland Development Code for Transport Noise Corridors, accommodation activities (residential development) within the area identified as 'Railway Acoustic Treatment Zone' on Figure 3 – 'Dwelling Acoustic Treatment Area', Drawing No. 11-077-3-IR, Job No. 11-007, prepared by MWA Environmental and dated 06/08/13, must be designed and constructed to meet the following internal noise criteria for railways: • ≤45 dB(A) single event maximum sound pressure level for sleeping areas at all times; and • ≤50 dB(A) single event maximum sound pressure level for habitable rooms at all times. (b) The applicant must provide RPEQ certification to the Department of Transport and Main Roads that the development has been designed and constructed in accordance with part (a) of this condition.	(a) Prior to the commencement of use and to be maintained at all times for the relevant stage (b) Prior to obtaining a final inspection certificate or certificate of classification, whichever is applicable, or prior to the commencement of use, whichever occurs first for the relevant stage	Land use and transport coordination under the Transport Planning and Coordination Act 1994 and the purpose mentioned in the Transport Infrastructure Act 1994, section 258(2). The development will be impacted on by environmental emissions generated by public passenger transport, public passenger transport infrastructure and/or railways and is required to address these impacts. Comments or additional information: Should Transport Noise Corridors be gazetted for railways at a future date, the applicant can apply to change any existing approval in accordance with the *Sustainable Planning Act 2009*.

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No.	Conditions of Development	Condition Timing	Jurisdiction and Reasons
			Further information regarding development in a railway environment can be obtained from the Guide for Development in a Railway Environment which is available at: http://www.tmr.qld.gov.au/Business-industry/Technical-standards-publications.aspx.
14	(a) The development must provide earth mounds adjacent to the railway, to the north and south of Olive Street, generally in accordance with: • Figure 2 – 'Proposed Acoustic Mound Alignment', Drawing No. 11-077-2-IR, Job No. 11-007, prepared by MWA Environmental and dated 06/08/13; and • Figure 5 – 'Railway Noise Acoustic Barrier', Drawing No. 11-077-5, Job No. 11-007, prepared by MWA Environmental and dated 27/02/13. (b) Earth mounds must be designed and constructed to have a batter slope no steeper than 1:2 on either side and be in accordance with the Department of Transport and Main Roads' Technical Standard - MRTS04, where relevant. (c) Earth mounds must be landscaped in accordance with the following Department of Transport and Main Roads' Technical Standards and Specifications, where relevant: • MRTS16 – General Requirements Landscape and Revegetation	(a) - (d) Prior to the commencement of use and to be maintained at all times for the relevant stage (e) Prior to obtaining a final inspection certificate or certificate of classification, whichever is applicable, or prior to the commencement of use, whichever occurs first, for the relevant stage	Land use and transport coordination under the Transport Planning and Coordination Act 1994 and the purpose mentioned in the Transport Infrastructure Act 1994, section 258(2). The development will be impacted on by environmental emissions generated by public passenger transport, public passenger transport infrastructure and/or railways and is required to address these impacts. Comments or additional information: Further information regarding development in a railway environment can be obtained from the Guide for Development in a Railway Environment

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No.	Conditions of Development	Condition Timing	Jurisdiction and Reasons
	Works; • MRTS16B – Vegetation Ground Works; • MRTS16C – Vegetation Works; and • MRTS16E – Establishment and Monitoring Works. (d) Earth mounds must not be located on rail corridor land. (e) The applicant must provide RPEQ certification to the Department of Transport and Main Roads that the development has been designed and constructed in accordance with parts (a) – (d) of this condition.		which is available at: http://www.tmr.qld.gov.au/Business-industry/Technical-standards-publications.aspx.
15	(a) Stormwater management for the development must be generally in accordance with the following: • Flood Management Report, Report Number: B11007.W.-01D, Issue D, prepared by Brown Consulting (QLD) Pty Ltd and dated 27 September 2013; and • Ellida Local Plan, Parkhurst - Stormwater Quality Management Plan Masterplan, prepared by Design Flow and dated July 2013. In particular, the management of stormwater (quantity and quality) post development must achieve a no worsening impact (on the pre-development condition) for all flood and stormwater events that exist prior to development and up to a 1% Annual Exceedance Probability (AEP) (equivalent to 1/100 year Average Recurrence Interval (ARI)). Stormwater management for the development must ensure no worsening or actionable nuisance to the rail corridor land and rail transport infrastructure caused by peak discharges, flood levels, frequency/duration of flooding, flow velocities, water quality,	(a) and (b) Prior to the commencement of use and to be maintained at all times for the relevant stage (c) Prior to obtaining a final inspection certificate or certificate of classification, whichever is applicable, or prior to the commencement of use, whichever occurs first, for the relevant stage	Land use and transport coordination under the Transport Planning and Coordination Act 1994 and the purpose mentioned in the Transport Infrastructure Act 1994, section 258(2). Stormwater runoff from development can have a significant adverse impact on public passenger transport and/or public passenger transport infrastructure and on the safety and operational integrity of railways and future railways. Comments or additional information: Further information regarding development in a railway environment can be obtained from the Guide for

