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Lindfield Local Centre

Transport Network Model Study

Supplementary Report 2015/16

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Lindfield Local Centre

Transport Network Model Study

Supplementary Report

Client:	Ku-ring-gai Council
Job Number:	13S170
Issue:	A-Dr
Date:	26/02/16

Quality Record

Issue	Date	Details	Prepared By	Reviewed By	Approved By
A-Dr	26/02/16	Draft	Alan Stewart Tim Clark	Matthew Houlden	Alan Stewart

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1. Introduction

1.1 Background

In December 2014 PeopleTrans completed the Lindfield Transport Network Model Study which included an updated traffic management plan TMM1C (Refer **Appendix A**) for the Lindfield Local Centre to support the preferred land uses for the Council owned sites of Woodford Lane (West) and the Village Green (East) and surrounding future LEP development. These land use options were developed by Ku-ring-gai Council.

The key purpose of this study was as follows:

- To determine, in traffic terms, an acceptable[1] land use scale and mix for the Council owned Woodford Lane car park site west of the Pacific Highway (a preferred option) such that Ku-ring-gai Council could provide a land use benchmark when appointing an Urban Design Consultant to provide more clarity and detail around the built form for this site.
- To develop a transport solution which supported the preferred land use options for the Council owned car park sites and which also accommodated the future anticipated development of the wider Lindfield Town Centre.

This supplementary and final report needs to be read in conjunction with all previous transport reports prepared by PeopleTrans associated with the Lindfield Local Centre, in particular reports 5, 6 & 7, as detailed in Table 1.1.

Table 1.1: Lindfield Transport Reports (Prepared by PeopleTrans)

Report No.	Report Title	Report Description	Date Issued
1.	Lindfield Base Model Development Report	Details AM, PM & SAT peak period Commuter Model Development Process.	14/12/13
2.	Lindfield Base Model Audit Report	An independent audit of the commuter model/s to ensure that it was "fit for purpose" for assessing proposed land use options.	16/02/14
3.	Lindfield Pedestrian Bridge Feasibility Study Report	A high level feasibility study of the engineering feasibility of providing a pedestrian bridge across the Pacific Highway in Lindfield.	13/08/14
4.	Lindfield Village Green, Transport, Parking & Access Assessment Report	A report providing initial guidance on the access and parking requirements of the Village Green site.	18/09/14
5.	Lindfield Local Centre – Transport Network Model Study Main Report	The main Lindfield Transport report including all Council provided land use options assessments and the recommendation of a traffic management plan for Lindfield.	15/12/14
6.	Lindfield Village Green Transport Review	A transport review of the 4 x design competition submissions for the Lindfield Village Green site.	20/05/15
7.	Lindfield Community Hub Transport Review (Incl. Modelling Technical Note)	A transport review of the 4 x SJB land use options for the Woodford Lane site.	03/09/15

This report primarily supplements the "Lindfield Local Centre – Transport Network Model Study Main Report" and assesses the impacts of SJB's preferred land use option 2 for the Woodford lane site.

[1] Acceptable for the purposes of this study has been defined as development proposals which are of a scale and mix that still allow efficient access to and from them and do not result in widespread congestion throughout the Lindfield local centre.

1.2 Scope and Objectives of this Report

This report documents the final transport assessment work undertaken by PeopleTrans following the engagement of Urban Design Consultants SJB and their subsequent refinement of the built form for the Woodford Lane site together with the adoption by Council of a preferred urban design concept for the Village Green site and associated infrastructure updates identified through the course of this work as follows:

- The widening proposals at Grosvenor Road. (Original Report Recommendation)
- Intersection investigations at Havilah Road/Lindfield Avenue. (Original Report Recommendation)
- The widening and one-way operation of Bent Lane.
- The two-way operation of Havilah Lane. (i.e. Opened at the Havilah Road end to two-way traffic)
- The relocation of the entry/exit into the Village Green car park site from Tryon Road to Millray Street.
- The splitting of the commuter car parking between the east and west sides of the Pacific Highway (i.e. 140 spaces west and 100 spaces east to be consistent with SJB land use option 2.)

2. SJB Preferred Land Use Option

2.1 Land Use Option 2 – Woodford Lane (Proposal)+Coles (Redevelopment)+Library Site (Redevelopment)

The preferred land uses for the Woodford Lane site are provided in Table 2.1 noting that this table also includes the redevelopment of the existing Coles and Library sites, the latter of which is included as Figure 2.2.

Table 2.1: Proposed Land Use Details Options 2

Site Location	Proposed Land Uses	Scale/Size (Area m2, GLFA or as stated otherwise.)
Woodford Lane Site (SJB2F) – FSR 2.13:1	Community Facilities	2,465
	Major Retail/Supermarket	3,000
	Specialty Retail	1.174
	Commercial	325
	Gymnasium	575
	Childcare	533
	Medium Density Residential	12,850 [1]
	TfNSW Commuter Parking	140 spaces [2]
Coles – Balfour Street Site	Major Retail-Supermarket	1900
	Specialty Retail	2700
	High Density Residential	110
Library Site Precinct – 259-271 Pacific Highway.	Residential	15,319 [1]
	Commercial	1638

Notes:

[1] – The ratios of 2 and 3 bedroom units as they relate to m2 areas were determined through an assessment of approved residential apartments in Ku-ring-gai.

[2] – Originally TfNSW requested that a total of 240 commuter car parking spaces be provided on the western side of the Pacific Highway in Lindfield. It was later determined that a split of 140 west and 100 east of the Pacific Highway would be a more suitable arrangement.

The SJB land use proposals for the Woodford Lane site aimed to optimise development on the site and included a slightly larger retail component than was originally proposed by Council as well as more residential apartments up to seven storeys in height.

The Option 2 Woodford Lane site layout is shown in Figure 2.1.

Figure 2.1: Final SJB Option 2 - Site Layout

Key traffic and transport features of the Woodford Lane site in Option 2 are as follows:

(1) Drovers Way has a two-way linear alignment between Bent Street and Beaconsfield Parade and intersects with Beaconsfield Parade at the existing Woodford Lane/Beaconsfield Parade intersection.

(2) Woodford Lane generally retains its existing alignment but at its southern end it terminates prior to Beaconsfield Parade allowing rear servicing to occur but with only pedestrian and cyclist access permitted to Beaconsfield Parade.

(3) Woodford Lane is also connected to Drovers Way forming two T-intersections within the site and dividing the two residential buildings.

(4) Vehicle access to the main car park and the supermarket loading area would be from Drovers Way. This would potentially also include residential parking.

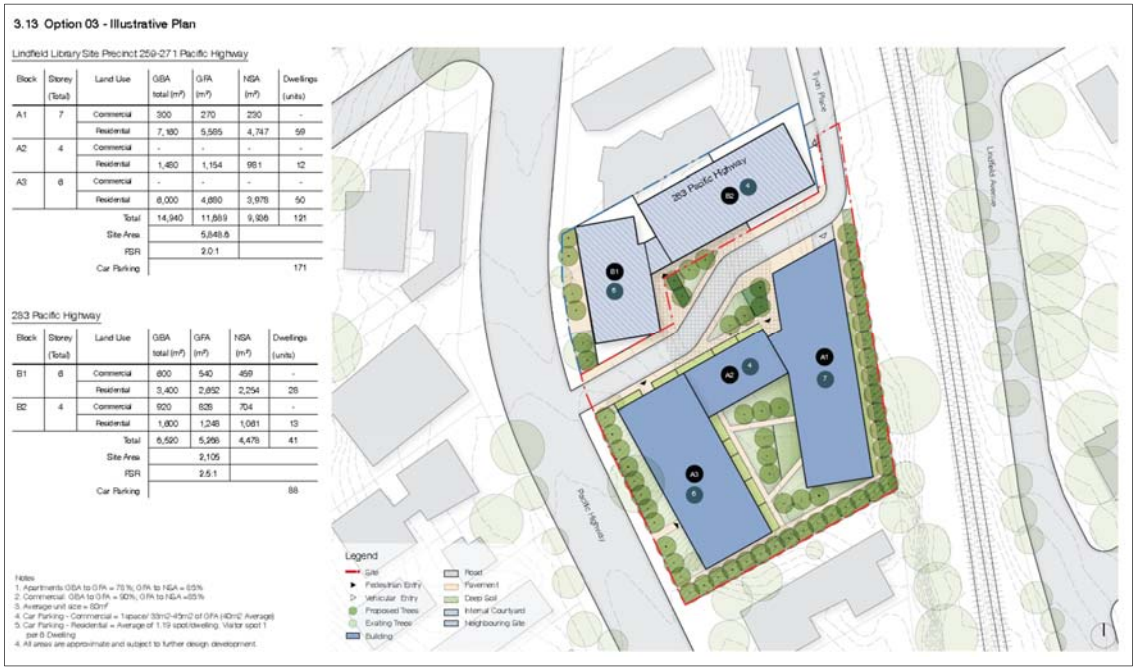
(5) Vehicle access for residential (second car park) would be from the section of Woodford Lane which extends to Drovers Way.

(6) The park fronts Bent Street and Woodford Lane at the north eastern corner of the site.

(7) There is a continuous pedestrian link between the park, central square and the Pacific Highway/Lindfield Railway Station via an existing pedestrian laneway and the existing

pedestrian crossing on the Pacific Highway or in future this could be via a potential future pedestrian bridge over the Pacific Highway.

Figure 2.2 Lindfield Library Site



The old Lindfield Library site includes 259-271 Pacific Highway and 283 Pacific Highway and consists primarily of residential apartments up to 7 stories with 1820 m2 of ground floor commercial space. The concept proposals for the old library site include a one-way roadway which links to Lindfield Station which is consistent with the traffic management plan TMM1C developed in the original Lindfield Town Centre study.

3. Operational Assessment of Final SJB Land Use Option 2

This section of the report presents the operational assessment of the final SJB Option 2 land uses for the Woodford Lane site together with the proposed expansion of Coles at Balfour Street and the concept land use proposals for the old library site.

The future traffic demands for the preferred SJB land use Option 2 are included in Table 3.1 with full details of the traffic generation included in **Appendix B.**

Table 3.1: Traffic Generation Summary – Option 2

Option	AM Traffic Generation	PM Traffic Generation	Sat Traffic Generation
Woodford Lane Site– Community Facilities, Supermarket, Specialty Retail and Medium Density Residential	387	519	584
Coles Site –Major Retail, Specialty Retail and High Density Residential	256	355	562
Library Site – Residential; Commercial	87	80	61
Totals	**730**	**954**	**1207**
Original Land Use Option C Total Traffic Generation	**580 (25% lower)**	**861 (10% lower)**	**1045 (15% lower)**

It is important to note that the traffic demands from this option when compared against those identified by Councils' land use option C were higher although not to an extent once distributed across the network that was likely to have a significant impact on the overall operation of the road network. The Council land use option C also did not include the demands associated with the land use proposals on the old Lindfield library site.

3.1 Transport Impact Modelling

The updated traffic demands for SJB Option 2 were applied to the commuter model/s for the AM, PM and Saturday peak periods and the impacts analysed by TMA both in terms of intersection operation and travel times on the Pacific Highway, full details of which are included in **Appendix C** of this report.

3.2 Modelling Results

The results from the assessment when compared against the future baseline model in summary indicated the following:

- The final development option SJB2F achieves the same if not better intersection levels of service when compared against the future baseline intersection performance, particularly as it relates to the Pacific Highway.
- There is an increase in delay on the Balfour Street (W) approach due to the increased demands associated with the Coles redevelopment but these could be resolved by redesigning the access to be located further away from the Pacific Highway with appropriate geometric design to allow efficient ingress and egress.
- There is a significant improvement at the Havilah Road/Lindfield Avenue intersection due to the banned right turn from Balfour Street (E) into the Pacific Highway. It should be noted

that a roundabout option was also assessed at this intersection to include pedestrian crossing facilities but this indicated some significant traffic issues, one being that it had the potential to create queues extending back to the Pacific Highway due to left turning traffic from the Pacific Highway into Havilah Road (W) no longer having right of way to turn right into Lindfield Avenue. It is also understood that Ku-ring-gai Council have proposals to provide a pedestrian refuge island between Havilah Road and Woodside Avenue which would be sufficient for pedestrians to cross Lindfield Avenue safely at this location.

- Importantly the proposed traffic signal intersections at Tryon Place/Pacific Highway and Beaconsfield Parade/Pacific Highway result in travel times on the Pacific Highway being maintained within 15% of the future baseline as indicated in Table 3.2 with the exception of the southbound direction during the PM peak period which could be improved once clearways are implemented.

Table 3.2: Pacific Highway Travel Time Assessment

Time Period	Pacific Highway Northbound			Pacific Highway Southbound		
	FBL	SJB2F	% Difference	FBL	SJB2F	% Difference
AM	00:01:56	00:02:09	+10%	00:04:10	00:03:49	-9%
PM	00:02:22	00:02:36	+10%	00:03:39	00:04:40	+28%
SAT	00:02:15	00:02:36	+15%	00:03:50	00:03:25	-11%

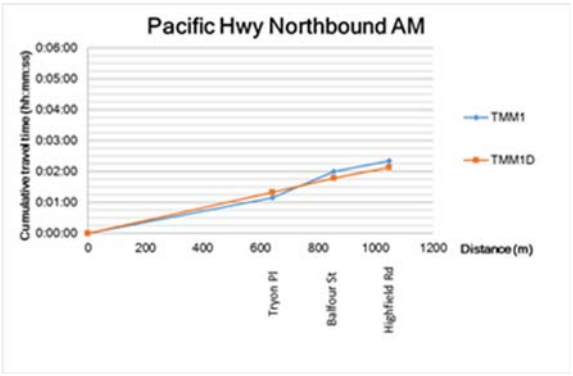
3.2.1 Comparison of TMM1 v TMM1D

In addition to the above assessment TMA also compared the demand impacts of SJB2F on traffic management plan TMM1 which did not include the additional set of traffic signals at Beaconsfield Parade.

This traffic management option would result in the majority of traffic entering and exiting the Woodford Lane site via the Balfour Street intersection and results in higher travel times and delay on the Pacific Highway during all peak periods not to mention the unattractiveness of having two retail supermarkets utilising the same access road.

In fact, during the PM and Saturday peak periods the two signal intersection configuration actually performs much better as gaps for traffic are created and signal progression allows for continuous flow along the Pacific Highway as indicated in Figures 3.1 to 3.6.

