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**THOMPSON
STANBURY
ASSOCIATES**

ABN: 79 943 737 368

22 October 2012

General Manager
Hawkesbury Council
PO Box 21
WINDSOR
NSW 1860

Dear Sir,

TRAFFIC IMPACT STATEMENT
PROPOSED RESIDENTIAL SUBDIVISION
396 BELLS LINE OF ROAD, KURMOND

This Practice has been engaged by the applicant and owner of the subject property, Ken Hardaker, to report upon an assessment of traffic impacts in support of approval to the rezoning and subdivision of the subject property.

INTRODUCTION

The proposal consists of the rezoning of an existing rural parcel of land to form a rural residential subdivision creating 27 allotments, providing a minimum lot size of 4,000m². The subdivision is proposed to be serviced by a new access road, extending to the north-east from Bells Line of Road into the site.

The purpose of this report is to assess the likely traffic implications resulting from the proposed rezoning and subdivision addressing each of the following issues:

- Review current traffic conditions with respect to safety and efficiency in the vicinity of the site;
- Assess vehicle safety associated with the proposed new access road junction with Bells Line of Road in respect to current Roads & Maritime Services and Austroads criteria for safe access for the prevailing sign posted speed limit;
- Identify the potential external traffic generation of the proposed subdivision based on established traffic generation rates provided by Roads & Maritime Services; and
- Derive and comment on the impact of the generated traffic flows and new road junction arrangements and recommend, where necessary, measures to address these impacts.

Throughout this report, reference is made to the following documents:

- The Roads & Maritime Services' *Guide to Traffic Generating Developments*; and
- Austroads *Guide to Road Design Part 4A: Unsignalised and Signalised Intersections*.

The report has been prepared pursuant to State Environmental Planning Policy (Infrastructure) 2007.

This report should be read in conjunction with the following:

- Subdivision plans prepared by North Western Surveys;
- A concept intersection design plan for the subdivision access road prepared by the Practice; and
- A sight distance diagram detailing the available sight distance between the proposed new subdivision access road and Bells Line of Road prepared by this Practice.

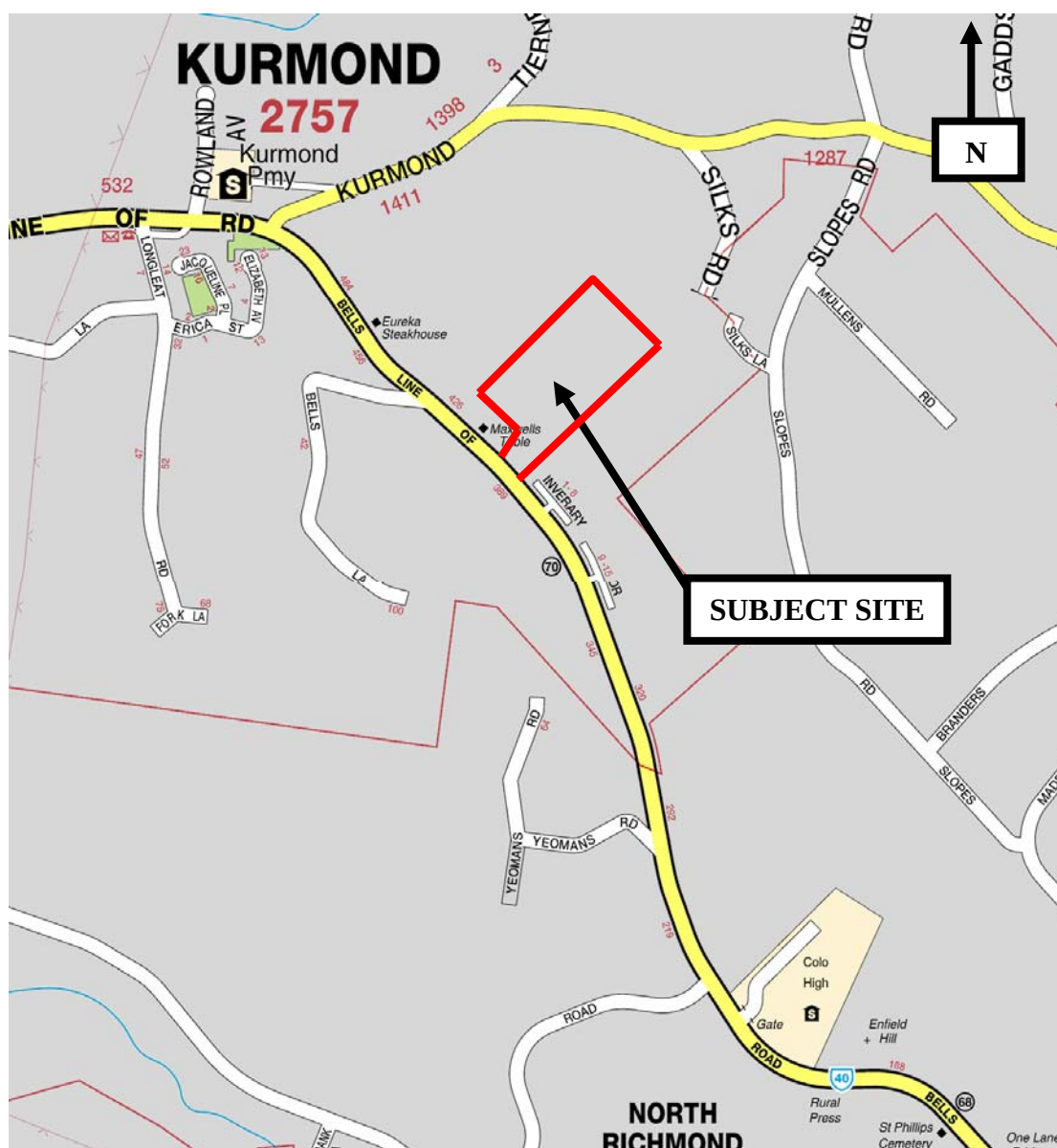
Copies of the above plans are appended to this correspondence.

SITE DETAILS

Site Location

The subject site is located on the north-eastern side of Bells Line of Road, Kurmond approximately midway between Kurmond Road to the north and Yeomans Road to the south. This location is illustrated overleaf within a neighbourhood context by **Figure 1**, being an extract of UBDs *Australian City Streets*, Version 4.

FIGURE 1
SITE LOCATION



Site Description

The site provides a real property description of Lot 2 DP 607906, Bells Line of Road, Kurmond. The land forms an irregular shape providing a frontage of approximately 90m to Bells Line of Road. The site provides a total area of approximately 13.07 ha.

Existing Use

The subject site accommodates a single rural residential dwelling fronting and providing unrestricted vehicular access to Bells Line of Road via a combined ingress / egress driveway located within the southern corner of the site.

The remainder of the site comprises disused grass and farmland, including two large dams.

Surrounding Uses

Rural residential land-uses occupy surrounding allotments, with the exception of the land adjoining immediately to the north-west, which accommodates a restaurant building known as Kurmond Wine Bar and Grill (previously known as Kurmond Roadhouse and Maxwell's Table). The restaurant was recently extensively damaged by fire however an application was approved in 2010 for its rebuilding. Work has not yet commenced on this rebuilding.

Other non rural residential development within the subject vicinity includes a strip of commercial / retail developments located approximately 1km to the north-west associated with the Kurmond town centre.

