TRAFFIC IMPACT ASSESSMENT REPORT
FOR
140 - 152 SPRINGACRE ROAD (RECONFIGURING OF A LOT)

MAY 2026

DRAFT REPORT

ITE CONSULTING
TRAFFIC AND TRANSPORT ENGINEERS

PREPARED FOR:	PREPARED BY:
	ITE Consulting 34 Flamingo Crescent Thornlands Brisbane 4164
Contact Person: **Tel**: **Email:**	**Contact Person:** Herman Joubert **Tel:** 0424110122 **Email:** herman@iteconsulting.com.au

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Signed **Date**

Herman Joubert
RPEQ No.: 25899

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1.0 INTRODUCTION AND APPROACH

1.1 Project Overview

ITE Consulting was appointed to conduct a Traffic Impact Assessment (TIA) for a proposed land subdivision and residential development situated on 140 - 152 Springacre Road, Thornlands. A copy of the development plans are provided in **Appendix A**. The site locality is provided in Figure 1.1.

Figure 1.1: Site Locality

Source: Queensland Globe (2026)

1.2 Proposed Application

The proposed application is for a reconfiguring of a Lot (ROL) consisting of:

Table 1.1 Proposed Development Extents

Parameter	Extent
Lots:	66
Internal Roads:	16m road reserve

There is currently no staging proposed to the subdivision Project. The following legislative summary items applicable to the proposed reconfiguration and TIS are indicated in Table 1.2.

Table 1.2 Legislative Summary

Legislative Summary	
Local Government Authority	Redland City Council
Applicable Planning Scheme Assessment Codes / Policies	EDQ Street and Movement Network, February 2019 EDQ Engineering Standards 2017 EDQ Residential 30, May 2015 RCC PSP 2—Infrastructure

1.3 Scope and Context of Report

This Traffic Impact Assessment (TIA) was carried out to determine the level of potential impacts of the Project on the operation of the surrounding road network. The outcomes of the TIA will be used in support of the Development Application which will be assessed by Economic Development Queensland (EDQ). This report investigates the transport aspects associated with the proposed development. The scope of the transport aspects investigated includes: The assessment methodology adopted for this TIA is summarised in the key tasks listed below.

- Broadly identify the existing transport infrastructure which is of relevance to the Project.
- Broadly define the proposed road upgrade works to address infrastructure requirements.
- Assess the current, background operation of the surrounding transport infrastructure.
- Estimate traffic generation associated with the Project and the distribution of this development traffic on the identified road network.
- Assess the potential traffic impact on the surrounding transport infrastructure.
- Identify potential mitigation and management strategies to be implemented to offset the traffic impact of the proposed Project (if required).
- Assess the proposed access arrangements to the site including safety and capacity.

1.4 Reference Guides

The following documents have been evaluated in order to formulate the traffic advice within this assessment:

- AS/NZS 2890.1 – 2004 Parking facilities Part 1: Off-street car parking
- AS/NZS 2890.2 – 2002 Part 2: Off-street commercial vehicle facilities
- TMR Guide to Traffic Impact Assessment (GTIA), 2018
- Road Planning and Design Manual, Chapter 13

- Plans of the proposed development provided in Appendix A to this report
- Redland City Council's (RCC's) online mapping
- Redland City Council's (RCC's) planning scheme

2.0 EXISTING CONDITIONS

2.1 On-Site Uses

The site is currently a block of land which will be subdivided and developed for 66 residential lots.

2.2 Site Surrounding Road Network

Descriptive details regarding the road network surrounding the proposed site are provided in Table 2.1. The table provides information regarding existing geometrical conditions of the road network and associated road links.

Table 2.1 Immediate Site Surrounding Road Network

Road Name	Road Class	Number of Lanes per Direction	Carriageway Single / Dual	Lane Width (m)	Shoulders (m)	Posted Speed (km/h)
Bunker Road	Sub Arterial	1	S	3.5	0.5m localised widening	80km/h
Kingfisher Road	Sub Arterial	1	S	3.5	0.5m localised widening	80km/h

The existing Springacre Road is a sub-arterial road within the Redland City Council Network. The existing road has a rural profile with a spray sealed wearing course and roadside swale drains. The proposed development site provides access to all lots via a new intersection on Springacre Road. The detailed design of the interim and ultimate intersections shall be in accordance with Austroads Guide to Road Design. The interim and ultimate intersection designs throughout the project shall consider input from all key stakeholders including EDQ, Council, Traffic Consultants and other relevant parties.

2.3 Intersections

2.3.1 Kingfisher Road / Bunker Road

The external intersection which is anticipated to receive the majority of generated traffic is considered to be the Kingfisher Road / Bunker Road intersection. The intersection illustrated in Figure 2.1.

Figure 2.1: Kingfisher Road / Bunker Road Intersection

The intersection is a priority-controlled intersection with a dedicated right turn along Bunker Road for the east-north movement. The minor movement is considered to be the Kingfisher Road approach. There are no formal pedestrian footpaths or linkages through this intersection.

2.4 Future Planning

Of relevance to this area, TMR is currently undertaking two planning studies: *Mount Cotton Road, Duncan Road to Double Jump Road Planning Study* and the *Redland Bay Road Taylor Road to Cleveland Redland Bay Road Planning Study*. The studies commenced with community consultation in 2023. Phase 2 community consultation is now underway where TMR is seeking feedback on upgraded intersections. Similarly it is assumed that EDQ are coordinating the design of the Kingfisher Road / Bunker Road intersection given the proximity and importance to the PDA (Figure 2.2.). More broadly, TMR is also undertaking a multi-modal transport study *(Bayside and Redlands Transport and Mobility Study*) to investigate the transport challenges and mobility priorities relating to road, active transport and public transport modes. This will identify the communities' current and future mobility priorities when travelling to, from and within the area, supported by desired outcomes and a high-level overview of the preferred 2046 transport networks. Again, it is assumed that EDQ and TMR are coordinating in this matter.

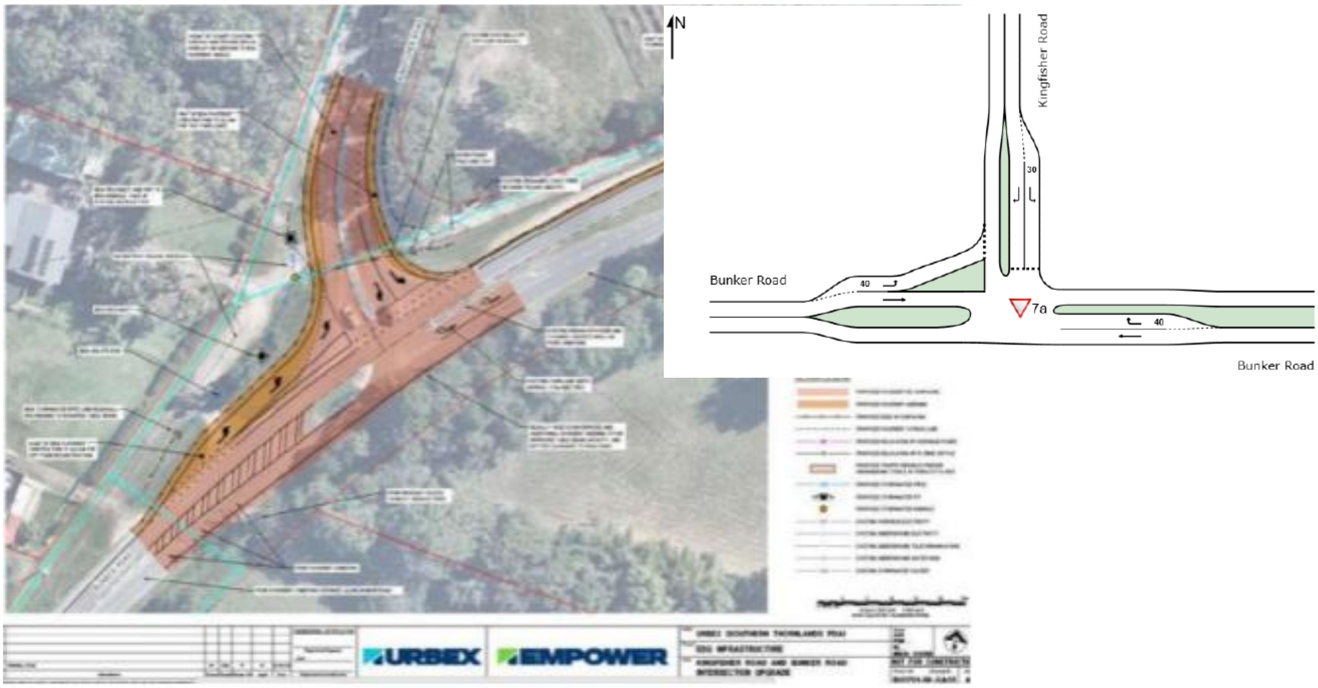
Of direct relevance to the subject development are the following LGIP items:

- Springacre Road will be widened (TR-L-107), and a new off-road cycle path (TR-L-79) will be constructed along the development frontage.

- The Kingfisher Rd/Bunker Road/Double Jump Road intersections will be upgraded with associated road realignment (TR-L-97, 106, 108, and 115).

It is understood that the latter works would convert the existing two offset T-Intersections into a single 4-way intersection. Due to the unknown timing of the planned LGIP works (despite being required imminently), interim works have been considered at the Kingfisher Road / Bunker Road intersection within he SLR Traffic Impact Assessment Report dated, 17 December 2025 to provide some mitigation to the developments impacts until such a time that the LGIP works and the upgrade of the two priority-controlled intersections to a signalised intersection is complete. These works are indicated in Figure 2.2.

Figure 2.2: Kingfisher Road / Bunker Road Intersection Concept Design Upgrade



Source: SLR TIA, 17 December 2025

The exact timing and delivery of these upgrade works are unknown but have been taken into consideration as part of this TIA report. It is understood that a DCOP will be established by EDQ to apportion reasonable infrastructure charges to developers within the PDA. The ultimate delivery of the road network upgrades will need to be coordinated by RCC and EDQ.

The upgrade works to this intersection will be delivered by EDQ and any anticipated impacts caused by the proposed development is anticipated to be offset through bulk contributions paid by the developer. It is also understood that Kingfisher Road is planned to form a dual carriageway with two lanes per direction, although exact design and timing of these works are also unknown at this stage.

2.5 Traffic Volumes

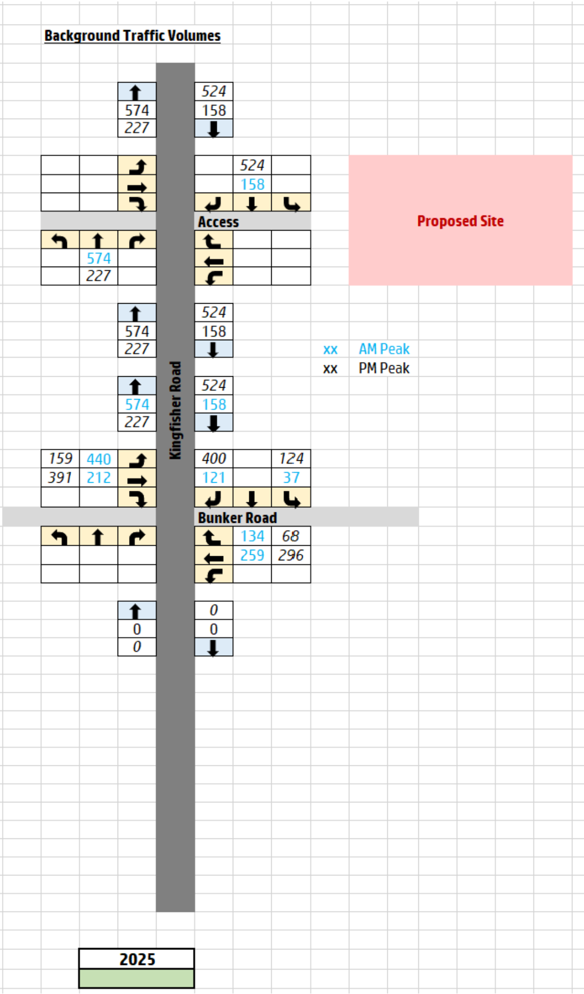
2.5.1 Intersection Volumes

In accordance with *Austroads Guide to Traffic Management Part 12: Integrated Transport Assessments for Developments*, the first intersection closest to the proposed site which would experience an increase in turn movement traffic was evaluated as part of this TIA to determine the potential impact on intersection operational performance. This was considered to be the Bunker Road / Kingfisher Road intersection. As such a site visit was conducted by ITE Consulting along with a traffic survey adopted from the SLR report dated 23 June 2025, which consisted of:

- AM Peak Hour: 7:30AM – 8:30AM
- PM Peak Hour: 3:30PM – 4:30PM
- Survey classification – light vehicles and heavy vehicles

The background traffic volumes as adopted from the SLR report are provided in Figure 2.3.

Figure 2.3: Background Traffic Volumes (2025)



2.5.2 Background Growth

A linear growth rate of 3.0% per annum has been adopted for the surrounding road network. TMR traffic census data (for the adjacent Boundary Road) has recorded approximately 1% growth per annum over the last ten years. For conservatism, 3% has been adopted across the road network to estimate traffic volumes at the assessed future year horizons. It is important to recognise that this growth rate does not allow for the full potential future development in the PDA.

2.6 Intersection and Network Performance

2.6.1 Intersections

The AM and PM traffic volumes established for the key intersection of Kingfisher Road / Bunker Road were utilised to undertake preliminary intersection analysis (using SIDRA software) to establish the operational performance of the existing intersection configurations under current (2025) traffic conditions. A summary of the results of the peak hour analysis of the key intersections is provided in Table 2.3 below, with further detailed results included for reference as Appendix D.

Table 2.3 SIDRA Results – Key Intersection (Current Configuration) - Existing (2025) AM & PM Peak Hours

Analysis Scenario	Intersection Degree of Saturation	Worst Movement Level of Service**	Intersection Average Delay (sec)	Maximum 95% Back of Queue Length (m)
Kingfisher Road / Bunker Road				
2025 AM Peak	0.37	A	4.7	8.7
2025 PM Peak	1.0	E (Right Turn from North of King Fisher Rd)	20.1	149.5

The results above indicate that the existing configuration of the intersection operates at oversatured conditions during the PM peak under current conditions (2025). This is indicated by all calculated values for degree of saturation (DOS), level of service (LOS), average delay and vehicle queueing. An upgrade of this intersection is required based on existing traffic volumes.

3.0 DEVELOPMENT DETAILS

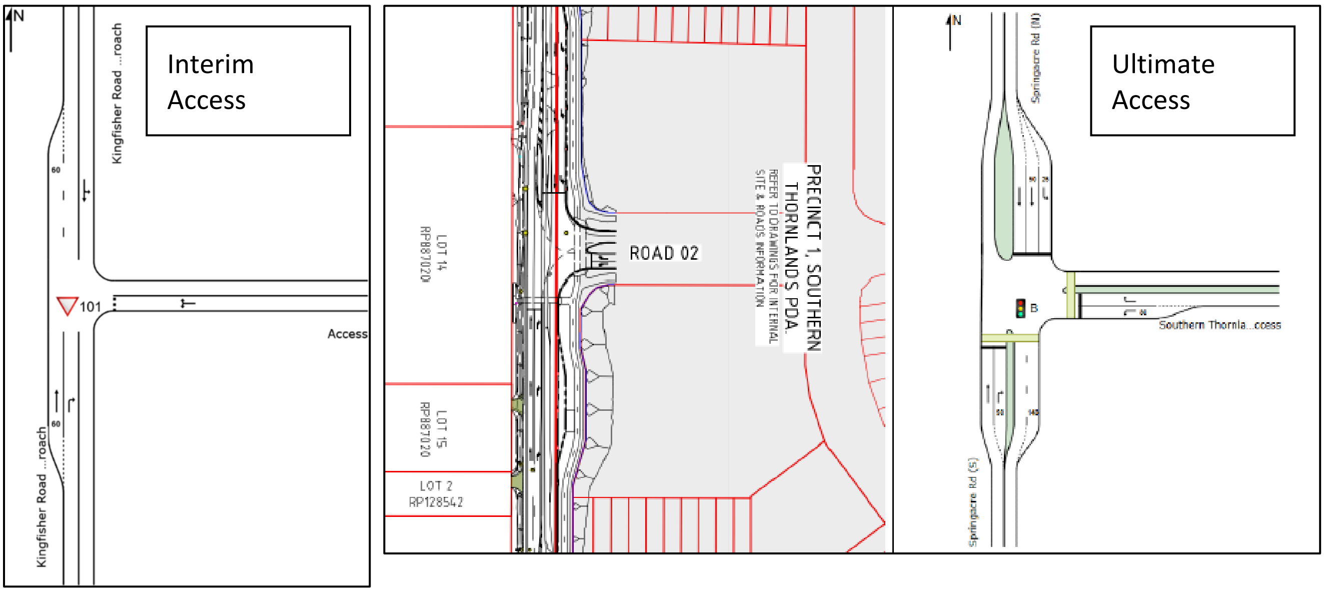
3.1 Development Layout

The proposed site layout plan is attached as **Annexure A**.