Figure 3.1 & Figure 3.2 – AM Travel Times Pacific Highway



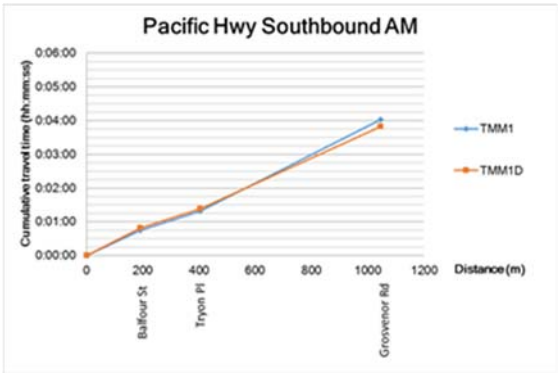
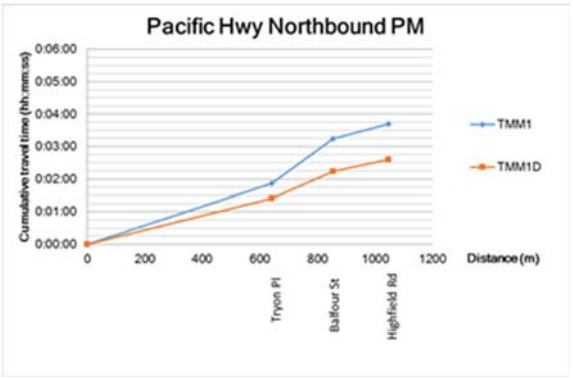


Figure 3.3 & Figure 3.4 – PM Travel Times Pacific Highway



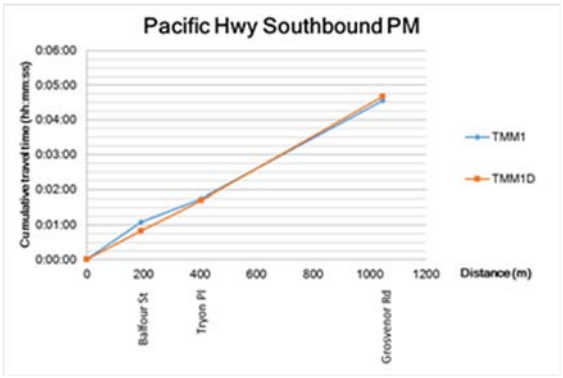
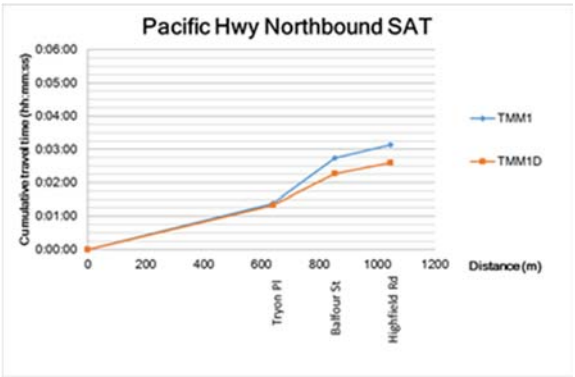
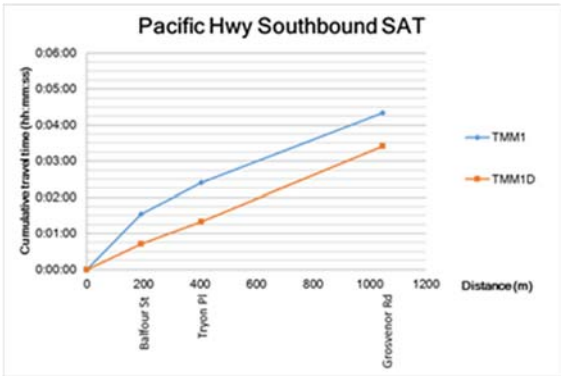


Figure 3.5 & Figure 3.6 – Saturday Travel Times Pacific Highway





4. Roads & Maritime Services Consultation

4.1 Network & Road Safety Meeting

PeopleTrans and Ku-ring-gai Council staff met with RMS Network & Road Safety staff on the 27th November 2015 to present the findings of the Lindfield Network Model Study and to get in principle agreement on the proposed traffic management plan for Lindfield. At this meeting all traffic & transport reports and the commuter traffic models were provided electronically to RMS for their information and review as required.

4.2 Network Operations (TMC) Meeting

PeopleTrans and Ku-ring-gai Council staff also met with RMS Network Operations on the 1st December 2015 to present the findings of the Lindfield Network Model Study and to get in principle agreement on the proposed traffic management plan for Lindfield. Details of this presentation are provided in **Appendix D** of this report.

Key comments provided by RMS network operations were as follows:

Although they acknowledged the amount of work undertaken by Council and were supportive of a number of proposals within the preferred traffic management plan they had concerns related to the closely spaced traffic signal intersections of Tryon Place/Pacific Highway and Beaconsfield/Pacific Highway intersections.

- These concerns related primarily to the following:
    - "In practise experience" where there was insufficient storage capacity between the intersections resulting in queues extending back through the adjacent intersections and across the pedestrian crossings.
    - The potential see-through safety effect of closely spaced intersections.
    - The practicalities of providing a single traffic controller for intersections spaced 80m apart.

The outcomes of this meeting was a request to RMS network operations to provide a formal response to Ku-ring-gai Council in order to progress this further.

5. Final Traffic Management Plan

The traffic management plan prepared to support the final SJB Option 2 land uses proposed for Lindfield is included in **Appendix E** as TMM1D.

Table 5.1 provides details of the Traffic Management Option TMM1D road infrastructure proposals.

Table 5.1: TMM1D Key Features

Item No.	Proposed Road Infrastructure
1.	New Traffic Signals Pacific Highway/Tryon Place & Pacific Highway/Beaconsfield Parade (2 Phase Operation, No right turn into Beaconsfield Parade from Pacific Highway)
2.	New Traffic Signals Pacific Highway/Strickland Avenue
3.	Traffic Signal Phasing Adjustments at Pacific Highway/Balfour Street intersection in conjunction with banned right turn from Havilah Street into Pacific Highway
4.	Kochia Lane closed at Lindfield Avenue
5.	New Traffic Signals Lindfield Avenue/Tryon Road
6.	Bent Lane/Woodford Lane – One way southbound
7.	Bent Street closed between Woodford Lane and Pacific Highway
8.	Tryon Place Shared Zone
9.	New Road between Drovers Way & Bent Street
10.	New Road between Tryon Place & Pacific Highway (one way northbound)
11.	Road Widening on south side of Grosvenor Road
12.	New Access to Village Green car parking from Milray Street.
13.	Two Way Access in Havilah Lane at Havilah Road
14.	Pacific Highway Clearways (Saturday Peak Period)
15.	Milray Street Traffic Management Measures (Pedestrian Refuge Islands at Tryon Road & Havilah Road intersections)

Traffic Management Plan TMM1 is also provided in **Appendix E** for reference.

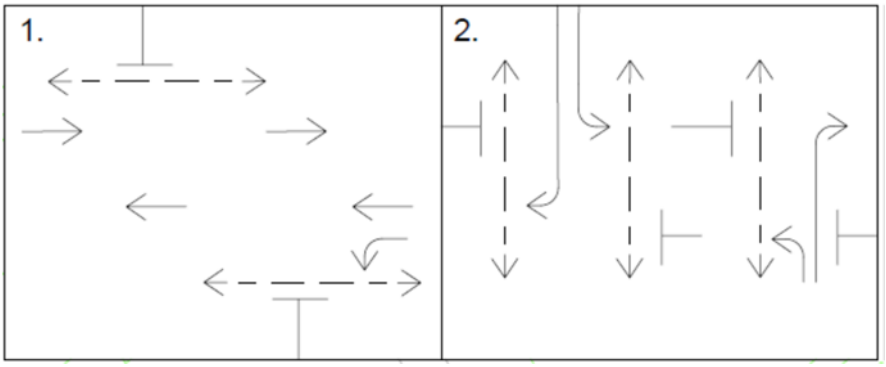
6. Conclusions & Recommendations

Based on the transport assessment contained within this report the following conclusions and recommendations are made:

6.1 Conclusions

- The proposed Lindfield Traffic Management Plan TMM1D provides the best balance between minimising the delays on the Pacific Highway and permitting acceptable levels of growth within the Town Centre allowing a far more logical and reasonable access strategy for development of the Woodford Lane, Village Green and other surrounding sites.
- The concerns raised by RMS network operations regarding the see through effects and storage capacity between the closely spaced signal intersections of Tryon Place and Beaconsfield Parade are not ones which hold a high degree of weight.
- As indicated there will not be any see-through effects at these two intersections as the signal phasing is designed such that they operate as a single intersection with two phases as shown in Figure 6.1 and the storage capacity concerns can be addressed or controlled such that any queues occur in Beaconsfield Parade.

Figure 6.1 – Tryon Place/Beaconsfield Parade/Pacific Highway Proposed Intersection Phasing



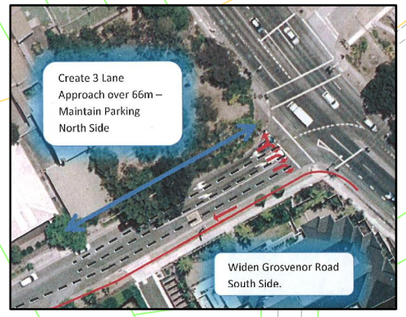
- Importantly RMS's preference of providing access for the Woodford Lane site via Balfour Street will have a much more detrimental impact on delay and safety for the Pacific Highway.

6.2 Recommendations

- It is strongly recommended that traffic management option TMM1D be adopted as the preferred traffic management plan for Lindfield as it has been demonstrated to be the most effective option for supporting the future development needs of Lindfield whilst minimising the delay impacts to the Pacific Highway.
- Traffic management options which do not incorporate access via Beaconsfield Parade would, in our view, be discouraging growth and not supporting government population and employment requirements whilst at the same time resulting in higher travel times and delay on the Pacific Highway.

Appendix A

Lindfield Traffic Management Plan TMM1C



LINDFIELD AVENUE/TRYON ROAD INTERSECTION: TRAFFIC SIGNALS TO REPLACE BOTH EXISTING PRIORITY JUNCTION AND PEDESTRIAN SIGNALS AT STATION ENTRANCE

LEFT TURN BAY EXTENSIONS

SHARED ZONE / 'KISS & RIDE'

TRYON PLACE PRECINCT: EXTENSION OF TRYON PLACE SOUTHWARD TO NEW CONNECTING ROAD

PACIFIC HIGHWAY/STRICKLAND AVE INTERSECTION: NEW TRAFFIC SIGNALS

PACIFIC HIGHWAY/GROSVENOR ROAD INTERSECTION: CAPACITY IMPROVEMENT

GROSVENOR ROAD WIDENING: WIDEN ON SOUTH SIDE. MAINTAIN PARKING ON NORTH SIDE.

POTENTIAL PEDESTRIAN THOROUGHFARE

BENT STREET CLOSED

EXTEND RIGHT TURN BAY BY 20m TO 95m

CONVERT TO ONE WAY

POTENTIAL WIDENING OF BENT LANE

REALIGN WOODFORD LANE FOR EASE OF ACCESS TO RETAIL

LEFT TURN BAY EXTENDED

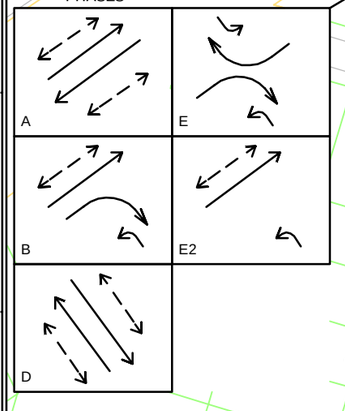
COLES SITE

NEW TRAFFIC SIGNALS TO FACILITATE SAFER CROSSING OF PACIFIC HIGHWAY AND 'KISS & RIDE" FACILITY AND TO FACILITATE ACCESS TO NEW DEVELOPMENT SITE, PARTICULARLY TO AND FROM THE SOUTH.

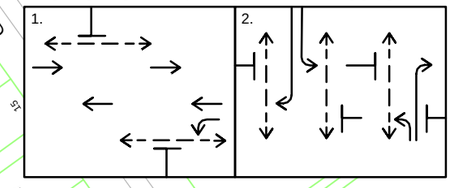
BEACONSFIELD PARADE TO BENT STREET: LOCAL ROAD CONNECTION BETWEEN BEACONSFIELD PARADE AND BENT STREET

TRAFFIC SIGNAL PHASING/TIMING AMENDMENTS.
PLUS BANNED RIGHT TURN
FROM BALFOUR STREET
EAST TO PACIFIC HIGHWAY

PHASES



PROPOSED SIGNAL PHASING:
PACIFIC HIGHWAY/TRYON LANE/BEACONSFIELD PDE



COUNCIL DEVELOPMENT SITES
COLES DEVELOPMENT SITE
'KISS & RIDE' PARKING
SATURDAY PEAK PARKING RESTRICTIONS

No.	BY	DATE	DESCRIPTION	APPD.
REV. 1	A.S.	19/09	REVISED FOLLOWING MODELLING OF COLES - BALFOR ST REDEVELOPMENT SITE	A.S.
	A.S.	17/02	ORIGINAL ISSUE	A.S.

A1 Original | Co-ordinate System: MGA Zone 56 | Height Datum: A.H.D.

CLIENT

Ku-ring-gai Council

peopletrans

DRAWN G.W. JARRETT
DESIGNED A. STEWART
DRG CHECK A. STEWART
DESIGN CHECK
APPROVED

LINDFIELD TRANSPORT NETWORK STUDY 2013/14
DRAFT CONCEPT PLAN

TRAFFIC MANAGEMENT MEASURES 1C

OF

DRG No.

Appendix B

SJB Option 2 Final – Traffic Generation Calculations

Lindfield Town Centre
Woodford Lane Car Park Site Development Option SBJ2
Traffic Generation

SBJ 2 Final	Use	Area (Sqm GFA)	AM Traffic Generation	Rate and Source	AM In	AM Out	PM Traffic Generation	Source	PM In	PM Out	Sat Traffic Gen	Source	Sat In	Sat Out
FSR 2.13 to 1	Community Facilities / Library	2465	27	0.5 spaces / hour	14	14	27	1 mvmt per sp	14	14	55	1 mvmt per sp	27	27
	Child Care	533	32	0.8 per student 7-9am	18	14	36	0.7 per student 4-6pm	16	20				
	Gymnasium	575	9	3.0 PER 100 sqm x 50% for AM	4	5	17	3.0 PER 100 sqm	9	8	17	3.0 PER 100 sqm	9	8
	Major Retail	3000	124	10.35 PER 100sqm GFA 50% for AM	62	62	248	10.35 PER 100sqm GFA (RMS x .75)	124	124	265	11.025 per 100sqm GFA (RTA x.75)	132	132
	Secondary Retail	1174	20	4.2 per 100sqm GFA x 50% for AM	10	10	39	4.2 per 100sqm GFA (RMS GTTGD)	20	20	100	10.7 sp / 100sqm (RMS GTTGD)	50	50
	Residential (Med Density)	12850	57	0.5/2 Bed Dwelling & 0.65/3 Bed Dwelling (RMS GTTGD)	51	6	57	0.5/2 Bed Dwelling & 0.65/3 Bed Dwelling (RMS GTTGD)	34	23	57	0.5/2 Bed Dwelling & 0.65/3 Bed Dwelling (RMS GTTGD)	28	29
	Commercial	325	5	1.6 per 100m2 GFA	5	1	4	1.2 per 100m2 GFA (RMS GTTGD)	0	4				
	TfNSW Commuter Parking	0	100	50% in in peak hour	100	0	50	25% total (90% out and 10% in)	5	45	50	25% of all spaces (70% in and 30% out)	35	15
	Council Parking	0	13	33% in peak hour	12	1	40	100% in peak hour	20	20	40	100% in peak hour	20	20
	Sub-Total 1	**20922**	**387**	**Sub-Total 1**	275	112	**519**	**Sub-Total 1**	242	276	**584**		302	281
Coles Redevelopment	Major Retail NET INCREASE	1,900	98	10.35 PER 100sqm GFA 50% for AM	49	49	197	10.35 PER 100sqm GFA (RMS x .75)	98	98	209	11.025 per 100sqm GFA (RTA x.75)	105	105
	Secondary retail	3,000	126	4.2 per 100sqm GFA	63	63	126	4.2 per 100sqm GFA x 50% for AM	63	63	321	10.7 sp / 100sqm (RMS GTTGD)	161	161
	Residential (High Density) - Net Units	110	32	0.29/unit (RMS GTTGD)	29	3	32	0.29/unit (RMS GTTGD)	19	13	32	0.29/unit (RMS GTTGD)	16	16
	Sub-Total 2		**256**	**Sub-Total 2**	141	115	**355**	**Sub-Total 2**	180	174	**562**		281	281
Library Site Precinct 259-271 Pacific Hwy	Residential	15,319	61	0.5/2 Bed Dwelling & 0.65/3 Bed Dwelling (RMS GTTGD)	54	7	61	0.5/2 Bed Dwelling & 0.65/3 Bed Dwelling (RMS GTTGD)	36	25	61	0.5/2 Bed Dwelling & 0.65/3 Bed Dwelling (RMS GTTGD)	30	31
	Commercial	1,638	26	1.6 per 100m2 GFA	24	3	20	1.2 per 100m2 GFA (RMS GTTGD)	2	18				
	Sub-Total 3		**87**				**80**				**61**			
	Grand Total		**730**				**953**				**1207**			

Appendix C

TMA Technical Note – Final Options Modelling 18/12/15

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QMS-500-06

Technical note

Project: Lindfield Local Centre
Note: Final Options Modelling
Author: Tim Clark

Date: 18/12/15
Ref:

1 Introduction

This technical note details the finalisation of the preferred development option for the Lindfield Local Centre traffic study.

