WALKER CORPORATION

## Wilton Junction Traffic Assessment

STAGED DEVELOPMENT OPTIONS TESTING

CONFIDENTIAL JULY 2016



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**Walker Corporation** 

#### Confidential

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## 1 PROJECT BACKGROUND

Wilton Junction is located on the Hume Highway southwest of Sydney and northwest of Wollongong (Figure 1.1). A Transport Management and Access Plan (TMAP) was delivered for a master planned community in the area in 2014.



Figure 1.1 Site location

Source: supplied

Urban development has commenced in the area, primarily in the 'Bingara Gorge' estate to the north of Picton Road which has been developed by Lend Lease. A second major land holder in the area is Walker Corporation whose interests are primarily in land located to the south of Picton Road. The general location of these areas is shown in Figure 1.2 below.

WSP | Parsons Brinckerhoff has now been commissioned by Walker Corporation to provide advice on likely traffic impacts associated with early stage delivery of their development area, with particular emphasis on timing requirements for improvements to intersections at:

- Hume Motorway/Picton Road
- → Pembroke Parade/Picton Road
- Almond Street/Picton Road.

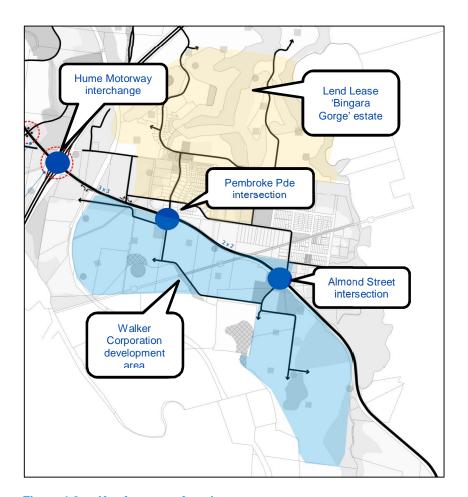


Figure 1.2 Key features of study area

## 2 INFORMATION RECEIVED

WSP | Parsons Brinckerhoff was provided with input data and models from previous studies. These include:

- AIMSUM macroscopic model from the TMAP studies
- Spreadsheet-based trip generation model from the TMAP studies.

For this investigation, additional information supplied included:

Maps of two staging options for the Walker Land:

- → 20160608\_Wilton\_Concept\_Stage Plan\_Opt 1 Pembroke Street.pdf
- → 20160608\_Wilton\_Concept\_Stage Plan\_Opt 2 Almond Street.pdf.

Data of anticipated dwelling and jobs growth for the area:

- → Growth estimates WSEP and Bingara (June 2016).docx (reproduced in Appendix B)
- → WSEP Residential & Employment.xlsx.

## 3 METHODOLOGY

An assessment has been undertaken to understand the required infrastructure upgrades required to support the expected development at the Walker owned property and the existing rezoned areas of Bingara Gorge. The following methodology has been utilised for this assessment:

- The ultimate year of development that includes all development at the Walker owned land and Bingara Gorge has been undertaken using the AIMSUN macroscopic model adopted from the TMAP studies. This initially assumes no network upgrades to determine distribution and assignment of traffic.
- The required network infrastructure upgrades have then been identified for the ultimate year of development using the SIDRA intersection assessment software. The extent of this study includes the following intersections:
  - Hume Highway / Picton Road interchange
  - Picton Road / Pembroke Road intersection
  - Picton Road / Almond Street intersection
- → An assessment of the staging of the development at the Walker owned property has then be undertaken by interpolating the level of traffic generation against the likely schedule of build-out. SIDRA has then been used to identify the trigger points for the various network upgrades.

## 4 ULTIMATE YEAR ASSESSMENT

The 'ultimate' scenario that was provided to the study team focused on the proposed development on the Walker Land. This scenario includes the rezoned Bingara Gorge land and further development expected in that area, but excludes other development areas, yet to be rezoned that were considered as part of the TMAP.

The ultimate development quantum is as in Table 4.1 below. Note that the development yield at Bingara Gorge is currently the subject of a planning appeal. The current development control plan allows for 1,165 dwellings at Bingara Gorge, while the developer is currently seeking consent for an additional 685 dwellings. In order to provide a conservative assessment, an upper limit of 1,850 dwellings has been allowed for.

Table 4.1 Anticipated ultimate development

	WALKER	BINGARA GORGE	TOTAL
Dwellings	3,000	1,850*	4,850
Jobs	1,802	250	2052

Source: data supplied by Walker Corporation and Wilton Junction TMAP document

These figures were entered into the TMAP trip generation spreadsheet and then tested using the AIMSUM macroscopic model.

The first round of testing utilised the regional road network in its current format. This test produced high levels of congestion within the model confirming that it was not possible to deliver the ultimate development with the current infrastructure.

A second round of testing was then undertaken using an enhanced network which included:

- → Duplication of Picton Road to 4 lanes (2 in each direction) between Hume Motorway and east of Almond Street
- Duplication of right-turn lanes of the northbound and southbound off-ramp from the Hume Motorway to Picton Road
- Provision of additional stand-up lanes at signals at the Hume Motorway interchange.

This upgraded network was modelled within AIMSUM and signals optimised within SIDRA. Testing of the upgraded network showed acceptable performance on the analysed network.

The conclusion reached is that, on the information currently available, the main road networks including Hume Motorway interchange and Picton Road through Pembroke Parade and Almond Street should be able to operate satisfactorily under full Walker and Bingara Gorge development without additional ramps or overbridges. However, upgrades to Picton Road and intersections with Pembroke Parade and Almond Street would be required.

<sup>\* -</sup> Yield currently subject to planning appeal. Development control plan currently accommodates 1,165 dwellings

## 5 STAGING ASSESSMENT

#### 5.1 Introduction

The following assessment identifies the level of build out for the Walker-owned property at Wilton that could be accommodated within the constraints of a 4-way signalised intersection at either Pembroke Parade and / or Almond Street with Picton Road.

The ultimate year assessment reported above indicated that acceptable performance of the arterial network (Picton Road and Hume Motorway interchange) could be maintained with full build-out, provided that there were a number of improvements to Picton Road. These included duplication to 4 lanes (2 in each direction) between the Hume Motorway interchange and downstream of Almond Street, and upgrades to the capacity at the interchange including additional stand-up lanes.