3.2 Proposed Vehicle Access

Access to the site is proposed to be obtained from Springacre Drive (Kingfisher Road). This will include a new all way movement intersection as an interim access solution until such time that the access to the Southern Thornlands Stage 1 & 2 development has been implemented. This allows for only 1 x ultimate access to service this development area in order to reduce access point density and enhance vehicle safety and mobility. The development will also include a new internal road network classed as Neighborhood Access Streets with 16m road reserve widths. The interim access and ultimate access arrangements are illustrated in Figure 3.1.

Figure 2.3: Proposed Access Arrangements



The interim access will be decommissioned and closed off once the access to the Southern Thornlands PDA has been established.

3.3 Internal Road Layout

The proposed internal roads will serve Lots as Urban Access Streets for design purposes. The internal roads will tie in with the proposed Neighbourhood Access Streets within the surrounding network and proposed developments to the north. The proposed internal road parameters are provided in Table 3.1.

Table 3.1 Geometrical Provisions of proposed Internal Roads

Road Type	Neighbourhood Access Street
Catchment	<3000 veh/d)
Road Reserve Width	16m
Carriageway Width	7.5m
Footpath	1.5m one side
Cycle track	No
Traffic Lanes	One with passing opportunities
Operational Speed	Posted speed of 50km/h

The proposed internal roads are fully compliant with council requirements.

3.4 Servicing

It is anticipated that kerbside collection will occur for the collection general and recycled waste by council. The street layout will be able to facilitate forward entry and exit movements of the waste collection vehicle at all times. A swept path analysis was also prepared illustrating kerbside collection for the development in its entirety. The swept paths are provided in **Appendix B**. Overall, ITE Consulting consider the service vehicle arrangements suitable for the development.

4.0 IMPACT ASSESSMENT

4.1 Traffic Impact Assessment Performance Criteria (Methodology)

4.1.1 Delay Based Intersection Analysis Criteria

The intersection assessment approach consisted with the approach of analysis as contained in the GTIA (Guide to Traffic Impact Assessment, TMR December 2018) manual. An increase in vehicles through an intersection as a result of the development will likely increase traffic delays. Increases in delays have an economic and social impact on the community through increased travel times, driver impatience (leading to possible crashes) and the associated economic cost of these delays to private and commercial / heavy vehicle trips according to the GTIA. The following input types were required as a basis to evaluate existing intersection performance:

- Existing intersection geometry and lane configuration data
- Existing traffic signal phasing and sequence data as determined through site observations
- Vehicle movement data
- Peak hour traffic volume data.

The delay based analyses criteria adopted for the purposes of the TIA are provided in Table 4.1 The table indicates the LOS per intersection control type associated with a respective delay per vehicle measured in seconds.

Table 4.1 *LOS Definitions Based on Vehicle Delay in Seconds (Source: SIDRA Intersection 9 User Guide)*

Control delay per Vehicle in Seconds (d)			
Level of Service	**Signals**	**Roundabout**	**Sign Control**
A	d ≤ 10	d ≤ 10	d ≤ 10
B	10 d ≤ 20	10 d ≤ 20	10 d ≤ 15
C	20 d ≤ 35	20 d ≤ 35	15 d ≤ 25
D	35 d ≤ 55	35 d ≤ 50	25 d ≤ 35
E	55 d ≤ 80	50 d ≤ 70	35 d ≤ 50
F	d < 80	d < 70	d < 50

The assessment of delay impacts was consistent with the following process:

- Determine the development's design peak periods for assessment and the impact assessment year(s)
- Identify all of the intersections in the impact assessment area
- Analyse every intersection in the impact assessment area for the base case for the design peak periods in the opening year(s), by means of a recognised analytical methodology (SIDRA) to determine intersection delays.
- An analysis of every intersection in the impact assessment area for the 'with development case' for the design peak periods in the impact assessment year(s).
- The total vehicle-minutes across each intersection and across all design peak periods assessed for the 'base case' and the 'with development case' were added together. The development impact was then reflected as:

$$\mathrm{ID} = \sum_{i=1}^{n} \mathrm{WD} + \sum_{i=1}^{n} \mathrm{BC}$$

where:

ID is the aggregate intersection-delay impact on vehicle-minutes.

WD is 'with development' intersection vehicle-minutes for design peak periods. This is calculated by multiplying the 'with development' average delay by movement to the base case volume on each movement, thus not counting the impact as delays to development traffic, only to pre-existing traffic that is affected by these additional delays.

BC is base case intersection vehicle-minutes for design peak periods

n is the number of intersections in the impact assessment area

i is each intersection within the impact assessment area.

- Possible intersection upgrades (if required) for the 'with development' case for intersections within the impact assessment area will be identified. The upgrades and or mitigations may also be short term operational management strategies due to the short term nature of construction traffic.
- Intersections, including any proposed upgrades, across the design peak periods in the impact assessment year were analysed to demonstrate that the aggregate intersection-delay impact 'with development' is equal to or less than the aggregate intersection-delay impact in the base case.
- Where development traffic adds less than 5% of delay to base traffic in aggregate, no mitigation to treat the intersection delay is required.

The impact assessment year is the year at which the impacts of the development are assessed. The impact assessment year varies by impact type because the effects of development can be quite different on infrastructure than they are on other users. The impact years which are to be assessed were adopted from GTIA (Guide to Traffic Impact Assessment Manual, December 2018) and summarised in Table 4.2.

Table 4.2: Impact Assessment Years

Impact Type	Impact assessment years
Intersection Delay	Year of opening of each stage including the final stage (Assumed to be end of year 2030)
Access	Year of Opening + 10 years after opening (Assumed to be year 2040)

An increase in vehicles through an intersection as a result of the development or future growth will likely increase traffic delays. Increases in delays have an economic and social impact on the community through increased travel times, driver impatience (leading to possible crashes) and the associated economic cost of these delays to private and commercial / heavy vehicle trips according to the GTIA (Guide to Traffic Impact Assessment Manual). The following input types are required as a basis to evaluate existing intersection performance:

- Existing intersection geometry and lane configuration data
- Traffic signal phasing and sequence data if required
- Vehicle movement data
- Peak hour traffic volume data

The delay-based analyses criteria adopted for the purposes of this study are provided in Table 4.2. The table indicates the LoS per intersection control type associated with a respective delay per vehicle measured in seconds.

Table 4.2 LoS Definitions Based on Vehicle Delay

Control delay per Vehicle in Seconds (d)			
Level of Service	**Signals**	**Roundabout**	**Sign Control**
A	d ≤ 10	d ≤ 10	d ≤ 10
B	10 d ≤ 20	10 d ≤ 20	10 d ≤ 15
C	20 d ≤ 35	20 d ≤ 35	15 d ≤ 25
D	35 d ≤ 55	35 d ≤ 50	25 d ≤ 35
E	55 d ≤ 80	50 d ≤ 70	35 d ≤ 50
F	d < 80	d < 70	d < 50

Source: RMS Modelling Guidelines 2013

Intersection Level of Service (LoS) was assessed using the NSW LoS criteria as provided in Table 2.3 above. For the purpose of this assessment a maximum threshold of LoS D for the whole intersection was adopted. Therefore, an intersection option found to operate at LoS E or F is deemed unacceptable from a traffic performance perspective, as defined in the Austroads Guide to Traffic Management: Part 3 Traffic Studies and Analysis (2017).

4.1.2 Practical Degree of Saturation

The Degree of Saturation (DoS) is defined as the ratio of demand (arrival) flow to capacity, which is equivalent to volume / capacity ratio, or V/C ratio. A DoS above 1.0 represents oversaturated conditions where the demand flows exceeds available capacity. The DoS criteria adopted for this assessment is provided in Any intersection operating at higher than the maximum DoS is considered unacceptable for operational performance.

Table 4.3 LoS Definitions Based on Vehicle Delay

Intersection type	Maximum Practical degree of saturation
Signals	0.900
Roundabouts	0.850
Sign-controlled	0.800
Continuous lanes	0.980

Source: RMS Modelling Guidelines 2013

4.1.3 Queueing Ratio Analysis Criteria

Vehicle queueing analysis results were evaluated in parallel to vehicle delay (LoS). Queueing analyses results depict the queue storage ratio (percentile of vehicles queueing in relation to the lane storage capacity in meters). Queueing analysis outputs contribute to safety impacts, where extensive queueing beyond allowable storage capacity contributes to a higher probability for the occurrence of an accident. The queue storage ratio analyses criteria are indicated in Table 4.4.

Table 4.4 Queue Ratio Measures

Control delay per Vehicle in Seconds (d)			
Level of Service	**Queue Storage Ratio – Percentile (Rq%)**	**Colour**	**Rating**
A	Rq% ≤ 6	Green	Excellent
B	0.6< Rq% ≤ 0.7	Light Blue	Very Good
C	0.7< Rq% ≤ 0.8	Dark Blue	Good
D	0.8< Rq% ≤ 0.9	Magenta	Fair
E	0.9< Rq% ≤ 0.1	Orange	Poor
F	1.0 < Rq%	Red	Very Poor

Source: SIDRA Intersection 8 User Guide

4.2 Traffic Impact Assessment Analysis Scenarios

4.2.1 External Intersection Analyses Scenarios

This subsection provides the impact analysis findings of the expected intersections of impact. Traffic modelling has been conducted using SIDRA v9 for the following scenarios for both the AM and PM peak hours for each of the expected intersection of impact:

External Intersection

1. **Scenario 1**: Future Year 2030 (opening years) AM Peak Hour Analysis Results with existing geometry and control (without Development) – This scenario evaluated the operational conditions of the intersection based on existing geometry and control without the additional development generated traffic at year 2030.
2. **Scenario 2**: Future Year 2030 (opening years) PM Peak Hour Analysis Results with existing geometry and control (without Development) – This scenario evaluated the operational conditions of the intersection based on existing geometry and control without the additional development generated traffic at year 2030.
3. **Scenario 3**: Future Year 2030 (opening years) AM Peak Hour Analysis Results with existing geometry and control (with Development) – This scenario evaluated the operational conditions of the intersection based on existing geometry and control with the additional development generated traffic at year 2030.
4. **Scenario 4**: Future Year 2030 (opening years) PM Peak Hour Analysis Results with existing geometry and control (with Development) – This scenario evaluated the operational conditions of the intersection based on existing geometry and control with the additional development generated traffic at year 2030.

4.3 Development Traffic Demands

4.3.1 Traffic Generation

The following development traffic generation rates for detached dwellings were found to be applicable in accordance with the hierarchical approach outlined in TMR's GTIA and data published on the Queensland Open Data Portal.

- Weekday daily vehicle trips: 7.2 vehicles per dwelling
- AM and PM peak hours: 0.72 vehicles per dwelling.

These are industry standard trip generation rates applicable for this proposed development.

Table 4.1 Development Generated Traffic

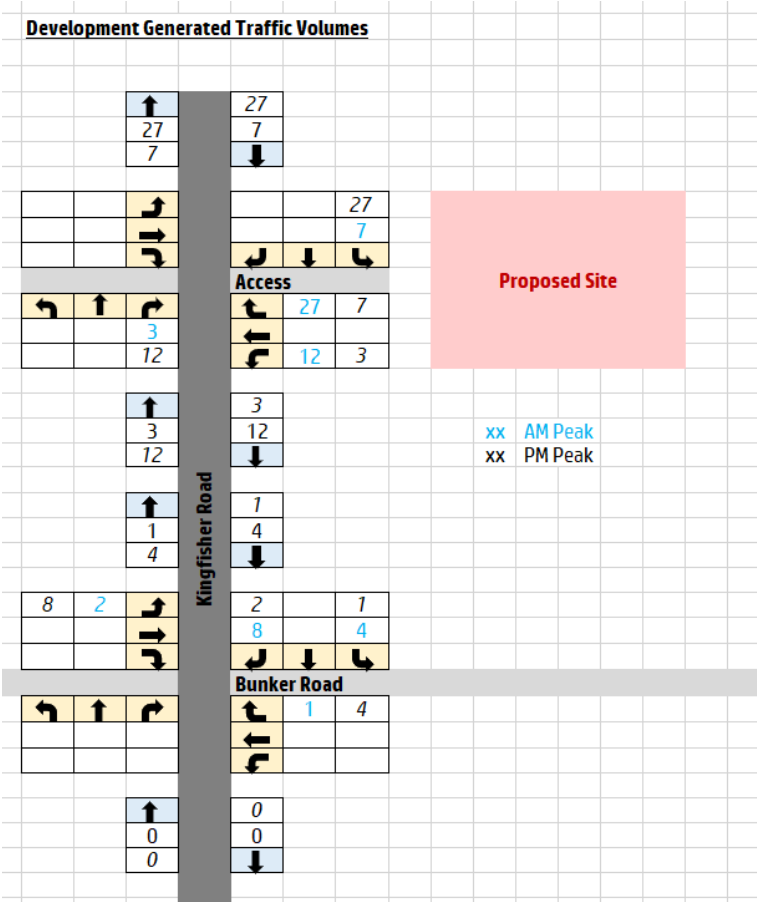
Development Traffic Calculations						
Proposed No. Lots	=	66				
TRAFFIC GENERATION						
AM Peak Generation Rate	=	0.72	trips per lot			
AM Peak Dev Traffic Volume	=	48				
PM Peak Generation Rate	=	0.72	trips per lot			
PM Peak Dev Traffic Volume	=	48				
Daily Generation Rate	=	7.2	trips per lot			
Daily Dev Traffic Volume	=	475				
TRAFFIC DISTRIBUTION						
AM PEAK				**PM PEAK**		
% New Trips	=	100%		**% New Trips**	=	100%
New Trips Volume	=	48		New Trips Volume	=	48
Inbound %	=	20%		Inbound %	=	80%
Inbound Volume	=	10		Inbound Volume	=	38
Inbound from North via Springacre Rd	=	70%		Inbound from North via Springacre Rd	=	70%
	=	7			=	27
Inbound from South via Springacre Rd	=	30%		Inbound from South via Springacre Rd	=	30%
	=	3			=	12
Outbound %	=	80%		Outbound %	=	20%
Outbound Volume	=	38		Outbound Volume	=	10
Outbound toNorth via Springacre Rd	=	70%		Outbound toNorth via Springacre Rd	=	70%
	=	27			=	7
Outbound to South via Springacre Rd	=	30%		Outbound to South via Springacre Rd	=	30%
	=	12			=	3

The trip distribution and assignment is based on the overall development which takes the total development quantum into consideration to determine overall impacts.

4.4 Project Traffic Volumes

Based on the traffic generation and distribution assumptions identified above, estimates of the additional traffic volumes on the surrounding road network were established. A summary of the resultant AM and PM peak hour Project volumes provided in Figure 4.1.