The final development option involved some small land use changes at the Woodford Lane development site and the old Lindfield library site. As well as the demand changes there were two network changes, the first being the configuration of the commuter parking split between the Woodford Lane site and the Lindfield Village Green Site and the second an upgrade of the Pacific Hwy Grosvenor Rd intersection.

The Grosvenor Rd upgrade was established to address a previous capacity issue and is not required as a result of demand changes at any of the Lindfield Development sites.

2 Results

TABLE 1 AM INTERSECTION COMPARISON

		AM											
		Base Model				FBL				SBJ2F			
Intersection Name	Approach	LOS	Delay (Sec)	Queue Ave	Queue Max	LOS	Delay (Sec)	Queue Ave	Queue Max	LOS	Delay (Sec)	Queue Ave	Queue Max
Pacific Hwy / Highfield Rd	Highfield Rd	F	91	6	24	F	133	10	32	F	92	6	23
	Pacific Hwy (S)	A	4	0	23	A	4	1	19	A	4	1	13
	Pacific Hwy (N)	F	79	7	49	F	80	8	43	F	88	17	116
Pacific Hwy / Balfour St	Balfour St (W)	D	55	2	14	E	60	2	12	F	72	2	9
	Pacific Hwy (S)	C	31	5	44	C	38	9	49	C	31	28	81
	Balfour St (E)	D	46	22	67	D	50	25	78	D	47	24	78
	Pacific Hwy (N)	F	80	4	9	F	86	5	8	F	99	4	8
Pacific Hwy / Tyron Pl.	Pacific Hwy (S)	A	3	0	9	A	3	0	8	A	13	4	18
	Tyron Pl	B	21	0	1	B	19	0	1	F	74	3	12
	Pacific Hwy (N)	B	22	2	34	B	23	2	35	C	31	7	59
Pacific Hwy / Beaconsfield Prd	Pacific Hwy (s)									C	35	5	39
	Pacific Hwy (N)									A	8	2	15
	Beaconsfield Parade	B	20	0	2	B	22	1	4	C	35	3	16
Pacific Hwy / Strickland Ave	Pacific Hwy (s)									B	22	1	17
	Strickland Ave	C	38	2	11	D	44	2	15	E	61	4	19
	Pacific Hwy (N)									B	27	5	50
Pacific Hwy / Grosvenor Rd / Burleigh St	Grosvenor Rd	F	150	11	28	F	225	16	39	F	185	14	45
	Pacific Hwy (s)	E	67	5	31	E	67	5	31	F	71	7	39
	Burghleigh St	F	152	1	5	F	208	2	7	F	623	9	23
	Pacific Hwy (N)	C	30	25	90	C	39	31	118	C	38	31	97
Lindfield Ave / Balfour St / Havilah Rd	Balfour St	A	8	0	3	A	9	0	9	A	8	0	2
	Lindfield Ave (S)	A	14	0	6	B	28	3	12	A	14	0	6
	Lindfield Ave (S) Slip lane	B	24	1	4	F	90	2	4	C	29	0	4
	Havilah RD	B	24	0	2	F	90	2	14	D	52	0	8
	Lindfield Ave (N)	B	23	1	11	C	40	4	21	C	30	3	18
Lindfield Ave / Tryon Rd	Lindfield Ave (S)	A	14	1	7	C	39	4	12	C	34	2	12
	Tryon Rd	B	26	0	6	F	78	3	17	D	43	2	11
	Lindfield Ave (N)	A	12	1	8	B	28	3	11	B	25	3	15

TABLE 2 PM INTERSECTION COMPARISON

		PM											
		Base Model				FBL				SBJ2F			
Intersection Name	Approach	LOS	Delay (Sec)	Queue Ave	Queue Max	LOS	Delay (Sec)	Queue Ave	Queue Max	LOS	Delay (Sec)	Queue Ave	Queue Max
Pacific Hwy / Highfield Rd	Highfield Rd	F	72	4	20	F	110	8	23	F	80	4	22
	Pacific Hwy (S)	A	6	2	34	A	7	2	33	A	3	1	15
	Pacific Hwy (N)	E	64	1	16	E	64	1	22	E	65	1	16
Pacific Hwy / Balfour St	Balfour St (W)	D	52	1	8	D	54	2	10	F	78	3	12
	Pacific Hwy (S)	D	44	13	72	D	51	17	77	D	48	26	93
	Balfour St (E)	C	35	10	42	C	40	12	46	C	42	12	65
	Pacific Hwy (N)	E	57	3	9	E	64	6	10	E	58	2	8
Pacific Hwy / Tyron Pl.	Pacific Hwy (S)	A	8	2	30	A	10	3	42	A	6	2	14
	Tyron Pl	B	16	0	0	B	16	0	0	D	49	1	8
	Pacific Hwy (N)	B	25	2	20	C	29	3	30	C	36	5	40
Pacific Hwy / Beaconsfield Prd	Pacific Hwy (s)									C	32	5	36
	Pacific Hwy (N)									B	16	4	18
	Beaconsfield Parade	B	28	0	3	B	26	0	3	B	28	2	9
Pacific Hwy / Strickland Ave	Pacific Hwy (s)									C	30	6	43
	Strickland Ave	A	14	0	6	B	16	0	7	F	71	7	17
	Pacific Hwy (N)									A	13	0	1
Pacific Hwy / Grosvenor Rd / Burleigh St	Grosvenor Rd	F	396	33	44	F	419	33	43	F	380	31	52
	Pacific Hwy (s)	E	65	6	40	E	65	7	34	E	67	6	36
	Burghleigh St	A	0	1	3	A	0	1	2	A	0	13	29
	Pacific Hwy (N)	A	4	2	20	A	5	2	19	A	6	3	24
Lindfield Ave / Balfour St / Havilah Rd	Balfour St	A	8	0	2	A	8	0	1	A	8	0	2
	Lindfield Ave (S)	B	18	1	10	C	41	6	16	B	17	1	9
	Lindfield Ave (S) Slip lane	B	16	1	4	F	181	3	4	A	12	0	3
	Havilah RD	A	14	0	2	F	433	11	16	B	16	0	3
	Lindfield Ave (N)	B	18	0	6	F	92	6	19	B	18	0	4
Lindfield Ave / Tryon Rd	Lindfield Ave (S)	A	11	0	6	B	19	2	12	B	21	2	10
	Tryon Rd	B	21	0	4	D	55	3	13	C	39	2	9
	Lindfield Ave (N)	A	14	1	6	D	53	2	11	B	24	2	15

TABLE 3 SAT INTERSECTION COMPARISON

		SAT											
		Base Model				FBL				SBJ2F			
Intersection Name	Approach	LOS	Delay (Sec)	Queue Ave	Queue Max	LOS	Delay (Sec)	Queue Ave	Queue Max	LOS	Delay (Sec)	Queue Ave	Queue Max
Pacific Hwy / Highfield Rd	Highfield Rd	E	60	3	11	F	81	5	20	E	67	4	14
	Pacific Hwy (S)	A	7	2	25	A	8	2	27	A	3	1	18
	Pacific Hwy (N)	E	67	1	21	E	66	1	21	E	66	1	25
Pacific Hwy / Balfour St	Balfour St (W)	D	52	1	9	D	54	1	10	F	114	2	8
	Pacific Hwy (S)	C	34	9	61	E	59	18	64	D	56	31	97
	Balfour St (E)	D	43	14	53	D	44	16	58	C	41	13	59
	Pacific Hwy (N)	D	54	3	9	D	56	5	9	D	45	4	8
Pacific Hwy / Tyron Pl.	Pacific Hwy (S)	A	5	3	27	A	12	5	41	A	42	4	25
	Tyron Pl	A	0	0	0	A	0	0	0	C	42	1	8
	Pacific Hwy (N)	B	25	2	21	C	38	9	42	C	39	9	52
Pacific Hwy / Beaconsfield Prd	Pacific Hwy (s)									C	35	7	37
	Pacific Hwy (N)									A	12	2	13
	Beaconsfield Parade	B	23	0	3	C	32	0	5	C	32	3	16
Pacific Hwy / Strickland Ave	Pacific Hwy (s)									B	26	3	32
	Strickland Ave	B	27	1	11	B	26	1	8	C	40	2	13
	Pacific Hwy (N)									D	43	12	56
Pacific Hwy / Grosvenor Rd / Burleigh St	Grosvenor Rd	F	77	6	21	F	90	7	31	F	77	7	26
	Pacific Hwy (s)	E	69	7	39	E	70	7	41	F	88	13	114
	Burghleigh St	F	164	1	3	F	113	0	3	F	147	1	4
	Pacific Hwy (N)	A	5	6	39	A	5	6	37	A	6	3	20
Lindfield Ave / Balfour St / Havilah Rd	Balfour St	A	8	0	2	A	8	0	2	A	8	0	2
	Lindfield Ave (S)	B	15	1	9	D	53	8	15	B	17	3	15
	Lindfield Ave (S) Slip lane	B	16	1	4	F	181	3	4	F	72	2	4
	Havilah RD	B	17	0	1	F	300	12	15	B	23	0	6
	Lindfield Ave (N)	B	20	1	6	F	343	17	20	E	59	6	22
Lindfield Ave / Tryon Rd	Lindfield Ave (S)	A	8	0	5	C	35	4	13	C	29	4	14
	Tryon Rd	B	21	0	5	F	304	19	42	D	45	2	11
	Lindfield Ave (N)	A	10	1	7	D	49	3	12	D	49	5	15