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No.	Conditions of Development	Condition Timing	Jurisdiction and Reasons
	sedimentation and scour effects. (b) Any excavation, filling, paving, landscaping, construction or any other works to the land, including noise barriers (earth mounds), must not: • create any new discharge points for stormwater runoff onto the rail corridor land; and • adversely interfere with the existing stormwater drainage on the rail corridor land. (c) The applicant must provide RPEQ certification to the Department of Transport and Main Roads that the development has been designed and constructed in accordance with parts (a) and (b) of this condition.		Development in a Railway Environment which is available at: http://www.tmr.qld.gov.au/Business-industry/Technical-standards-publications.aspx. Further guidance regarding stormwater management is also provided in the Queensland Urban Drainage Manual available at http://www.ehp.qld.gov.au/water/policy/urban_stormwater_planning_guidelines.html and in the Environmental Protection Act 1994 and Environmental Protection (Water) Policy 2009 which are available at www.legislation.qld.gov.au.
16	(a) The design of any excavation works, filling and backfilling works, earth mound structures, retaining works and other works involving ground disturbance abutting rail corridor land must not de-stabilise rail transport infrastructure or the land supporting this infrastructure. (b) Temporary structures and batters must not encroach into rail corridor land. (c) Any retaining structures necessary to stabilise any excavations to the development must be located outside rail corridor land.	(a) – (c) Prior to the commencement of use and to be maintained at all times for the relevant stage (d) To be maintained at all times during construction for the relevant stage (e)	Land use and transport coordination under the Transport Planning and Coordination Act 1994 and the purpose mentioned in the Transport Infrastructure Act 1994, section 258(2). The way the object of s.8A of the TPCA is to be achieved includes ensuring, as far as practicable, development does not have a significant adverse impact on public passenger transport and future

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	(d) The development must not store any fill, spoil or any other material on rail corridor land at any stage of construction. (e) The applicant must provide RPEQ certification to the Department of Transport and Main Roads that the development has been designed and constructed in accordance with parts (a) – (d) of this condition.	Prior to obtaining a final inspection certificate or certificate of classification, whichever is applicable, or prior to the commencement of use, whichever occurs first, for the relevant stage	public passenger transport infrastructure. The development is required to ensure the safety and operational integrity of railways and future railways. Comments or additional information: Further information regarding development in a railway environment can be obtained from the Guide for Development in a Railway Environment which is available at: http://www.tmr.qld.gov.au/Business-industry/Technical-standards-publications.aspx.
17	(a) Fencing must be provided on the site along the boundary with the rail corridor land in accordance with the Guide for Development in a Railway Environment and Queensland Rail Standard Drawing 2573 – Chain-Link Fabric Fence. (b) The applicant must provide RPEQ certification to the Department of Transport and Main Roads that the development has been designed and constructed in accordance with part (a) of this condition.	(a) Prior to the commencement of use and to be maintained at all times for the relevant stage (b) Prior to obtaining a final inspection certificate or certificate of classification, whichever is applicable, or prior to the commencement of use,	Land use and transport coordination under the Transport Planning and Coordination Act 1994 and the purpose mentioned in the Transport Infrastructure Act 1994, section 258(2). The way the object of s.8A of the TPCA is to be achieved includes ensuring, as far as practicable, development does not have a significant adverse impact on public passenger transport and future

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		whichever occurs first for the relevant stage	public passenger transport infrastructure. The development is required to ensure the safety and operational integrity of railways and future railways. Comments or additional information: Further information regarding development in a railway environment can be obtained from the Guide for Development in a Railway Environment which is available at: http://www.tmr.qld.gov.au/Business-industry/Technical-standards-publications.aspx.
18	(a) The roads identified as 'bus route' shown on Road Hierarchy, Project Number 109116-93a, dated August 2013 and prepared by RPS must be designed and constructed in accordance with the Schedule – Code for IDAS, Part 2 – Development Standards of the *Transport Planning and Coordination Regulation 2005* to accommodate a single unit rigid bus of 12.5m in length and Chapter 6, Appendix C - Bus Route Infrastructure of the *TransLink Transit Authority Public Transport Infrastructure Manual*, May 2012. (b) The applicant must provide RPEQ certification to the Department of Transport and Main Roads that the roads identified as 'bus route' have	(a) Prior to the commencement of use for the relevant stage (b) Prior to obtaining a final inspection certificate or certificate of classification, whichever is applicable, or prior to the commencement of use, whichever occurs first for the	Land Use and Transport Coordination under the *Transport Planning and Coordination Act 1994* (TPCA). The way the object of s.8A of the TPCA is to be achieved includes ensuring as far as practicable that public passenger transport offers an attractive alternative to private transport. It also seeks to promote urban development that maximises the use of public passenger