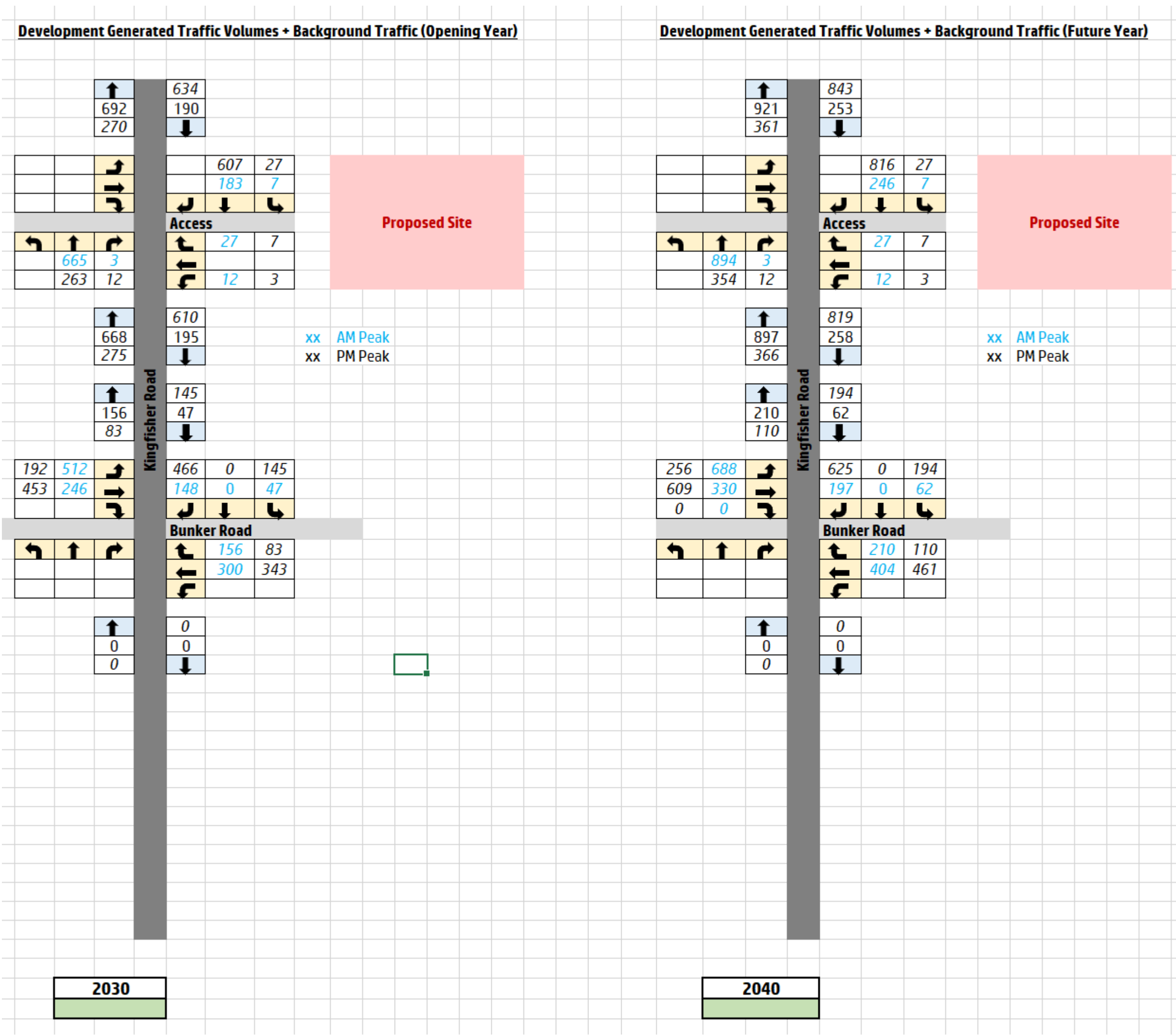
Figure 4.1: AM Peak Hour Project Volumes



4.5 Post Development Volumes

The post development traffic volumes on the network were then established by adding the estimated traffic volumes from the proposed development to the calculated predevelopment traffic volumes, with volumes calculated for both the AM and PM peak periods at the expected year of completion (2030) and the required 10-year design horizon (2040). A summary of the resultant 2030 and 2040 peak hour post development traffic volumes established for the assessment are shown in Figure 4.2.

Figure 4.2: Peak Hour Post Development Volumes



4.6 5% Volume Comparison

A 5% comparison assessment of the additional increase in traffic was carried out to determine development generated traffic volumes. Table 4.2 illustrates the results.

Table 4.2 5% Comparison

Kingfisher Road / Bunker Road					
Year of Operation	**Peak**	**Movement**	**Background Volume (veh/h)**	**Development volume (veh/h)**	**5% Comparison Results**
Opening Year 2030 Volumes with Development	AM	North (LT)	43	4	9.30%
		North (TH)			
		North (RT)	140	8	5.71%
		East (LT)			
		East (TH)	300		0.00%

		East (RT)	155	1	0.65%
		South (LT)			
		South (TH)			
		South (RT)			
		West (LT)	510	2	0.39%
		West (TH)	246		0.00%
		West (RT)			
	PM	North (LT)	144	1	0.69%
		North (TH)			
		North (RT)	464	2	0.43%
		East (LT)			
		East (TH)	343		0.00%
		East (RT)	79	4	5.06%
		South (LT)			
		South (TH)			
		South (RT)			
		West (LT)	184	8	4.35%
		West (TH)	453		0.00%
		West (RT)			

The proposed development would increase base traffic during the peak hours slightly >5%. For some of the movements. As such, SIDRA modelling was undertaken to estimate the anticipated increase in aggregate vehicle delay. This is provided in subsequent sections.

4.7 Traffic Impact Assessment Analysis Results

4.7.1 External Intersection Analysis Results

Intersection delay for the road network has been calculated in accordance with the GTIA 'no net worsening' methodology. The analysis results based on the "without" and "with development" scenarios of the intersection are provided in Table 4.4.

Table 4.4 Kingfisher Road / Bunker Road Analysis Results

Year 2030 AM Peak Analysis							
		Without Development (Base Case)			With Development		
		Volume (veh/h)	Delays	LOS	Volume (veh/h)	Delays	LOS
Kingfisher Road / Bunker Road	North (LT)	45	6.4	A	49	6.4	A
	North (TH)						
	North (RT)	147	18.2	B	156	18.6	B
	East (LT)						
	East (TH)	316	0	A	316	0	A
	East (RT)	163	9.7	A	164	9.8	A
	South (LT)						
	South (TH)						
	South (RT)						
	West (LT)	537	5.7	A	539	5.7	A
	West (TH)	259	0.2	A	259	0.2	A

	West (RT)						
Year 2030 PM Peak Analysis							
		Without Development (Base Case)			With Development		
		Volume (veh/h)	Delays	LOS	Volume (veh/h)	Delays	LOS
Kingfisher Road / Bunker Road	North (LT)	152	7.5	A	153	7.5	A
	North (TH)						
	North (RT)	488	403.5	F	491	423.9	F
	East (LT)						
	East (TH)	361	0	A	361	0	A
	East (RT)	83	8.5	A	87	8.5	A
	South (LT)						
	South (TH)						
	South (RT)						
	West (LT)	194	5.7	A	202	5.7	A
	West (TH)	477	0.1	A	477	0.1	A
	West (RT)						

The analysis results indicate that at opening year conditions the right turn from Kingfisher Drive would be at LOS F with high levels of vehicle delay even without the development traffic. Vehicle delays are expected to be high for this right turn movement and upgrade works are considered to accommodate background vehicle volumes. The aggregate delay assessment results are provided in Table 4.5.

Table 4.5 Kingfisher Road / Bunker Road Aggregate Delay Analysis Results

Year 2030 AM Peak Analysis				Change in Delay
		Aggregate Delay		
		BC	WD	
Kingfisher Road / Bunker Road		veh-mins	veh-mins	
	North (LT)	288	288	
	North (TH)	0	0	
	North (RT)	2675.40	2734	
	East (LT)	0.00	0	
	East (TH)	0.00	0	
	East (RT)	1581.10	1597	
	South (LT)	0.00	0	
	South (TH)	0.00	0	
	South (RT)	0.00	0	
	West (LT)	3060.90	3061	
	West (TH)	51.80	52	
	West (RT)	0.00	0	
Total Aggregate		7657	7732	
Year 2030 PM Peak Analysis				
		Aggregate Delay		
		BC	WD	
Kingfisher Road / Bunker Road		veh-mins	veh-mins	
	North (LT)	1140	1140	
	North (TH)	0	0	
	North (RT)	196908	206863	

	East (LT)	0	0	
	East (TH)	0	0	
	East (RT)	706	706	
	South (LT)	0	0	
	South (TH)	0	0	
	South (RT)	0	0	
	West (LT)	1106	1106	
	West (TH)	48	48	
	West (RT)	0	0	
Total Aggregate		199907	209862	
Percentage Change in Delay		207564	217595	4.8%

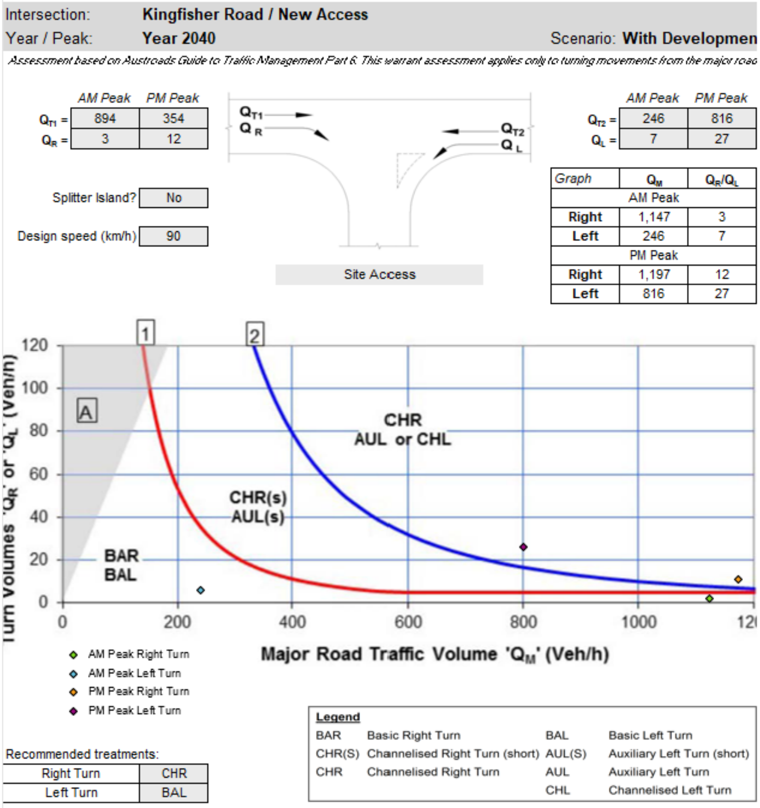
The development is not expected to increase vehicle delays in the aggregate by >5%. As such no mitigation measures to the responsibility of the proposed development is required to offset any network impacts. Detailed movement summary tables are provided in **Appendix C**. The proposed development is not expected to have any impacts on the operational performance of the intersection.

5.0 ACCESS DESIGN ASSESSMENT

5.1 Proposed Vehicle Access Geometry

A turn lane warrant analysis was undertaken for the opening + 10-year design horizon. The turn warrant analysis results are provided in Figure 5.1.

Figure 5.1: Design Year Access Turn Warrant Results (Interim Access)



Based on the analysis a BAL and CHR configuration is warranted. Turn lane warrants are used to determine the most appropriate intersection treatments. We note that these warrants have been developed to mitigate the risk of rear end crashes on the major traffic stream. These warrants consist of speed dependent charts for plotting through traffic and turning traffic volumes. The charts contain two (2) curves that represent the boundary between lower and higher order treatments with each curve representing the volumes at which a benefit-cost ratio of 1.0 is achieved for right turn treatments on a 10-year infrastructure lifetime. We note that the requirement for left turn treatments is based on the same boundaries as the right turn treatments. However, as detailed in Commentary 6 of AGRD Part 4:

For the left-turn treatments, however, using BCR values of one with a design life as high as 50 years, the warrants produced are such that traffic flows, on even the busiest roads, would never be high enough to justify using higher-level left-turn treatments. Omitting higher-level left-turn treatments in all circumstances would not meet driver expectations and would cause operational problems, especially on the busier roads.

Further evidence of this is illustrated in the turn lane warrant equation noted in Commentary 17 of RPDM. This equation is used to determine the safety benefit in dollars derived from building a higher order turn treatment. This equation is shown below.

$$C_{RM} = 2.75\times10^{-12} \times C_A \times T_{DL} \times Q_i^{0.406} \times Q_M^{0.912} \times S_{MT}^{2.94} \times (e^{TT_M} - e^{TT_A}) \quad \text{(Equation 4A–17.1)}$$

Where:

C_{RM}	=	safety benefit of using the higher order turn treatment ($)
C_A	=	average cost of a Rear-End-Major vehicle accident = $38,974 from Arndt (2004)
T_{DL}	=	design life (years)
Q_i	=	turning traffic flow from the major leg (veh/h) (Q_R or Q_L as per Figure 4A A 4
Q_M	=	traffic flow (veh/h) on the major legs according to Figure 4A A 4
S_{MT}	=	85th percentile through major road speed (km/h)
TT_M	=	type of lower-order turn treatment (values given below)
TT_A	=	type of higher-order turn treatment (values given below)
		MNR = 4.59, BAR=3.83, CHR(S) & CHR=0.00, BAL=0.666, AUL(S) & AUL=0.0493

As shown, the equation assigns numerical values to the existing lower order and higher order treatments that represent scale of the safety benefit. The difference in benefit scale for such left turns would not result in positive benefit / cost ratio findings. Hence the statement provided above, even at a 50-year design life, benefits would not exceed the costs required for left turn lane provisions. Therefore, it can be concluded that higher order left turn treatments do not provide a significant and justifiable safety benefit. It can also be concluded that omitting higher order left turns could cause operational issues on busy higher order roads, however as indicated through the trip generation and absorption capacity assessment no impact on such capacity levels is expected. Access point density is also minimal along this section of road.

The value assigned to a CHR and CHR(S) is the same at 0. This means that the turn lane warrants equations do not assign a greater crash reduction value to a full CHR when compared to a CHR(S). Therefore, the treatments are considered equal in mitigating the risk of rear end crashes at the major stream of a priority-controlled intersection. As such, we believe that BARs are the minimum treatment for a right turn and that the minimum left turn treatment for safety for the proposed development is a Basic Left Turn treatment (BAL) criterion.

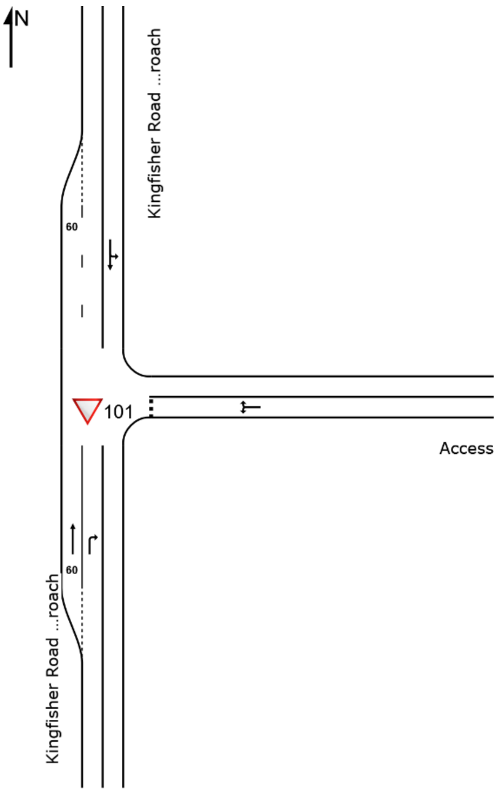
5.1.1 Interim Access Control and Configuration

The interim access configuration and control will be a priority-controlled intersection with a BAR and BAL arrangement. This is anticipated to be up until such time that Kingfisher Drive is upgraded allowing for a dual carriageway and the access intersection be upgraded to a signalised intersection. The exact timing of these upgrades are unknown at this stage and a such only an interim access arrangement is proposed. The access intersection was modelling in SIDRA software in order to determine operational performance metrics for the proposed arrangement at design year (year 2040) traffic conditions. The following scenarios have been modelled:

1. **Scenario 1**: Future Year 2040 (opening + 10 years) AM Peak Hour Analysis Results with interim access geometry and control (with Development) – This scenario evaluated the operational conditions of the intersection based on the proposed access geometry and control with the additional development generated traffic at year 2040. This was done for the AM peak hour for the future year 2040 in order to determine the impact on operational performance metrics (vehicle queueing, vehicle delay and LoS) of the intersection.
2. **Scenario 2**: Future Year 2040 (opening + 10 years) PM Peak Hour Analysis Results with interim access geometry and control (with Development) – This scenario evaluated the operational conditions of the intersection based on the proposed access geometry and control with the additional development generated traffic at year 2040. This was done for the PM peak hour for the future year 2040 in order to determine the impact on operational performance metrics (vehicle queueing, vehicle delay and LoS) of the intersection.