Further advice was then requested on the potential to stage development to help determine at what stage upgrades to the intersections would be required, and potentially at what stage full duplication of Picton Road might be required.

This chapter discusses the assessment of three key intersections (Picton Road/Almond Street, Picton Road/Pembroke Parade and Hume Motorway/Picton Road) considering development staging.

#### 5.2 Method, inputs and assumptions

#### 5.2.1 Method

Testing of the staging of intersection performance was undertaken using static testing of each intersection independently using SIDRA 6.1 software. This approach was deemed appropriate as the early stages of development would be isolated with limited internal route choice, and thus microsimulation of each stage would not be necessary.

The trip generation and distribution spreadsheet as used for the ultimate scenario was adopted for the intermediate scenario testing. Both AM and PM peak hours were tested.

Note that this assessment does not consider the requirement for a secondary point of access in relation to emergency access. Best practice is to provide a secondary form of access for emergency purposes when the site yield exceed 100 homes. This secondary access need not be prominent and can be limited to a minimal left-in / left-out arrangement for example. Depending on potential connectivity, the secondary access may even exclude the need for auxiliary turn lanes if it can be demonstrated that it will not be used for 'business as usual' access and that turning volumes are below those deemed to require auxiliary lanes as detailed in Austroads Part 4a.

#### 5.2.2 Input data

Testing was conducted in three stages in accordance with the data provided by Walker and indicative staging maps. This data is summarised in Table 5.1 below which shows the cumulative development at the end of each stage.

Table 5.1 Input data by stage (cumulative)

	CURREN	IT (2016)	STAGE 1	(TO 2021)	STAGE 2	(TO 2023)	STAGE 3	(TO 2025)
	WALKER	BINGARA GORGE	WALKER	BINGARA GORGE	WALKER	BINGARA GORGE	WALKER	BINGARA GORGE
Dwellings	0	480	500	1,200	900	1,500	1,300	1,850*
Jobs-retail	0	230+	100	250	100	250	229	250
Jobs- enterprise	0		200		200		400	

Source: data supplied by Walker Corporation and Wilton Junction TMAP document

- \* Yield currently subject to planning appeal. Development control plan currently accommodates 1,165 dwellings
- + Estimated current jobs across retail and service sectors in Bingara Gorge and old Wilton Village

#### 5.2.3 Location scenarios

Two location scenarios were tested:

- → 'Scenario A' assumes that all early-stage development for the Walker development area would occur at the east of the site with all traffic access via a new connection to the Picton Road/Almond Street intersection
- → 'Scenario P' assumes that all early-stage development for the Walker development area would occur at the west of the site with all traffic access via a new connection to the Picton Road/Pembroke Parade intersection.

The performance of each scenario's intersection was tested for each of Stages 1, 2 and 3 in turn.

As the volumes flowing through the Hume Motorway/Picton Road interchange were assumed to be identical regardless of which scenario was chosen, the interchange was tested once for each of Stages 1, 2 and 3 in turn.

#### 5.2.4 Assumptions

The development of the scenario testing was based on the same assumptions as the ultimate testing, which was based on that developed for the TMAP process. Thus the same assumptions from the TMAP are carried through to this assessment.

It was assumed that development in each location / scenario would occur independently and that there would be no internal road network within the Walker development area connecting the two access points within the timeframes of the scenario tests. This means that all traffic to/from the Walker development area would move through either Pembroke Parade south of Almond Street south as appropriate.

The ultimate year AIMSUM model was used as a guide to distribution of trips. External trips out of zone 113 (Bingara Gorge) were distributed 50% eastbound and 50% westbound, while external trips out of zone 114 (Walker Land) were distributed 66% westbound and 33% eastbound. Maintaining this assumption aligns with the TMAP.

#### 5.3 Findings

#### 5.3.1 Scenario A

Various intersection configurations were tested and it was found that in order for the Almond Street/Picton Road intersection to perform acceptably with Stage 1 it would be necessary to upgrade the road with signalisation to provide two through and one right turn lane for approximately 200-300 metres in each direction along Picton Road. This is shown schematically in Figure 5.1. Note that single-stage pedestrian crossings were provided across all legs.

This general configuration was shown to perform satisfactorily (LOS C or better) in the AM and PM peak hours for Stage 1 and Stage 2.

With Stage 3 data however, the intersection performed less than adequately. It was found possible to achieve LOS D for the intersection overall at the cost of LOS E delays for traffic into the development only if a two-stage pedestrian crossing was introduced on the east leg. This would require further widening of the eastern approach to provide for a safe storage space for pedestrians. The technical feasibility of this will need to be tested.

It is assumed that the existing access for Bingara Gorge (Pembroke Parade) will likely fail in its current unsignalised format without any development at the Walker owned property due to the ongoing build-out of the Bingara Gorge development. In the case of the early staging of the Walker development using access at Almond Street, it is likely that Pembroke Parade will become signalised due to the development of Bingara Gorge.

Detailed SIDRA results are included in Appendix A.

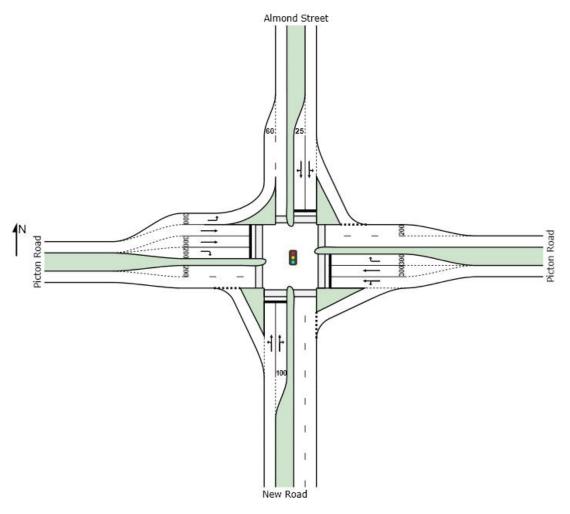


Figure 5.1 Almond Street intersection conceptual design

#### 5.3.2 Scenario P

A similar range of infrastructure options were tested in Scenario P as for Scenario A, and the base case intersection required to perform adequately similarly required the provision of an additional through lane with appropriate approach distances. This is shown schematically in Figure 5.2.