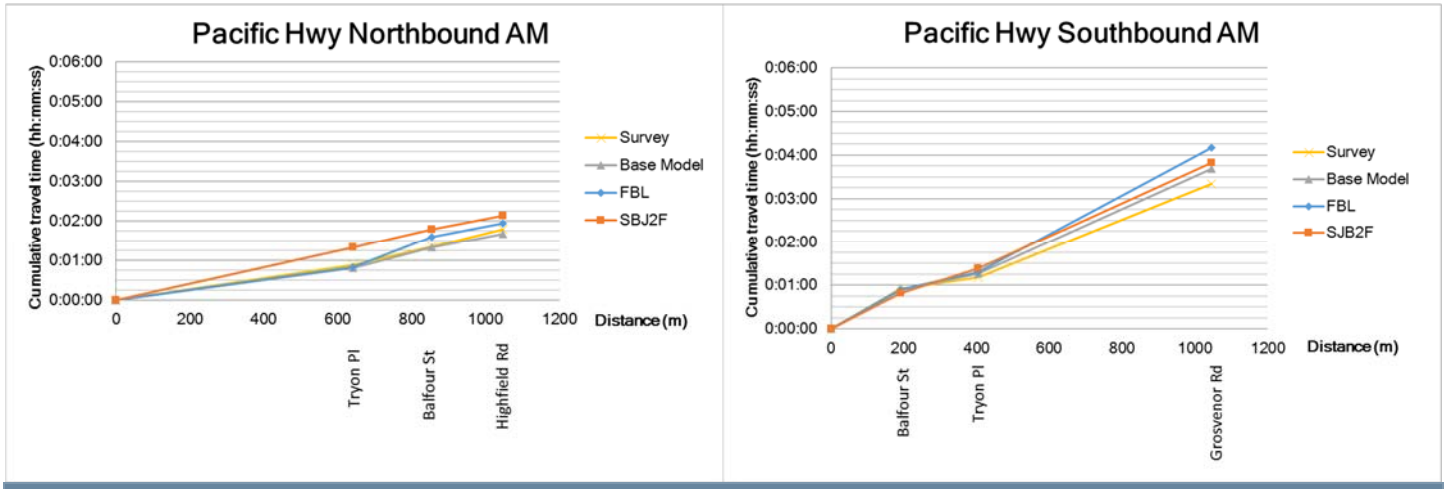


FIGURE 1 AM TRAVEL TIME COMPARISON

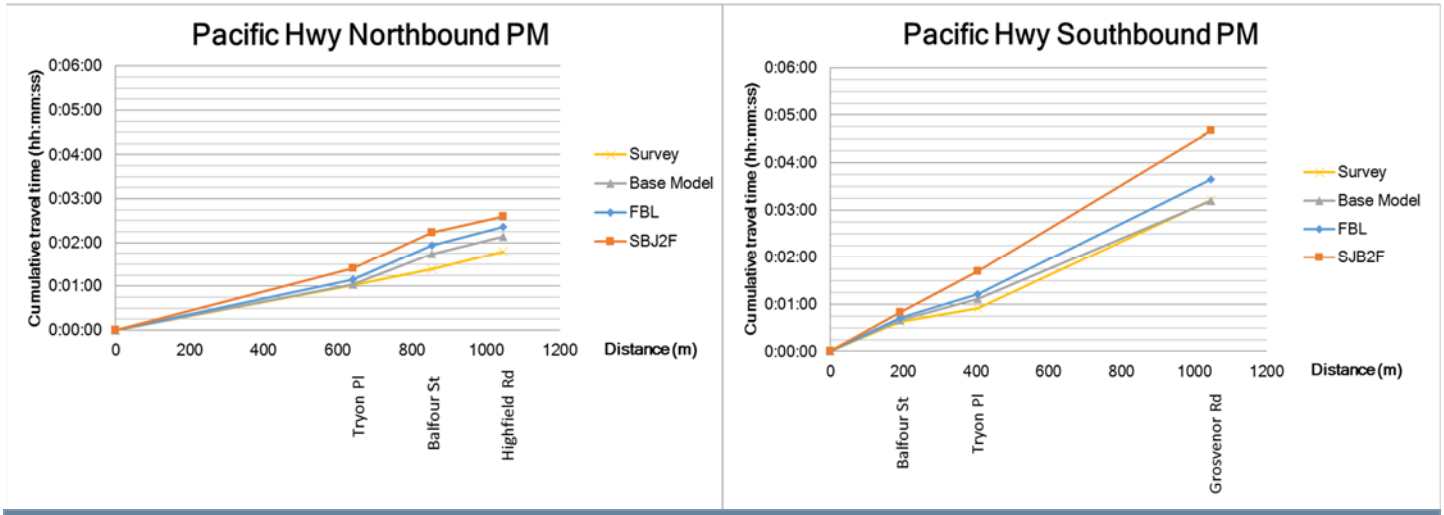


FIGURE 2 PM TRAVEL TIME COMPARISON

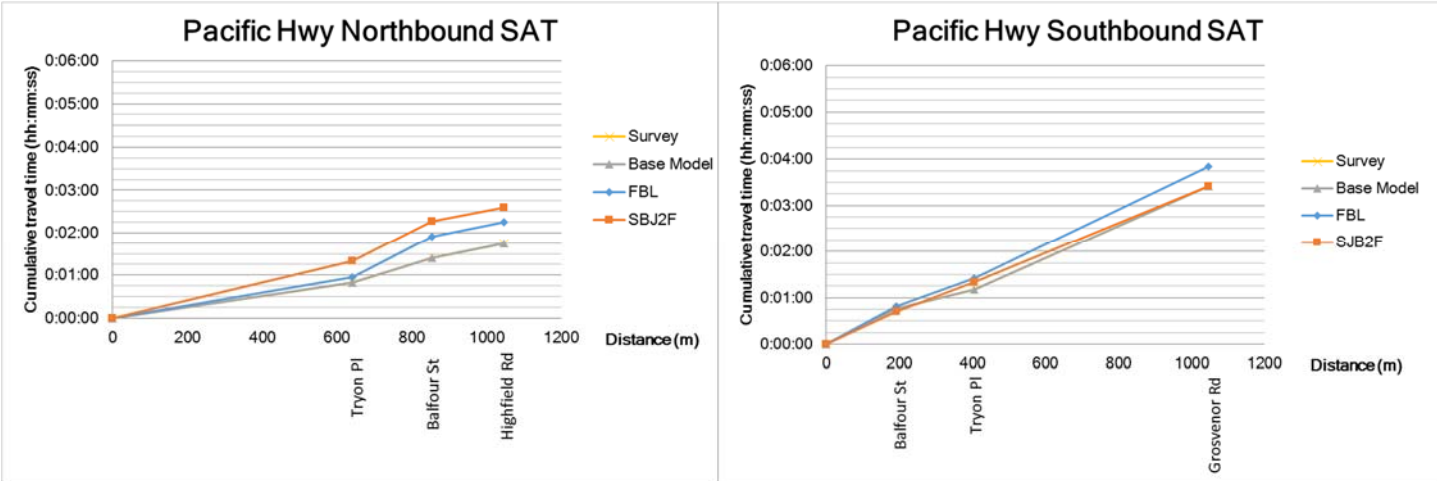


FIGURE 3 SAT TRAVEL TIME COMPARISON

	Pacific Hwy Northbound			Pacific Hwy Southbound		
	FBL	SJB2F	%diff	FBL	SJB2F	%diff
AM	0:01:56	0:02:09	+10%	0:04:10	0:03:49	-9%
PM	0:02:22	0:02:36	+10%	0:03:39	0:04:40	+28%
SAT	0:02:15	0:02:36	+15%	0:03:50	0:03:25	-11%

The intersection performance and Pacific Highway travel times were collected for the final model (SJB2F) and compared against the 2013 base model (Base Model) and the 2021 future base model (FBL).

The intersection comparison demonstrates how, with network edits, the final development option (SBJ2F) is able to achieve the same if not better level of service when compared to the future base (FBL). One exception is the Balfour Street (W) approach which increases in delay as a result of the Coles re-development, it however must be noted that the site access has not been finalised and this level of service is likely to improve as the access to Coles is moved further away from the adjacent intersection as proposed.

The intersection comparison also highlights the effect of the Grosvenor Road changes to the AM peak. There is less pronounced effect in the PM and Saturday peaks due to the heavy left hand turn. Given the position of the pedestrian crossing only a single left hand turn approach can be used without taking green time away from the Pacific Highway movements.

Also noteworthy is the dramatic improvement at Balfour St Havilah Rd as a result of a band right hand turn for all time periods. This turn is currently operating at capacity and in future scenarios was shown to cause extensive delays. By removing the right hand turn (as a right hand turn is now provided at Strickland Avenue) the congestion was able to be alleviated.

The network edits involved the addition of a signalised intersection on the Pacific Hwy and the conversion of a mid-block pedestrian crossing into another. The Pacific Highway travel time indicate that with the addition of the two new signals to the Pacific Hwy the same journey travel times can be maintained. The only travel time that shows noticeable effect (difference greater than 15%) is the pacific Hwy southbound in the PM. This is the counter peak direction and there is the possibility to explore clear ways to improve upon this travel time.

2.1 ADITIONAL COMPARISON

The travel times were also compared to an earlier version of the model that does not include the signalisation of Beaconsfield Parade / Pacific Highway intersection (TMM1), the final network is referred to as TMM1D.

Figures 4 – 6 below demonstrate how there is no deterioration in the performance of the highway for the two intersection configuration when compared to the single intersection configuration. For the PM and Saturday peaks the two signal intersection configuration actually performs much better as gaps for traffic are created and signal progression allows for continuous flow along the highway.

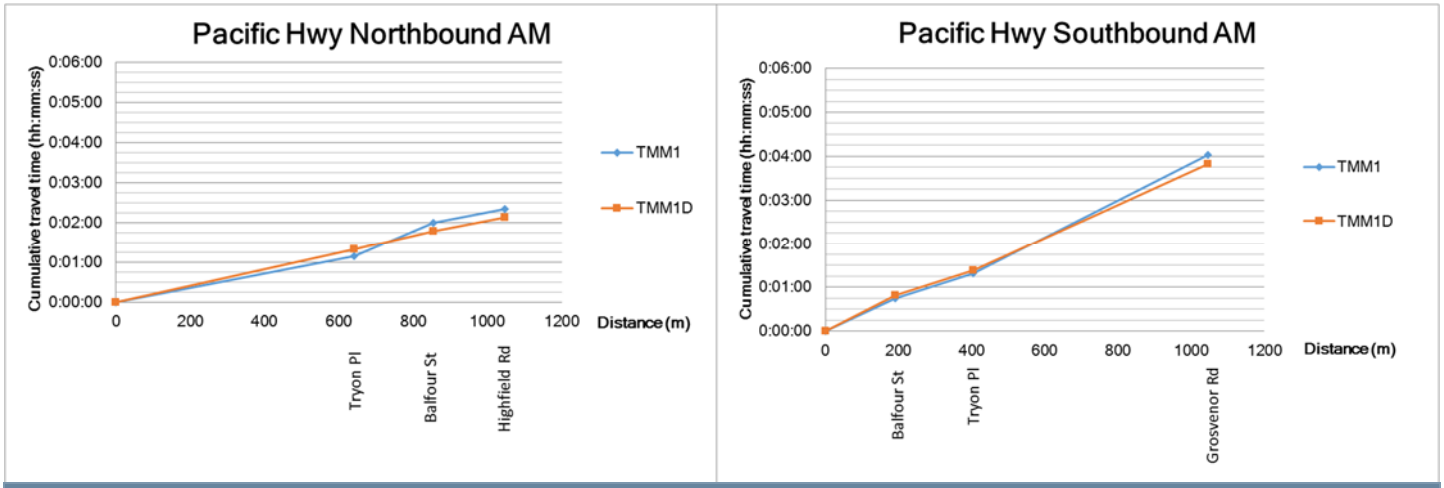


FIGURE 4 ADDITIONAL AM TRAVEL TIME COMPARISON

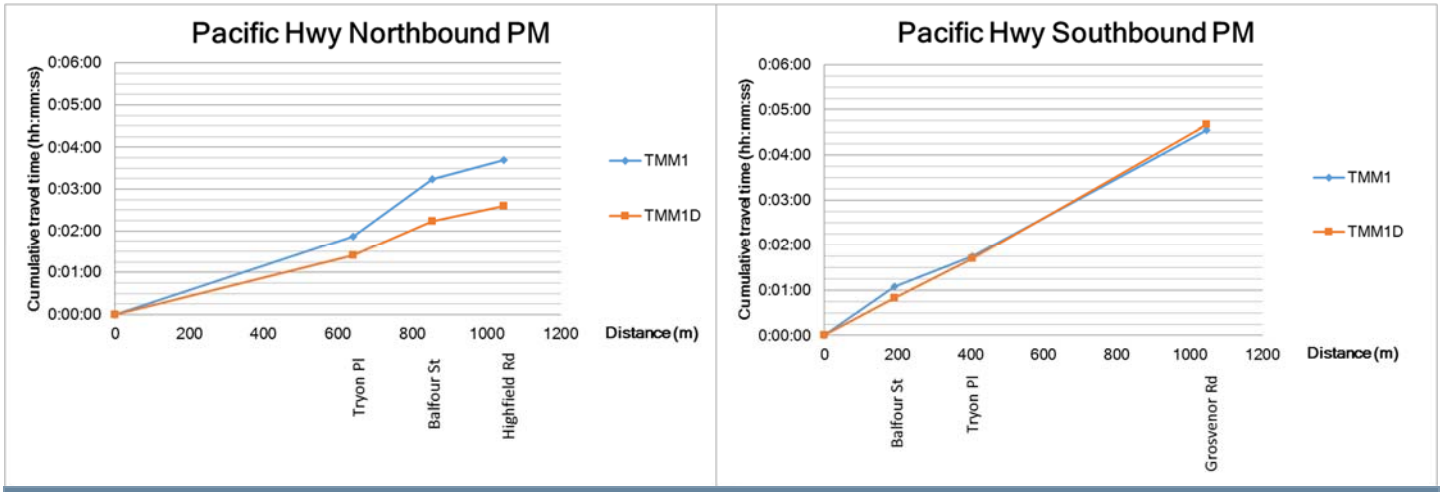


FIGURE 5 ADDITIONAL PM TRAVEL TIME COMPARISON

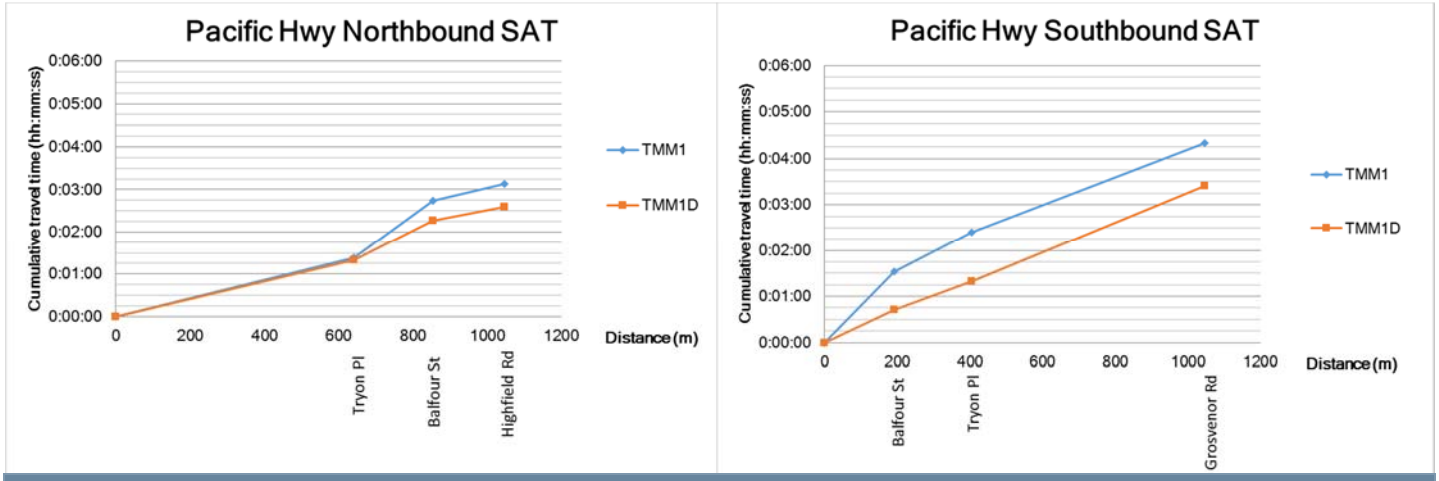


FIGURE 6 ADDITIONAL SAT TRAVEL TIME COMPARISON

Appendix D

PeopleTrans Presentation to RMS Network Operations

Lindfield Local Centre
Transport Model Network
Study 2015

Presentation to TMC
01st December 2015 – 10am-12pm

peopletrans

Presentation Outline/Agenda

PART 1 – 11-11:30am (KMC & PPLT)

1.	Background/Planning Context (KMC)	- 5 mins
2.	Study Objectives/Aim & Scope of Works	- 5 mins
3.	Existing Key Transport Issues	-5 mins
4.	Future Land Use Options	- 10 mins

PART 2 – 12:30pm-1:00pm (PPLT)

1.	Lindfield Modelling Methodology	- 5 mins
2.	Lindfield Preferred Traffic Management Plan	- 15 mins
3.	Key Conclusions & Recommendations	-10 mins
4.	Next Steps & Questions?	- 5 mins

Presentation Outline/Agenda

PART 3 – 11:30am-12:15pm (TMA)

1. Lindfield Model Network & Demo - 20 mins
   - Future Base Line
   - Woodford Lane Site Options Assessment (SJB2)

2. Lindfield Modelling Options Results (TMA) -20 mins
   LOS/Delay Tables/Travel Time Comparisons – Pacific Highway

PART 1 – Background/Objectives/Land Uses

Key Study Objectives 1 – Council Land Uses

- To work with Council to assist in determining an "acceptable" land use for Councils Woodford Lane Car Park development site, west of the Pacific Highway.

A benchmark to inform the future Urban Design Study.

- To develop a "traffic management plan" which could…. not only support Councils Woodford Lane development proposals but….. also support the LEP development identified for the wider Lindfield Town Centre.

Key Study Objectives 2 – SJB Land Uses

- To work with SJB to assist in determining an "acceptable" land use for Councils Woodford Lane Car Park development site, west of the Pacific Highway.

- To update/refine the "Lindfield Traffic Management Plan" which could…. not only support SJB's Woodford Lane preferred development proposals but….. also support the LEP development identified for the wider Lindfield Town Centre.

Scope of Works - Broadly

1

Understand Lindfield Land Use & Transport ✓

2

Prepare Demands for Future Land Uses & Assess impacts of various Land Use Options ✓

Develop Existing Base Transport Model & Obtain RMS Sign Off ✓

Determine Preferred Land Use for Woodford Lane Site & Prepare an Updated Traffic Management Plan ✓

3

Project Complete – Report Findings & Recommendations ✓

Key Transport Issues

1. **Balfour Road/Pacific Highway Intersection Weekday Peak Hour At Capacity**
2. **Unsafe Pedestrian Behaviour Crossing of Pacific Highway outside Lindfield Station**
3. Grosvenor Road/Pacific Highway Intersection Weekday Peak Hour At Capacity
4. No close & practical kiss& ride facilities on the west side of Lindfield station. Woodford Lane used as a substitute.
5. Narrow two way east-west road connections between Beaconsfield Parade and Balfour Street

3.1 Future Land Use Options Assessment

- Five Council land use scenarios provided for the Woodford Lane site together with existing approved DA's & LEP development sites.
- Further land-use scenarios developed/refined by SJB for Woodford Lane Site.
- Used the "Commuter" traffic model to **set the future baseline** and test the various Woodford Lane land use options provided by Council & SJB.
- Used Councils/RMS previous Town Centre Traffic Scheme as a "starting point" for developing a traffic management option for Lindfield as part of this study.

peopletrans

Legend

- Study Development Sites (Mixed Use)
- Future/ Approved Mixed Use Development Sites
- Future/Approved/Under Construction Residential Development Sites
- 74 Net Increase in Residential Dwellings
- Traffic Signals
- R12 Site label added by study team

13S170 Lindfield Town Centre Study
Ku-ring-gai Council

Figure 7.1: Land Use Plan - Approved and Likely Development Sites 2013-2031

Date: 25/02/2014 | Version: Final

3.2 Land Use Options

- Woodford Lane Site - Council Land Use Options A,B & D.