The access intersection was modelled in SIDRA based on the proposed intersection configuration to accommodate both development generated traffic and future year background traffic at design year conditions. The access intersection was modelled as illustrated in Figure 5.2.

Figure 5.2: Proposed Intreim Access Configuration



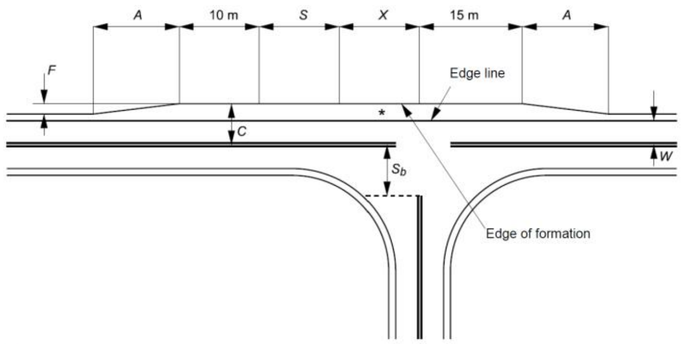
The anticipated operational performance results at design year conditions are provided in Table 5.1.

Table 5.1 SIDRA Results – Interim Access Intersection – Design year (2040) AM & PM Peak Hours

Analysis Scenario	Intersection Degree of Saturation	Worst Movement Level of Service**	Intersection Average Delay (sec)	Maximum 95% Back of Queue Length (m)
Kingfisher Road / Bunker Road				
2040 AM Peak	0.49	C (Right Turn from Access)	1.0	4.5
2040 PM Peak	0.45	C (Right Turn from Access)	0.6	1.2

The results above indicate that the proposed configuration of the intersection operates at acceptable conditions during the both AM and PM peak periods at design year 20240 conditions. This is indicated by all calculated values for degree of saturation (DOS), level of service (LOS), average delay and vehicle queueing. Detailed SIDRA outputs are provided in **Appendix C**. The anticipated design of the interim access is functionally depicted in Figure 5.3.

Figure 5.3: Proposed Interim Access Functional Design



Notes:
This treatment applies to the right turn from a major road to a minor road.
The dimensions of the treatment are:

- *W = Nominal through lane width (m) (including widening for curves). Width to be continuous through the intersection*
- *C = On straights – 6.5 m minimum*
  7.0 m minimum for Type 1 & Type 2 road trains
  On curves – widths as above + curve widening (based on widening for the design turning vehicle plus widening for the design through vehicle)
- *A =* $\frac{0.5VF}{3.6}$
  Increase length A on tighter curves (e.g. those with a side friction demand greater than the maximum desirable). Where the design through vehicle is larger than or equal to a 19 m semi-trailer the minimum speed used to calculate A is 80 km/h
- *V = Design speed of major road approach (km/h)*
- *F = Formation/carriageway widening (m)*
- *S = Storage length to cater for one design turning vehicle (m) (minimum length 12.5 m)*
- *X = Distance based on design vehicle turning path, typically 10–15 m*
- *S_b = Setback distance between the centre of the major road and the give way or stop line in the minor road. The holding line is typically placed in prolongation of the kerb line or edge line, however, it may be set back if there is a problem with the design vehicle over-running the holding line, or if it is desired to hold vehicles back some distance from the intersecting roadway (AS 1742.2 - 2009). The setback needs to be balanced such that sight distance is not negatively impacted to create a safety issue and the needs of pedestrians is met.*

Source: Department of Main Roads (2006).

Design Item	Extent	Parameter
C	6.5	m
A	18.75	m
S	12.5	m

X	10	m
V	90	km/h
F	1.5	m

The interim access arrangement requires a total BAR formation length of 60m.

5.1.2 Ultimate Access Control and Configuration

The ultimate access as mentioned will be provided via the Southern Thornlands Precinct 1 access. At such time the interim access will be closed off. The ultimate access has been modelled in SIDRA as na three-way signalized intersection as depicted in the SLR Traffic Impact Assessment report dated 17 December 2025. The analysis was carried out to determine capacity performance metrics of the access at design year 2040 conditions which includes the Southern Thornlands Stage 1 & 2 development traffic as well as that of the proposed development. These were modeled as "with development" volumes. The following scenarios have been modelled:

3. **Scenario 1**: Future Year 2040 (opening + 10 years) AM Peak Hour Analysis Results with ultimate access geometry and control (with Development) – This scenario evaluated the operational conditions of the intersection based on the proposed access geometry and control with the additional development generated traffic at year 2040 (Stage 1 & 2 Precinct 1 + Proposed Development). This was done for the AM peak hour for the future year 2040 in order to determine the impact on operational performance metrics (vehicle queueing, vehicle delay and LoS) of the intersection.
4. **Scenario 2**: Future Year 2040 (opening + 10 years) PM Peak Hour Analysis Results with interim access geometry and control (with Development) – This scenario evaluated the operational conditions of the intersection based on the proposed access geometry and control with the additional development generated traffic at year 2040 (Stage 1 & 2 Precinct 1 + Proposed Development). This was done for the PM peak hour for the future year 2040 in order to determine the impact on operational performance metrics (vehicle queueing, vehicle delay and LoS) of the intersection.

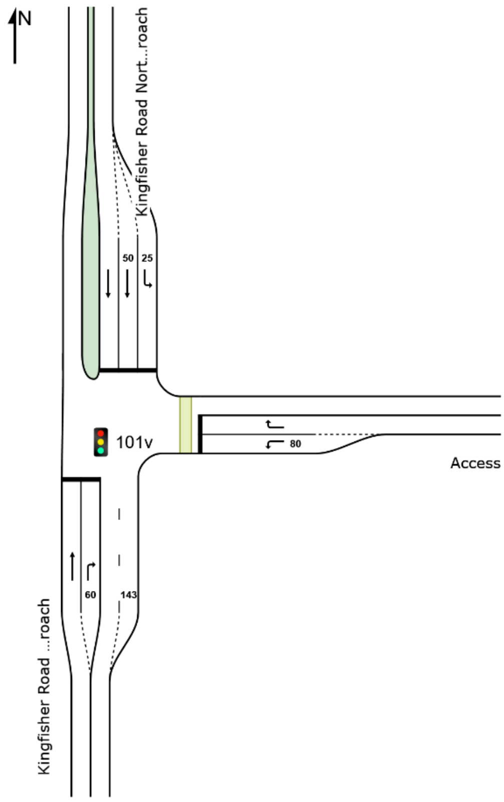
The analysis results for the ultimate access which includes the Southern Thornlands Stage 1 & 2 RAL traffic as well as that of the proposed development is provided in Table 5.2.

Table 5.2 SIDRA Results – Ultimate Access Intersection – Design year (2040) AM & PM Peak Hours

Analysis Scenario	Intersection Degree of Saturation	Worst Movement Level of Service**	Intersection Average Delay (sec)	Maximum 95% Back of Queue Length (m)
Kingfisher Road / Bunker Road				
2040 AM Peak	0.77	C	12.1	129.6
2040 PM Peak	0.64	C	12.8	71

The results indicate that the ultimate access arrangement would provide adequate capacity based on the proposed configuration as depicted in the SLR Traffic Impact Assessment dated 17 December 2025. The ultimate access arrangement is provided in Figure 5.4.

Figure 5.4: Proposed Ultimate Access via Souther Thornlands Precinct 1



5.2 Proposed Interim Vehicle Access Location and Spacing

An assessment has been carried out to determine the viability of the proposed access positions from a traffic engineering perspective whilst taking the RCC LGIP planning and duplication of Kingfisher Road into account. From an engineering perspective the location of an access / driveway should be spaced at sufficient distances to allow for safe and effective driver reaction times and deceleration distances, whilst not impacting on operational performance / capacity of a road. Analysis was carried out to determine compliance with the requirements of the PSP2 Infrastructure Works Policy as well as design guidelines of AGRD Part 3, AGRD Part 4A and AGRD Part 4. The spacing of unsignalised accesses (minor streets and driveways) can be assessed by considering the:

- left turn overlap conflict
- Intersection sight distance
- ingress vehicle queueing
- Safety (turn treatments)

- AS2890.1:2004 requirements

5.2.1 Design Speed

The design speed was estimated to be 90km/h (80km/h + 10km/h) for both sub arterial road frontages.

5.2.2 Left Turn Overlap Conflict

An overlap occurs when the through driver must monitor more than one access at a time. Providing at least the stopping sight distance between access points will allow a through vehicle to avoid a collision with an entering vehicle. By applying the standard equations of motion and assuming constant acceleration and deceleration rates, the values for ‘d’ and ‘a’ can be calculated, the value of ‘d’ being the minimum spacing to avoid the collision. as provided by the *Austroads Guide to Road Design Part 4*, indicates the minimum spacing requirements between unsignalised intersections / driveways measured centreline to centreline.

Figure 5.5: Minimum spacing of driveways based on left-turn collision avoidance

Speed (km/h)	*d + a* (m)		*a* (m)		Spacing (desirable) *A – C* (m)	Spacing (minimum) *B – D* (m)	SSD (m)
	A Decel. rate 2.5 m/s²	B Decel. rate 3.5 m/s²	C Accel. rate 1.0 m/s²	D Accel. rate 1.5 m/s²			
50	31	26	5	7	30 (26)	20 (19)	45
60	45	38	7	10	40 (38)	30 (28)	65
70	61	51	9	14	55 (52)	40 (37)	85
80	79	67	12	18	70 (67)	50 (49)	105
90	100	85	15	23	85 (85)	65 (62)	130
100	124	105	19	29	105 (105)	80 (76)	170

From Figure 5.5, the following spacings were considered:

- King Fisher Road = 85m spacing where design speed is currently 90km/h

An 85m separation (centre line to centre line) as minimum is required according to *Austroads Guide to Road Design Part 4* requirements where the through movement posted speed is 80km/h (90km/h design speed). The proposed access is considered to be sufficiently spaced

5.2.3 Access Intersection Sight Distance

A comprehensive sight distance analysis was carried out to determine the adequacy of the proposed access locations. The following was considered for the sight distance analysis.

Normal Design Domain has used the following:

- Observation time (OT) of 3 seconds (Clause 3.2.2 of Austroads Part 4A)
- Reaction time (RT) of 1.5 seconds (Table 5.2 of Austroads Part 3)

- Coefficient of longitudinal deceleration of 0.36 (Table 5.3 of Austroads Part 3)
- SSD (driver eye height 1.1m and object height 0.2m)
- SISD (driver eye height 1.1m and upper parts of cars 1.25m)
- MGSD (driver eye height 1.1m and vehicle indicator light 0.65m)

Extended Design Domain has used the following:

- Observation time (OT) of 1.5 seconds (Table A8 of Part 4A)
- Reaction time (RT) of 1.5 seconds (Table A5 of Austroads Part 3)
- Coefficient of longitudinal deceleration of 0.46 (Table A6 of Austroads Part 3)
- SISD (driver eye height 1.1m and upper parts of cars 1.25m)

The sight distance from the proposed access locations have been assessed according to the requirements of MGSD and SSD and the requirements for normal and the extended design domain for SISD as explained in Appendix A.3 of Austroads.

5.2.3.1 Minimum Gap Sight Distance

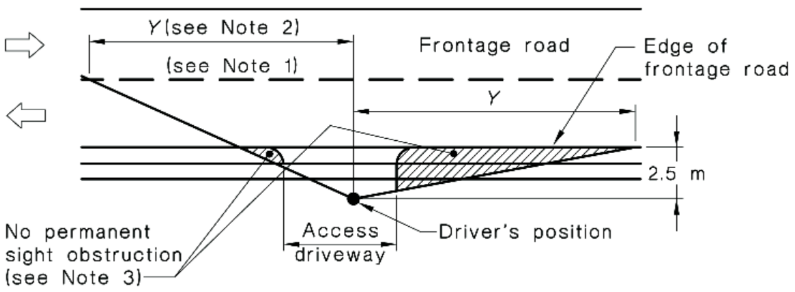
The MGSD was calculated based on the observation angle to approaching traffic and critical gap acceptance values adopted by drivers undertaking typical manoeuvres at the intersections. The MGSD was determined as defined in AS2890.1:2004 and the Guide to Road Design – Part 4A: Unsignalised and Signalised Intersections (Austroads, 2010) as the minimum distance in meters required for the driver of a vehicle entering the major flow to see a vehicle in the conflicting streams, in order to safely commence the desired manoeuvre.

<u>AS2890.1:2004 MGSD Requirements</u>

The design speed is 90km/h and therefore the desirable sight distance as per Figure 3.2 of AS2890.1 for an access driveway with a frontage road speed (speed of 80km/h) should be 111m to allow a 5 second gap. The concept of vehicle sight distance envelope which should be required is illustrated in Figure 5.6.

Figure 5.6: AS2890.1:2004 Access Sight Distance (MGSD)

Figure 3.2 — Sight distance requirements at access driveways



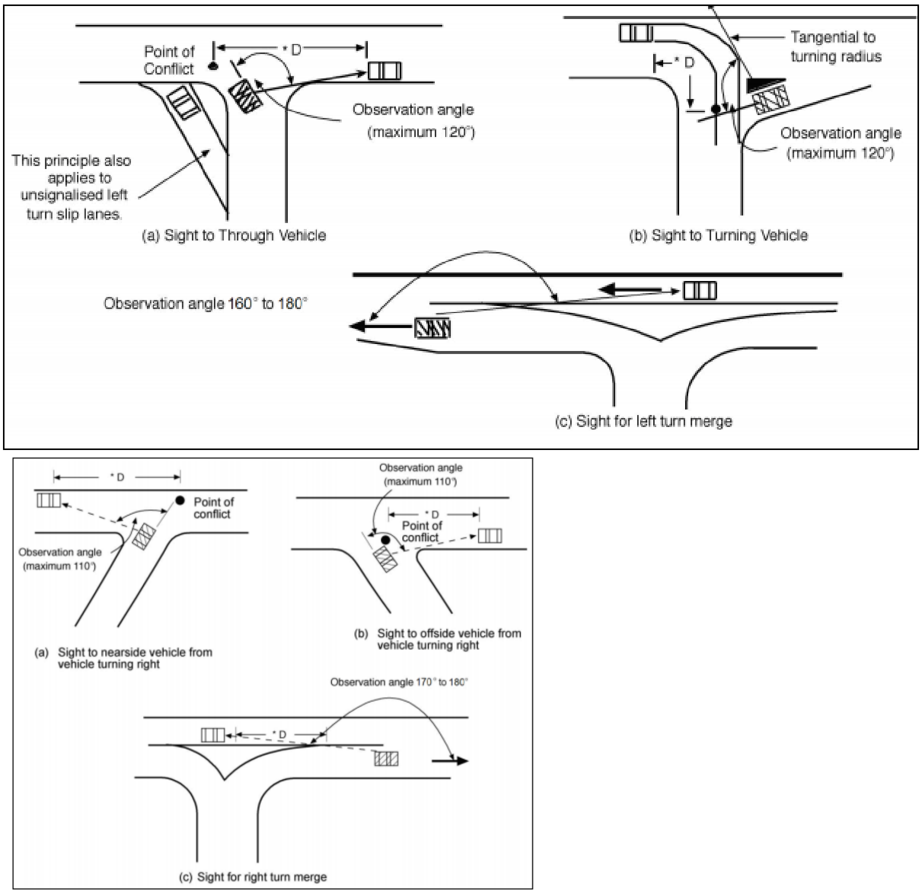
Frontage road speed (Note 4) km/h	Distance (Y) along frontage road m		
	Access driveways other than domestic (Note 5)		Domestic property access (Note 6)
	Desirable 5 s gap	Minimum SSD	
40	55	35	30
50	69	45	40
60	83	65	55
70	97	85	70
80	111	105	95
90	125	130	Use values from 2nd and 3rd columns
100	139	160	
110	153	190	

A detailed MGSD sight distance analysis as illustrated in Annexure B, indicates that both the MGSD sight lines would be complied with along both directions of travel (as measured in line of travel path), to comply with AS2890.1:2004 requirements.