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No.	Conditions of Development	Condition Timing	Jurisdiction and Reasons
	been designed and constructed in accordance with part (a) of this condition.	relevant stage	transport. The identified roads are to be designed and constructed to support and facilitate the use of public passenger transport. The roadway design must not impede the safe and efficient movement of buses on the identified route/s. Comments or additional information: This condition does not imply that a bus service will be provided to the development. Any new services have to be assessed against other priorities across the network, available funding and funding constraints, and the ability of the road network through the new urban area to allow for the efficient routing of a service, amongst other relevant considerations. The *Transport Planning and Coordination Regulation 2005* is available at: www.legislation.qld.gov.au. TransLink's *Public Transport Infrastructure Manual May 2012* is available at:

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			http://translink.com.au/about-translink/what-we-do/public-transport-planning.
Development Permit for Reconfiguring a Lot (five lots into 199 lots, public use land and balance lots)			
19	Development must be carried out generally in accordance with the following plan except as modified by these concurrence agency conditions: • Proposal Plan (Plan Reference 109116-82, Revision I) dated 29 July 2013; and • Balance Lot Plan (Plan Reference 109116-86, Revision D), dated 29 July 2013.	Prior to submitting the Plan of Survey to the local government for approval for the relevant stage	The purposes of the Transport infrastructure Act 1994. Land use and transport coordination under the *Transport Planning and Coordination Act 1994.* The Department of Transport and Main Roads' assessment of the development application was undertaken on the basis of the cited plan/s and/or report/s which depict how the proposed development will be carried out.
20	(a) The development must be in accordance with the Stormwater Management Plan Brown Consulting (Qld) Pty Ltd's Flood Management Report, Issue D, dated 27 September 2013 (Report Number B11007.W.-01D) (Stormwater Quantity) and DesignFlow's Stormwater Quality Management Plan – Stages 1 – 3, dated July 2013 (Stormwater Quality. Stormwater management for the development must ensure no worsening or actionable nuisance to the state-controlled road network caused by peak discharges, flood levels, frequency/duration of flooding,	(a) - (c) Prior to submitting the Plan of Survey to the local government for approval for each stage	The purposes of the Transport Infrastructure Act 1994. The safety and efficiency of state-controlled roads can be adversely affected by changes to stormwater runoff as a result of development.

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	flow velocities, water quality, sedimentation and scour effects. AND (b) Any excavation, filling, paving, landscaping, construction or any other works to the land must not: i. create any new discharge points for stormwater runoff onto the state-controlled road; ii. adversely interfere with and/or cause damage to the existing stormwater drainage on the state-controlled road; iii. surcharge any existing culvert or drain on the state-controlled road; iv. reduce the quality of stormwater discharge onto the state-controlled road. AND (c) The applicant must provide RPEQ certification to the Department of Transport and Main Roads that the development has been designed and constructed in accordance with parts (a) and (b) of this condition.		Additional comments or information: Please refer to the Department of Transport and Main Roads' Road Drainage Manual which can be accessed at http://www.tmr.qld.gov.au/Business-industry/Technical-standards-publications.aspx. Further guidance regarding stormwater management is also provided in the Queensland Urban Drainage Manual available at www.derm.qld.gov.au and in the Environmental Protection Act 1994 and Environmental Protection (Water) Policy 2009 which are available at www.legislation.qld.gov.au In accordance with Section 33 of the TIA, you must have written approval to carry out road works, including road access works on a state-controlled road. These development conditions do not constitute such approval. You will need to contact the Department of Transport and Main Roads on (07) 4931 1500 to

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No.	Conditions of Development	Condition Timing	Jurisdiction and Reasons
			make an application for approval under section 33 of the TIA to carry out road works.
21	(a) The Bruce Highway and Olive Street intersection must be upgraded to a 4 way signalised intersection. The intersection must be designed and constructed in accordance with the Department of Transport and Main Roads' Road Planning and Design Manual including the Interim Guide to Road Planning, Figure 4.5.1.2a of Cambray Consulting Pty Ltd's Traffic Impact Assessment (Stage 1 - 3 Reconfiguration of Lot), dated 7 August 2013. (b) The intersection upgrade must be designed and constructed to include: • The installation of lighting at the intersection of Bruce Highway and Olive Street in accordance with Chapter 17 of the Department of Transport and Main Roads' Road Planning and Design Manual including the Interim Guide to Road Planning and Design Practice and AS/NZS1158. • Appropriate diverge/deceleration distances in accordance with the requirements of the Department of Transport and Main Roads' Road Planning and Design Manual as well as the storage distances indicated in the analysis contained in the Cambray Consulting Pty Ltd's Traffic Impact Assessment (Stage 1-3 Reconfiguration of Lot) dated 7 August 2013. AND	(a) – (d) Prior to submitting the Plan of Survey to the local government for approval for the 1st lot of the development	The purposes of the Transport Infrastructure Act 1994 (TIA). The intersection upgrade is required as a result of the development and its associated traffic impacts to ensure the safety and efficiency of the state-controlled road network. In accordance with Section 33 of the TIA, you must have written approval to carry out road works, including road access works on a state-controlled road. These development conditions do not constitute such approval. You will need to contact the Department of Transport and Main Roads on (07) 4931 1500 to make an application for approval under section 33 of the TIA to carry out road works. The Department of Transport and Main Roads' technical standards and publications can be accessed at