Two important points are worth noting with this intersection design:

- → No pedestrian crossing is provided on the western approach, in line with designs previously recommended through the TMAP process
- Capacity approach from the northern (Bingara Gorge) approach is also critical to the performance of this intersection and widening of this approach will be critical. The ongoing development at Bingara Gorge will likely require the signalisation of the Picton Road / Pembroke Parade intersection regardless of any development at the Walker owned property

This intersection design was found to perform satisfactorily with Stage 1 and Stage 2 loads, but would fail (LOS F) with Stage 3 volumes.

Detailed SIDRA outputs are included in Appendix A.

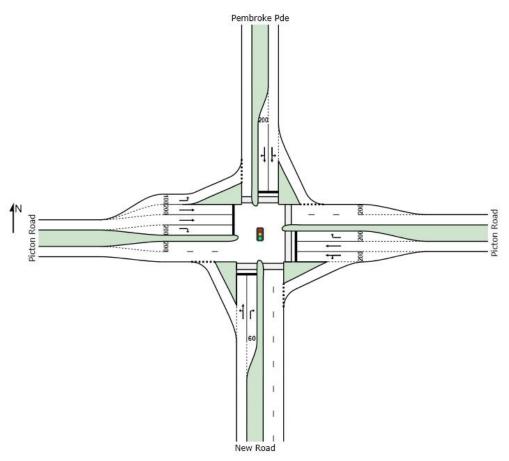


Figure 5.2 Pembroke Parade intersection conceptual design

It should be noted that the upgrade requirements of the Pembroke Parade intersection under an Almond Street development scenario have not been tested, as the upgrade requirements would be driven primarily by Bingara Gorge development independently of Walker development site traffic.

#### 5.3.3 Hume Motorway Interchange

The Hume Motorway/Picton Road interchange was modelled in SIDRA Intersection 7.0, again over the three stages.

The interchange was tested in an 'as is' configuration and it showed unsatisfactory performance under Stage 1 loads. This was found to be due primarily to the short right-turn approach lanes from Picton Road. Lengthening this right turn lane to approximately 300m was shown to have benefits. This interchange layout is shown conceptually in Figure 5.3.

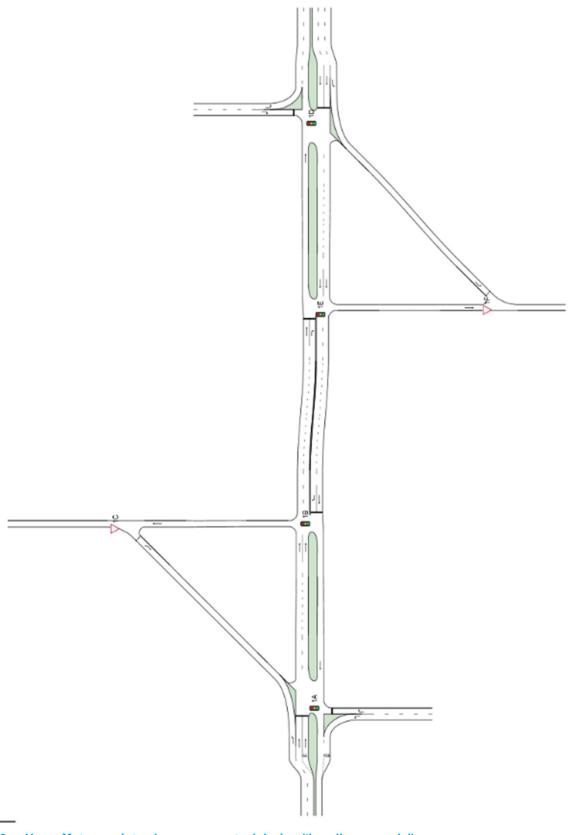


Figure 5.3 Hume Motorway interchange conceptual design ('baseline upgrade')

Under this general configuration, the interchange was shown to perform adequately under Stage 1 and Stage 2 demands. However, with Stage 3 demands the intersection started to fail, with unsatisfactory queues on both motorway off ramps.

Resolving this would likely require transition to the complete build-out concept including duplication of offramps and provision of additional stand-up lanes at signals. This layout is described earlier at Section 4 for the ultimate build-out of the Walker development.

## 6 CONCLUSIONS

Based on the information supplied and the assumptions made, the following conclusions are reached:

- Development of Walker Corporation sites at Wilton will require upgrades to provide additional capacity to the intersection at the access point on Picton Road as well as the Picton Road approach to the Hume Motorway interchange
- → Development of up to Stage 2 (900 dwellings and 300 jobs) should be possible as a 'single access' development based on either a Pembroke Parade or Almond Street access regime
- → Development of up to Stage 2 (900 dwellings and 300 jobs) should be possible with enhancements to the Hume Motorway interchange to lengthen the right turn approach lanes
- Development beyond this point will require:
  - further upgrades to the Hume Motorway interchange
  - construction and signalisation of the second access point on Picton Road
  - construction of the internal road distribution network within the Walker development area
- Development beyond 100 dwellings should consider a secondary emergency access point.

The above conclusions should be considered preliminary and further testing and design confirmation is recommended once the preferred staging plan has been adopted by Walker Corporation.

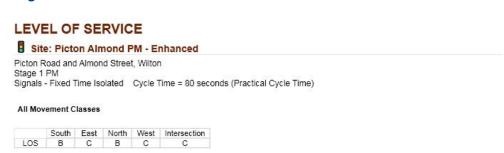
## Appendix A

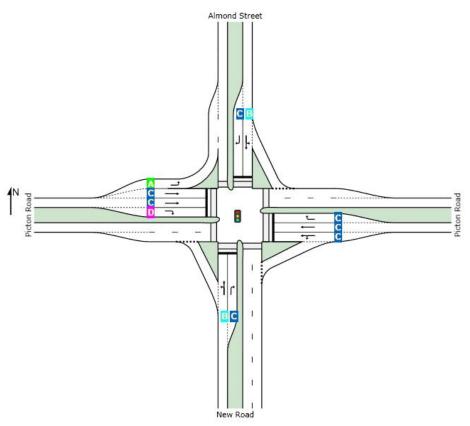
SIDRA INTERSECTION MODEL RESULTS

### **SCENARIO** A

PM peak hour data reported as this was found to be the critical time period.