EXISTING TRAFFIC CONDITIONS

Surrounding Road Function & Hierarchy

Bells Line of Road performs a State Road function under the care and control of the Roads & Maritime Services providing an east-west arterial function between North Richmond and Lithgow. Immediately adjoining the subject site, Bells Line of Road forms a 9m wide pavement providing one through lane of traffic in each direction with directional lanes being separated by a double barrier centre line. Marked edge lines delineate the edge of pavement whilst unsealed shoulders are provided along both carriageway alignments. Traffic flow is governed by a sign posted speed limit of 60km/h.

Bells Line of Road intersects with lower order rural residential access roads to the north and south of the site in Bells Lane and Yeomans Road respectively. These intersections operate under major / minor priority control with Bells Line of Road forming the priority route. Further to the north-west, Bells Line of Road intersects with Kurmond Road within the Kurmond town centre. Kurmond Road performs a collector road function providing an easterly connection to Spinks Road, Creek Ridge Road and Putty Road. It is noted that none of these public road junctions are provided with exclusive turning lanes within Bells Line of Road to assist turning movements.

The closest traffic controls are recently installed signals governing the intersection of Bells Line of Road, Old Bells Line of Road and Mill Road approximately 2km to the north-east.

Traffic Volumes

In order to obtain an indication of the existing operation of the local road network in the vicinity of the site, reference is made to morning and evening peak hour traffic surveys undertaken by staff of this Practice. Traffic surveys were undertaken of the directional travel lanes of Bells Line of Road immediately adjoining the subject site between 7.00am – 9.00am and 4.00pm – 6.00pm on 3 September 2012. The peak hour volumes obtained from the surveys are represented overleaf diagrammatically as **Figure 2** whilst full details are contained within **Appendix 1**.

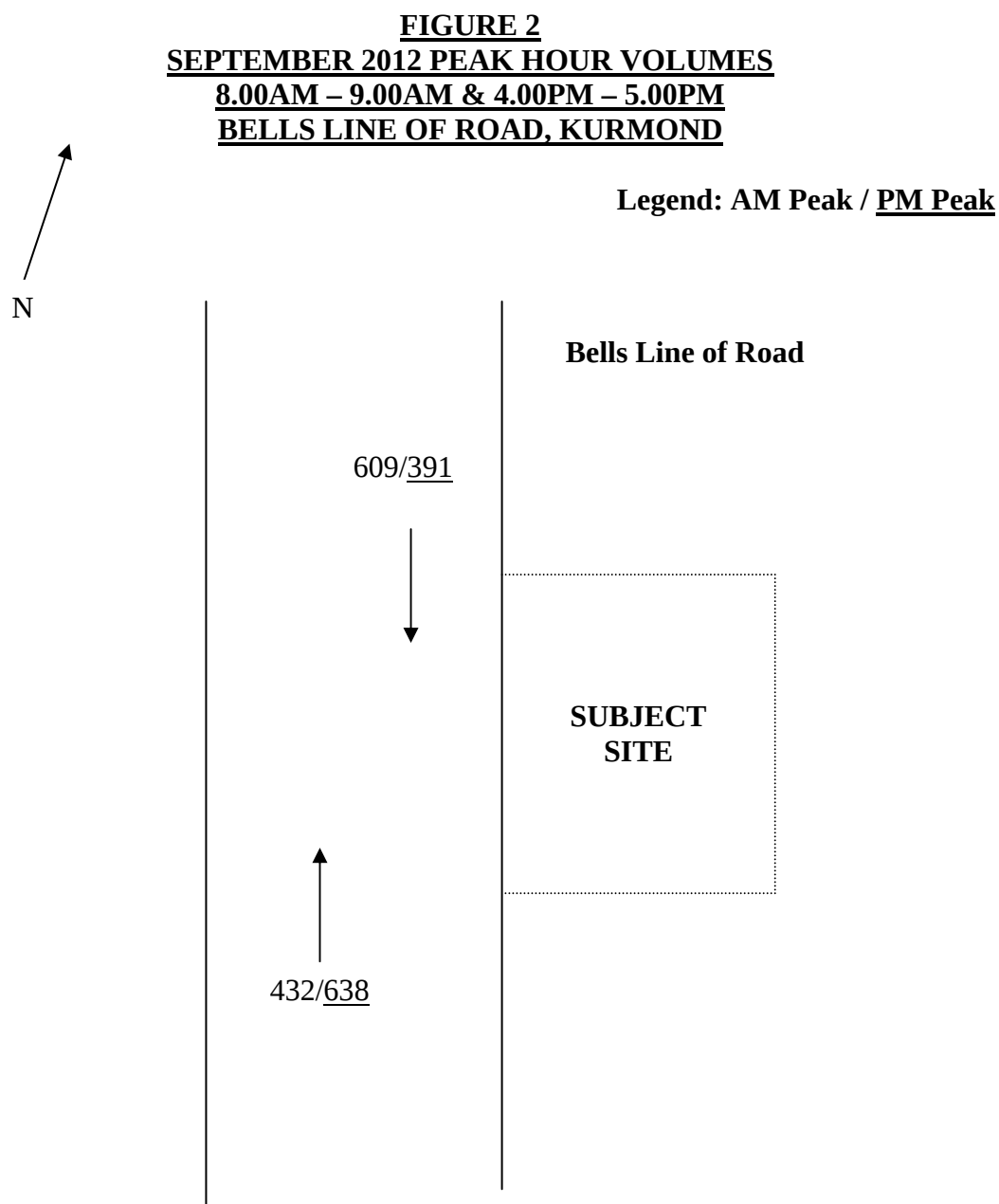


Figure 2 indicates through Bells Line of Road movements are tidal during peak periods with south-eastbound traffic movements dominating during the morning peak and north-westbound traffic movements dominating during the evening peak.

Existing Road Network Operation

AUSTROADS states that a conservative capacity of a 2 lane rural roadway carriageway is approximately 1,800 vehicles per hour per direction, not taking into consideration the terrain conditions or the percentage of heavy vehicles. **Figure 2** indicates that the peak hourly directional travel volume of Bells Line of Road is between approximately 400 - 650 vehicles, whilst traffic flow characteristics observed during the undertaking of the surveys indicate the terrain is generally rolling and heavy vehicles constitute approximately 5% of peak hour flows. Further, platooning of traffic flows occurs whereby vehicles generally travel at or near the sign posted

speed limit of 60km/h with maximum groupings of 7-8 vehicles separated by gaps of up to 30 seconds at most times.

These previously mentioned traffic characteristics provide motorists, accordingly to the Roads & Maritime Services' *Guide to Traffic Generating Developments* with a level of service "B" where LOS value of "B" is described as stable flow where drivers have a reasonable freedom to select their desired speed and manoeuvre within the traffic stream and the general level of conform and convenience is good.

Public Transport

Public transport facilities are limited within the surrounding area given the regional nature of the locality. Notwithstanding this, Westbus operates Route 682 along Bells Line of Road between Richmond and Kurrajong. This service operates every 30 minutes during the peak periods with the closest stop being located in the vicinity of the post office within the Kurmond town centre.

PROPOSED DEVELOPMENT

Development Application

The subject application involves the rezoning and subdivision of the existing rural residential lot into 27 lots varying in size from 4,000m² – 8,200m².