<u>AGRD Part 4A MGSD Requirements</u>

Figure 5.7 and Figure 5.8 illustrate the MGSD for left turning and right turning traffic respectively as the distance labelled 'D'.

Figure 5.7 Sight distance requirements and angles for traffic turning left



The MGSD varies depending on vehicle approach speeds and critical gap acceptance times, as shown in Figure 5.8.

Figure 5.8 Minimum gap sight distances ('D' in metres) for various speeds

Critical gap acceptance time (ta) (secs)	85th percentile speed of approaching vehicle (km/h)										
	10	20	30	40	50	60	70	80	90	100	110
4	11	22	33	44	55	67	78	89	100	111	122
5	14	28	42	55	69	83	97	111	125	139	153
6	17	33	50	67	83	100	117	133	150	167	183
7	19	39	58	78	97	117	136	155	175	194	214
8	22	44	67	89	111	133	155	178	200	222	244
9	25	50	75	100	125	150	175	200	225	250	275
10	28	56	83	111	139	167	194	222	250	278	305

Based on the evaluation the following MGSD is required for the access as per AGRD Part 4A:

- Left turn movement from minor road (Access) = 125m

- Right turn movement from minor road (Access) = 125m
- Right turn movement from major road (Bunker Road) = 100m

The MGSD analysis results are provided in Table 5.3.

Table 5.3 MGSD Results

Kingfisher Road		
Movement	**MGSD Required**	**Sight Distance Achieved (Y/N)**
AS2890.1:2004	111m	Y (from and to the north)
AGRD Part 4A Left turn from access	125m	Y (from and to the north)
AGRD Part 4A Right turn from access	125m	Y (from and to the north)
AGRD Part 4A Right turn from major road	100m	Y (from and to the north)

The MGSD sight distance for the access on Kingfisher Road is considered acceptable given the location of the access in proximity of the Kingfisher Road / Bunker Road intersection, and the anticipated road geometry. All other minimum required sight distances would be complied with for both AS2890.1:2004 and AGRD Part 4A.

5.2.3.2 Normal Design Domain Safe Intersection Stopping Sight Distance

The Safe Stopping Sight Distance (SISD) have been calculated in accordance with Austroads Guide to Road Design Part 4A Section 3.2.2. The following design parameters have been used:

- Based on Austroads Guide to Road Design Part 3 Section 5.2.2 a reaction time of 1.5 seconds has been adopted
- For Safe Intersection Sight Distance (SISD) calculations Austroads Guide to Road Design Part 4A Section 3.2.2 allows for a 3.0 second observation time.
- When calculating the sight distance requirements in accordance with AS2890.1, Figure 3.2 assumes a reaction time of 1.5 seconds.
- It is measured from a driver eye height of 1.1 m above the road to points 1.25 m above the road, which represents drivers seeing the upper part of cars.
- Based on Austroads Guide to Road Design Part 3 Section 5.2.3 a coefficient of deceleration of 0.36 been adopted and is considered to be appropriate for private acceses.

The SISD required under the Normal Design Criteria for the access intersection are provided in Table 5.4.

Table 5.4 SISD Requirements (NDD)

Parameter	Direction of Travel	
	To North	To South
Ot	3	3
Rt	1.5	1.5
Dt	4.5	4.5
V	90	90
d	0.36	0.36
a	2.5	3.3
SISD Required	**195**	**194**

5.2.3.3 Extended Design Domain Safe Intersection Stopping Sight Distance

The Safe Stopping Sight Distance (SISD) under EDD criteria have been calculated in accordance with Austroads Guide to Road

Design Part 4A Section 3.2.2. The following design parameters have been used:

- Based on Austroads Guide to Road Design Part 3 Section 5.2.2 a reaction time of 1.5 seconds has been adopted
- For Safe Intersection Sight Distance (SISD) calculations Austroads Guide to Road Design Part 4A Section 3.2.2 allows for a 1.5 second observation time as EDD element.
- When calculating the sight distance requirements in accordance with AS2890.1, Figure 3.2 assumes a reaction time of 1.5 seconds.
- It is measured from a driver eye height of 1.1 m above the road to points 1.25 m above the road, which represents drivers seeing the upper part of cars.
- Based on Austroads Guide to Road Design Part 3 Section 5.2.3 a coefficient of deceleration of 0.36 been adopted and is considered to be appropriate for private accesses.

The SISD required under the Extended Design Criteria for the access intersection are provided in Table 5.5.

Table 5.5 SISD Requirements (EDD)

Parameter	Direction of Travel	
	To North	To South
Ot	1.5	1.5
Rt	1.5	1.5
Dt	3	3
V	90	90
d	0.36	0.36
a	2.5	3.3
SISD Required	**158**	**156**

Based on the SISD calculations and the site visit observations, the following findings area made as indicated in Table 5.6.

Table 5.6 SISD Results

Kingfisher Road	Required	Sight Distance Achieved (Y/N)
SISD NDD	194m travelling north 195m travelling south	Travelling south – N Travelling north - Y
SISD EDD	156m travelling south 158m travelling north	Travelling south – Y Travelling north - Y

The access is proposed to be located in a sag curve along Kingfisher Road. The vertical alignment of Kingfisher Road is gently undulating. Observations and measurements identified that sufficient sight lines would prevail for the access locations proposed to meet NDD and EDD SISD criteria. The SISD from the north would meet NDD criteria to achieve >197m of sight lines and the SISD from the south would meet EDD criteria to achieve at least 158m of sight line due to the vertical curvature. The sight distances are illustrated in Figure 5.9.

Figure 5.9 Interim Access Sight Distances

6.0 TRAFFIC IMPACT CONCLUSIONS AND RECOMMENDATIONS

6.1 Conclusion

ITE Consulting was engaged to undertake a Traffic Impact Assessment (TIA) for the proposed Reconfiguring of a Lot (ROL) at 40–152 Springacre Road, Thornlands, comprising 66 residential lots accessed via a new intersection on Springacre Road (Kingfisher Road). The assessment was prepared in accordance with the TMR *Guide to Traffic Impact Assessment* (GTIA, December 2018), the *Austroads Guide to Road Design* and *Guide to Traffic Management*, AS/NZS 2890.1:2004, and applicable EDQ and Redland City Council policies and standards.

The following conclusions are drawn from the assessment:

- **Traffic generation** – Applying TMR-endorsed industry-standard rates for detached dwellings (7.2 daily trips and 0.72 AM/PM peak hour trips per lot), the development is estimated to generate approximately 475 vehicle trips per day and 48 vehicle trips during each of the AM and PM peak hours.
- **External intersection performance (Kingfisher Road / Bunker Road)** – SIDRA modelling of the existing intersection configuration under 2025 conditions indicates that the PM peak already operates at an oversaturated degree of saturation of 1.0 with LOS E and a 95th percentile queue of approximately 150 m on the right-turn movement from the north along Kingfisher Road, confirming that an upgrade of this intersection is required to accommodate existing and background traffic growth independent of the proposed development. Future-year (2030) modelling shows the AM peak hour operates at acceptable LOS A–B both with and without the development, while the PM peak right-turn from the north deteriorates to LOS F under both base case and with-development scenarios. The upgrade works are understood to be coordinated and delivered by EDQ as part of the planned LGIP works (TR-L-97, 106, 108 and 115), with any development-attributable impacts to be offset through bulk infrastructure contributions paid by the developer.
- **'No net worsening' assessment** – The aggregate delay analysis demonstrates that the development contributes a 4.8% increase in aggregate vehicle delay at the Kingfisher Road / Bunker Road intersection during the PM peak hour, which is below the 5% threshold specified in the GTIA. On this basis, no mitigation measures attributable to the proposed development are required to offset network impacts.
- **Site access** – A turn lane warrant analysis confirms that a Basic Auxiliary Right (BAR) and Basic Auxiliary Left (BAL) treatment is warranted at the proposed interim site access. The interim priority-controlled access on Kingfisher Road has been modelled in SIDRA at the 2040 design year horizon, returning LOS C for the worst movement, an intersection degree of saturation of 0.49 (AM) and 0.45 (PM), and 95th percentile queues of less than 5 m, indicating that the interim access will operate well within capacity. Once Kingfisher Road is duplicated and the Southern Thornlands Precinct 1 access is established, the interim access will be decommissioned and closed, with site access provided via the

ultimate three-way signalised intersection. SIDRA modelling of the ultimate access at the 2040 design year horizon (including Southern Thornlands Stage 1 & 2 and the proposed development traffic) returns LOS C, an intersection degree of saturation of 0.77 (AM) and 0.64 (PM), and average delays of approximately 12.1 and 12.8 seconds, demonstrating that the ultimate arrangement also provides adequate capacity.

- **Sight distance** – The proposed interim access location satisfies the Minimum Gap Sight Distance (MGSD) requirements of AS 2890.1:2004 and AGRD Part 4A in both directions. Safe Intersection Sight Distance (SISD) is achieved to Normal Design Domain (NDD) criteria from the north and to Extended Design Domain (EDD) criteria from the south, which is acceptable given the gently undulating vertical alignment of Kingfisher Road.
- **Internal road network and servicing** – The proposed internal Neighbourhood Access Streets (16 m road reserve, 7.5 m carriageway, 50 km/h operating speed) comply with the relevant EDQ and Council standards. Swept path analysis confirms that waste collection vehicles can enter and exit the site in a forward direction.

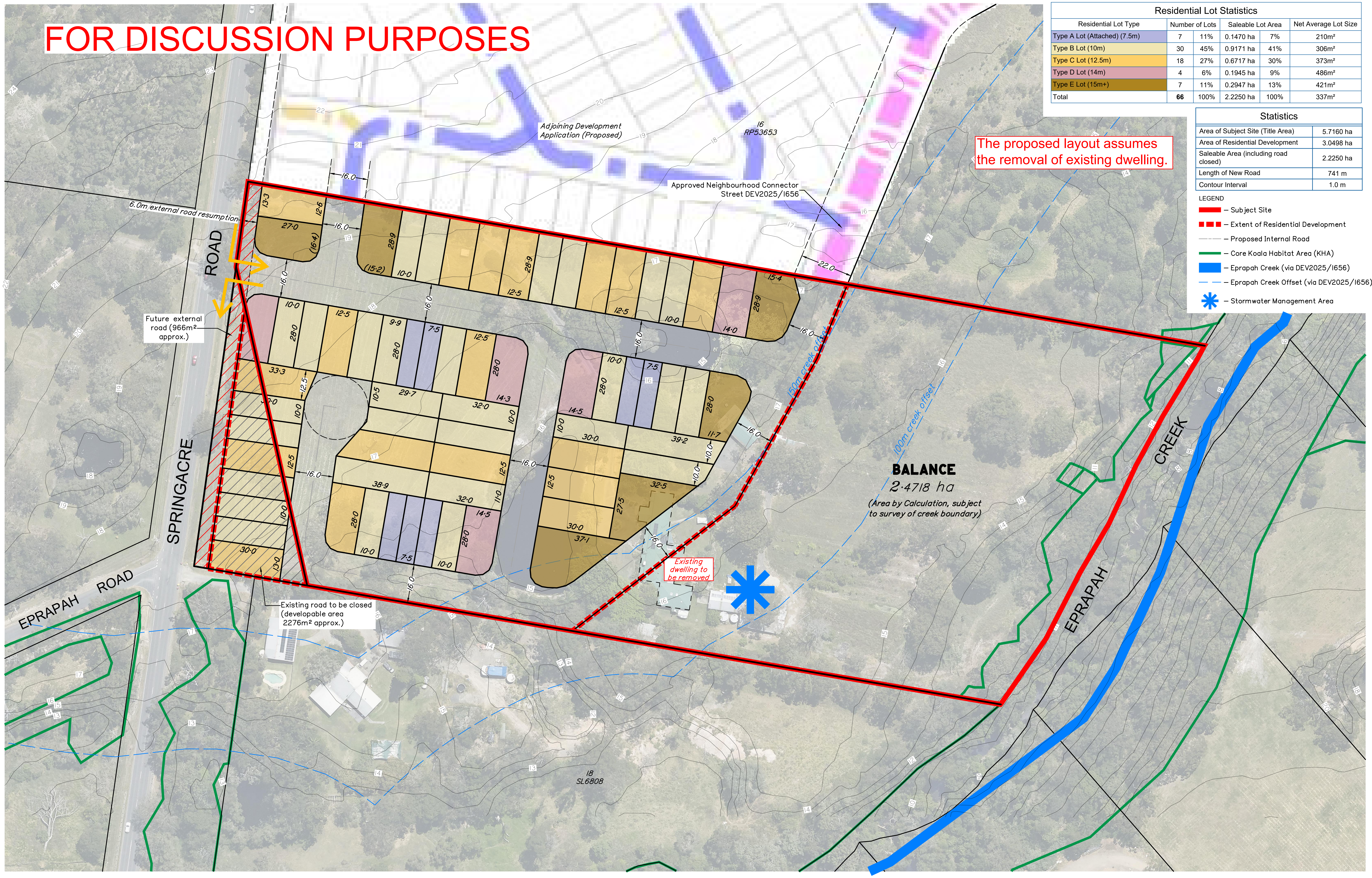
6.2 Summary

Overall, ITE Consulting considers that the traffic and transport characteristics associated with the proposed 66-lot residential subdivision at 40–152 Springacre Road, Thornlands, will not result in a significant adverse impact on the surrounding road network. Development-generated traffic contributes a 4.8% increase to aggregate vehicle delay at the key external intersection of Kingfisher Road / Bunker Road, which is below the 5% threshold and therefore satisfies the ‘no net worsening’ criterion of the TMR GTIA. The upgrade of the Kingfisher Road / Bunker Road intersection is required to address existing oversaturated PM peak conditions and is to be coordinated and delivered by EDQ as part of the planned LGIP works, with the development’s contribution to be addressed through bulk infrastructure charges. The proposed interim BAR/BAL priority-controlled access on Kingfisher Road, and the ultimate signalised access via the Southern Thornlands Precinct 1 intersection, both provide safe and operationally efficient solutions at the 2040 design year horizon, with all sight distance requirements (MGSD and SISD) being satisfied. The proposed development layout, internal road hierarchy and access geometry are fully compliant with the applicable EDQ, Redland City Council, Austroads and AS/NZS 2890.1:2004 codes, standards and policies, and the development is therefore supportable from a traffic engineering perspective without the need for any development-attributable mitigation measures beyond the developer’s contribution to the planned EDQ-led intersection upgrade works.