#### Stage 1





Level of Service (LOS) Method: Delay (RTA NSW).

Lane LOS values are based on average delay per lane.

Intersection and Approach LOS values are based on average delay for all lanes.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

#### LANE SUMMARY

Site: Picton Almond PM - Enhanced

Picton Road and Almond Street, Wilton
Stage 1 PM
Signals - Fixed Time Isolated Cycle Time = 80 seconds (Practical Cycle Time)

	Dema	nd Flows		Deg.	Lane	Average	Level of	95% Back of C	viene	Lane	Lane	Cap.	Prob.
	Total veh/h	HV %	Cap. veh/h	Satn	Util.	Delay	Service	Veh	Dist	Config	Length	Adj.	Block.
South: New Road	ven/n	76	ven/n	v/c	%	sec			m		m	%	%
Lane 1	152	5.0	642	0.236	100	15.9	LOS B	3.0	21.8	Full	500	0.0	0.0
Lane 2	23	5.0	269	0.086	100	38.0	LOSC	0.8	5.8	Short	60	0.0	NA.
Approach	175	5.0		0.236		18.9	LOS B	3.0	21.8				
East: Picton Road													
Lane 1	371	9.3	532	0.697	100	29.2	LOS C	13.1	99.2	Short	200	0.0	N/
Lane 2	367	10.0	526	0.697	100	28.6	LOS C	13.3	100.9	Full	500	0.0	0.0
Lane 3	12	5.0	202	0.057	100	40.9	LOS C	0.4	3.1	Short	300	0.0	N.
Approach	749	9.6		0.697		29.1	LOS C	13.3	100.9				
North: Almond Street													
Lane 1	34	5.0	293	0.115	100	20.1	LOS B	0.8	5.5	Full	200	0.0	0.0
Lane 2	7	5.0	269	0.027	100	37.4	LOS C	0.2	1.8	Short	25	0.0	N/
Approach	41	5.0		0.115		23.2	LOS B	0.8	5.5				
West: Picton Road													
Lane 1	23	5.0	1793	0.013	100	5.7	LOSA	0.0	0.0	Short	300	0.0	N/
Lane 2	423	10.0	526	0.803	100	33.1	LOS C	17.0	129.3	Short	300	0.0	N/
Lane 3	423	10.0	526	0.803	100	33.1	LOS C	17.0	129.3	Full	500	0.0	0.0
Lane 4	165	5.0	202	0.819	100	49.7	LOS D	7.2	52.6	Short	200	0.0	N/
Approach	1034	9.1		0.819		35.1	LOS C	17.0	129.3				
Intersection	1999	8.8		0.819		31.2	LOS C	17.0	129.3				

Level of Service (LOS) Method: Delay (RTA NSW),
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

#### Stage 2

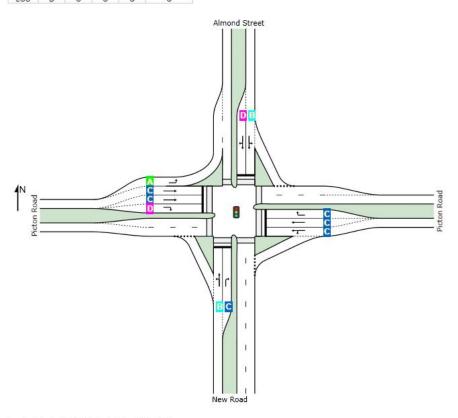
#### LEVEL OF SERVICE

Site: Picton Almond PM - enhanced

Picton Road and Almond Street, Wilton
Stage 2 PM
Signals - Fixed Time Isolated Cycle Time = 90 seconds (Practical Cycle Time)

#### All Movement Classes

	South	East	North	West	Intersection
100	B	0	- C	- C	



Level of Service (LOS) Method: Delay (RTA NSW). Lane LOS values are based on average delay per lane. Intersection and Approach LOS values are based on average delay for all lanes. SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

#### LANE SUMMARY

#### Site: Picton Almond PM - enhanced

Picton Road and Almond Street, Wilton Stage 2 PM Signals - Fixed Time Isolated Cycle Time = 90 seconds (Practical Cycle Time)

	Deman	d Flows		Deg.	Lane	Average	Level of	95% Back of	Queue	Lane	Lane	Cap.	Prob.
	Total		Сар.	Satn	Util.	Delay	Service	Veh	Dist	Config	Length	Adj.	Block.
South: New Road	veh/h	%	veh/h	v/c	%	sec			m	10000	m	%	%
			77848-2				And a final final a fi	Contracts	Daniel Co.	t and the second			
Lane 1	265	5.0	731	0.363	100	16.5	LOS B	6.1	44.4	Full	500	0.0	0.0
Lane 2	39	5.0	279	0.140	100	41.8	LOS C	1.5	11.0	Short	60	0.0	NA
Approach	304	5.0		0.363		19.8	LOS B	6.1	44.4				
East: Picton Road													
Lane 1	419	9.0	557	0.753	100	33.9	LOSC	17.1	128.8	Full	500	0.0	0.0
Lane 2	413	10.0	549	0.753	100	32.9	LOSC	17.3	131.7	Short	500	0.0	NA
Lane 3	12	5.0	379	0.031	100	36.0	LOSC	0.4	3.0	Short	300	0.0	NA
Approach	844	9.4		0.753		33.4	LOS C	17.3	131.7				
North: Almond Street													
Lane 1	26	5.0	143	0.182	100	26.8	LOS B	0.7	5.3	Full	200	0.0	0.0
Lane 2	22	5.0	123	0.182	100	47.6	LOS D	1.0	7.2	Short	25	0.0	NA
Approach	48	5.0		0.182		36.4	LOSC	1.0	7.2				
West: Picton Road													
Lane 1	22	5.0	1793	0.012	100	5.7	LOSA	0.0	0.0	Short	300	0.0	NA
Lane 2	463	10.0	549	0.843	100	38.9	LOSC	21.8	165.5	Full	500	0.0	0.0
Lane 3	463	10.0	549	0.843	100	38.9	LOSC	21.8	165.5	Short	500	0.0	NA
Lane 4	308	5.0	379	0.815	100	47.9	LOS D	14.4	105.4	Short	200	0.0	NA.
Approach	1257	8.7		0.843		40.5	LOSC	21.8	165.5				
ntersection	2454	8.4		0.843		35.4	LOS C	21.8	165.5				