The lots are proposed to be serviced by a single new internal access road running approximately east-west intersecting with Bells Line of Road. The access road is proposed to provide a reservation of 20m wide, containing a carriageway width of 8m. This road reservation is proposed to widen to 25m on immediate approach to Bells Line of Road to accommodate a subdivision entry feature comprising a dual carriageway comprising 4m wide directional carriageways, separated by a 5m wide landscaped central median. The internal access road is proposed to terminate in the north-eastern portion of the site via a cul-de-sac.

A majority of the lots are proposed to provide direct and unrestricted connectivity to the internal access road, with the exception of lots 21 and 22 located approximately central to the northern site boundary, which are proposed to be accessed from the internal roadway via battle axe arrangements. No lots are proposed to be accessed via Bells Line of Road.

A subdivision plan has been prepared by North Western Surveys, a copy of which is attached to this correspondence as **Appendix 2**.

Potential Future Expansion

Whilst not forming part of the current development application, it is planned that the subdivision be subject to a second stage whereby, the subdivision be extended to the north, towards Kurmond Road. This expansion incorporates the provision of an additional 18 lots, totalling 45 lots.

The expansion is to be facilitated by the provision of a second 20m wide road running in an approximate north-south alignment, extending to the north from the abovementioned original subdivision access road. The new road is proposed to be provided in place of the abovementioned battle axe driveway servicing lots 21 and 22, and be extended approximately 260m to the north, prior to terminating under similar cul-de-sac arrangements as that presented for the primary subdivision access road.

A total of 16 of the additional 18 lots are proposed to be serviced by this second internal access road. The remaining 2 additional lots are proposed to be serviced by battle axe type driveways connecting with Kurmond Road.

An indicative expanded subdivision plan has been prepared by North Western Surveys, a copy of which is attached to this correspondence as **Appendix 3**.

Whilst this potential subdivision expansion does not form part of the subject application, this assessment is mindful of the potential traffic generation of the expanded subdivision with respect to likely impacts on Bells Line of Road and overall subdivision access considerations.

Subdivision Access

The new subdivision access road is proposed to form a T-junction with Bells Line of Road within the south-western corner of the site. Pavement widening is proposed within Bells Line of Road to provide a channelised right turn treatment with a short turn slot in accordance with a CHR(S) treatment specified by Figure 7.6 of AUSTROADS' *Guide to Road Design Part 4A: Unsignalised and Signalised Intersections*.

The pavement widening is proposed to be undertaken on the north-eastern side of the existing Bells Line of Road pavement to ensure that there is no requirement to acquire land to the south-west.

This Practice has prepared a concept design of the CHR(S) type intersection treatment incorporating Bells Line of Road and the new subdivision road, a copy of which is attached to this correspondence as **Appendix 4**.

PROJECTED TRAFFIC CONDITIONS

Traffic Generation

The Roads & Maritime Services in their *Guide to Traffic Generating Developments* have established vehicular generation rates for a range of land-uses based on surveys of similar uses throughout the Sydney Metropolitan Area. This publication specifies that residential dwellings generate an average of 9 daily and 0.85 peak hour vehicle trips. These traffic generation rates however do not take into consideration the rural nature of the subject vicinity and the lack of available public transport. Accordingly, the rates generally underestimate the traffic generating potential of rural residential lots.

In consideration of the above, a peak hour traffic generation of 1.0 trip per lot has been applied to the subject proposal. The proposed 27 lot subdivision is therefore projected to generate in the order of 27 peak hour vehicle trips to and from the site.

Similarly, the potential future expanded subdivision is projected to generate in the order of 45 peak hour vehicle trips, 43 of which will be serviced by the proposed access road intersecting with Bells Line of Road (the remaining 2 trips are to be serviced by Kurmond Road via battle axe type driveways).

Trip Assignment & Future Traffic Volumes

The trip assignment of vehicle movements generated by any development is most commonly generated based on existing traffic distributions. The peak hour traffic surveys presented within **Figure 2** indicates that traffic demands are tidal during peak periods, with south-eastbound vehicle movements dominating during the morning peak and north-westbound vehicle movements dominating during the evening peak.

On the above basis and with consideration that the greater Sydney metropolitan area is located to the south-east, it is expected that 80% of vehicles exiting the site will travel to the south-east along Bells Line of Road, with the remaining vehicles exiting the site to the north-west. Similarly, 80% of entering vehicles are expected to travel from the south-east whilst the remaining 20% are envisaged to travel from the north-west.

A further consideration with respect to trip assignment is the split of incoming and outgoing movements. It is normal for residential properties to primarily generate outgoing movements during the morning peak and incoming movements during the evening peak. Accordingly, an 80% / 20% split of outbound / inbound vehicle movements is anticipated during the morning peak and the reverse condition is projected during the evening peak.

Figures 3 and 4 overleaf provides a graphical representation of the projected traffic volumes at the proposed T-junction of Bells Line of Road and the subdivision access road, incorporating the subject development application and the potential expanded subdivision respectively, based on the above considerations.

FIGURE 3
PROJECTED WEEKDAY PEAK TRAFFIC VOLUMES
JUNCTION OF BELLS LINE OF ROAD & SUBDIVISION ACCESS ROAD
INCORPORATING DEVELOPMENT APPLICATION TRAFFIC DEMANDS