Table 7.2: Woodford Lane Car Park Site (Original Land Use Options)

Option Name	Proposed Land Uses	Scale/Size (Area Sqm GLFA or as stated otherwise)
A FSR 0.93:1 Height 11.5m	Community Facilities	2,700
	Specialty Retail	400
	Medium Density Residential	2,930 (25 Units) [1]
	TfNSW Commuter Parking	240 spaces
B FSR 2.13:1 Height 11.5m	Community Facilities	2,700
	Major Retail - Supermarket	3,430
	Specialty Retail	400
	Medium Density Residential	7,230 (54 Units) [1]
	TfNSW Commuter Parking	240 spaces
D FSR 2.13:1 Height 17.5m	Community Facilities	2700
	High Density Residential	11,060 (82 Units) [1]
	TfNSW Commuter Parking	240 spaces

3.2 Land Use Options

- Woodford Lane Site – Council Land Use Options C & E.

Table 7.3: Woodford Lane Car Park Site (Additional Land Use Options)

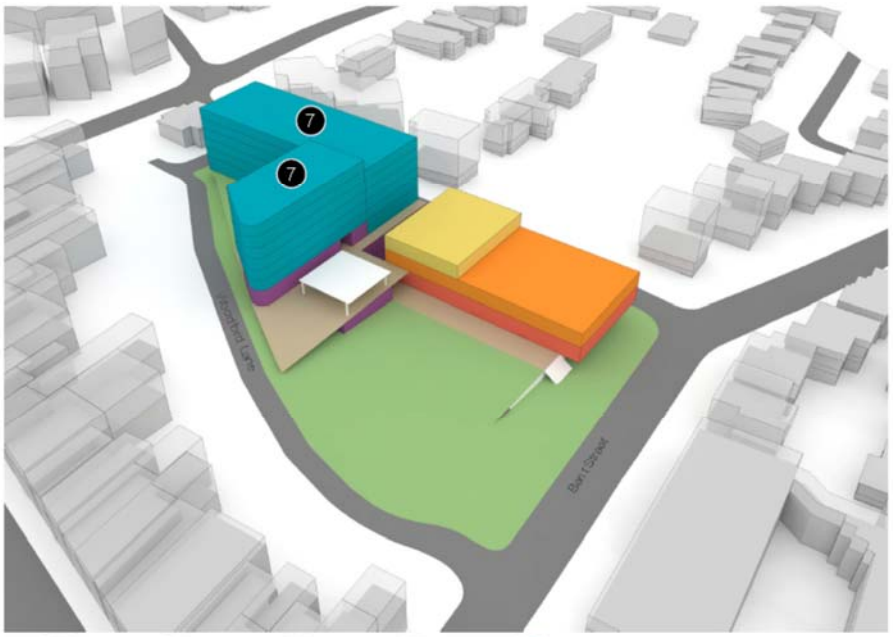
Option Name	Proposed Land Uses	Scale/Size (Area Sqm GLFA or as stated otherwise)
C (Option B+M4 Coles Redevelopment)	As per Option B	As per Option B
	Major Retail-Supermarket	7,354 (4,905 Increase)
	Medium Density Residential	110 Units
E	Community Facilities	2,820
	Major Retail - Supermarket	4,150
	Specialty Retail	2,210
	Gymnasium	1,000
	Commuter Parking	245 spaces

3.3 Land Use Options – SJB2 Final

SJB 2 Final Land Use Option

Option Name	Proposed Land Uses	Scale/Size (Area Sqm GLFA or as stated otherwise)
Woodford Lane Site (SJB2F) FSR 2.13:1	Community Facilities	2,465
	Major Retail - Supermarket	3,000
	Specialty Retail	1,174
	Commercial	325
	Gymnasium	575
	Childcare	533
	Medium Density Residential	12,850 [1]
	TfNSW Commuter Parking	140 spaces [2]
Coles Balfour Street Site	Major Retail – Supermarket	1,900
	Specialty Retail	2,700
	High Density Residential	110
Library Site Precinct – 259-271 Pacific Highway	Residential	15,319 [1]
	Commercial	1,638

5.19 Preferred Option - Massing



3.4 Woodford Lane Site SJB Land Use Option 2 – (Final/Refined)

3.5 Library Site Concept

3.13 Option 03 - Illustrative Plan

Lindfield Library Site Precinct 259-271 Pacific Highway

Block	Storey (Total)	Land Use	GBA total (m²)	GFA (m²)	NSA (m²)	Dwellings (units)
A1	7	Commercial	300	270	230	-
		Residential	7,180	5,585	4,747	59
A2	4	Commercial	-	-	-	-
		Residential	1,480	1,154	981	12
A3	8	Commercial	-	-	-	-
		Residential	6,000	4,680	3,978	50
		Total	14,940	11,689	9,936	121
		Site Area		5,848.6		
		FSR		2.0:1		
		Car Parking				171

283 Pacific Highway

Block	Storey (Total)	Land Use	GBA total (m²)	GFA (m²)	NSA (m²)	Dwellings (units)
B1	8	Commercial	600	540	459	-
		Residential	3,400	2,852	2,254	28
B2	4	Commercial	920	828	704	-
		Residential	1,600	1,248	1,061	13
		Total	6,520	5,268	4,478	41
		Site Area		2,105		
		FSR		2.5:1		
		Car Parking				88

Notes
1. Apartments GBA to GFA = 78%; GFA to NSA = 85%
2. Commercial: GBA to GFA = 90%; GFA to NSA =85%
3. Average unit size = 80m²
4. Car Parking - Commercial = 1space/ 33m2-45m2 of GFA (40m2 Average)
5. Car Parking - Residential = Average of 1.19 spot/dwelling. Visitor spot 1 per 8 Dwelling
4. All areas are approximate and subject to further design development.

PART 2 – Modelling Methodology/Traffic Management Plan

4.1 Modelling Methodology

3 Step Process:

1. Existing Operation Models (AM/PM/Saturday)
   Base model approved by RMS (February 2014)

2. Future Baseline Models (Committed Infrastructure/Committed Development/Background Traffic Growth)

3. Woodford Lane Site Options Assessment Models (Compared Against Future Baseline) – Re-iterative modelling to prepare **suitable traffic management plan.**

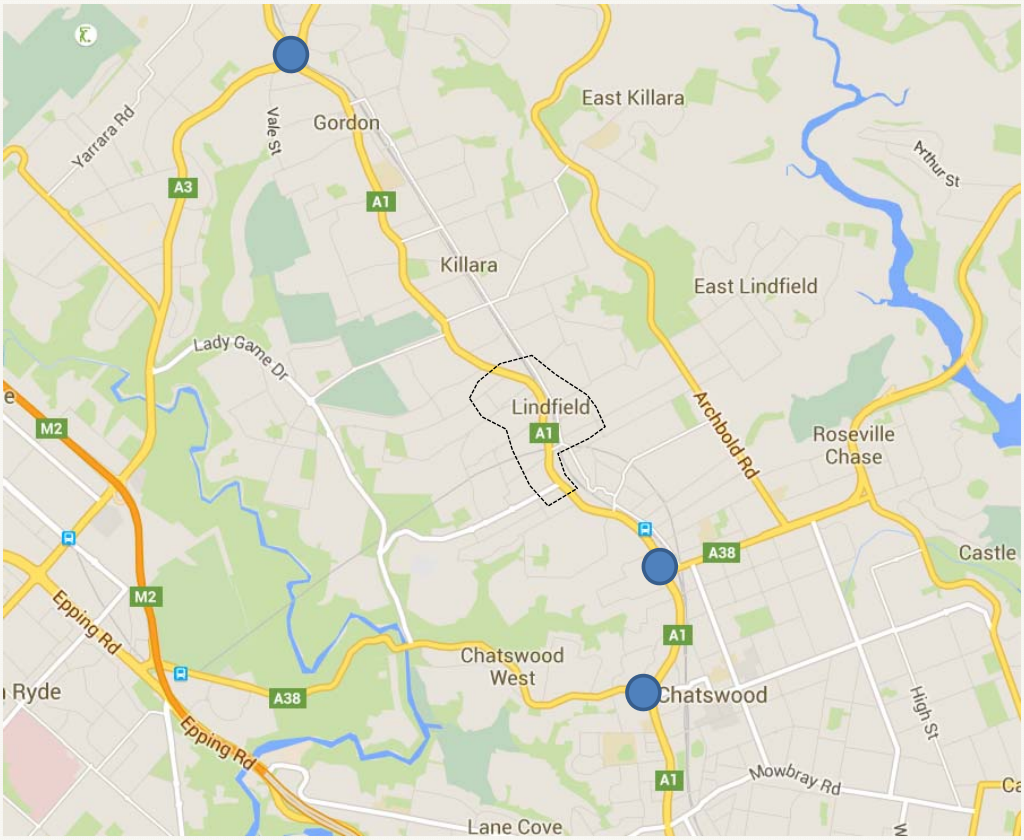
4.2 Future Demand Development Methodology

- Identify land use changes likely to occur in the future baseline situation. (10 Year). Simultaneously identify all land use options for the Council development sites.
- Compare future land use changes with projections prepared by the Bureau of Transport Statistics(BTS). *This test checks that the land use scenarios to be tested are not unrealistically high or low.*
- Using standard traffic generation rates estimate the potential future traffic, net out existing traffic generation and apply discounts for linked trips, pass-by, double counting an mode choice.
- Distribute trips across the network according to the spatial spread of trips within the network.
- Combine the above information to build the demand matrices.

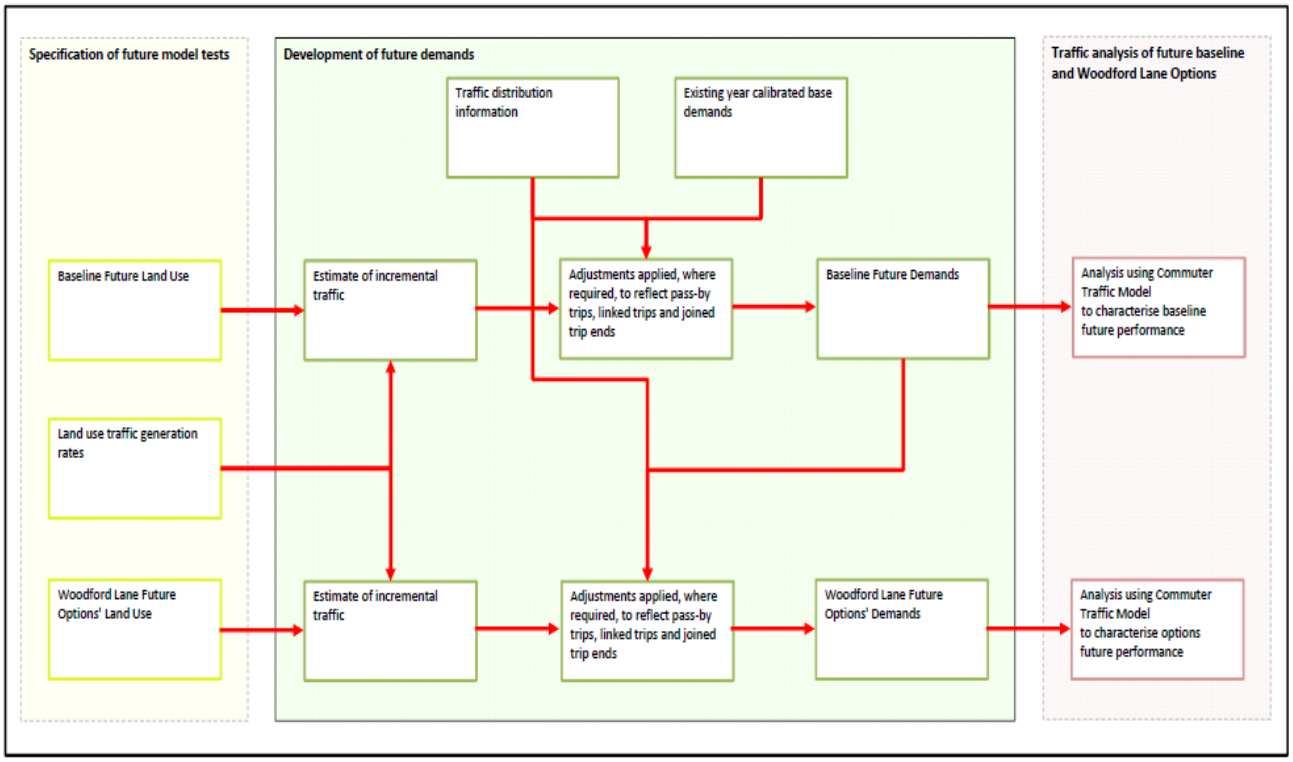
4.3 Pacific Highway Trips

- All growth on the Pacific Hwy is associated with internal development
- Assumed no growth in though trips on the highway as a result of capacity constraints at Ride Rd, Boundary St and Fullers Rd.
- These capacity constraints are unlikely to be upgraded and the construction of North Connex is likely to absorbed any potential increase in through trips on the Pacific Hwy Pennant Hills RD corridor.
- Permanent counts likely to show an increase in Annual Average Daily Traffic (AADT) however Peak Hour Traffic will not increase due to aforementioned capacity constraints.