Level of Service (LOS) Method: Delay (RTA NSW).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

#### Stage 3

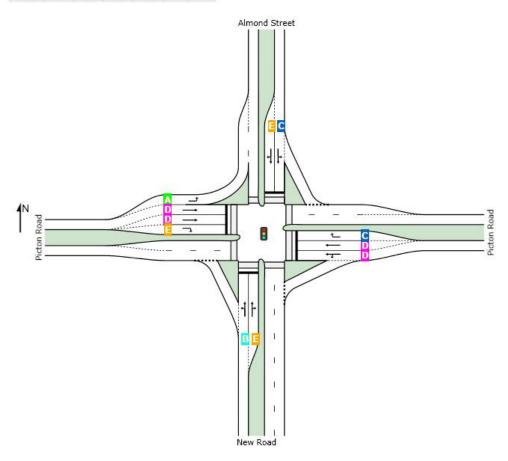
#### LEVEL OF SERVICE

Site: Picton Almond PM - enhanced

Picton Road and Almond Street, Wilton Stage 3 PM Signals - Fixed Time Isolated Cycle Time = 120 seconds (Practical Cycle Time)

#### All Movement Classes

	South	East	North	West	Intersection
LOS	В	D	D	D	D



Level of Service (LOS) Method: Delay (RTA NSW), Lane LOS values are based on average delay per lane. Intersection and Approach LOS values are based on average delay for all lanes. SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

#### LANE SUMMARY

Site: Picton Almond PM - enhanced

Picton Road and Almond Street, Wilton Stage 3 PM Signals - Fixed Time Isolated Cycle Time = 120 seconds (Practical Cycle Time)

	Dema Total	nd Flows HV	Cap.	Deg. Satn	Lane Util	Average Delay	Level of Service	95% Back of Queue Veh	Dist	Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	veh/h	%	veh/h	v/c	%	sec	SOLAIGO		m	Coming	m	~uj. %	%
South: New Road													
Lane 1	497	5.0	1155	0.431	100	19.2	LOS B	16.2	118.0	Full	500	0.0	0.0
Lane 2	105	5.0	243	0.431	100	57.0	LOS E	5.8	42.3	Short	100	0.0	NA
Approach	602	5.0		0.431		25.8	LOS B	16.2	118.0				
East: Picton Road													
Lane 1	469	8.6	588	0.797	100	45.6	LOS D	25.6	192.2	Full	500	0.0	0.0
Lane 2	462	10.0	580	0.797	100	43.3	LOS D	25.9	197.1	Short	300	0.0	NA
Lane 3	12	5.0	538	0.022	100	36.9	LOS C	0.5	3.4	Short	300	0.0	NA
Approach	942	9.2		0.797		44.4	LOS D	25.9	197.1				
North: Almond Street													
Lane 1	26	5.0	105	0.245	100	37.1	LOS C	1.0	7.2	Full	200	0.0	0.0
Lane 2	23	5.0	93	0.245	100	64.7	LOS E	1.4	9.9	Short	25	0.0	NA
Approach	48	5.0		0.245		50.0	LOS D	1.4	9.9				
West: Picton Road													
Lane 1	23	5.0	1793	0.013	100	5.7	LOSA	0.0	0.0	Short	300	0.0	NA
Lane 2	491	10.0	580	0.847	100	47.8	LOS D	29.5	224.5	Full	300	0.0	0.0
Lane 3	491	10.0	580	0.847	100	47.8	LOS D	29.5	224.5	Short	300	0.0	NA
Lane 4	466	5.0	538	0.867	100	57.6	LOS E	29.2	213.5	Short	200	0.0	NA
Approach	1472	8.3		0.867		50.3	LOS D	29.5	224.5				
Intersection	3064	7.9		0.867		43.6	LOS D	29.5	224.5				

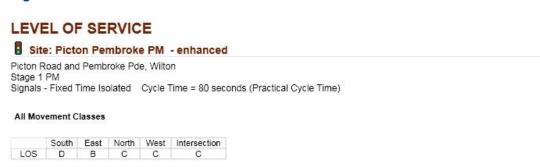
Level of Service (LOS) Method: Delay (RTA NSW).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

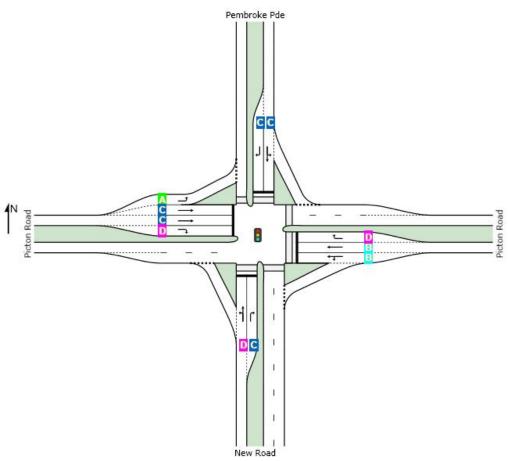
Note this option includes split-phasing for pedestrian movements on east leg.

### SCENARIO P

PM peak hour data reported as this was found to be the critical time period.

#### Stage 1





Level of Service (LOS) Method: Delay (RTA NSW).

Lane LOS values are based on average delay per lane.

Intersection and Approach LOS values are based on average delay for all lanes.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

#### LANE SUMMARY

Site: Picton Pembroke PM - enhanced

Picton Road and Pembroke Pde, Wilton
Stage 1 PM
Signals - Fixed Time Isolated Cycle Time = 80 seconds (Practical Cycle Time)