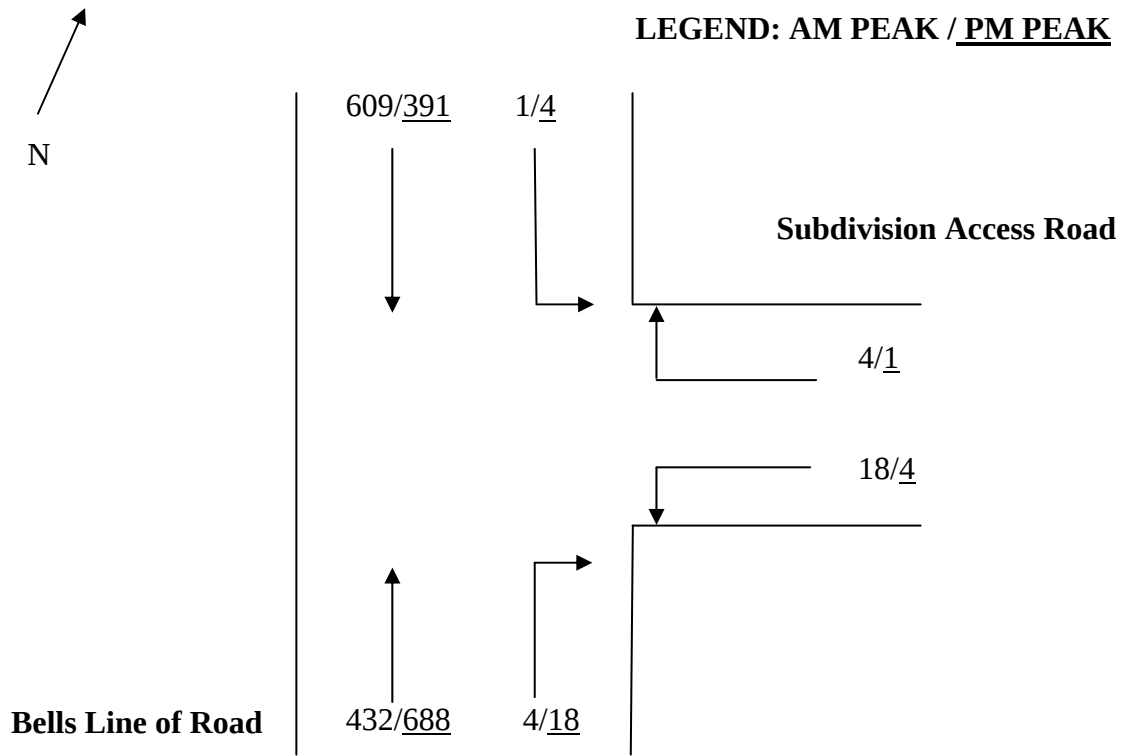
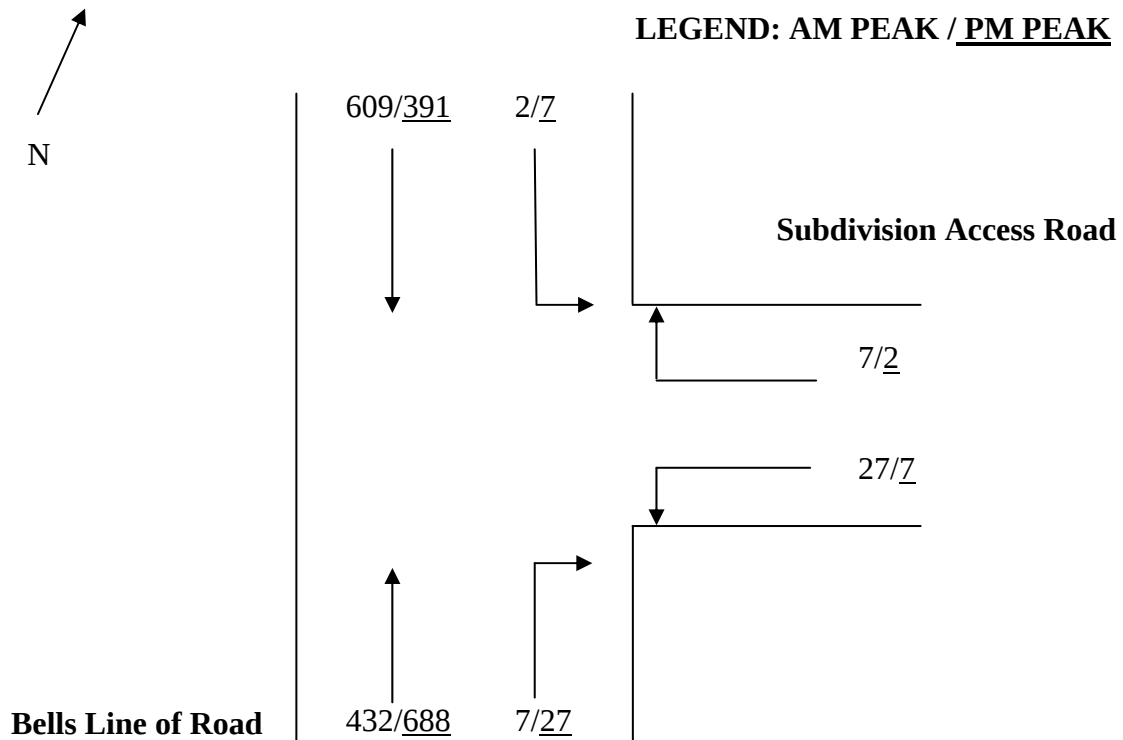


FIGURE 4
PROJECTED WEEKDAY PEAK TRAFFIC VOLUMES
JUNCTION OF BELLS LINE OF ROAD & SUBDIVISION ACCESS ROAD
INCORPORATING EXPANDED SUBDIVISION TRAFFIC DEMANDS



Traffic Efficiency Considerations

In order to estimate the projected operational efficiency of the junction of Bells Line of Road and the subdivision access road, an INTANAL analysis has been undertaken. INTANAL is an advanced analytical tool for evaluation of alternative intersection designs in terms of capacity, level of service, a wide range of performance measures including delay, queue length, and number of stops. Key indicators of INTANAL include level of service which is a summary indicator ranging from 'A' to 'F' with 'A' representing optimum intersection performance, and degree of saturation which represents a ratio of the demand of an approach to its capacity.

INTANAL uses detailed analytical traffic models coupled with an iterative approximation method to provide estimates of the abovementioned key indicators of capacity and performance statistics. Other key indicators provided by INTANAL are average vehicle delay, the number of stops per hour and the degree of saturation. Degree of saturation is the ratio of the arrival rate of vehicles to the capacity of the approach. Degree of saturation is a useful and professionally accepted measure of intersection performance.

INTANAL provides analysis of the operating conditions that can be compared to the performance criteria set out in **Table 1** (adapted from the Roads & Maritime Services' *Guide to Traffic Generating Developments*).

TABLE 1 LEVELS OF SERVICE CRITERIA FOR INTERSECTION			
Level of Service	Average Delay per Vehicle (secs/veh)	Traffic Signals, Roundabout	Give Way & Stop Signs
A	Less than 14	Good Operation	Good operation
B	15 to 28	Good with acceptable delays & spare capacity	Acceptable delays & Spare capacity
C	29 to 42	Satisfactory	Satisfactory, but accident study required
D	43 to 56	Operating near capacity	Near capacity & accident study required
E	57 to 70	At capacity; at signals, incidents will cause excessive delays Roundabouts require other control mode	At capacity, requires other control mode
F	> 70	Extra capacity required	Extreme delay, traffic signals or other major treatment required

The projected conditions have been modelled utilising the peak hour traffic volumes presented within **Figures 3** and **4**. In this regard, two scenarios have been modelled: one incorporates the development application subdivision and the second incorporating the planned expanded subdivision.

Both scenarios have been modelled whereby a short channelised right turn lane is provided within Bells Line of Road servicing the subdivision access road, in accordance with the concept junction design prepared by this Practice contained within **Appendix 4**.

Table 2 provides a summary of the INTANAL output data whilst **Appendix 5** contains full details.

TABLE 2		
INTANAL OUTPUT – PEAK HOUR INTERSECTION PERFORMANCE		
JUNCTION OF BELLS LINE OF ROAD & SUBDIVISION ACCESS ROAD		
SCENARIO 1 – DEVELOPMENT APPLICATION SUBDIVISION		
	AM Peak	PM Peak
Average Vehicle Delay (sec/veh)	23.7	9.5
Number of Stops	2	1
Degree of Saturation	0.10	0.03
Level of Service	B	A
SCENARIO 2 – PLANNED EXPANDED SUBDIVISION		
	AM Peak	PM Peak
Average Vehicle Delay (sec/veh)	24.4	17.3
Number of Stops	4	1
Degree of Saturation	0.14	0.04
Level of Service	B	B

Table 2 indicates that the junction of Bells Line of Road and the subdivision access road to operate with a level of service ‘A’ / ‘B’ during the morning and evening peaks incorporating both the development application and planned expanded subdivisions, representing good operation with spare capacity. Accordingly, motorists are projected to be capable of entering and exiting the new subdivision access road with a good level of efficiency with minimal delay.