4.4 Capacity Constraints Locations



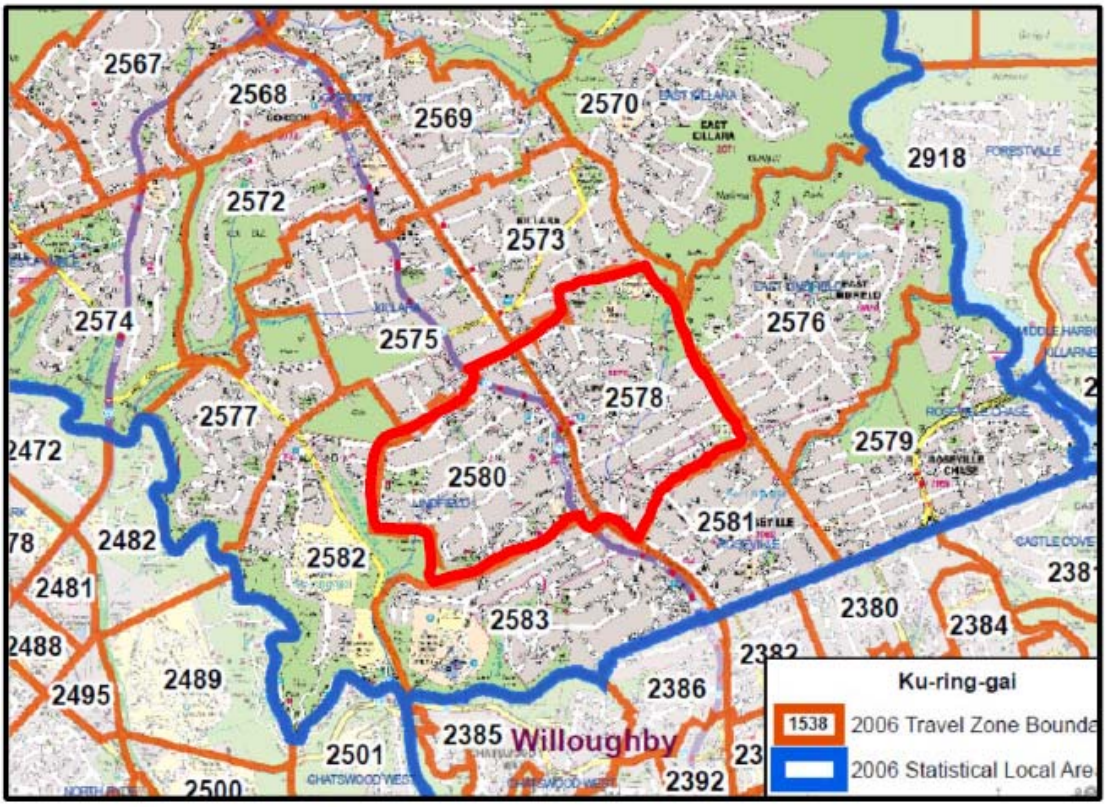
4.5 Future Demand Development Process Flow Chart



4.6 Reasonable Test

- BTS prepares land use projections for small areas, covering both population and employment.
- These projections are compared with the background incremental development.
- It was determined that the traffic demand from future land uses was reflective of the BTS projections for 10 years and perhaps 15 years.
- In including the proposed developments associated with the study area it was found that the predictions were broadly in line with the BTS projections for population for the same area for the next 10 to 15 years.

4.7 BTS Travel Zones – Study Area Extract



Source: BTS 2006 zone system map for Ku-ring-gai

4.8 BTS Small Area Population of the Broad Study Area

Zone	Year		
	2011	2016	2021
Projected population (ERP)			
2578	3,669	4,002	4,518
2580	3,808	4,264	4,500
Total	**7,477**	**8,266**	**9,017**
Incremental population from 2011			
2578	0	332	848
2580	0	457	692
Total	**0**	**789**	**1,541**

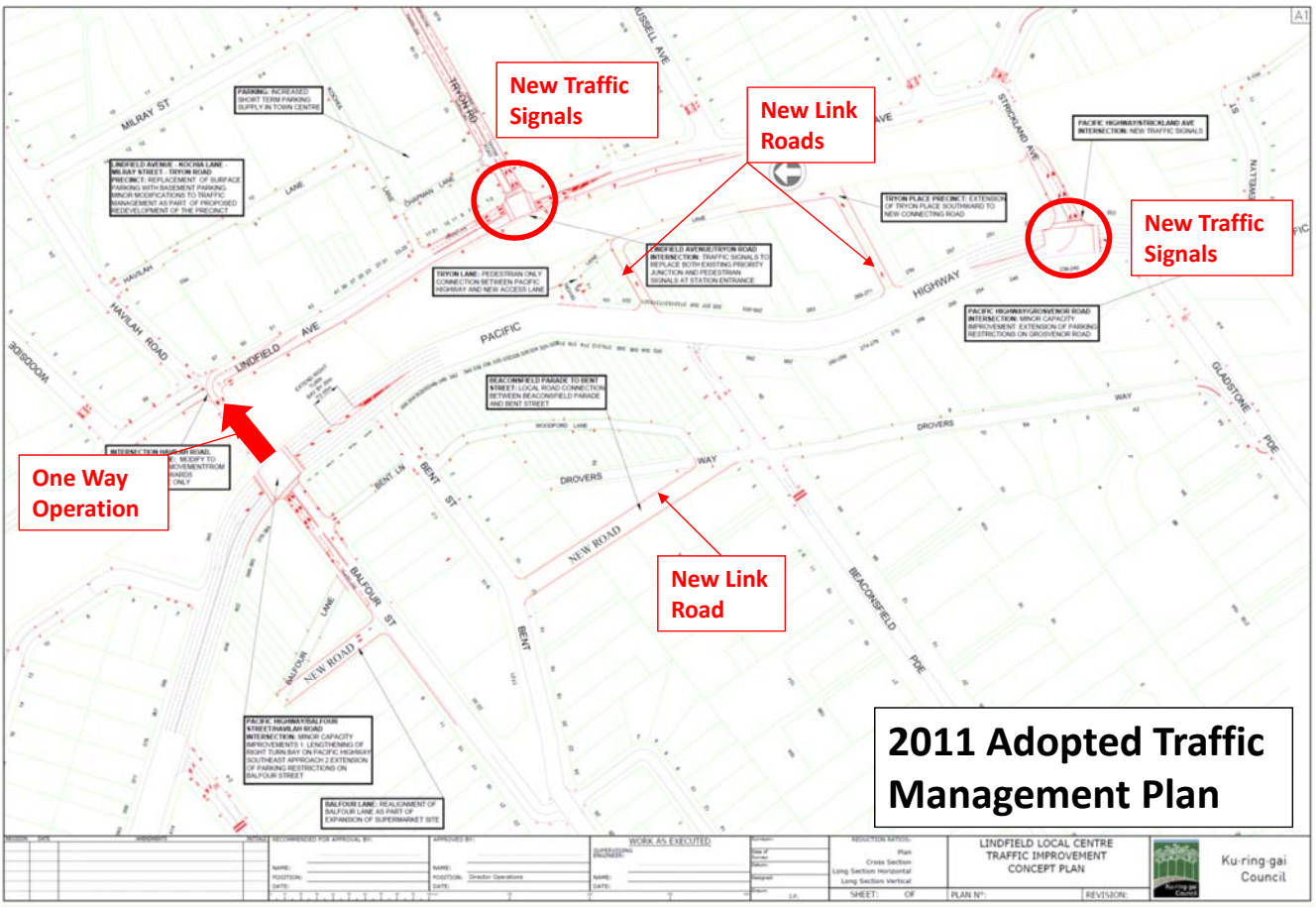
Source: BTS August 2012 small-area population projections

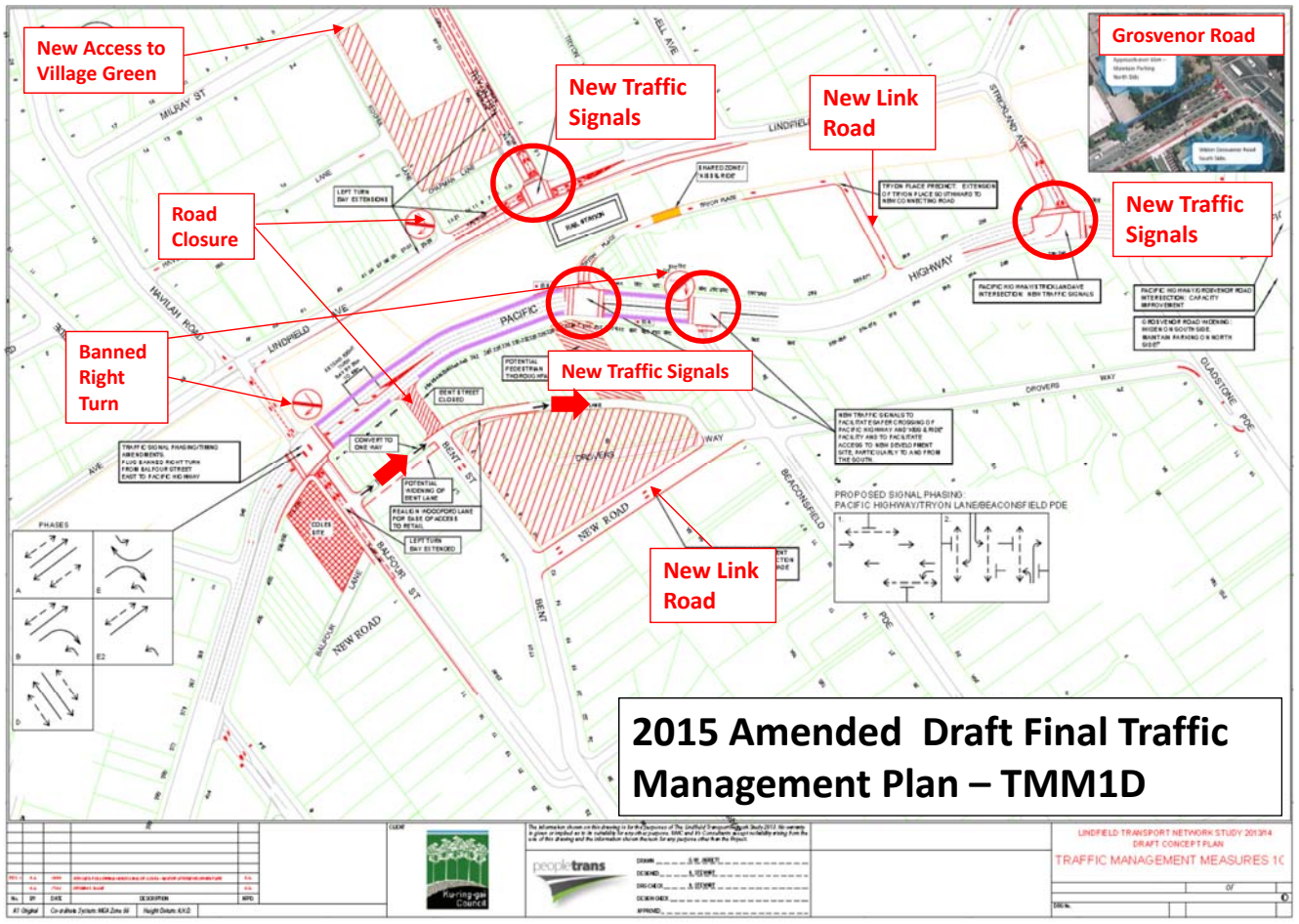
4.9 BTS Small Area Employment of the Broad Study Area

Zone	Year		
	2011	2016	2021
Projected employment			
2578	1,240	1,348	1,459
2580	1,500	1,613	1,720
Total	2,740	2,961	3,179
Incremental employment from 2011			
2578	0	108	218
2580	0	113	220
Total	0	221	439

Source: BTS August 2012 small-area employment projections

PART 2 – Lindfield Preferred Traffic Management Plan


New Traffic Signals
New Link Roads
New Traffic Signals
One Way Operation
New Link Road
2011 Adopted Traffic Management Plan
LINDFIELD LOCAL CENTRE TRAFFIC IMPROVEMENT CONCEPT PLAN
Ku-ring-gai Council


New Access to Village Green
New Traffic Signals
New Link Road
Grosvenor Road
Road Closure
New Traffic Signals
Banned Right Turn
New Traffic Signals
New Link Road
PROPOSED SIGNAL PHASING: PACIFIC HIGHWAY/TRYON LANE/BEACONSFIELD PDE
2015 Amended Draft Final Traffic Management Plan – TMM1D
LINDFIELD TRANSPORT NETWORK STUDY 2013/14
DRAFT CONCEPT PLAN
TRAFFIC MANAGEMENT MEASURES 1C

5.1 Preferred Traffic Management Plan Features

Item No.	Proposed Road Infrastructure
1.	New Traffic Signals Pacific Highway/Tryon Place & Pacific Highway/Beaconsfield Parade (2 Phase Operation, No right turn into Beaconsfield Parade from Pacific Highway)
2.	New Traffic Signals Pacific Highway/Strickland Avenue
3.	Traffic Signal Phasing Adjustments at Pacific Highway/Balfour Street intersection in conjunction with banned right turn from Havilah Street into Pacific Highway
4.	Kochia Lane closed at Lindfield Avenue
5.	New Traffic Signals Lindfield Avenue/Tryon Road
6.	Bent Lane/Woodford Lane – One way southbound
7.	Bent Street closed between Woodford Lane and Pacific Highway
8.	Tryon Place Shared Zone
9.	New Road between Drovers Way & Bent Street
10.	New Road between Tryon Place & Pacific Highway (one way northbound)
11.	Road Widening on south side of Grosvenor Road
12.	New Access to Village Green car parking from Milray Street.
13.	Two Way Access in Havilah Lane at Havilah Road
14.	Pacific Highway Clearways (Saturday Peak Period)
15.	Milray Street Traffic Management Measures (Pedestrian Refuge Islands at Tryon Road & Havilah Road intersections)

PART 3.1 – Model Operation & Results Comparison Existing/Future Baseline/SJB2 Final

6.1 Levels of Service Analysis - AM

		AM											
		Base Model				FBL				SBJ2F			
Intersection Name	Approach	LOS	Delay (Sec)	Queue Ave	Queue Max	LOS	Delay (Sec)	Queue Ave	Queue Max	LOS	Delay (Sec)	Queue Ave	Queue Max
Pacific Hwy / Highfield Rd	Highfield Rd	F	91	6	24	F	133	10	32	F	92	6	23
	Pacific Hwy (S)	A	4	0	23	A	4	1	19	A	4	1	13
	Pacific Hwy (N)	F	79	7	49	F	80	8	43	F	88	17	116
Pacific Hwy / Balfour St	Balfour St (W)	D	55	2	14	E	60	2	12	F	72	2	9
	Pacific Hwy (S)	C	31	5	44	C	38	9	49	C	31	28	81
	Balfour St (E)	D	46	22	67	D	50	25	78	D	47	24	78
	Pacific Hwy (N)	F	80	4	9	F	86	5	8	F	99	4	8
Pacific Hwy / Tyron Pl.	Pacific Hwy (S)	A	3	0	9	A	3	0	8	A	13	4	18
	Tyron Pl	B	21	0	1	B	19	0	1	F	74	3	12
	Pacific Hwy (N)	B	22	2	34	B	23	2	35	C	31	7	59
Pacific Hwy / Beaconsfield Prd	Pacific Hwy (s)									C	35	5	39
	Pacific Hwy (N)									A	8	2	15
	Beaconsfield Parade	B	20	0	2	B	22	1	4	C	35	3	16
Pacific Hwy / Strickland Ave	Pacific Hwy (s)									B	22	1	17
	Strickland Ave	C	38	2	11	D	44	2	15	E	61	4	19
	Pacific Hwy (N)									B	27	5	50
Pacific Hwy / Grosvenor Rd / Burleigh St	Grosvenor Rd	F	150	11	28	F	225	16	39	F	185	14	45
	Pacific Hwy (s)	E	67	5	31	E	67	5	31	F	71	7	39
	Burghleigh St	F	152	1	5	F	208	2	7	F	623	9	23
	Pacific Hwy (N)	C	30	25	90	C	39	31	118	C	38	31	97
Lindfield Ave / Balfour St / Havilah Rd	Balfour St	A	8	0	3	A	9	0	9	A	8	0	2
	Lindfield Ave (S)	A	14	0	6	B	28	3	12	A	14	0	6
	Lindfield Ave (S) Slip lane	B	24	1	4	F	90	2	4	C	29	0	4
	Havilah RD	B	24	0	2	F	90	2	14	D	52	0	8
	Lindfield Ave (N)	B	23	1	11	C	40	4	21	C	30	3	18
Lindfield Ave / Tryon Rd	Lindfield Ave (S)	A	14	1	7	C	39	4	12	C	34	2	12
	Tryon Rd	B	26	0	6	F	78	3	17	D	43	2	11
	Lindfield Ave (N)	A	12	1	8	B	28	3	11	B	25	3	15