	Demar	nd Flows		Deg.	Lane	Average	Level of	95% Back of Que	ie	Lane	Lane	Cap.	Prob.
	Total		Cap.	Satin	Util.	Delay	Service	Veh	Dist	Config	Length	Adj.	Block.
	veh/h	%	veh/h	v/c	%	sec			m		m	%	%
South: New Road													
Lane 1	211	5.0	254	0.830	100	51.1	LOS D	8.8	64.5	Full	500	0.0	0.0
Lane 2	32	5.0	224	0.141	100	40.5	LOS C	1.1	8.3	Short	60	0.0	NA
Approach	242	5.0		0.830		49.8	LOS D	8.8	64.5				
East: Picton Road													
Lane 1	441	9.4	622	0.709	100	27.6	LOS B	15.2	115.2	Short	200	0.0	NA
Lane 2	438	10.0	618	0.709	100	25.9	LOS B	15.4	116.9	Full	500	0.0	0.0
Lane 3	71	5.0	134	0.524	100	47.3	LOS D	2.9	21.0	Short	200	0.0	NA
Approach	949	9.4		0.709		28.3	LOS B	15.4	116.9				
North: Pembroke Pde													
Lane 1	242	5.0	315	0.769	100	40.5	LOS C	9.5	69.5	Full	200	0.0	0.0
Lane 2	47	5.0	291	0.163	100	37.6	LOSC	1.6	12.0	Short	25	0.0	NA
Approach	289	5.0		0.769		40.1	LOS C	9.5	69.5				
West: Picton Road													
Lane 1	138	5.0	1317	0.105	100	7.9	LOSA	1.2	8.8	Short	100	0.0	NA
Lane 2	509	10.0	618	0.824	100	31.8	LOS C	20.7	157.0	Short	200	0.0	NA
Lane 3	509	10.0	618	0.824	100	31.8	LOS C	20.7	157.0	Full	500	0.0	0.0
Lane 4	79	5.0	134	0.587	100	47.8	LOS D	3.3	23.8	Short	200	0.0	NA
Approach	1235	9.1		0.824		30.1	LOS C	20.7	157.0				
ntersection	2716	8.4		0.830		32.3	LOS C	20.7	157.0				

Level of Service (LOS) Method: Delay (RTA NSW).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap.-Acceptance Capacity. SIDRA Standard (Akçelik MSD).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

#### Stage 2

#### LEVEL OF SERVICE

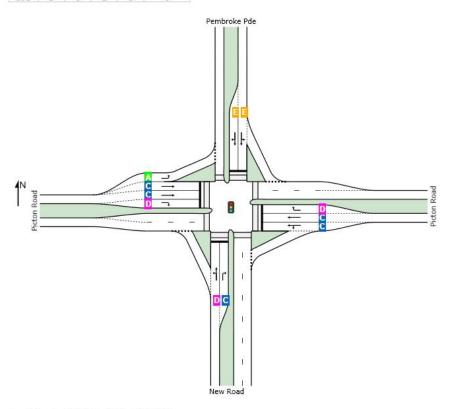
Site: Picton Pembroke PM - enhanced

Picton Road and Pembroke Pde, Wilton

Stage 2 PM
Signals - Fixed Time Isolated Cycle Time = 80 seconds (Practical Cycle Time)

#### All Movement Classes

	South	East	North	West	Intersection
1.05	D	C	F	C	C



Level of Service (LOS) Method: Delay (RTA NSW).

Lane LOS values are based on average delay per lane.

Intersection and Approach LOS values are based on average delay for all lanes.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

The results of iterative calculations indicate a somewhat unstable solution. See the Diagnostics section in the Detailed Output report.

#### LANE SUMMARY

#### Site: Picton Pembroke PM - enhanced

Picton Road and Pembroke Pde, Wilton
Stage 2 PM
Signals - Fixed Time Isolated Cycle Time = 80 seconds (Practical Cycle Time)

		d Flows		Deg.	Lane	Average	Level of	95% Back of		Lane	Lane	Cap.	Prob.
	Total		Сар.	Satn	Util.	Delay	Service	Veh	Dist	Config	Length	Adj.	Block.
South: New Road	veh/h	%	veh/h	v/c	%	sec	September 1	1770	m	5.25300.00	m	%	%
	320	5.0	394	0.811	100	43.8	LOS D	13.0	95.1	Full	500	0.0	0.0
Lane 1			0.77	(50.00									
Lane 2	47	5.0	359	0.132	100	34.5	LOS C	1.6	11.3	Short	60	0.0	NA
Approach	367	5.0		0.811		42.6	LOS D	13.0	95.1				
East: Picton Road													
Lane 1	429	9.0	536	0.801	100	34.0	LOSC	16.8	126.4	Short	200	0.0	NA
Lane 2	422	10.0	526	0.801	100	33.0	LOSC	16.9	128.7	Full	502	0.0	0.0
Lane 3	31	5.0	157	0.195	100	44.3	LOS D	1.2	8.6	Short	200	0.0	N/
Approach	881	9.3		0.801		33.9	LOS C	16.9	128.7				
North: Pembroke Pde													
Lane 1	236	5.0	249	0.950	100	59.5	LOS E	11.8	86.1	Full	200	0.0	0.0
Lane 2	171	5.0	180 <sup>1</sup>	0.950	100	61.6	LOS E	8.8	64.4	Short	25	0.0	NA
Approach	407	5.0		0.950		60.4	LOS E	11.8	86.1				
West: Picton Road													
Lane 1	171	5.0	1261	0.135	100	8.1	LOSA	1.6	11.8	Short	100	0.0	NA
Lane 2	463	10.0	526	0.880	100	40.3	LOS C	21.1	160.3	Short	200	0.0	NA
Lane 3	463	10.0	526	0.880	100	40.3	LOS C	21.1	160.3	Full	502	0.0	0.0
Lane 4	120	5.0	157	0.765	100	49.4	LOS D	5.1	37.6	Short	200	0.0	NA
Approach	1217	8.8		0.880		36.7	LOSC	21.1	160.3				
Intersection	2873	7.9		0.950		39.9	LOSC	21.1	160.3				

Level of Service (LOS) Method: Delay (RTA NSW),
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
The results of iterative calculations indicate a somewhat unstable solution. See the Diagnostics section in the Detailed Output report.

<sup>1</sup> Reduced capacity due to a short lane effect. Short lane queues may extend into the adjacent full-length lanes. Some upstream delays at entry to short lanes are not included.