The impacts on the efficiency of existing through movements within Bells Line of Road are projected to be minimal as a result of right turn movements being provided with the exclusive right turn bay and the low volume of left turn movements. The impacts of left turning vehicles accessing the site on trailing south-eastbound through Bells Line of Road traffic are anticipated to be minimal given the low traffic volumes expected to access the site from the north-west.

In a broader context, it is acknowledged that somewhat congested traffic conditions prevail within the North Richmond town centre. This has recently been publicised as being associated with the limited capacity of the two lane North Richmond bridge however is, in the opinion of this Practice, a more direct result of the split approach phasing of the traffic signals at the Grose Vale Road and Terrace Road and the single lane northbound Bells Line of Road approach. In any case, the projected additional 22 peak hour vehicle trips through the North Richmond town centre (or approximately one vehicle movements every two traffic signal cycles) is not anticipated to have any noticeable impacts on existing traffic conditions.

Traffic Safety Considerations

The proposed access point is located on a section of Bells Line of Road where sight distance is acceptable with respect to the existing horizontal and vertical alignment. This is clearly demonstrated on a sight distance plan prepared by this Practice included as **Appendix 6**, in which sight lines are indicated for both entering and exiting traffic from the subject site and through traffic on Bells Line of Road.

In order to assess the suitability of the right turn lane treatment, reference is made to Austroads' *Guide to Road Design Part 4A: Unsignalised and Signalised Intersections* which outlines the fundamental types of right turn treatments for rural areas and depicts a graphical representation of warrants (Figure 4.9 of the publication), which clearly shows that the current through volumes and projected right turn volumes require a type CHR(S) treatment. This treatment involves pavement widening to create a channelised right turn lane whereby north-westbound vehicles can pass on decelerating and stationary vehicles turning right into the subdivision access road.

The plan included as **Appendix 3** indicates localised widening on Bells Line of Road in the vicinity of the proposed subdivision access road compliant with Figure 7.6 of the abovementioned AUSTROADS publication. Accordingly, the proposed right turn treatment design is considered to be satisfactory.

CONCLUSION

This correspondence provides an assessment of the traffic impacts in support of Council approval to the rezoning and subdivision of a parcel of land located on the north-eastern side (No. 396) of Bells Line of Road, Kurmond. Having regard to the findings of this assessment, the following conclusion is provided:

- Bells Line of Road currently provides motorists with a good level of service in the vicinity of the subject site;
- The proposed subdivision is projected to generate a minor level of additional traffic to and from the subject site;
- A significant majority of traffic associated with the subdivision is projected to travel to / from the south-east;
- In order to ensure that interruption to through traffic flows on Bells Line of Road are minimised (if not eliminated), localised widening is to be undertaken on the north-eastern side of the State Road in the vicinity of the proposed subdivision access road, in accordance with a type CHR(S) treatment as provided within Austroads *Guide to Road Design Part 4A: Unsignalised and Signalised Intersections*;
- The existing vertical and horizontal alignment of Bells Line of Road results in satisfactory sight distance provisions along the State Road to / from the proposed subdivision access road; and
- Incorporating the abovementioned CHR(S) access treatment, the surrounding road network is envisaged to be capable of accommodating the additional traffic generated by the subject development in a safe and efficient manner.

Based on the contents of this correspondence and above conclusion, this Practice is of the opinion that there are no traffic and parking related issues that should prevent approval of the subject application.

It would be appreciated if the information contained within this correspondence could be incorporated within Council's assessment of the subject application.

Yours faithfully,



David Thompson
Transport Planner

APPENDIX 1

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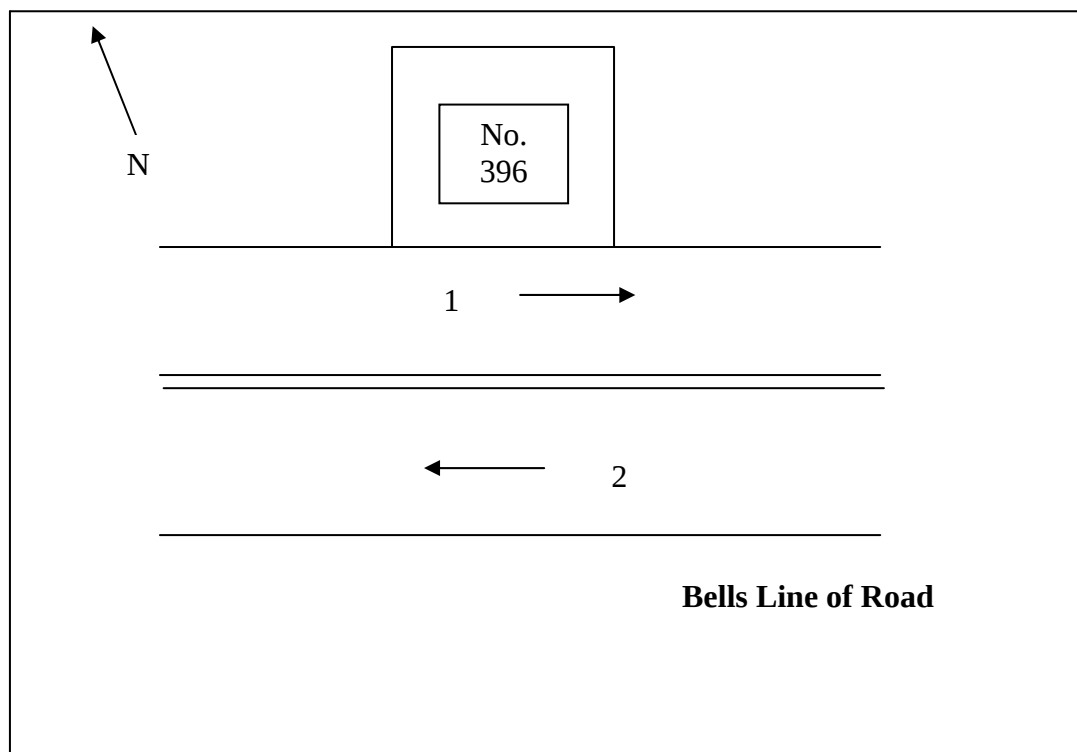
David Thompson: 0418 262 125

Morgan Stanbury: 0410 561 848

ABN: 79 943 737 368

TRAFFIC COUNTS AT: 396 Bells Line of Road, Kurmond
DATE: 3 September 2012
TIME: 7am – 9am and 4pm – 6pm
WEATHER: Fine