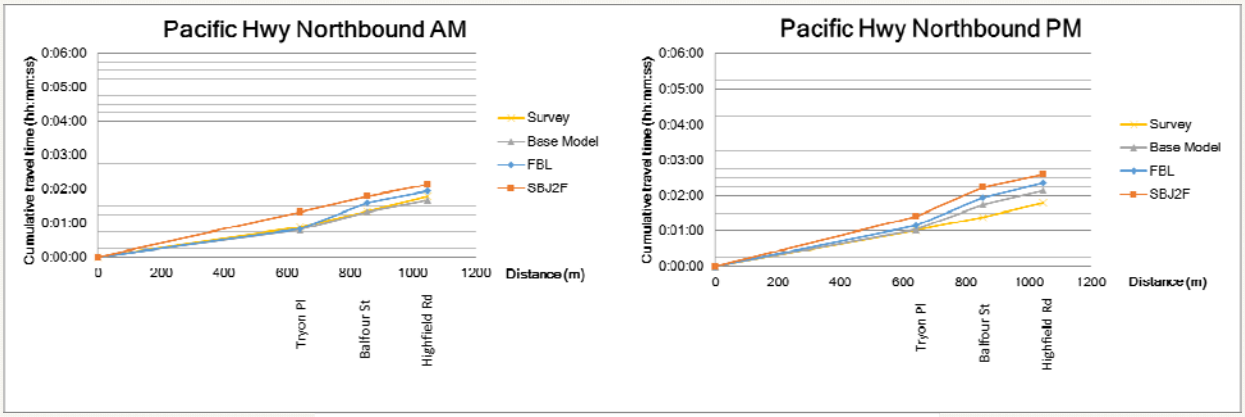
6.2 Levels of Service Analysis - PM

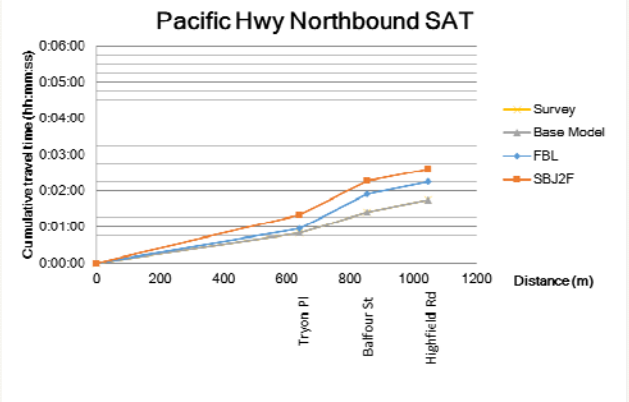
		PM											
		Base Model				FBL				SBJ2F			
Intersection Name	Approach	LOS	Delay (Sec)	Queue Ave	Queue Max	LOS	Delay (Sec)	Queue Ave	Queue Max	LOS	Delay (Sec)	Queue Ave	Queue Max
Pacific Hwy / Highfield Rd	Highfield Rd	F	72	4	20	F	110	8	23	F	80	4	22
	Pacific Hwy (S)	A	6	2	34	A	7	2	33	A	3	1	15
	Pacific Hwy (N)	E	64	1	16	E	64	1	22	E	65	1	16
Pacific Hwy / Balfour St	Balfour St (W)	D	52	1	8	D	54	2	10	F	78	3	12
	Pacific Hwy (S)	D	44	13	72	D	51	17	77	D	48	26	93
	Balfour St (E)	C	35	10	42	C	40	12	46	C	42	12	65
	Pacific Hwy (N)	E	57	3	9	E	64	6	10	E	58	2	8
Pacific Hwy / Tyron Pl.	Pacific Hwy (S)	A	8	2	30	A	10	3	42	A	6	2	14
	Tyron Pl	B	16	0	0	B	16	0	0	D	49	1	8
	Pacific Hwy (N)	B	25	2	20	C	29	3	30	C	36	5	40
Pacific Hwy / Beaconsfield Prd	Pacific Hwy (s)									C	32	5	36
	Pacific Hwy (N)									B	16	4	18
	Beaconsfield Parade	B	28	0	3	B	26	0	3	B	28	2	9
Pacific Hwy / Strickland Ave	Pacific Hwy (s)									C	30	6	43
	Strickland Ave	A	14	0	6	B	16	0	7	F	71	7	17
	Pacific Hwy (N)									A	13	0	1
Pacific Hwy / Grosvenor Rd / Burleigh St	Grosvenor Rd	F	396	33	44	F	419	33	43	F	380	31	52
	Pacific Hwy (s)	E	65	6	40	E	65	7	34	E	67	6	36
	Burghleigh St	A	0	1	3	A	0	1	2	A	0	13	29
	Pacific Hwy (N)	A	4	2	20	A	5	2	19	A	6	3	24
Lindfield Ave / Balfour St / Havilah Rd	Balfour St	A	8	0	2	A	8	0	1	A	8	0	2
	Lindfield Ave (S)	B	18	1	10	C	41	6	16	B	17	1	9
	Lindfield Ave (S) Slip lane	B	16	1	4	F	181	3	4	A	12	0	3
	Havilah RD	A	14	0	2	F	433	11	16	B	16	0	3
	Lindfield Ave (N)	B	18	0	6	F	92	6	19	B	18	0	4
Lindfield Ave / Tryon Rd	Lindfield Ave (S)	A	11	0	6	B	19	2	12	B	21	2	10
	Tryon Rd	B	21	0	4	D	55	3	13	C	39	2	9
	Lindfield Ave (N)	A	14	1	6	D	53	2	11	B	24	2	15

6.3 Levels of Service Analysis – Saturday

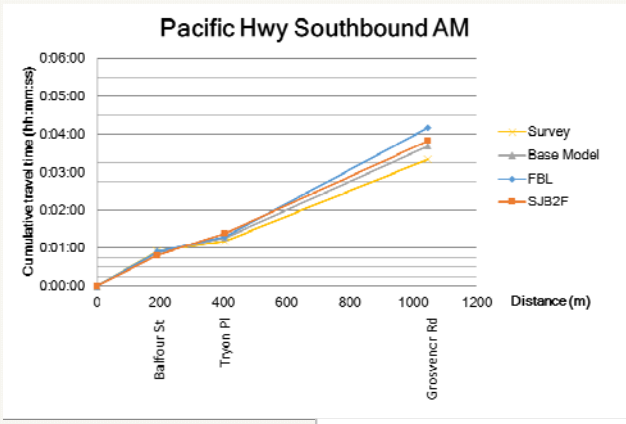
		SAT											
		Base Model				FBL				SBJ2F			
Intersection Name	Approach	LOS	Delay (Sec)	Queue Ave	Queue Max	LOS	Delay (Sec)	Queue Ave	Queue Max	LOS	Delay (Sec)	Queue Ave	Queue Max
Pacific Hwy / Highfield Rd	Highfield Rd	E	60	3	11	F	81	5	20	E	67	4	14
	Pacific Hwy (S)	A	7	2	25	A	8	2	27	A	3	1	18
	Pacific Hwy (N)	E	67	1	21	E	66	1	21	E	66	1	25
Pacific Hwy / Balfour St	Balfour St (W)	D	52	1	9	D	54	1	10	F	114	2	8
	Pacific Hwy (S)	C	34	9	61	E	59	18	64	D	56	31	97
	Balfour St (E)	D	43	14	53	D	44	16	58	C	41	13	59
	Pacific Hwy (N)	D	54	3	9	D	56	5	9	D	45	4	8
Pacific Hwy / Tyron Pl.	Pacific Hwy (S)	A	5	3	27	A	12	5	41	A	42	4	25
	Tyron Pl	A	0	0	0	A	0	0	0	C	42	1	8
	Pacific Hwy (N)	B	25	2	21	C	38	9	42	C	39	9	52
Pacific Hwy / Beaconsfield Prd	Pacific Hwy (s)									C	35	7	37
	Pacific Hwy (N)									A	12	2	13
	Beaconsfield Parade	B	23	0	3	C	32	0	5	C	32	3	16
Pacific Hwy / Strickland Ave	Pacific Hwy (s)									B	26	3	32
	Strickland Ave	B	27	1	11	B	26	1	8	C	40	2	13
	Pacific Hwy (N)									D	43	12	56
Pacific Hwy / Grosvenor Rd / Burleigh St	Grosvenor Rd	F	77	6	21	F	90	7	31	F	77	7	26
	Pacific Hwy (s)	E	69	7	39	E	70	7	41	F	88	13	114
	Burghleigh St	F	164	1	3	F	113	0	3	F	147	1	4
	Pacific Hwy (N)	A	5	6	39	A	5	6	37	A	6	3	20
Lindfield Ave / Balfour St / Havilah Rd	Balfour St	A	8	0	2	A	8	0	2	A	8	0	2
	Lindfield Ave (S)	B	15	1	9	D	53	8	15	B	17	3	15
	Lindfield Ave (S) Slip lane	B	16	1	4	F	181	3	4	F	72	2	4
	Havilah RD	B	17	0	1	F	300	12	15	B	23	0	6
	Lindfield Ave (N)	B	20	1	6	F	343	17	20	E	59	6	22
Lindfield Ave / Tryon Rd	Lindfield Ave (S)	A	8	0	5	C	35	4	13	C	29	4	14
	Tryon Rd	B	21	0	5	F	304	19	42	D	45	2	11
	Lindfield Ave (N)	A	10	1	7	D	49	3	12	D	49	5	15

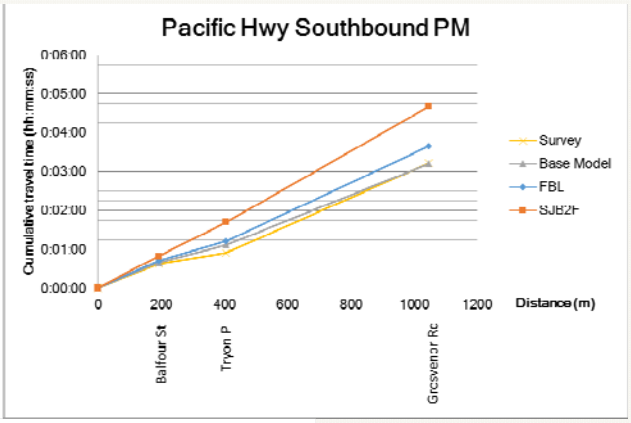
6.4 Travel Times Analysis – Pacific Highway Northbound

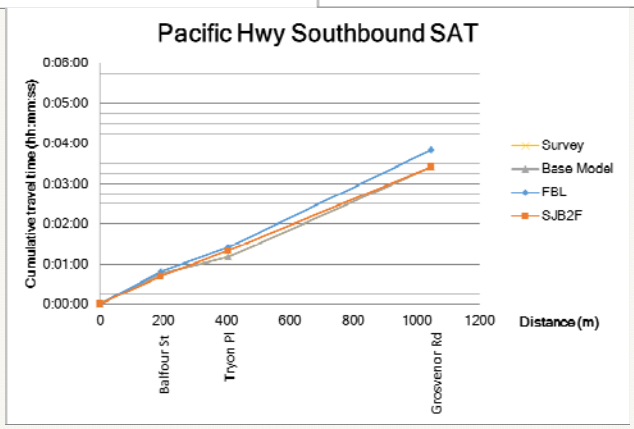




6.5 Travel Times Analysis – Pacific Highway Southbound



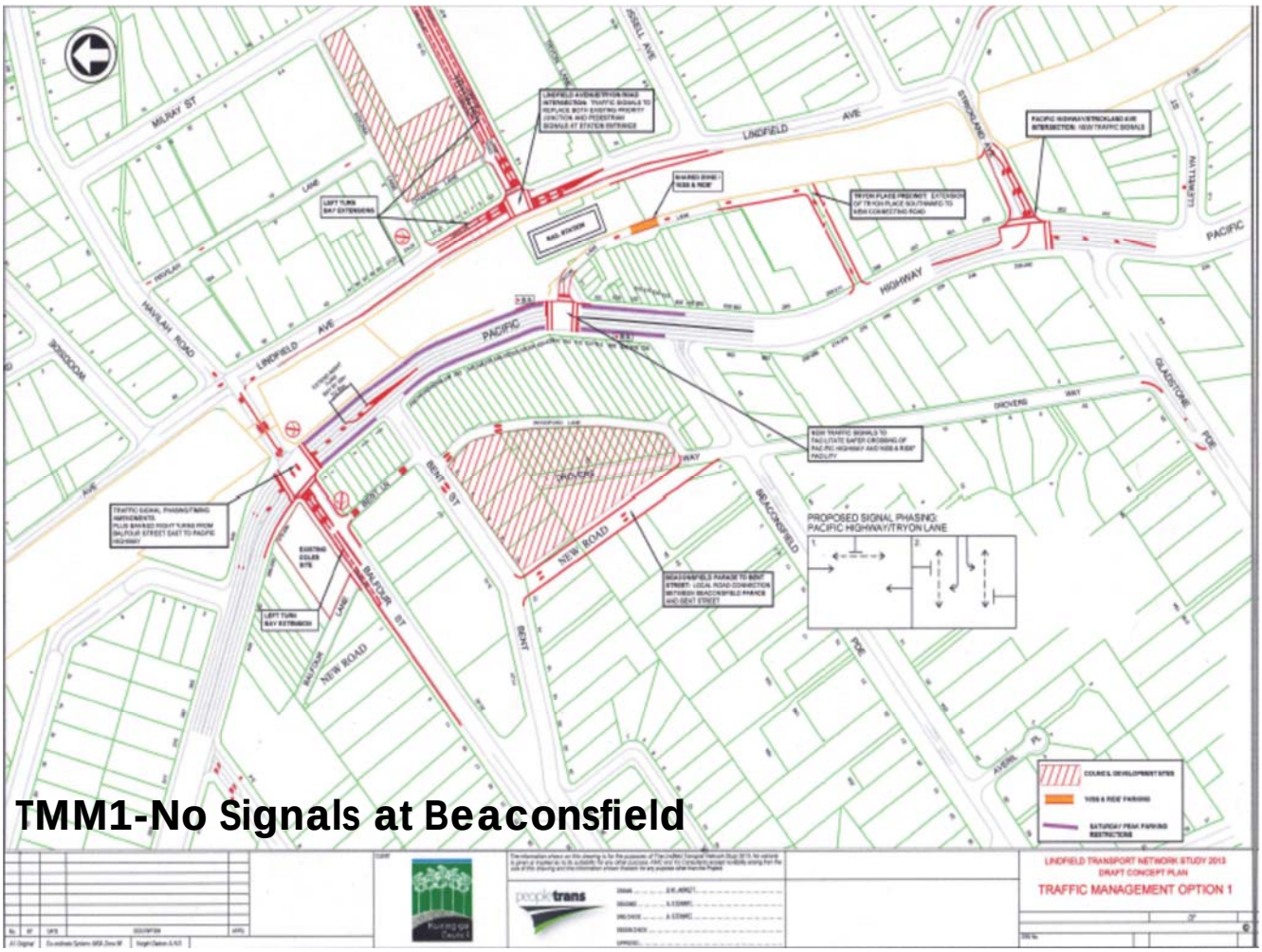




6.6 Travel Times Summary – Pacific Highway Northbound & Southbound

	Pacific Hwy Northbound			Pacific Hwy Southbound		
	FBL	SBJ2F	%diff	FBL	SBJ2F	%diff
AM	0:01:56	0:02:09	+10%	0:04:10	0:03:49	-9%
PM	0:02:22	0:02:36	+10%	0:03:39	0:04:40	+28%
SAT	0:02:15	0:02:36	+15%	0:03:50	0:03:25	-11%