APPENDIX

A

Layout Plans



Residential Lot Statistics

Residential Lot Type	Number of Lots		Saleable Lot Area		Net Average Lot Size
Type A Lot (Attached) (7.5m)	7	11%	0.1470 ha	7%	210m²
Type B Lot (10m)	30	45%	0.9171 ha	41%	306m²
Type C Lot (12.5m)	18	27%	0.6717 ha	30%	373m²
Type D Lot (14m)	4	6%	0.1945 ha	9%	486m²
Type E Lot (15m+)	7	11%	0.2947 ha	13%	421m²
Total	**66**	100%	2.2250 ha	100%	337m²

Statistics

Area of Subject Site (Title Area)	5.7160 ha
Area of Residential Development	3.0498 ha
Saleable Area (including road closed)	2.2250 ha
Length of New Road	741 m
Contour Interval	1.0 m

LEGEND
- – Subject Site
- – Extent of Residential Development
- – Proposed Internal Road
- – Core Koala Habitat Area (KHA)
- – Eprapah Creek (via DEV2025/1656)
- – Eprapah Creek Offset (via DEV2025/1656)
- – Stormwater Management Area

dts urban planning, surveying & development
PO Box 3128, West End QLD 4101 | Ph: 07 3118 0600 | brisbane@dtsqld.com.au

Issue	Revision	Int	Date
A	Original issue	AV	8/12/25
B	Amended layout	NQ	2/02/26
C	Amended layout	NQ	7/04/26

Property Description
Lot 17 on RP53653

SUBDIVISION CONCEPT PLAN

140-152 Springacre Road, Thornlands

Local Authority: Redland City Council
Client: Adpen Pty Ltd

SCALE 1:1000 @ A2
10 0 10 20 30 40 50

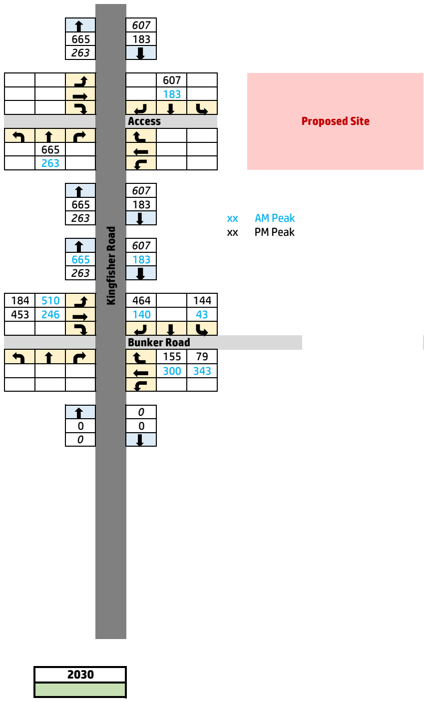
Project BNE250622
File B250622P1.dwg
Date 7/04/2026
Drawing A2 1262
Revision C
Sheet 1 of 1

APPENDIX

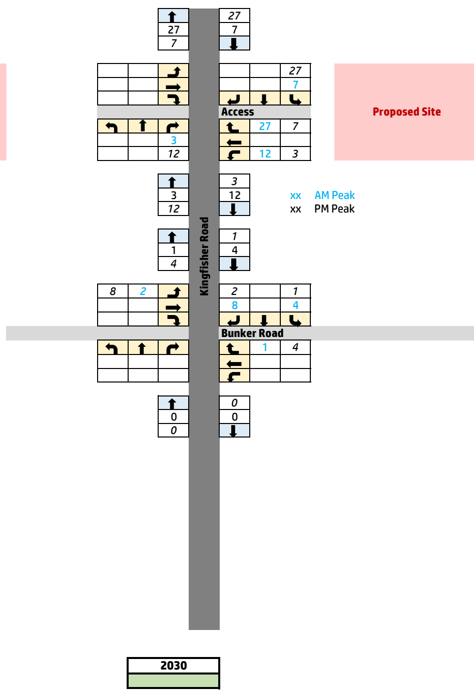
B

Traffic Volumes

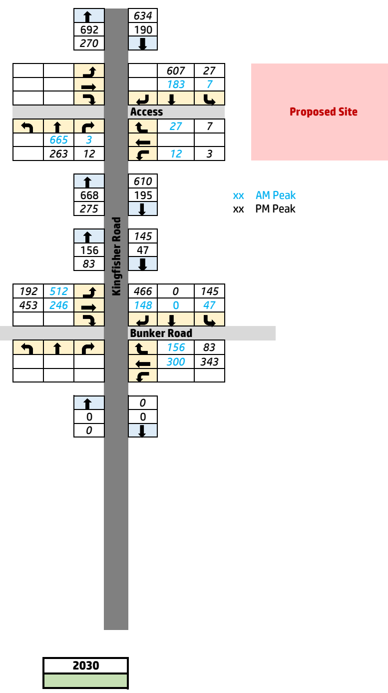
Background Traffic Volumes (Opening Year)



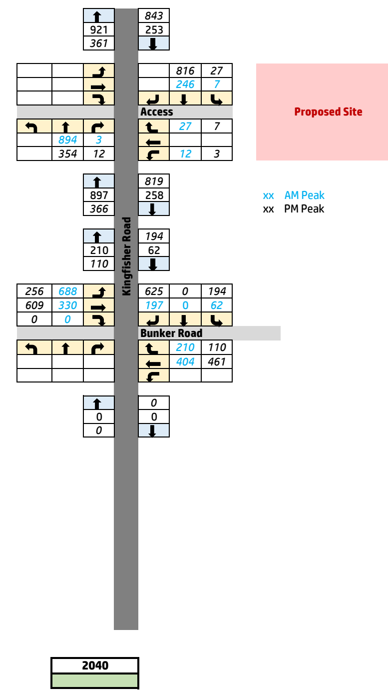
Development Generated Traffic Volumes (Opening Year)



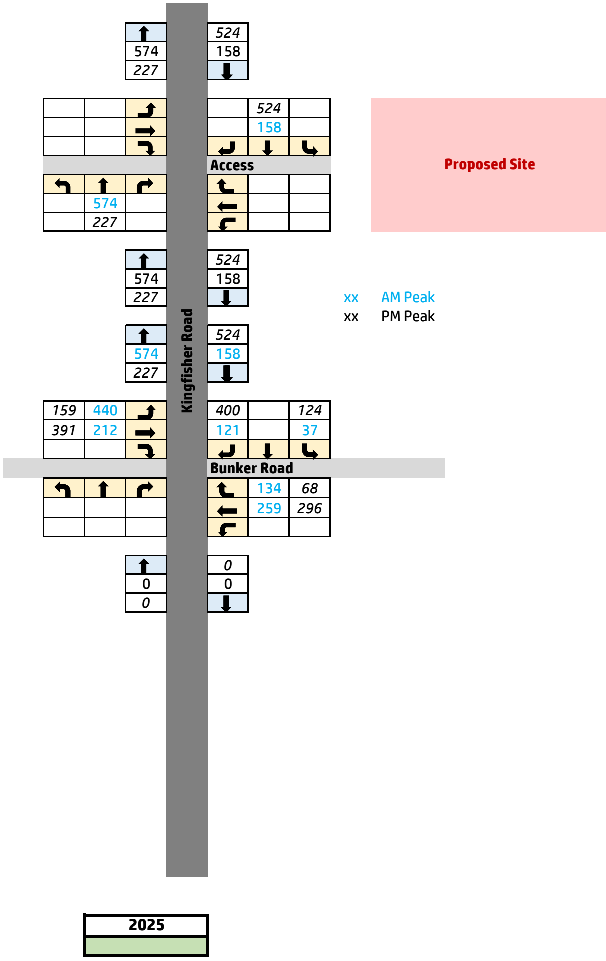
Development Generated Traffic Volumes + Background Traffic (Opening Year)



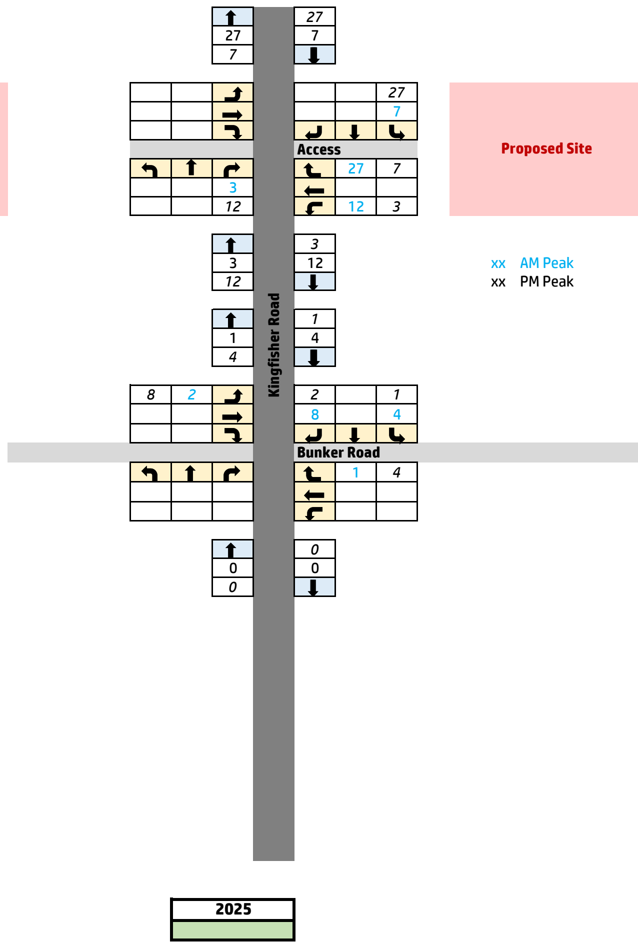
Development Generated Traffic Volumes + Background Traffic (Future Year)



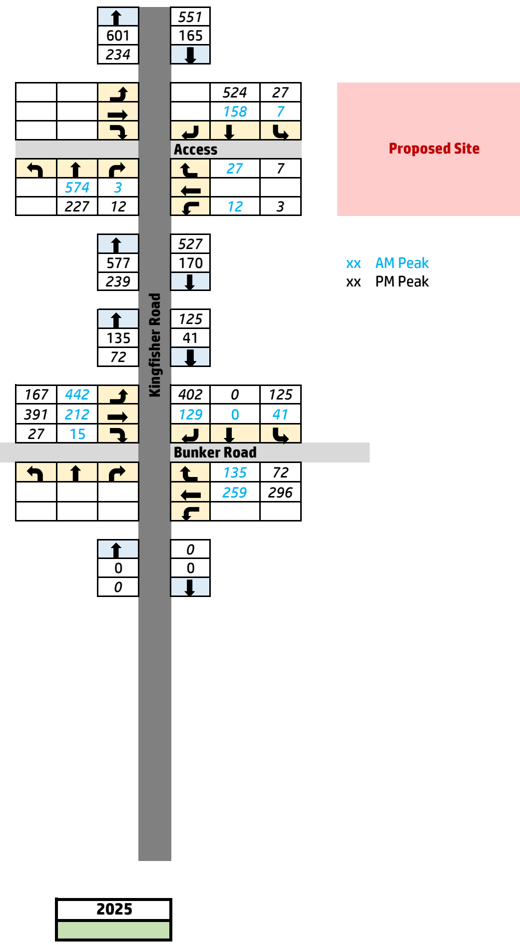
Background Traffic Volumes



Development Generated Traffic Volumes



Development Generated Traffic Volumes + Background Traffic



APPENDIX

C

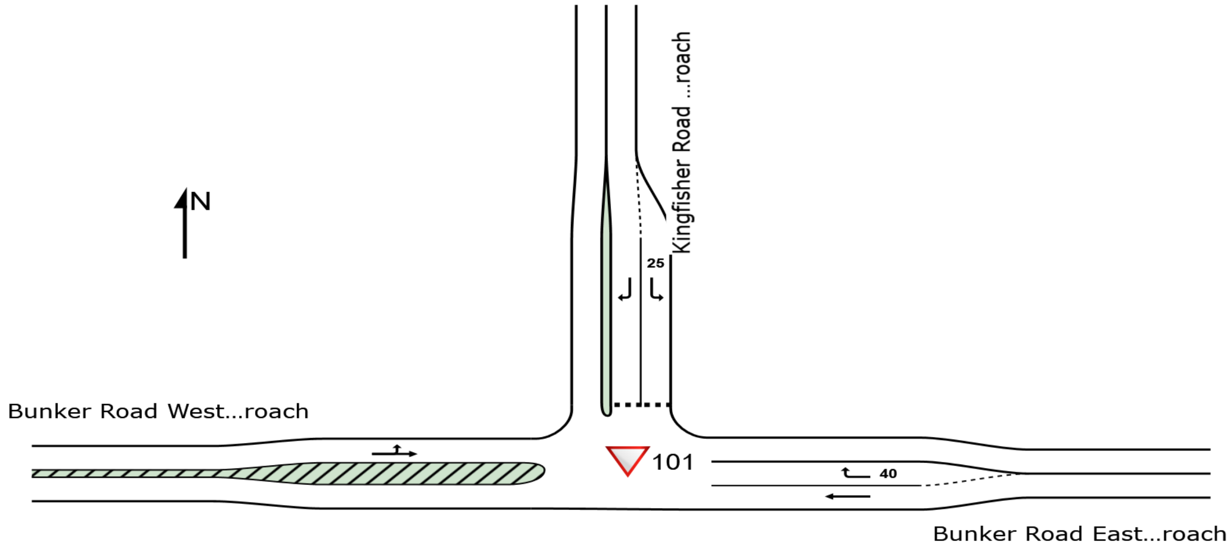
SIDRA Results

SITE LAYOUT

▽ Site: 101 [Kingfisher Road / Bunker Road Exisitng Conditions Base Year 2025 AM Peak (Site Folder: Existing Conditions)]

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

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



PHASING SUMMARY

Site: 101v [Kingfisher Road / Ultimate Site Access Future Year 2040 PM Peak (Site Folder: Ultimate Site Access)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated   Cycle Time = 50 seconds (Site Practical Cycle Time)

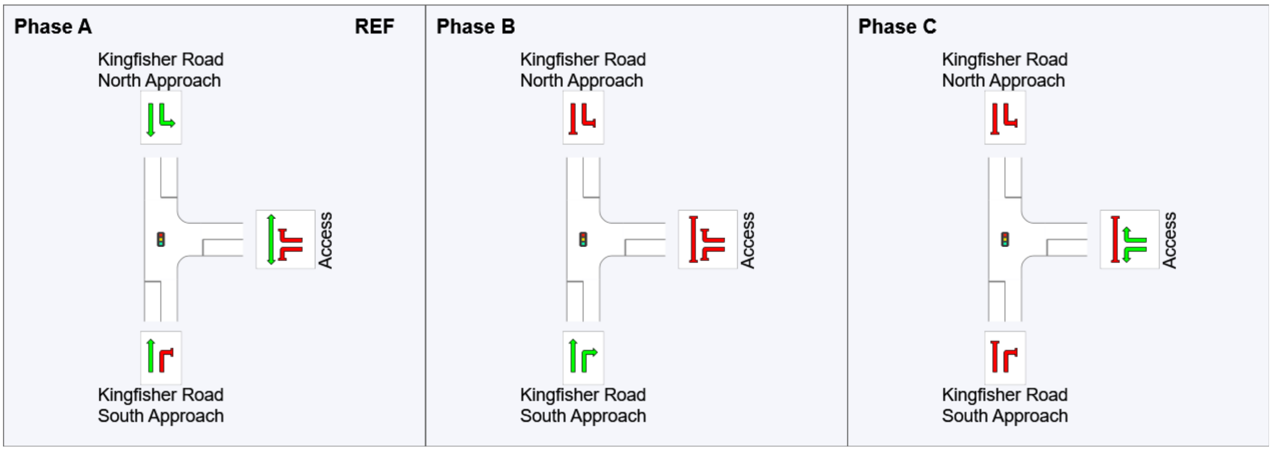
Timings based on settings in the Site Phasing & Timing dialog
Phase Times determined by the program
Phase Sequence: Convert Function Default
Input Phase Sequence: A, B, C
Output Phase Sequence: A, B, C
Reference Phase: Phase A

Phase Timing Summary

Phase	A	B	C
Phase Change Time (sec)	0	26	38
Green Time (sec)	20	6	6
Phase Time (sec)	26	12	12
Phase Split	52%	24%	24%
Phase Frequency (%)	100.0	100.0	100.0

See the Timing Analysis report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Minor Phase Actuation and Phase Frequency values (user-specified or implied) less than 100%.