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No.	Conditions of Development	Condition Timing	Jurisdiction and Reasons
	(c) The intersection must be provided by the applicant at no cost to the Department of Transport and Main Roads. AND (d) All adjustments and/or relocations to existing services within the state-controlled road as a result of the development are at the applicant's expense.		http://www.tmr.qld.gov.au/Business-industry/Technical-standards-publications.aspx Where services within the state-controlled road reserve will be impacted by the development, the applicant will need to contact the relevant service provider.
22	WORKS WITHIN STATE-CONTROLLED ROAD RESERVE (WSCRR) Preparation of plans (in accordance with RFCD-0101) and submission of these plans to the Rockhampton office of the Department of Transport and Main Roads for approval. No works (including installation of services) are to commence within the State-controlled road reserve until approval of the plan/s showing the proposed works is issued by the department. This approval may be subject to conditions related to the works construction process. All works in State-controlled road reserves are required to be completed and accepted by the Department of Transport and Main Roads prior to the signing and sealing of the first lot within the development.	Plans are required to be submitted to the department to demonstrate the any works proposed to be constructed within the State-controlled road reserve. Amendments may be required to the plans showing the works prior to the issuing of the approval to construct.	This Department has the power under section 33 of the *Transport Infrastructure Act 1994* to require plans of proposed works to be submitted for review and acceptance prior to the works commencing.
23	Where services required to serve this development are proposed be laid/placed within the boundaries of the State-controlled road reserve,	The department is concerned that the placement of services	The Department of Transport and Main Roads has the power under section 33

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No.	Conditions of Development	Condition Timing	Jurisdiction and Reasons
	they shall be laid/placed in accordance with the Department of Transport and Main Roads requirements.	by developers in the State-controlled road reserve may restrict future upgrading works in the reserve.	of the *Transport Infrastructure Act 1994.*
24	(a) All conditions stated above are required to be completed prior to the issue of certificate of classification for building works by Council or private certifier or prior to the commencement of use (whichever is the earliest) for the development unless otherwise stated within the condition. (b) Bonding of any of the conditions not completed prior to the signing and sealing of the first lot within the development or other requisite date as stated in the particular condition will not be permitted unless the Department of Transport and Main Roads has given written agreement to the bonding of the condition. (c) All works associated with the development must be at no expense to the department.	Prior to the commencement of use	The Department of Transport and Main Roads has authority under Section 2 of the Transport Infrastructure Act 1994. The department is concerned the non-fulfilment of its conditions and the bonding of the conditions without the department's agreement can compromise the safety and efficiency objectives of the state-controlled road.
25	(a) The Works Within State-controlled Road Reserve (WSCRR) application referred to in condition (22) shall be accompanied by written consent from each affected landowner agreeing to any changes to any existing direct access arrangements proposed (i.e. if the direct access point is moved or the standard of access is altered) as a result of the Bruce Highway and Olive Street 4 way signalised intersection configuration upgrade referred to in condition (4) to the satisfaction of the Department of Transport and Main Roads.	(a) and (b) Plans are required to be submitted to the department to demonstrate the any works proposed to be constructed within the State-controlled road reserve. Amendments may be required to the plans showing	This Department has the power under section 33 of the *Transport Infrastructure Act 1994* to require plans of proposed works to be submitted for review and acceptance prior to the works commencing. It is the expectation of TMR that the applicant use its best endeavours to

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	(b) The applicant shall notify all landowners where access arrangements are proposed to be indirectly affected (i.e. existing all movements access reduced to a left-in left out arrangement) as a result of the Bruce Highway and Olive Street 4 way signalised intersection configuration upgrade referred to in condition (21) to the satisfaction of the Department of Transport and Main Roads.	the works prior to the issuing of the approval to construct.	obtain any necessary consents, without any involvement from the department during any required third party negations.
26	(a) The proposed replacement rail level crossing located on Olive Street must be designed and constructed at the applicant's expense in accordance with the following: • Correspondence entitled "Olive Street, Parkhurst Crossing Proposal In-Principle Approval Parkhurst Masterplanned Community", from Queensland Rail to Stockland Development Division dated 28/08/2013; • Yaamba Road Intersection Interim Design Geometry, Drawing Number N12081-SK11, Issue C, prepared by Brown Smart Consulting and dated 27/08/2013; and • Yaamba Road Intersection Ultimate Design Geometry, Drawing Number N12081-SK10, Issue C, prepared by Brown Smart Consulting and dated 22/08/2013. (b) The rail level crossing must be designed and constructed in accordance with AS1742.7–2007 *Manual of uniform traffic control devices, Part 7: Railway crossings* and must include the following at a minimum:	(a) and (b) Upon decommissioning of the existing rail level crossing located on William Palfrey Drive and prior to submitting the Plan of Survey to the local government for approval for stage 1 (c) Prior to submitting the Plan of Survey to the local government for approval for Stage 1	Land use and transport coordination under the Transport Planning and Coordination Act 1994 and the purpose mentioned in the Transport Infrastructure Act 1994, section 258(2). The way the object of s.8A of the TPCA is to be achieved includes ensuring, as far as practicable, development does not have a significant adverse impact on public passenger transport and future public passenger transport infrastructure. The development is required to ensure the safety and operational integrity of railways and future railways. Comments or additional information:

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	• active control devices and treatments (RX-5 railway crossing flashing signal assemblies and boom gates) on each side of the crossing for each vehicle lane and overhead flashing signal assemblies, including signage, to cover multiple traffic lanes. The active controls must be coordinated with the proposed traffic light system at the intersection of Olive Street and the Bruce Highway; • advanced warning signage; • railway crossing signage and pavement markings; and • pedestrian crossings with active protection controls and mazes on each side of the crossing. (c) The applicant must provide to the Department of Transport and Main Roads written evidence from the railway manager that the development has been designed and constructed in accordance with parts (a) and (b) of this condition.		Pursuant to section 255 of the *Transport Infrastructure Act 1994*, the railway manager's written approval is required to carry out works in or on a railway corridor or otherwise interfere with the railway or its operations. The applicant is responsible for obtaining any necessary approvals and/or other agreements from Queensland Rail for the detailed design and construction of the rail level crossing.
27	(a) The existing rail level crossing of the North Coast Line at William Palfrey Drive (ID: 5412) must be decommissioned and closed. The existing level crossing is situated within private property (Lease Lot 49 on SP129857). The closure of the level crossing is subject to agreement and / or consent being provided by the State of Queensland. (b) The applicant must provide to the Department of Transport and Main Roads written evidence from the railway manager that the rail level crossing has been decommissioned and closed.	(a) Prior to submitting the Plan of Survey to the local government for approval for stage 1 and prior to the opening of the replacement rail level crossing located on Olive Street (b) Prior to submitting the Plan of	Land use and transport coordination under the Transport Planning and Coordination Act 1994 and the purpose mentioned in the Transport Infrastructure Act 1994, section 258(2). The way the object of s.8A of the TPCA is to be achieved includes ensuring, as far as practicable, development does not have a significant adverse impact on public passenger transport and future

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			Survey to the local government for approval for stage 1	public passenger transport infrastructure. The development is required to ensure the safety and operational integrity of railways and future railways. In particular, the development must ensure no further crossings are added to the rail network in accordance with the *Queensland Level Crossing Safety Strategy 2012-2021.* Comments or additional information: The existing rail level crossing must be decommissioned and closed in accordance with the requirements of the railway manager (Queensland Rail). The applicant is responsible for obtaining any necessary approvals, contract arrangements, and/or other agreements from Queensland Rail for the decommissioning and closing of the rail level crossing. Queensland Rail will need to verify that the rail level crossing has been appropriately decommissioned and

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			closed in accordance with their standards and requirements.
28	(a) The development must provide noise attenuation measures as detailed in the following, except where modified by these concurrence agency conditions: • Correspondence entitled "Response to Queensland Department of Transport and Main Roads Information Request – Noise Impact Assessment for Proposed Master Planned Community – 'Ellida' – Parkhurst North", from MWA Environmental to Stockland Development Pty Ltd, Reference Number L15713/BH/11-007 and dated 17/08/2013; and • Noise Amenity Assessment – Stages 1 to 3 – 'Ellida' - Parkhurst North, Job Number 11-007, prepared by MWA Environmental and dated 27 February 2013. (b) The applicant must provide RPEQ certification to the Department of Transport and Main Roads that the development has been designed and constructed in accordance with parts (a) and (b) of this condition.	(a) and (b) Prior to submitting the Plan of Survey to the local government for approval for the relevant stage	Land use and transport coordination under the Transport Planning and Coordination Act 1994 and the purpose mentioned in the Transport Infrastructure Act 1994, section 258(2). The development will be impacted on by environmental emissions generated by public passenger transport, public passenger transport infrastructure and/or railways and is required to address these impacts. Comments or additional information: Further information regarding development in a railway environment can be obtained from the Guide for Development in a Railway Environment which is available at: http://www.tmr.qld.gov.au/Business-industry/Technical-standards-publications.aspx.