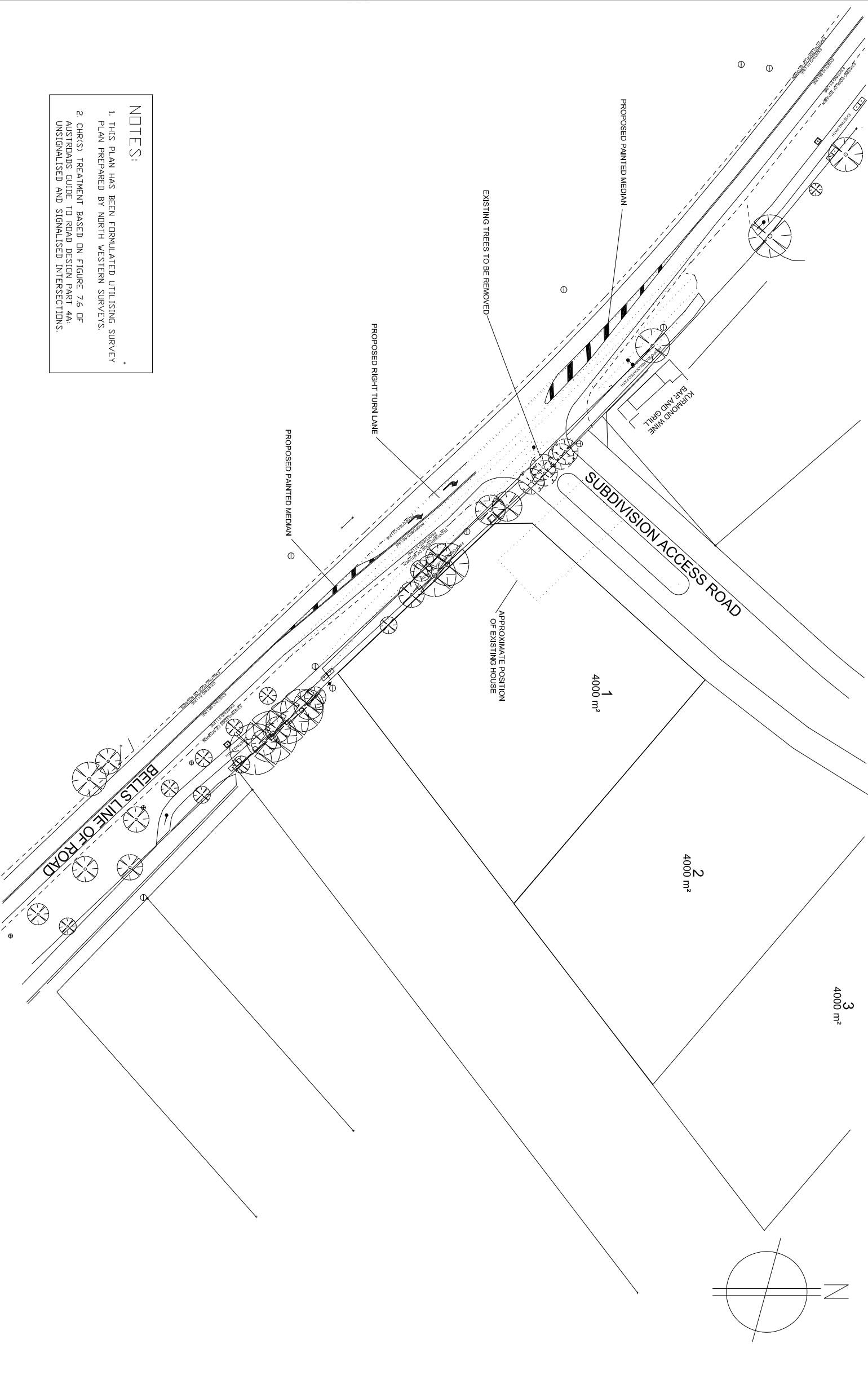
Time	Direction of Vehicular Traffic	
	1	2
7.00 – 7.15am	111	75
7.15 – 7.30am	129	111
7.30 – 7.45am	144	91
7.45 – 8.00am	171	114
TOTAL	555	391
8.00 – 8.15am	132	109
8.15 – 8.30am	155	121
8.30 – 8.45am	169	115
8.45 – 9.00am	153	87
TOTAL	609	432
4.00 – 4.15pm	91	151
4.15 – 4.30pm	100	159
4.30 – 4.45pm	88	162
4.45 – 5.00pm	112	166
TOTAL	391	638
5.00 – 5.15pm	80	162
5.15 – 5.30pm	102	161
5.30 – 5.45pm	95	150
5.45 – 6.00pm	104	138
TOTAL	381	611



APPENDIX 2

APPENDIX 3

APPENDIX 4



NOTES:

1. THIS PLAN HAS BEEN FORMULATED UTILISING SURVEY PLAN PREPARED BY NORTH WESTERN SURVEYS.
2. CHR(S) TREATMENT BASED ON FIGURE 76 OF AUSTRADAS GUIDE TO ROAD DESIGN PART 4A, UNSIGNALISED AND SIGNALISED INTERSECTIONS.

THOMPSON STANBURY ASSOCIATES
Transport Planning, Town Planning
and Environmental Consultants

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THOMPSON STANBURY ASSOCIATES
CONCEPT DESIGN
PROPOSED CHR(S) TREATMENT
SERVICING ACCESS ROAD ASSOCIATED WITH
PROPOSED RESIDENTIAL SUBDIVISION
396 BELLS LINE OF ROAD, KURMOND

SCALE: 1: 1000 @ A3 OR 1: 500 @ A1			ISSUE
FILE: 12-025	SUPERSEDES SHEET/ISSUE	-	
DATE: OCTOBER 2012			A
			SHEET
			1

APPENDIX 5

INTANAL DATA FILE

ACCBEL01

INTANAL Program Version: 3.19 Date: 22-OCT-12 Time: 10:05:49

Registered User Name. - THOMPSON STANBURY ASSOCIATES

Registered User No. - 1050

BELLS LINE & SUBDIVISION ACC
PROJECTED CONDITIONS - STAGE 1

VOLUME DATA SCREEN

	AM PEAK					PM PEAK					BUSINESS				
AM	Vol	Sat	Phse	Yval	Utrn	Vol	Sat	Phse	Yval	Utrn	Vol	Sat	Phse	Yval	Utrn
1L															
1T	432	1874	AB	0.24		688	1870	AB	0.39		392	1874	AB	0.22	
1R	4	1850	B	0.00		18	1850	B	0.01		8	1850	B	0.00	
2L	18	1446	BC	0.01		4	44	S	0.09		8	1400	BC	0.01	
2T															
2R	4	304	C	0.01		0		C			2	350	C	0.01	
3L	1	41	A	0.02		4	44	A	0.09		2	42	A	0.05	
3T	609	1747	A	0.37		391	1733	A	0.24		350	1741	A	0.21	
3R															
4L															
4T															
4R															

A	Min	ELT	H%AM	H%PM	H%B	L/S	PD-L	PD-R	Sign	Hold	LKph
1	5	4.0	5	5	5	0'		0			
2	5	4.0	5	5	5		0	0	G	N	25
3	5	4.0	5	5	5	0'	0				25
4											

File = ACCBEL01

Type = T2

PLATOON DATA				PEDESTRIAN VOLUME			WALK-CLEARANCE	
App	P%AM	P%PM	P%B	P#AM	P#PM	P#B	Walk	Clear
1	R0	R0	R0	0	0	0	0	0
2	R0	R0	R0	0	0	0	0	0
3	R0	R0	R0	0	0	0	0	0
4	R0	R0	R0	0	0	0	0	0