Output Phase Sequence



REF: Reference Phase
VAR: Variable Phase

Normal Movement	Permitted/Opposed
Slip/Bypass-Lane Movement	Opposed Slip/Bypass-Lane
Stopped Movement	Turn On Red
Other Movement Class (MC) Running	Undetected Movement
Mixed Running & Stopped MCs	Continuous Movement
Other Movement Class (MC) Stopped	Phase Transition Applied

MOVEMENT SUMMARY

Site: 101 [Kingfisher Road / Bunker Road Exisitng Conditions Base Year 2025 AM Peak (Site Folder: Existing Conditions)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

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

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
East: Bunker Road East Approach															
5	T1	All MCs	273	3.0	273	3.0	0.143	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	59.9
6	R2	All MCs	141	3.0	141	3.0	0.158	8.7	LOS A	0.6	4.6	0.60	0.80	0.60	50.4
Approach			414	3.0	414	3.0	0.158	3.0	NA	0.6	4.6	0.20	0.27	0.20	56.3
North: Kingfisher Road North Approach															
7	L2	All MCs	39	3.0	39	3.0	0.029	6.3	LOS A	0.1	0.8	0.30	0.56	0.30	51.9
9	R2	All MCs	127	3.0	127	3.0	0.295	14.3	LOS A	1.2	8.7	0.73	0.93	0.87	46.8
Approach			166	3.0	166	3.0	0.295	12.4	LOS A	1.2	8.7	0.63	0.84	0.73	47.9
West: Bunker Road West Approach															
10	L2	All MCs	463	3.0	463	3.0	0.371	5.7	LOS A	0.0	0.0	0.00	0.40	0.00	54.0
11	T1	All MCs	223	3.0	223	3.0	0.371	0.1	LOS A	0.0	0.0	0.00	0.40	0.00	56.3
Approach			686	3.0	686	3.0	0.371	3.9	NA	0.0	0.0	0.00	0.40	0.00	54.7
All Vehicles			1266	3.0	1266	3.0	0.371	4.7	NA	1.2	8.7	0.15	0.41	0.16	54.2

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Two-Way Sign Control Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

▽ Site: 101 [Kingfisher Road / Bunker Road Exisitng Conditions Base Year 2025 PM Peak (Site Folder: Existing Conditions)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

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

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
East: Bunker Road East Approach															
5	T1	All MCs	312	3.0	312	3.0	0.163	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	59.9
6	R2	All MCs	72	3.0	72	3.0	0.070	7.9	LOS A	0.3	2.0	0.54	0.71	0.54	51.0
Approach			383	3.0	383	3.0	0.163	1.5	NA	0.3	2.0	0.10	0.13	0.10	58.0
North: Kingfisher Road North Approach															
7	L2	All MCs	131	3.0	131	3.0	0.115	7.1	LOS A	0.5	3.3	0.44	0.66	0.44	51.4
9	R2	All MCs	421	3.0	421	3.0	1.005	66.5	LOS E	20.8	149.5	1.00	2.38	5.76	28.0
Approach			552	3.0	552	3.0	1.005	52.4	LOS D	20.8	149.5	0.87	1.97	4.50	31.4
West: Bunker Road West Approach															
10	L2	All MCs	167	3.0	167	3.0	0.307	5.7	LOS A	0.0	0.0	0.00	0.17	0.00	55.8
11	T1	All MCs	412	3.0	412	3.0	0.307	0.1	LOS A	0.0	0.0	0.00	0.17	0.00	58.3
Approach			579	3.0	579	3.0	0.307	1.7	NA	0.0	0.0	0.00	0.17	0.00	57.5
All Vehicles			1514	3.0	1514	3.0	1.005	20.1	NA	20.8	149.5	0.34	0.82	1.66	44.2

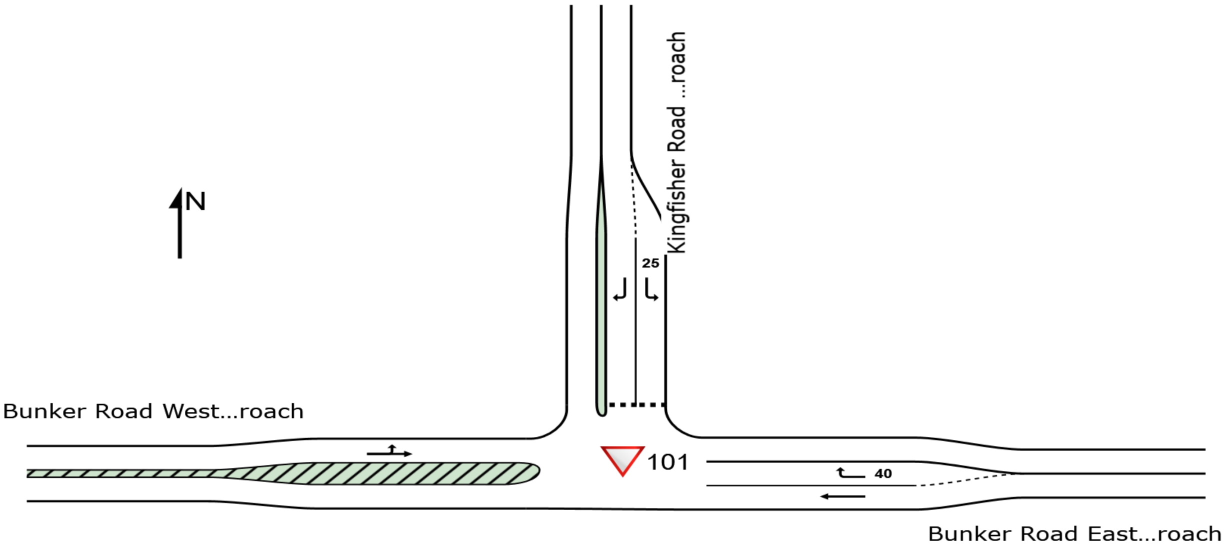
Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Two-Way Sign Control Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

SITE LAYOUT

Site: 101 [Kingfisher Road / Bunker Road Exisitng Conditions Opening Year 2030 AM Peak without development (Site Folder: Opening Year Exisitng Conditions)]

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

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



MOVEMENT SUMMARY

Site: 101 [Kingfisher Road / Bunker Road Exisitng Conditions Opening Year 2030 AM Peak without development (Site Folder: Opening Year Exisitng Conditions)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

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

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
East: Bunker Road East Approach															
5	T1	All MCs	316	3.0	316	3.0	0.165	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	59.9
6	R2	All MCs	163	3.0	163	3.0	0.212	9.7	LOS A	0.8	6.0	0.65	0.85	0.65	49.7
Approach			479	3.0	479	3.0	0.212	3.3	NA	0.8	6.0	0.22	0.29	0.22	56.0
North: Kingfisher Road North Approach															
7	L2	All MCs	45	3.0	45	3.0	0.035	6.4	LOS A	0.1	1.0	0.33	0.57	0.33	51.8
9	R2	All MCs	147	3.0	147	3.0	0.412	18.2	LOS B	1.8	12.9	0.81	1.00	1.10	44.5
Approach			193	3.0	193	3.0	0.412	15.4	LOS B	1.8	12.9	0.70	0.90	0.92	46.0
West: Bunker Road West Approach															
10	L2	All MCs	537	3.0	537	3.0	0.431	5.7	LOS A	0.0	0.0	0.00	0.39	0.00	54.0
11	T1	All MCs	259	3.0	259	3.0	0.431	0.2	LOS A	0.0	0.0	0.00	0.39	0.00	56.3
Approach			796	3.0	796	3.0	0.431	3.9	NA	0.0	0.0	0.00	0.39	0.00	54.7
All Vehicles			1467	3.0	1467	3.0	0.431	5.2	NA	1.8	12.9	0.16	0.43	0.19	53.8

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Two-Way Sign Control Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

▽ Site: 101 [Kingfisher Road / Bunker Road Exisitng Conditions Opening Year 2030 PM Peak without development (Site Folder: Opening Year Exisitng Conditions)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

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

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
East: Bunker Road East Approach															
5	T1	All MCs	361	3.0	361	3.0	0.189	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	59.9
6	R2	All MCs	83	3.0	83	3.0	0.091	8.5	LOS A	0.4	2.6	0.58	0.76	0.58	50.6
Approach			444	3.0	444	3.0	0.189	1.6	NA	0.4	2.6	0.11	0.14	0.11	57.9
North: Kingfisher Road North Approach															
7	L2	All MCs	152	3.0	152	3.0	0.143	7.5	LOS A	0.6	4.0	0.48	0.70	0.48	51.3
9	R2	All MCs	488	3.0	488	3.0	1.420	403.5	LOS F	96.1	690.1	1.00	5.90	18.75	7.8
Approach			640	3.0	640	3.0	1.420	309.7	LOS F	96.1	690.1	0.88	4.67	14.42	9.8
West: Bunker Road West Approach															
10	L2	All MCs	194	3.0	194	3.0	0.356	5.7	LOS A	0.0	0.0	0.00	0.17	0.00	55.8
11	T1	All MCs	477	3.0	477	3.0	0.356	0.1	LOS A	0.0	0.0	0.00	0.17	0.00	58.2
Approach			671	3.0	671	3.0	0.356	1.7	NA	0.0	0.0	0.00	0.17	0.00	57.5
All Vehicles			1755	3.0	1755	3.0	1.420	114.0	NA	96.1	690.1	0.35	1.81	5.29	20.7

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Two-Way Sign Control Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

Organisation: ITE CONSULTING | Licence: NETWORK / 1PC | Processed: 15 May 2026 09:33:30
Project: C:\Users\joube\Documents\Projects\Year 2026\-443_143 Springacre ROL TIA\Project1.sip9

MOVEMENT SUMMARY

Site: 101 [Kingfisher Road / Bunker Road Exisitng Conditions Opening Year 2030 AM Peak with development (Site Folder: Opening Year Exisitng Conditions)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

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

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
East: Bunker Road East Approach															
5	T1	All MCs	316	3.0	316	3.0	0.165	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	59.9
6	R2	All MCs	164	3.0	164	3.0	0.214	9.8	LOS A	0.9	6.1	0.65	0.86	0.66	49.7
Approach			480	3.0	480	3.0	0.214	3.4	NA	0.9	6.1	0.22	0.29	0.22	56.0
North: Kingfisher Road North Approach															
7	L2	All MCs	49	3.0	49	3.0	0.038	6.4	LOS A	0.1	1.1	0.33	0.58	0.33	51.8
9	R2	All MCs	156	3.0	156	3.0	0.437	18.6	LOS B	1.9	14.0	0.82	1.01	1.14	44.3
Approach			205	3.0	205	3.0	0.437	15.7	LOS B	1.9	14.0	0.70	0.91	0.94	45.9
West: Bunker Road West Approach															
10	L2	All MCs	539	3.0	539	3.0	0.432	5.7	LOS A	0.0	0.0	0.00	0.40	0.00	54.0
11	T1	All MCs	259	3.0	259	3.0	0.432	0.2	LOS A	0.0	0.0	0.00	0.40	0.00	56.3
Approach			798	3.0	798	3.0	0.432	3.9	NA	0.0	0.0	0.00	0.40	0.00	54.7
All Vehicles			1483	3.0	1483	3.0	0.437	5.4	NA	1.9	14.0	0.17	0.43	0.20	53.7

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Two-Way Sign Control Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

▽ Site: 101 [Kingfisher Road / Bunker Road Exisitng Conditions Opening Year 2030 PM Peak with development (Site Folder: Opening Year Exisitng Conditions)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

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

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
East: Bunker Road East Approach															
5	T1	All MCs	361	3.0	361	3.0	0.189	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	59.9
6	R2	All MCs	87	3.0	87	3.0	0.097	8.5	LOS A	0.4	2.7	0.58	0.77	0.58	50.5
Approach			448	3.0	448	3.0	0.189	1.7	NA	0.4	2.7	0.11	0.15	0.11	57.8
North: Kingfisher Road North Approach															
7	L2	All MCs	153	3.0	153	3.0	0.144	7.5	LOS A	0.6	4.1	0.48	0.70	0.48	51.3
9	R2	All MCs	491	3.0	491	3.0	1.443	423.9	LOS F	99.8	716.3	1.00	6.03	19.26	7.5
Approach			643	3.0	643	3.0	1.443	325.1	LOS F	99.8	716.3	0.88	4.77	14.80	9.4
West: Bunker Road West Approach															
10	L2	All MCs	202	3.0	202	3.0	0.360	5.7	LOS A	0.0	0.0	0.00	0.18	0.00	55.7
11	T1	All MCs	477	3.0	477	3.0	0.360	0.1	LOS A	0.0	0.0	0.00	0.18	0.00	58.2
Approach			679	3.0	679	3.0	0.360	1.8	NA	0.0	0.0	0.00	0.18	0.00	57.4
All Vehicles			1771	3.0	1771	3.0	1.443	119.2	NA	99.8	716.3	0.35	1.84	5.41	20.1

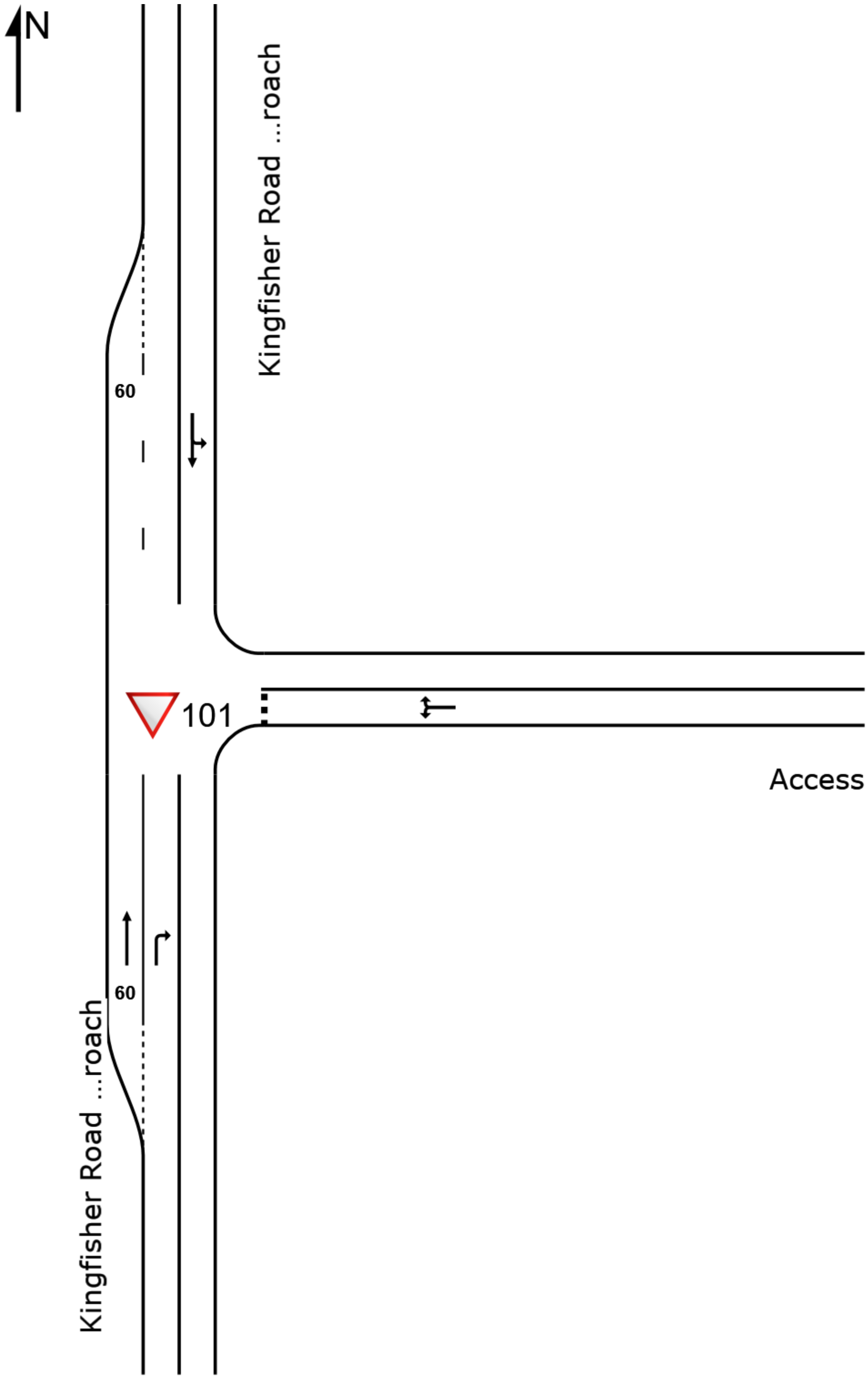
Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Two-Way Sign Control Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