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29	(a) An earth mound of 5.5m in height must be provided in accordance with: • Figure 1 - 'Acoustic Mound Concept', Drawing No. 11-077-1-IR, Job No. 11-007, prepared by MWA Environmental and dated 06/08/13; and • Figure 2 – 'Proposed Acoustic Mound Alignment', Drawing No. 11-077-2-IR, Job No. 11-007, prepared by MWA Environmental and dated 06/08/13. (b) The earth mound must be designed and constructed to have a batter slope no steeper than 1:2 on either side and be in accordance with the Department of Transport and Main Roads' Technical Standard - MRTS04, where relevant. (c) The earth mound must be landscaped in accordance with the following Department of Transport and Main Roads' Technical Standards and Specifications, where relevant: • MRTS16 – General Requirements Landscape and Revegetation Works; • MRTS16B – Vegetation Ground Works; • MRTS16C – Vegetation Works; and • MRTS16E – Establishment and Monitoring Works. (d) The earth mound must not be located on rail corridor land. (e) The applicant must provide RPEQ certification to the Department of Transport and Main Roads that the development has been designed	(a) - (e) Prior to submitting the Plan of Survey to the local government for approval for the relevant stage	Land use and transport coordination under the Transport Planning and Coordination Act 1994 and the purpose mentioned in the Transport Infrastructure Act 1994, section 258(2). The development will be impacted on by environmental emissions generated by public passenger transport, public passenger transport infrastructure and/or railways and is required to address these impacts. Comments or additional information: Further information regarding development in a railway environment can be obtained from the Guide for Development in a Railway Environment which is available at: http://www.tmr.qld.gov.au/Business-industry/Technical-standards-publications.aspx.

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	and constructed in accordance with parts (a) – (d) of this condition.		
30	(a) Stormwater management for the development must be in accordance with the following: • Flood Management Report, Report Number: B11007.W.-01D, Issue D, prepared by Brown Consulting Pty Ltd and dated 27 September 2013; and • Parkhurst North Stormwater Quality Management Plan Stages 1-3, prepared by Design Flow and dated July 2013. In particular, the management of stormwater (quantity and quality) post development must achieve a no worsening impact (on the pre-development condition) for all flood and stormwater events that exist prior to development and up to a 1% Annual Exeedance Probability (AEP) (equivalent to 1/100 year Average Recurrence Interval (ARI)). Stormwater management for the development must ensure no worsening or actionable nuisance to the rail corridor land and rail transport infrastructure caused by peak discharges, flood levels, frequency/duration of flooding, flow velocities, water quality, sedimentation and scour effects. (b) Any excavation, filling, paving, landscaping, construction or any other works to the land, including the noise barrier (earth mound), must not: • create any new discharge points for stormwater runoff onto the rail corridor land; and	(a) – (c) Prior to submitting the Plan of Survey to the local government for approval for the relevant stage	Land use and transport coordination under the Transport Planning and Coordination Act 1994 and the purpose mentioned in the Transport Infrastructure Act 1994, section 258(2). Stormwater runoff from development can have a significant adverse impact on public passenger transport and/or public passenger transport infrastructure and on the safety and operational integrity of railways and future railways. Comments or additional information: Further information regarding development in a railway environment can be obtained from the Guide for Development in a Railway Environment which is available at: http://www.tmr.qld.gov.au/Business-industry/Technical-standards-publications.aspx. Further guidance regarding stormwater management is also provided in the

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	• adversely interfere with the existing stormwater drainage on the rail corridor land. (c) The applicant must provide RPEQ certification to the Department of Transport and Main Roads that the development has been designed and constructed in accordance with parts (a) and (b) of this condition.		Queensland Urban Drainage Manual available at http://www.ehp.qld.gov.au/water/policy/urban_stormwater_planning_guidelines.html and in the Environmental Protection Act 1994 and Environmental Protection (Water) Policy 2009 which are available at www.legislation.qld.gov.au.
31	(a) The design of any excavation works, filling and backfilling works, earth mound structures, retaining works and other works involving ground disturbance abutting rail corridor land must not de-stabilise rail transport infrastructure or the land supporting this infrastructure. (b) Temporary structures and batters must not encroach into rail corridor land. (c) Any retaining structures necessary to stabilise any excavations to the development must be located outside rail corridor land. (d) The development must not store any fill, spoil or any other material on rail corridor land at any stage of construction. (e) The applicant must provide RPEQ certification to the Department of Transport and Main Roads that the development has been designed and constructed in accordance with parts (a) – (d) of this condition.	(a) – (e) Prior to submitting the Plan of Survey to the local government for approval for the relevant stage	Land use and transport coordination under the Transport Planning and Coordination Act 1994 and the purpose mentioned in the Transport Infrastructure Act 1994, section 258(2). The way the object of s.8A of the TPCA is to be achieved includes ensuring, as far as practicable, development does not have a significant adverse impact on public passenger transport and future public passenger transport infrastructure. The development is required to ensure the safety and operational integrity of railways and future railways. Comments or additional information:

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			Further information regarding development in a railway environment can be obtained from the Guide for Development in a Railway Environment which is available at: http://www.tmr.qld.gov.au/Business-industry/Technical-standards-publications.aspx.
32	(a) Fencing must be provided on the site along the boundary with the rail corridor land in accordance with the Guide for Development in a Railway Environment and Queensland Rail Standard Drawing 2573 – Chain-Link Fabric Fence. (b) The applicant must provide RPEQ certification to the Department of Transport and Main Roads that the development has been designed and constructed in accordance with part (a) of this condition.	(a) – (b) Prior to submitting the Plan of Survey to the local government for approval for the relevant stage	Land use and transport coordination under the Transport Planning and Coordination Act 1994 and the purpose mentioned in the Transport Infrastructure Act 1994, section 258(2). The way the object of s.8A of the TPCA is to be achieved includes ensuring, as far as practicable, development does not have a significant adverse impact on public passenger transport and future public passenger transport infrastructure. The development is required to ensure the safety and operational integrity of railways and future railways. Comments or additional information:

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No.	Conditions of Development	Condition Timing	Jurisdiction and Reasons
			Further information regarding development in a railway environment can be obtained from the Guide for Development in a Railway Environment which is available at: http://www.tmr.qld.gov.au/Business-industry/Technical-standards-publications.aspx.
33	(a) The roads identified as 'bus route' shown on Road Hierarchy, Project Number 109116-93a, dated August 2013 and prepared by RPS must be designed and constructed in accordance with the Schedule – Code for IDAS, Part 2 – Development Standards of the *Transport Planning and Coordination Regulation 2005* to accommodate a single unit rigid bus of 12.5m in length and Chapter 6, Appendix C - Bus Route Infrastructure of the *TransLink Transit Authority Public Transport Infrastructure Manual*, May 2012. (b) The applicant must provide RPEQ certification to the Department of Transport and Main Roads that the roads identified as 'bus route' have been designed and constructed in accordance with part (a) of this condition.	(a) Prior to submitting the Plan of Survey to the local government for the relevant stage (b) Prior to submitting the Plan of Survey to the local government for the relevant stage	Land Use and Transport Coordination under the *Transport Planning and Coordination Act 1994* (TPCA). The way the object of s.8A of the TPCA is to be achieved includes ensuring as far as practicable that public passenger transport offers an attractive alternative to private transport. It also seeks to promote urban development that maximises the use of public passenger transport. The identified roads are to be designed and constructed to support and facilitate the use of public passenger transport. The roadway design must not impede the safe and efficient movement of buses on the identified route/s.

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				Comments or additional information: This condition does not imply that a bus service will be provided to the development. Any new services have to be assessed against other priorities across the network, available funding and funding constraints, and the ability of the road network through the new urban area to allow for the efficient routing of a service, amongst other relevant considerations. The *Transport Planning and Coordination Regulation 2005* is available at: www.legislation.qld.gov.au. TransLink's *Public Transport Infrastructure Manual May 2012* is available at: http://translink.com.au/about-translink/what-we-do/public-transport-planning.

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Chris Hewitt

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Manager (Corridor Management & Operations)

17 October 2013

Advice Statement to Assessment Manager:

Pursuant to section 255 of the *Transport Infrastructure Act 1994*, the railway manager's written approval is required to carry out works in or on a railway corridor or otherwise interfere with the railway or its operations.

Under section 253 of the *Transport Infrastructure Act 1994,* Rockhampton Regional Council must seek permission from the Chief Executive of the Department of Transport and Main Roads in relation to relevant infrastructure associated with constructing, maintaining and operating a road on rail corridor land or non-rail corridor land by way of a level crossing. The permission can be subject to conditions and the railway manager will be consulted as part of this process. After the permission is granted, the permission will be recorded on the property title for the railway and under the *Transport (Rail Safety) Act 2010*, the Rockhampton Regional Council will be required to enter into an interface agreement with the railway manager (Queensland Rail).

Upon the decommissioning of the existing public level crossing of the North Coast Line at William Palfrey Drive, it is recommended that temporary vehicle access from William Palfrey Drive to the proposed public level crossing of the North Coast Line at Olive Street be considered to manage external traffic flows and community expectations until such time that formal road access can be provided through the proposed development.

Advice for state controlled roads
Under section 43 of the *Transport Infrastructure Act 1994*, a local government must obtain the Department of Transport and Main Roads' approval if it intends to approve the erection, alteration or operation of an advertising sign or other advertising device that would be visible from a motorway; and beyond the boundaries of the motorway; and reasonably likely to create a traffic hazard for the motorway.
Under section 33 of the *Transport Infrastructure Act 1994*, written approval is required from the Department of Transport and Main Roads to carry out road works , including road access works, on a state-controlled road. Please contact the Department of Transport and Main Roads on (07) 4931 1706 to make an application for road works approval. This approval must be obtained prior to commencing any works on the