LANES DATA SCREEN

Approach 1			Approach 2			Approach 3			Approach 4			
Down	Lanes	Grade	Down	Lanes	Grade	Down	Lanes	Grade	Down	Lanes	Grade	
Type	0	2	0	1	0	0	1	0				
T2												
Lane	Type	Lngth	Sat	Type	Lngth	Sat	Type	Lngth	Sat	Type	Lngth	Sat
1	T	9999	1900	LR	9999	1750	LT	9999	1750			
2	R	30	1850									
3												
4												
5												
6												
7												
8												
No Parking			No Parking			No Parking			No Parking			
AM	PM	BUS	AM	PM	BUS	AM	PM	BUS	AM	PM	BUS	
Apprch	0	0	0	0	0	0	0	0	0	0	0	
Depart	0	0	0	0	0	0	0	0	0	0	0	
Roundabout			Roundabout			Roundabout			Roundabout			
TCS#	Ent	Cir	Wdth	Ent	Cir	Wdth	Ent	Cir	Wdth	Ent	Cir	Wdth
0	1	1	4	1	1	4	1	1	4			

File = ACCBEL01

DELAY - STOPS - CYCLE LENGTH - PHASE SPLITS DATA SCREEN

AM PEAK				PM PEAK				BUSINESS			
Phse	PT%o	CLo	Yo	PT%o	CLo	Yo		PT%o	CLo	Yo	
A	87.1	140	0.40	89.0	140	0.37		87.1	140	0.23	
B	6.4			8.2				6.4			
C	6.4			2.9				6.4			
D		Peds	@ CLm=	140	Peds	@ CLm=	140	Peds	@ CLm=	140	
E		Delo	DSm=	0.43	Delo	DSm=	0.82	Delo	DSm=	0.25	
F		0	Ym=	0.40	0	Ym=	0.37	0	Ym=	0.23	
G			Delaym=	1.41		Delaym=	0.96		Delaym=	0.85	
Seq	ABC			ABC				ABC			
	Signals	Signs	Round	Signals	Signs	Round		Signals	Signs	Round	
Delo	1.4	0.1	0.9	1.0	0.1	0.9		0.8	0.0	0.6	
Stpo	215	2	17	149	1	4		125	0	7	
D/So	0.43	0.10	0.36	0.82	0.03	0.53		0.25	0.03	0.30	
L/So	A	B	A	A	A	A		A	B	A	

File = ACCBEL01

Required Bays

A	RHT	Lanes	LHT	Lanes
Length	No.	Length	No.	
1	10	1		
2	10	1	10	1
3			10	1
4				

SIGNS DELAY - STOPS DATA SCREEN

File = ACCBEL01

TCS = 0

Type = T2

AM Peak

NormalSigns

A	M	DS	Total Entry Capac	Delay Geom Rate	Delay Geom Sec/V	Delay Rate	Gap Accept	Delay Total Rate	Delay Average Sec/V	Queued Veh's	Queue Length Metres	Stops Total Hour
1	L											
1	T											
1	R	0.01		0.0	5.3	0.0	5.3	0.0	8.7	1	6	1
2	L	0.10	194	0.0	4.6	0.1	8.0	0.1	15.2	1	6	2
2	T											
2	R	0.02	161	0.0	5.5	0.0	6.0	0.0	23.7	1	6	1
3	L			0.0	4.3			0.0	4.3			
3	T											
3	R											
4	L											
4	T											
4	R											
TOT		0.10		0.0	4.8	0.1		0.1	15.1			2
TOTAL Average Delay = (Seconds Delay) / (Vehicles on Movements with Delay)												

SIGNS DELAY - STOPS DATA SCREEN

File = ACCBEL01

TCS = 0

Type = T2

PM Peak

NormalSigns

A	M	DS	Total Entry Capac	Delay Geom Rate	Delay Geom Sec/V	Delay Rate	Gap Accept	Delay Total Rate	Delay Average Sec/V	Queued Veh's	Queue Length Metres	Stops Total Hour
1	L											
1	T											
1	R	0.03		0.0	5.3	0.0	5.3	0.0	7.4	1	6	1
2	L	0.01	288	0.0	4.4	0.0	8.0	0.0	9.5	1	6	1
2	T											
2	R											
3	L			0.0	4.3			0.0	4.3			
3	T											
3	R											
4	L											
4	T											
4	R											
TOT		0.03		0.0	5.0	0.0		0.1	7.2			1
TOTAL Average Delay = (Seconds Delay) / (Vehicles on Movements with Delay)												

END OF FILE

INTANAL DATA FILE

ACCBEL02

INTANAL Program Version: 3.19 Date: 22-OCT-12 Time: 10:06:02

Registered User Name. - THOMPSON STANBURY ASSOCIATES

Registered User No. - 1050

BELLS LINE & SUBDIVISION ACC
PROJECTED CONDITIONS - STAGE 1

VOLUME DATA SCREEN

	AM PEAK					PM PEAK					BUSINESS				
AM	Vol	Sat	Phse	Yval	Utrn	Vol	Sat	Phse	Yval	Utrn	Vol	Sat	Phse	Yval	Utrn
1L															
1T	432	1891	AB	0.24		688	1874	AB	0.39		392	1874	AB	0.22	
1R	7	1850	B	0.00		27	1850	B	0.02		11	1850	B	0.01	
2L	27	1400	BC	0.02		7	1361	S	0.01		11	1400	BC	0.01	
2T															
2R	7	350	C	0.02		2	389	C	0.01		3	350	C	0.01	
3L	2	42	A	0.05		7	47	A	0.15		3	43	A	0.07	
3T	609	1745	A	0.37		391	1721	A	0.24		350	1736	A	0.21	
3R															
4L															
4T															
4R															

A	Min	ELT	H%AM	H%PM	H%B	L/S	PD-L	PD-R	Sign	Hold	LKph
1	5	4.0	5	5	5	0'		0			
2	5	4.0	5	5	5		0	0	G	N	25
3	5	4.0	5	5	5	0'	0				25
4											

File = ACCBEL02

Type = T2

PLATOON DATA				PEDESTRIAN VOLUME			WALK-CLEARANCE	
App	P%AM	P%PM	P%B	P#AM	P#PM	P#B	Walk	Clear
1	R0	R0	R0	0	0	0	0	0
2	R0	R0	R0	0	0	0	0	0
3	R0	R0	R0	0	0	0	0	0
4	R0	R0	R0	0	0	0	0	0

LANES DATA SCREEN

	Approach 1			Approach 2			Approach 3			Approach 4		
	Down	Lanes	Grade	Down	Lanes	Grade	Down	Lanes	Grade	Down	Lanes	Grade
Type	0	2	0		1	0	0	1	0			
T2												
Lane	Type	Lngh	Sat	Type	Lngh	Sat	Type	Lngh	Sat	Type	Lngh	Sat
1	T	9999	1900	LR	9999	1750	LT	9999	1750			
2	R	30	1850									
3												
4												
5												
6												
7												
8												
	No Parking			No Parking			No Parking			No Parking		
	AM	PM	BUS	AM	PM	BUS	AM	PM	BUS	AM	PM	BUS
Apprch	0	0	0	0	0	0	0	0	0			
Depart	0	0	0	0	0	0	0	0	0			
	Roundabout			Roundabout			Roundabout			Roundabout		
TCS#	Ent	Cir	Wdth	Ent	Cir	Wdth	Ent	Cir	Wdth	Ent	Cir	Wdth
0	1	1	4	1	1	4	1	1	4			