#### Stage 3

#### LEVEL OF SERVICE

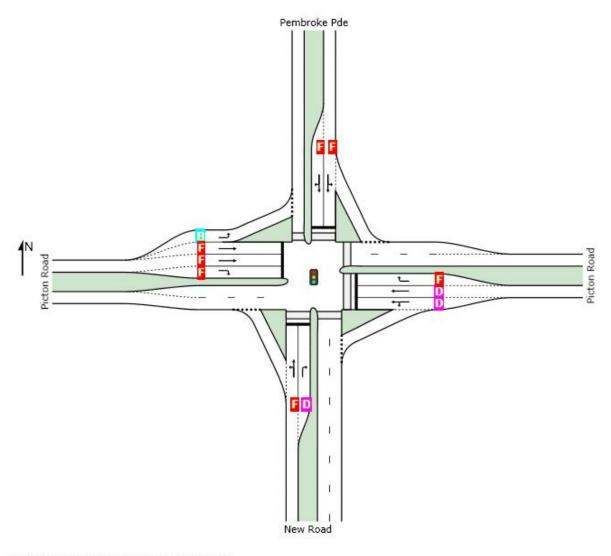
Site: Picton Pembroke PM - enhanced

Picton Road and Pembroke Pde, Wilton Stage 3 PM

Signals - Fixed Time Isolated Cycle Time = 150 seconds (Practical Cycle Time)

#### All Movement Classes

	South	East	North	West	Intersection
LOS	F	D	F	F	F



Level of Service (LOS) Method: Delay (RTA NSW).

Lane LOS values are based on average delay per lane.

Intersection and Approach LOS values are based on average delay for all lanes.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

#### LANE SUMMARY

Site: Picton Pembroke PM - enhanced

Picton Road and Pembroke Pde, Wilton Stage 3 PM Signals - Fixed Time Isolated Cycle Time = 150 seconds (Practical Cycle Time)

	Dema	nd Flows		Deg.	Lane	Average	Level of	95% Back of Queue		Lane	Lane	Сар.	Prob.
	Total		Сар.	Satn	Util.	Delay	Service	Veh	Dist	Config	Length	Adj.	Block.
	veh/h	%	veh/h	v/c	%	sec			m	59	m	%	%
South: New Road													
Lane 1	503	5.0	521	0.966	100	103.9	LOS F	46.6	340.1	Full	500	0.0	0.0
Lane 2	119	5.0	490	0.243	100	50.9	LOS D	6.7	49.1	Short	60	0.0	NA
Approach	622	5.0		0.966		93.8	LOSF	46.6	340.1				
East: Picton Road													
Lane 1	548	8.8	651	0.842	100	54.3	LOS D	38.2	287.6	Short	200	0.0	NA
Lane 2	544	10.0	647	0.842	100	52.2	LOS D	38.5	292.9	Full	502	0.0	0.0
Lane 3	109	5.0	143	0.763	100	84.1	LOSF	8.4	61.4	Short	200	0.0	NA
Approach	1202	9.0		0.842		56.1	LOS D	38.5	292.9				
North: Pembroke Pde													
Lane 1	247	5.0	257	0.958	100	102.9	LOS F	21.7	158.2	Full	200	0.0	0.0
Lane 2	238	5.0	248	0.958	100	99.2	LOS F	21.5	156.7	Short	200	0.0	NA
Approach	484	5.0		0.958		101.1	LOS F	21.7	158.2				
West: Picton Road													
Lane 1	213	5.0	1145	0.186	100	15.5	LOS B	5.8	42.7	Short	100	0.0	NA
Lane 2	545	10.0	552 <sup>1</sup>	0.988	100	96.1	LOS F	52.1	395.8	Short	200	0.0	NA
Lane 3	637	10.0	644	0.988	100	96.1	LOS F	63.0	478.9	Full	502	0.0	0.8
Lane 4	132	5.0	143	0.917	100	96.4	LOS F	11.1	81.2	Short	200	0.0	NA
Approach	1526	8.9		0.988		84.9	LOS F	63.0	478.9				
Intersection	3835	7.8		0.988		79.3	LOSF	63.0	478.9				

Level of Service (LOS) Method: Delay (RTA NSW).

Lane LOS values are based on average delay per lane.

Intersection and Approach LOS values are based on average delay for all lanes.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Algelik M3D).

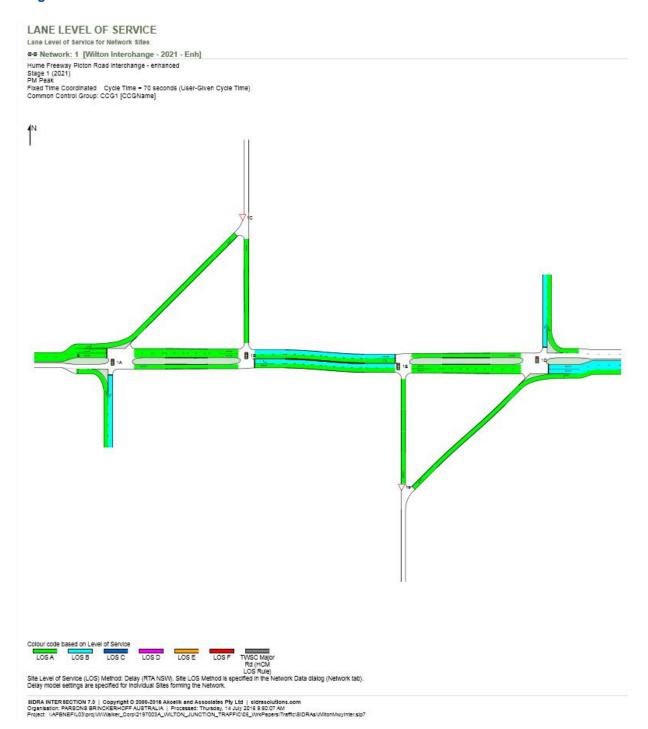
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

1 Reduced capacity due to a short lane effect. Short lane queues may extend into the adjacent full-length lanes. Some upstream delays at entry to short lanes are not included.

## **HUME MOTORWAY INTERCHANGE**

Network performance results are shown with 'baseline upgrade' (extended eastern approach turn lane) unless otherwise stated.