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Advice for state controlled roads
state-controlled road reserve. The approval process may require the approval of engineering designs of the proposed works, certified by a Registered Professional Engineer of Queensland (RPEQ).
An application for a Road Corridor Permit is required for any ancillary works and encroachments on the state-controlled road under section 50(2) and Schedule 6 of the *Transport Infrastructure Act 1994* and Part 5 and Schedule 1 of the *Transport Infrastructure (State-Controlled Roads) Regulation 2006*. Please contact the Department of Transport and Main Roads on (07) 4931 1706 to make an application for a Road Corridor Permit. Ancillary works and encroachments include but are not limited to advertising signs or other advertising devices, paths or bikeways, buildings/shelters, vegetation clearing, landscaping and planting.
Mandatory Part (MP) 4.4 of the *Queensland Development Code (QDC)* commenced on 1 September 2010 and applies to building work for the construction or renovation of a residential building in a designated *transport noise corridor*. MP4.4 seeks to ensure that the habitable rooms of Class 1, 2, 3 and 4 buildings located in a *transport noise corridor* are designed and constructed to reduce transport noise. *Transport noise corridor* means land designated under Chapter 8B of the *Building Act 1975* as a *transport noise corridor*. Information about *transport noise corridors* is available at state and local government offices. A free online search tool can be used to find out whether a property is located in a designated *transport noise corridor*. This tool is available at the Department of Local Government and Planning website (http://www.hpw.qld.gov.au/construction/BuildingPlumbing/Building/TransportNoiseCorridors/Pages/TransportNoiseCorridorSearchTool.aspx) and allows searches on a registered lot number and/or property address to determine whether and how the QDC applies to the land.
Pursuant to Section 580 of the *Sustainable Planning Act 2009* it is a development offence to contravene a development approval, including any condition in the approval.
Pursuant to Section 80 of the *Transport Infrastructure Act 1994*, the construction, augmentation, alteration or maintenance of a public utility plant on a state-controlled road reserve, must be in accordance with the Department of Transport and Main Roads' requirements.

Advice for public passenger transport and railways
Mandatory Part (MP) 4.4 of the *Queensland Development Code (QDC)* commenced on 1 September 2010 and applies to building work for the construction or renovation of a residential building in a designated *transport noise corridor*. MP4.4 seeks to ensure that the habitable rooms of Class 1, 2, 3 and 4 buildings located in a *transport noise corridor* are designed and constructed to reduce transport noise. *Transport noise corridor* means land designated under Chapter 8B of the *Building Act 1975* as a *transport noise corridor*. Information about *transport noise corridors* is available at state and local government offices. A free online search tool can be used to find out whether a property is located in a

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Advice for public passenger transport and railways
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Pursuant to section 255 of the *Transport Infrastructure Act 1994*, the railway manager's written approval is required to carry out works in or on a railway corridor or otherwise interfere with the railway or its operations.
To the extent any subsequent development of the land (for example, building work or operational work) involves a state resource, evidence of an allocation of, or an entitlement to, the resource will be required to support the development application. Please contact the Rail Ports & Freight Division on telephone number 07 3306 7430 regarding resource entitlements for rail corridor land.
Section 179 of the *Property Law Act 1974*, attaches an obligation to any land to ensure development does not withdraw support from any other land or from any building, structure or erection that has been placed on or below it.
Further information regarding development in a railway environment can be obtained from the *Guide for Development in a Railway Environment* which is available at: http://www.tmr.qld.gov.au/Business-industry/Technical-standards-publications.aspx
The Department of Transport and Main Roads' technical standards and publications can be accessed at http://www.tmr.qld.gov.au/Business-industry/Technical-standards-publications.aspx
The *Transport Planning and Coordination Regulation 2005* is available at: www.legislation.qld.gov.au
TransLink's TransLink Public Transport Infrastructure Manual 2007 is available at: http://translink.com.au/about-translink/what-we-do/public-transport-planning/public-transport-infrastructure-manual
The *Queensland Development Code (QDC)*, Mandatory Part 4.1 – Sustainable Buildings requires end of trip facilities (including bicycle parking and storage facilities, lockers and change rooms) to be provided for employees or occupants in Major Developments located in designated local government areas. Major Development includes commercial office buildings, shopping centres, tertiary education facilities or hospitals with a floor area greater than 2000m2 or development specified in a local government planning scheme for the purposes of QDC MP4.1. The applicant is responsible for achieving compliance with the QDC when obtaining any necessary development permits for building work for the proposed development.
Commonwealth legislation such as the *Airports Act 1996, Airport Regulations 1997, Airports (Protection of Airspace) Regulations 1996, Civil Aviation Act 1988, Civil Aviation Regulations 1988, Civil Aviation Safety Regulations 1998, Defence Act 1903 and Defence (Areas Control) Regulations 1989* regulates development in the vicinity of airports and aviation facilities.

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Advice for public passenger transport and railways
The applicant is responsible for obtaining any necessary approvals, permits and/or licences from the airport, Air Services Australia, the Civil Aviation Safety Authority (CASA) and any other relevant authority in respect of the proposed development.

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