SITE LAYOUT

Site: 101 [Kingfisher Road / Site Access Future Year 2040 AM Peak (Site Folder: Interim Site Access)]

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

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



Project: C:\Users\joube\Documents\Projects\Year 2026\-443_143 Springacre ROL TIA\Project1.sip9

MOVEMENT SUMMARY

Site: 101 [Kingfisher Road / Site Access Future Year 2040 AM Peak (Site Folder: Interim Site Access)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

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

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Kingfisher Road South Approach															
2	T1	All MCs	941	3.0	941	3.0	0.492	0.3	LOS A	0.0	0.0	0.00	0.00	0.00	59.6
3	R2	All MCs	3	3.0	3	3.0	0.002	6.3	LOS A	0.0	0.1	0.35	0.54	0.35	51.6
Approach			944	3.0	944	3.0	0.492	0.3	NA	0.0	0.1	0.00	0.00	0.00	59.6
East: Access															
4	L2	All MCs	13	3.0	13	3.0	0.197	6.9	LOS A	0.6	4.5	0.80	0.89	0.85	42.0
6	R2	All MCs	28	3.0	28	3.0	0.197	30.5	LOS C	0.6	4.5	0.80	0.89	0.85	41.8
Approach			41	3.0	41	3.0	0.197	23.3	LOS B	0.6	4.5	0.80	0.89	0.85	41.9
North: Kingfisher Road North Approach															
7	L2	All MCs	7	3.0	7	3.0	0.139	5.6	LOS A	0.0	0.0	0.00	0.02	0.00	57.2
8	T1	All MCs	259	3.0	259	3.0	0.139	0.0	LOS A	0.0	0.0	0.00	0.02	0.00	59.8
Approach			266	3.0	266	3.0	0.139	0.2	NA	0.0	0.0	0.00	0.02	0.00	59.7
All Vehicles			1252	3.0	1252	3.0	0.492	1.0	NA	0.6	4.5	0.03	0.03	0.03	58.8

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Two-Way Sign Control Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

▽ Site: 101 [Kingfisher Road / Site Access Future Year 2040 PM Peak (Site Folder: Interim Site Access)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

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

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Kingfisher Road South Approach															
2	T1	All MCs	373	3.0	373	3.0	0.195	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	59.9
3	R2	All MCs	13	3.0	13	3.0	0.023	11.1	LOS A	0.1	0.6	0.69	0.81	0.69	48.6
Approach			385	3.0	385	3.0	0.195	0.4	NA	0.1	0.6	0.02	0.03	0.02	59.4
East: Access															
4	L2	All MCs	3	3.0	3	3.0	0.057	10.8	LOS A	0.2	1.2	0.85	0.94	0.85	41.7
6	R2	All MCs	7	3.0	7	3.0	0.057	29.5	LOS C	0.2	1.2	0.85	0.94	0.85	41.5
Approach			11	3.0	11	3.0	0.057	23.9	LOS B	0.2	1.2	0.85	0.94	0.85	41.6
North: Kingfisher Road North Approach															
7	L2	All MCs	28	3.0	28	3.0	0.465	5.7	LOS A	0.0	0.0	0.00	0.02	0.00	56.9
8	T1	All MCs	859	3.0	859	3.0	0.465	0.2	LOS A	0.0	0.0	0.00	0.02	0.00	59.5
Approach			887	3.0	887	3.0	0.465	0.4	NA	0.0	0.0	0.00	0.02	0.00	59.4
All Vehicles			1283	3.0	1283	3.0	0.465	0.6	NA	0.2	1.2	0.01	0.03	0.01	59.2

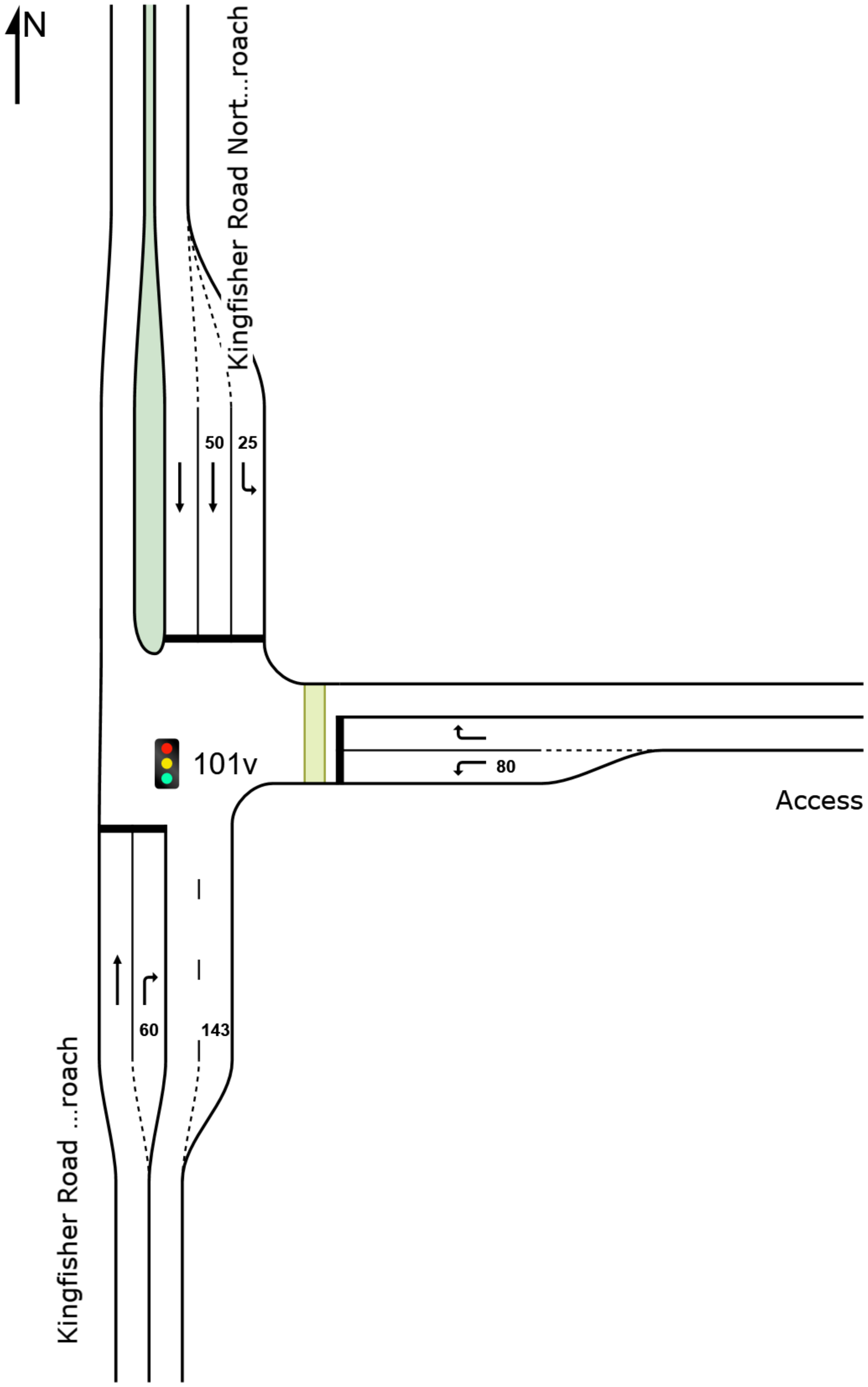
Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Two-Way Sign Control Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

SITE LAYOUT

Site: 101v [Kingfisher Road / Ultimate Site Access Future Year 2040 AM Peak (Site Folder: Ultimate Site Access)]

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



MOVEMENT SUMMARY

Site: 101v [Kingfisher Road / Ultimate Site Access Future Year 2040 AM Peak (Site Folder: Ultimate Site Access)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 50 seconds (Site Practical Cycle Time)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Kingfisher Road South Approach															
2	T1	All MCs	941	3.0	941	3.0	* 0.771	9.4	LOS A	18.1	129.6	0.77	0.75	0.83	52.4
3	R2	All MCs	22	3.0	22	3.0	0.101	28.7	LOS C	0.5	3.7	0.92	0.70	0.92	39.8
Approach			963	3.0	963	3.0	0.771	9.9	LOS A	18.1	129.6	0.77	0.74	0.83	51.6
East: Access															
4	L2	All MCs	41	3.0	41	3.0	0.188	28.8	LOS C	1.0	7.0	0.93	0.72	0.93	39.7
6	R2	All MCs	95	3.0	95	3.0	* 0.434	29.5	LOS C	2.3	16.8	0.97	0.76	0.97	39.3
Approach			136	3.0	136	3.0	0.434	29.3	LOS C	2.3	16.8	0.96	0.75	0.96	39.4
North: Kingfisher Road North Approach															
7	L2	All MCs	52	3.0	52	3.0	0.071	15.7	LOS B	0.8	5.6	0.64	0.70	0.64	46.1
8	T1	All MCs	259	3.0	259	3.0	0.192	10.7	LOS A	2.4	17.0	0.68	0.54	0.68	51.1
Approach			311	3.0	311	3.0	0.192	11.5	LOS A	2.4	17.0	0.67	0.57	0.67	50.2
All Vehicles			1409	3.0	1409	3.0	0.771	12.1	LOS A	18.1	129.6	0.77	0.71	0.81	49.8

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

* Critical Movement (Signal Timing)

Pedestrian Movement Performance

Mov ID	Crossing	Input Vol. ped/h	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Eff. Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
East: Access												
P2	Full	50	53	19.4	LOS B	0.1	0.1	0.88	0.88	173.2	200.0	1.15
All Pedestrians		0	53	19.4	LOS B	0.1	0.1	0.88	0.88	173.2	200.0	1.15

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

PHASING SUMMARY

Site: 101v [Kingfisher Road / Ultimate Site Access Future Year 2040 AM Peak (Site Folder: Ultimate Site Access)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated   Cycle Time = 50 seconds (Site Practical Cycle Time)

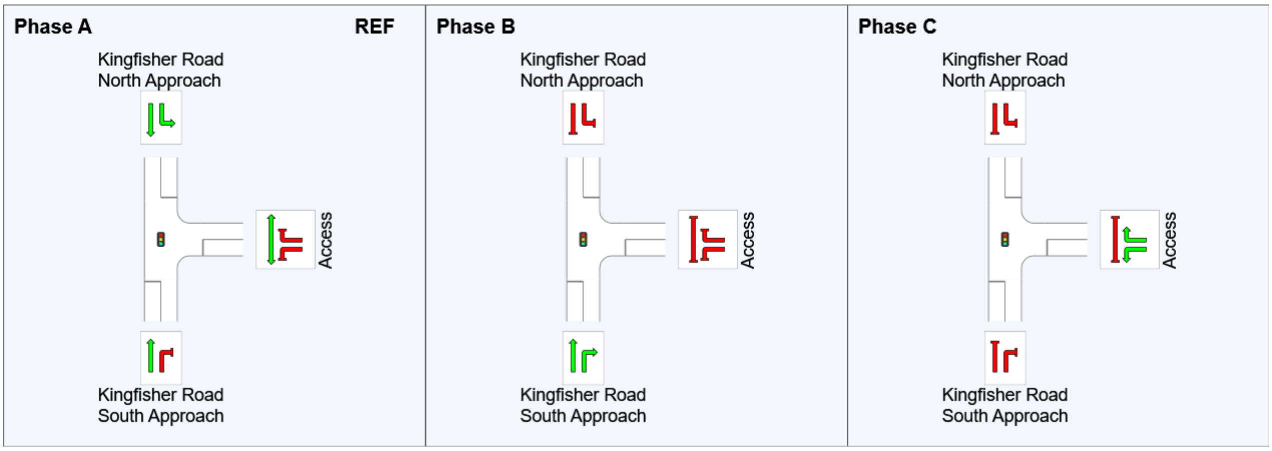
Timings based on settings in the Site Phasing & Timing dialog
Phase Times determined by the program
Phase Sequence: Convert Function Default
Input Phase Sequence: A, B, C
Output Phase Sequence: A, B, C
Reference Phase: Phase A

Phase Timing Summary

Phase	A	B	C
Phase Change Time (sec)	0	26	38
Green Time (sec)	20	6	6
Phase Time (sec)	26	12	12
Phase Split	52%	24%	24%
Phase Frequency (%)	100.0	100.0	100.0

See the Timing Analysis report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Minor Phase Actuation and Phase Frequency values (user-specified or implied) less than 100%.

Output Phase Sequence



REF: Reference Phase
VAR: Variable Phase

Normal Movement	Permitted/Opposed
Slip/Bypass-Lane Movement	Opposed Slip/Bypass-Lane
Stopped Movement	Turn On Red
Other Movement Class (MC) Running	Undetected Movement
Mixed Running & Stopped MCs	Continuous Movement
Other Movement Class (MC) Stopped	Phase Transition Applied

MOVEMENT SUMMARY

Site: 101v [Kingfisher Road / Ultimate Site Access Future Year 2040 PM Peak (Site Folder: Ultimate Site Access)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated   Cycle Time = 50 seconds (Site Practical Cycle Time)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Kingfisher Road South Approach															
2	T1	All MCs	373	3.0	373	3.0	0.304	4.4	LOS A	4.1	29.3	0.48	0.41	0.48	56.0
3	R2	All MCs	41	3.0	41	3.0	* 0.188	28.5	LOS B	1.0	7.0	0.93	0.72	0.93	39.6
Approach			414	3.0	414	3.0	0.304	6.8	LOS A	4.1	29.3	0.52	0.44	0.52	53.8
East: Access															
4	L2	All MCs	22	3.0	22	3.0	0.101	29.5	LOS C	0.5	3.7	0.92	0.70	0.92	39.8
6	R2	All MCs	52	3.0	52	3.0	* 0.236	28.7	LOS C	1.2	8.8	0.94	0.73	0.94	39.7
Approach			74	3.0	74	3.0	0.236	29.0	LOS C	1.2	8.8	0.93	0.72	0.93	39.7
North: Kingfisher Road North Approach															
7	L2	All MCs	95	3.0	95	3.0	0.130	16.8	LOS B	1.5	10.7	0.66	0.72	0.66	45.9
8	T1	All MCs	859	3.0	859	3.0	* 0.644	14.0	LOS A	10.0	71.9	0.83	0.72	0.83	49.4
Approach			954	3.0	954	3.0	0.644	14.2	LOS A	10.0	71.9	0.82	0.72	0.82	48.8
All Vehicles			1441	3.0	1441	3.0	0.644	12.8	LOS A	10.0	71.9	0.74	0.64	0.74	49.5

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

* Critical Movement (Signal Timing)

Pedestrian Movement Performance

Mov ID	Crossing	Input Vol. ped/h	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Eff. Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
East: Access												
P2	Full	50	53	19.4	LOS B	0.1	0.1	0.88	0.88	173.2	200.0	1.15
All Pedestrians		0	53	19.4	LOS B	0.1	0.1	0.88	0.88	173.2	200.0	1.15

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.