File = ACCBEL02

DELAY - STOPS - CYCLE LENGTH - PHASE SPLITS DATA SCREEN

AM PEAK				PM PEAK				BUSINESS			
Phse	PT%o	CLo	Yo	PT%o	CLo	Yo		PT%o	CLo	Yo	
A	85.0	123	0.40	85.4	140	0.39		87.1	140	0.23	
B	7.3			8.1				6.4			
C	7.7			6.4				6.4			
D		Peds	@ CLm=	140	Peds	@ CLm=	140	Peds	@ CLm=	140	
E		Delo	DSm=	0.44	Delo	DSm=	0.42	Delo	DSm=	0.25	
F		0	Ym=	0.40	0	Ym=	0.39	0	Ym=	0.23	
G			Delaym=	1.80		Delaym=	1.48		Delaym=	1.02	
Seq	ABC			ABC				ABC			
	Signals	Signs	Round	Signals	Signs	Round		Signals	Signs	Round	
Delo	1.8	0.2	1.0	1.5	0.1	1.0		1.0	0.1	0.7	
Stpo	260	4	23	213	1	14		133	1	9	
D/So	0.45	0.14	0.36	0.42	0.04	0.53		0.25	0.04	0.30	
L/So	A	B	A	A	B	A		A	B	A	

File = ACCBEL02

Required Bays

A	RHT	Lanes	LHT	Lanes
Length	No.	Length	No.	
1	10	1		
2	10	1	10	1
3			10	1
4				

SIGNS DELAY - STOPS DATA SCREEN

File = ACCBEL02

TCS = 0

Type = T2

AM Peak

NormalSigns

A	M	DS	Total Entry Capac	Delay Geom Rate	Delay Geom Sec/V	Delay Rate	Gap Accept	Delay Total Rate	Delay Average Sec/V	Queued Veh's	Queue Length Metres	Stops Total Hour
1	L											
1	T											
1	R	0.01		0.0	5.3	0.0	5.3	0.0	8.8	1	6	1
2	L	0.14	194	0.0	4.7	0.1	8.0	0.1	15.9	1	6	4
2	T											
2	R	0.04	160	0.0	5.5	0.0	6.0	0.0	24.4	1	6	1
3	L			0.0	4.3			0.0	4.3			
3	T											
3	R											
4	L											
4	T											
4	R											
TOT		0.14		0.1	4.9	0.1		0.2	15.6			4

TOTAl Average Delay = (Seconds Delay) / (Vehicles on Movements with Delay)

SIGNS DELAY - STOPS DATA SCREEN

File = ACCBEL02

TCS = 0

Type = T2

PM Peak

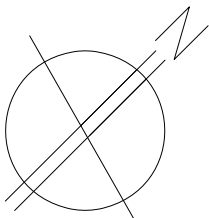
NormalSigns

A	M	DS	Total Entry Capac	Delay Geom Rate	Delay Geom Sec/V	Delay Rate	Gap Accept	Delay Total Rate	Delay Average Sec/V	Queued Veh's	Queue Length Metres	Stops Total Hour
1	L											
1	T											
1	R	0.04		0.0	5.3	0.0	5.3	0.1	7.4	1	6	1
2	L	0.02	288	0.0	4.4	0.0	8.0	0.0	9.6	1	6	1
2	T											
2	R	0.01	178	0.0	5.4	0.0	6.0	0.0	17.3	1	6	1
3	L			0.0	4.3			0.0	4.3			
3	T											
3	R											
4	L											
4	T											
4	R											
TOT		0.04		0.1	5.0	0.0		0.1	7.7			1

TOTAl Average Delay = (Seconds Delay) / (Vehicles on Movements with Delay)

END OF FILE

APPENDIX 6

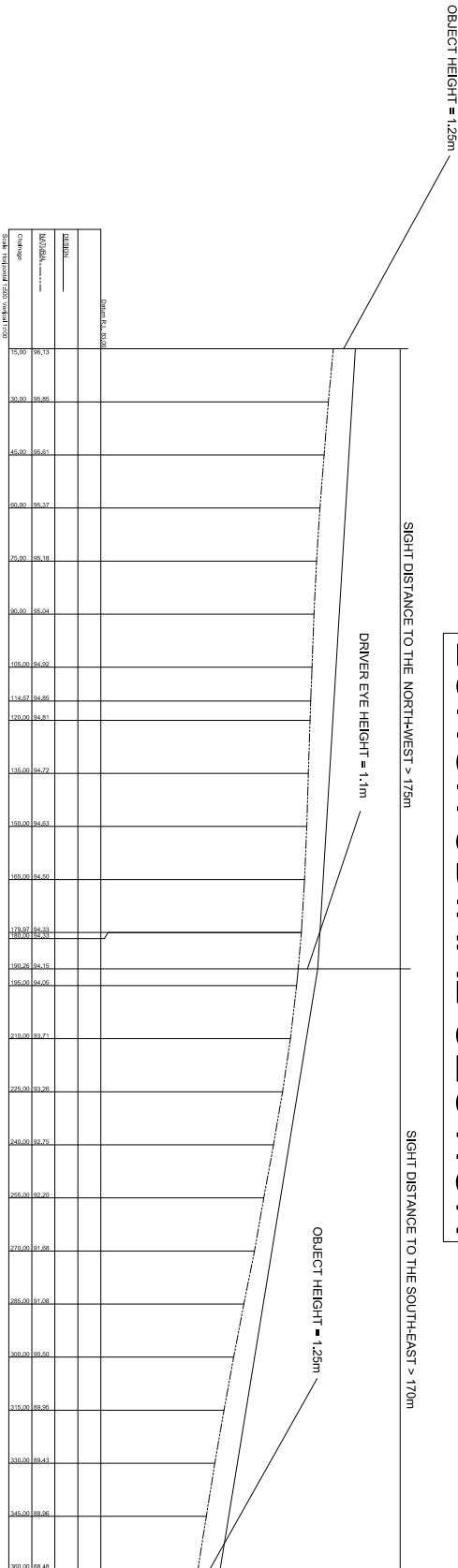


PLAN VIEW



HORIZONTAL SIGHT DISTANCE AVAILABLE	
NORTH-WEST	SOUTH-EAST
>175m	>170m

LONGITUDINAL SECTION



VERTICAL SIGHT DISTANCE AVAILABLE	
NORTH-WEST	SOUTH-EAST
>175m	>170m

- NOTES:
1. THIS PLAN HAS BEEN FORMULATED UTILISING SURVEY PLAN PREPARED BY NORTH WESTERN SURVEYS.
 2. SAFE INTERSECTION SIGHT DISTANCE FOR 60KM/H = 114m (AUSTRADADS GUIDE TO ROAD DESIGN PART 4A: UNSIGNALISED AND SIGNALISED INTERSECTIONS).

THOMPSON STANBURY ASSOCIATES

Transport Planning, Town Planning
and Environmental Consultants

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Correspondence: 75 Gindurra Avenue CASTLE HILL 2154
Telephone: (02)8850-2788 Facsimile: (02)8850-2799
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THOMPSON
STANBURY
ASSOCIATES

THOMPSON STANBURY ASSOCIATES

SIGHT DISTANCE DIAGRAM
ACCESS ROAD SERVICING
PROPOSED RESIDENTIAL SUBDIVISION 396
BELLS LINE OF ROAD, KURMOND

HORIZONTAL SCALE: 1: 2000 - VERTICAL SCALE: 1:4.00 (AT A3)

FILE: 12-025-2

SUPERSEDES
SHEET/ISSUE

-

DATE: OCTOBER 2012

ISSUE

A

SHEET

2