#### Stage 1



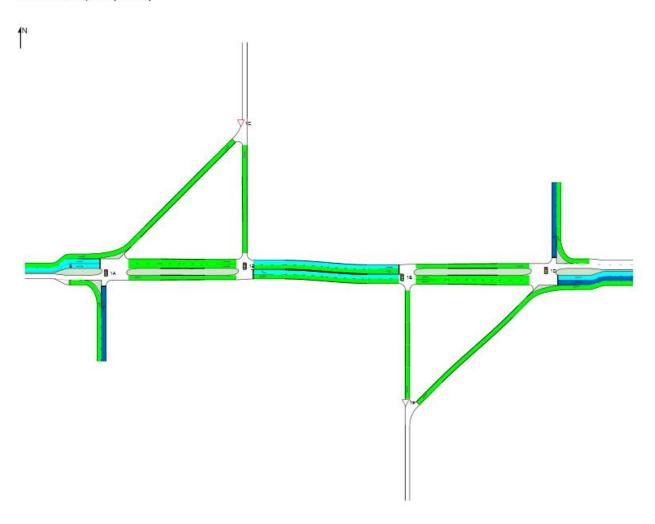
#### Stage 2

#### LANE LEVEL OF SERVICE

Lane Level of Service for Network Sites

■■ Network: 1 [Wilton Interchange - 2023 - Enh] Hume Freeway Ploton Road Interchange - enhanced Stage 2 (2024) PM Peak

PM Peak Fixed Time Coordinated Cycle Time = 110 seconds (User-Given Cycle Time) Common Control Group: CCG1 [CCGName]



Colour code based on Level of Service

LOS A LOS B LOS C LOS D LOS E LOS F TWISC Major
Rd (HCM
LOS Rule)

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).

Delay model settings are specified for Individual Sites forming the Network.

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Project: "IAPBNEFIL03/proj.WiWalker\_Corpl2197003A\_WILTON\_JUNCTION\_TRAFFIC/05\_WKFPapers/Traffic/8IDRAs/Witton/MwyInter.sip7

#### Stage 3

#### Intersection fails with only baseline enhancements:

# LANE LEVEL OF SERVICE Lane Level of Service for Network Sites ■■ Network: 1 [Wilton Interchange - 2025 - Enh] Hume Freeway Picton Road Interchange - enhanced Stage 3 (2026) PM Peak Fixed Time Coordinated Cycle Time - 150 seconds (User-Given Cycle Time) Common Control Group: CCG1 [CCGName] Colour code based on Level of Service LOS A LOS B LOS C LOS D LOS B LOS C LOS D LOS E LOS F TWISC Major Rd (HCM LOS Rule) Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab). Delay model settings are specified for individual Sites forming the Network.

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#### With additional upgrades:

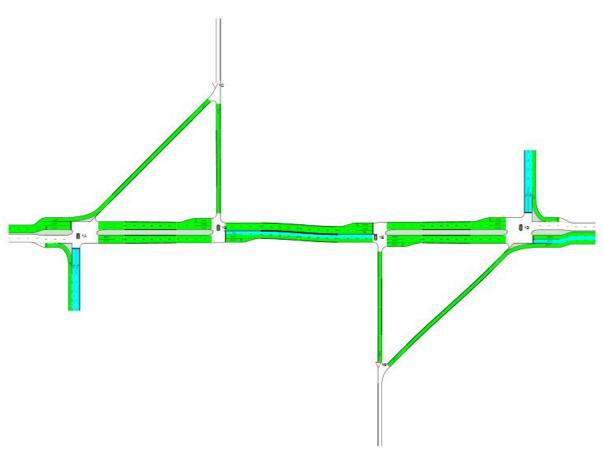
#### LANE LEVEL OF SERVICE

Lane Level of Service for Network Sites

■■ Network: 1 [Wilton Interchange - 2025 - full upgrade]

Hume Freeway Picton Road Interchange - full upgrade
Stage 3 (2025)
PM Peak
Fixed Time Coordinated Cycle Time = 50 seconds (User-Given Cycle Time)
Common Control Group: CCG1 [CCGName]





LOS A LOS B LOS C LOS D LOS E LOS F TWSC Major Rd (HCM LOS Rule)

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).

Delay model settings are specified for individual Sites forming the Network. Colour code based on Level of Service
LOS A LOS B LOS C

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# Appendix B

SUPPLIED DEVELOPMENT STAGING

## DEVELOPMENT STAGING (WALKER LAND)

Residential			Retail/Co	ommunity	Ente	rprise	Home/M	obile jobs	Employment Total		
Year	Dwelling Annual Production	Dwellings	Retail/ Community Annual Total	Retail/ Community Jobs (accumulative)	Enterprise Annual Total	Enterprise Jobs (accumulative)	Home/Mobile Annual Total	Home/Mobile Jobs (accumulative)	Employment Annual Total	Jobs (accumulative)	
2016	10.00	170	-	=	=:	151	-54	150	( <del></del>	858	
2017		17.0	-	-	7:	:=:	:52	150		134	
2018	50	50	-	-		5 <u>-</u> 16	120	-	15	-	
2019	100	150	2	2	-		123	P420	42	028	
2020	150	300	_	-	100	100	-	120	100	100	
2021	200	500	100	100	100	200	1=1	9=9	200	300	
2022	200	700	-	100	-	200	1-0	(10)		300	
2023	200	900	-	100	*:	200	1-0	180	*	300	
2024	200	1,100	129	229	100	300	(5)	1970	229	529	
2025	200	1,300	-	229	100	400	68	68	168	697	
2026	200	1,500	-	229	-	400	68	136	68	765	
2027	200	1,700	_	229	-	400	68	204	68	833	
2028	200	1,900	-	229	109	509	68	272	177	1,010	
2029	200	2,100	19	357	100	609	68	340	187	1,197	
2030	200	2,300	100	348	-	609	68	408	168	1,365	
2031	200	2,500	₩.	348	÷	609	68	476	68	1,433	
2032	200	2,700	₹	348	-	609	68	544	68	1,501	
2033	200	2,900	7	348	100	709	68	612	168	1,669	
2034	100	3,000	9	357	56	765	68	680	133	1,802	
TOTAL	3,000	3,000	357	357	765	765	680	680	1,802	1,802	

## DEVELOPMENT STAGING (BINGARA GORGE)

Year	Lend Lease
2016	300 Existing + 150 additional dwellings (450 Total)
2017	+150 dwellings (600 total)
2018	+150 dwellings (750 total)
2019	+150 dwellings (900 total)
2020	+150 dwellings (1050 total)
2021	+150 dwellings (1200 total)
2022	+150 dwellings (1350 total)
2023	+150 dwellings (1500 total)
2024	+150 dwellings (1650 total)
2025	+150 dwellings (1750 total)
2026	+150 dwellings (1850 total)