PART 3.2 – Model Operation & Results Comparison TMM1 v TMM1D

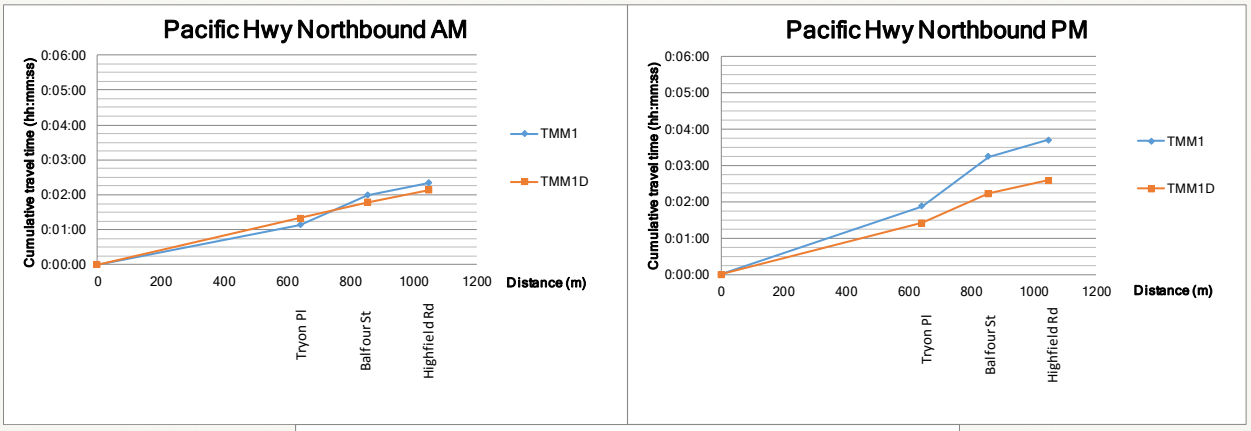


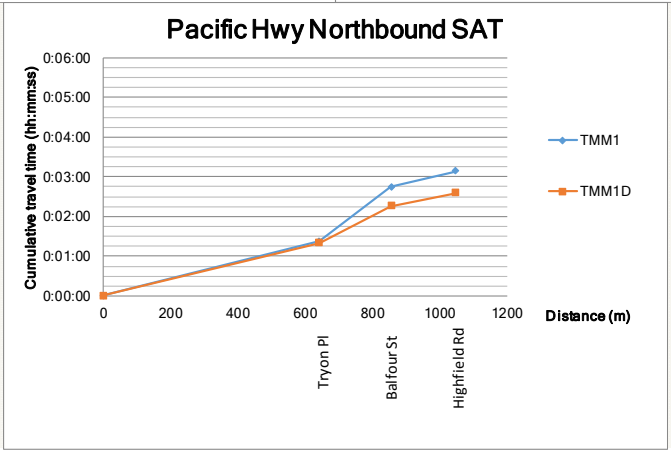
TMM1-No Signals at Beaconsfield

6.7 Levels of Service Analysis – TMM1 v TMM1D Options Comparison (AM/PM/Sat Peak Hours)

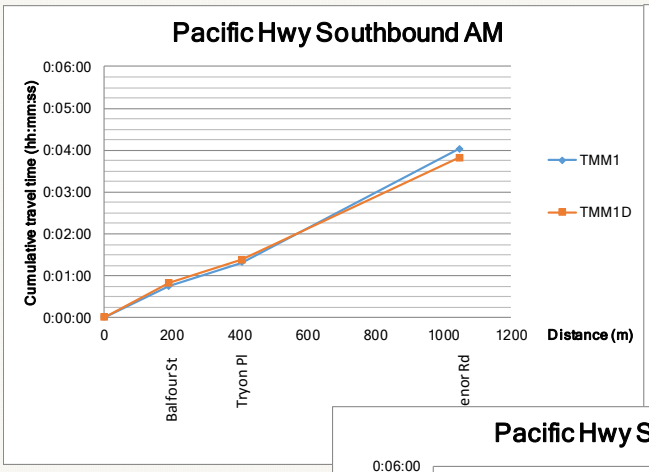
			AM								PM								SAT							
			TMM1				TMM1D				TMM1				TMM1D				TMM1				TMM1D			
Intersection Name	Approach	Approach Description	LOS	Delay (Sec)	Queue Ave	Queue Max	LOS	Delay (Sec)	Queue Ave	Queue Max	LOS	Delay (Sec)	Queue Ave	Queue Max	LOS	Delay (Sec)	Queue Ave	Queue Max	LOS	Delay (Sec)	Queue Ave	Queue Max	LOS	Delay (Sec)	Queue Ave	Queue Max
Pacific Hwy / Highfield Rd	Highfield Rd	E29_	F	133	9	33	F	92	6	23	F	87	5	31	F	80	4	22	F	73	4	14	E	67	4	14
	Pacific Hwy (S)	W22	A	2	0	6	A	4	1	13	A	7	2	39	A	3	1	15	A	6	2	35	A	3	1	18
	Pacific Hwy (N)	E28	F	72	4	35	F	88	17	116	E	64	1	16	E	65	1	16	F	80	7	58	E	66	1	25
Pacific Hwy / Balfour St	Balfour St (W)	_N25__	F	94	5	37	F	72	2	9	D	56	2	9	F	78	3	12	F	86	3	16	F	114	2	8
	Pacific Hwy (S)	N3_	D	52	22	84	C	31	28	81	F	82	46	111	D	48	26	93	F	82	46	105	D	56	31	97
	Balfour St (E)	E20	C	38	17	74	D	47	24	78	D	53	17	70	C	42	12	65	F	90	41	89	C	41	13	59
	Pacific Hwy (N)	_W18_	F	96	5	7	F	99	4	8	D	51	2	8	E	58	2	8	D	52	5	8	D	45	4	8
Pacific Hwy / Tyron Pl.	Pacific Hwy (S)	_N1_	B	16	5	56	A	13	4	18	B	25	13	61	A	6	2	14	C	34	16	83	A	42	4	25
	Tyron Pl	W2	F	105	1	7	F	74	3	12	F	417	12	21	D	49	1	8	F	152	0	2	C	42	1	8
	Pacific Hwy (N)	S27_	C	32	8	59	C	31	7	59	C	35	5	44	C	36	5	40	D	53	17	55	C	39	9	52
Pacific Hwy / Beaconsfield Prd	Pacific Hwy (s)	N4_					C	35	5	39					C	32	5	36					C	35	7	37
	Pacific Hwy (N)	S2__					A	8	2	15					B	16	4	18					A	12	2	13
	Beaconsfield Parade	N12	E	67	4	16	C	35	3	16	F	173	4	13	B	28	2	9	F	208	16	48	C	32	3	16
Pacific Hwy / Strickland Ave	Pacific Hwy (s)	W31_	B	20	1	14	B	22	1	17	C	31	8	56	C	30	6	43	B	24	3	22	B	26	3	32
	Strickland Ave	W5_	D	56	2	17	E	61	4	19	D	47	4	17	F	71	7	17	D	44	2	13	C	40	2	13
	Pacific Hwy (N)	S4_	A	9	0	0	B	27	5	50	B	27	0	1	A	13	0	1	C	42	0	1	D	43	12	56
Pacific Hwy / Grosvenor Rd / Burleigh St	Grosvenor Rd	E22	F	503	33	44	F	185	14	45	F	484	33	44	F	380	31	52	F	131	12	38	F	77	7	26
	Pacific Hwy (s)	W30_	E	69	6	41	F	71	7	39	F	71	9	55	E	67	6	36	F	74	9	54	F	88	13	114
	Burghleigh St	__E32_	F	359	3	12	F	623	9	23	A	0	5	10	A	0	13	29	F	1172	14	22	F	147	1	4
	Pacific Hwy (N)	_S1	C	30	25	111	C	38	31	97	A	12	8	33	A	6	3	24	A	10	10	52	A	6	3	20
Lindfield Ave / Balfour St / Havilah Rd	Balfour St	E26__	A	8	0	1	A	8	0	2	A	8	0	2	A	8	0	2	A	9	0	7	A	8	0	2
	Lindfield Ave (S)	_N15_	A	14	0	5	A	14	0	6	B	17	1	11	B	17	1	9	B	19	8	20	B	17	3	15
	Lindfield Ave (S) Slip lane	_N15_2	C	39	1	4	C	29	0	4	B	16	0	4	A	12	0	3	F	137	3	4	F	72	2	4
	Havilah RD	W13	C	31	0	1	D	52	0	8	B	16	0	3	B	16	0	3	A	14	0	3	B	23	0	6
	Lindfield Ave (N)	S26	D	43	5	21	C	30	3	18	B	19	0	6	B	18	0	4	C	30	2	16	E	59	6	22
Lindfield Ave / Tryon Rd	Lindfield Ave (S)	N11_	B	26	1	7	C	34	2	12	B	20	1	12	B	21	2	10	D	44	6	17	C	29	4	14
	Tryon Rd	W10_	E	65	4	19	D	43	2	11	C	40	2	8	C	39	2	9	F	133	11	28	D	45	2	11
	Lindfield Ave (N)	_S14_2	B	28	3	13	B	25	3	15	B	23	2	11	B	24	2	15	C	30	4	13	D	49	5	15

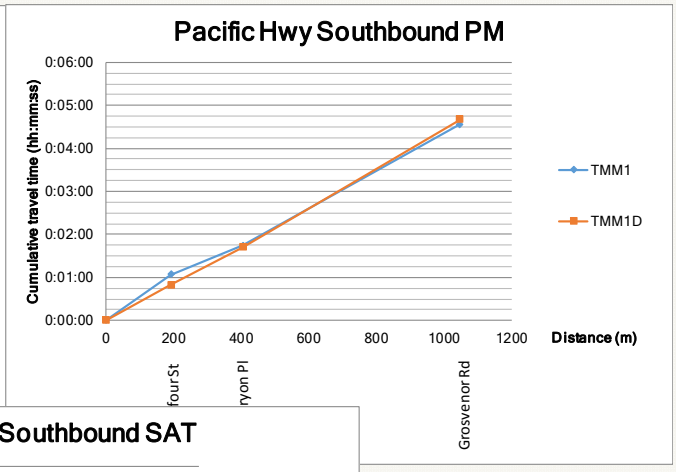
6.8 Travel Times Analysis – Pacific Highway Northbound

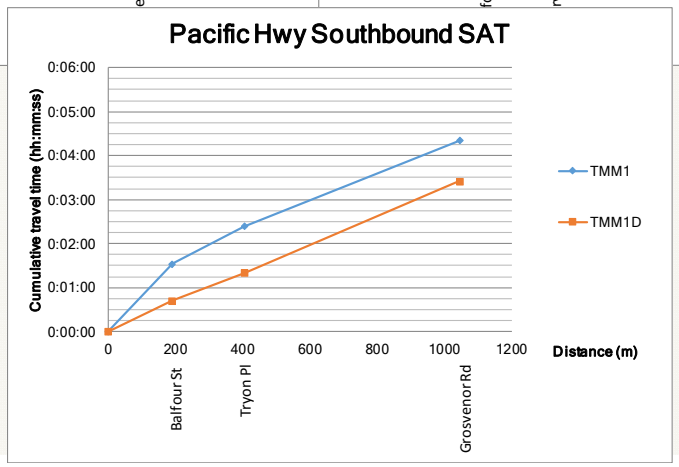




6.9 Travel Times Analysis – Pacific Highway Southbound







peopletrans

Conclusions & Recommendations

7. Key Conclusions & Recommendations

- Thorough Traffic Modelling Exercise Undertaken.
- Preferred Lindfield Traffic Management Plan (TMM1D) provides best balance between minimising road delays both locally and on the Pacific Highway but still providing adequate access for Council's development sites and supporting the wider land uses for the Lindfield Town Centre.
- Would like formal response/in principle acceptance from RMS to KMC of Lindfield scheme pre Xmas 2015, if possible.
- Final Report/s & Models provided to RMS 27/11/15.

8. Supporting Reports

8.1. Key Supporting Reports (Provided on USB)

- Lindfield Base Model Development Report - 14/12/13
- Lindfield Base Model Audit Report - 16/02/14
- Lindfield Pedestrian Bridge Feasibility Study - 13/08/14
- **Lindfield Local Centre – Transport Network Model Study Main Report -** 15/12/14
- Lindfield Village Green Transport Review - 20/05/15
- Lindfield Community Hub Transport Review (Includes Modelling Technical Note) - 03/09/15

Questions/Discussion?

Appendix E

Lindfield Traffic Management Plan TMM1D & TMM1

NEW ACCESS FROM MILRAY STREET TO VILLAGE GREEN SITE

IMPROVE PEDESTRIAN ACCESSIBILITY AT INTERSECTION

IMPROVE PEDESTRIAN ACCESSIBILITY AT INTERSECTION

LINDFIELD AVENUE/TRYON ROAD INTERSECTION: TRAFFIC SIGNALS TO REPLACE BOTH EXISTING PRIORITY JUNCTION AND PEDESTRIAN SIGNALS AT STATION ENTRANCE

TRYON PLACE PRECINCT: EXTENSION OF TRYON PLACE SOUTHWARD TO NEW CONNECTING ROAD

SHARED ZONE / 'KISS & RIDE'

LEFT TURN BAY EXTENSIONS

ROAD CLOSURE WITH ACCESS FOR PEDESTRIANS AND CYCLISTS

RAIL STATION

HAVILAH LANE WIDENED TO ALLOW TWO WAY ACCESS

PACIFIC HIGHWAY/STRICKLAND AVE INTERSECTION: NEW TRAFFIC SIGNALS

PACIFIC HIGHWAY/GROSVENOR ROAD INTERSECTION: CAPACITY IMPROVEMENT

GROSVENOR ROAD WIDENING:
WIDEN ON SOUTH SIDE.
MAINTAIN PARKING ON NORTH SIDE.

POTENTIAL PEDESTRIAN THOROUGHFARE

BENT STREET CLOSED

CONVERT TO ONE WAY

TRAFFIC SIGNAL PHASING/TIMING AMENDMENTS.
PLUS BANNED RIGHT TURN
FROM BALFOUR STREET
EAST TO PACIFIC HIGHWAY

POTENTIAL WIDENING OF BENT LANE

REALIGN WOODFORD LANE FOR EASE OF ACCESS TO RETAIL

LEFT TURN BAY EXTENDED

BEACONSFIELD PARADE TO BENT STREET: LOCAL ROAD CONNECTION BETWEEN BEACONSFIELD PARADE AND BENT STREET

NEW TRAFFIC SIGNALS TO FACILITATE SAFER CROSSING OF PACIFIC HIGHWAY AND 'KISS & RIDE" FACILITY AND TO FACILITATE ACCESS TO NEW DEVELOPMENT SITE, PARTICULARLY TO AND FROM THE SOUTH.

GROSVENOR ROAD WIDENING:
WIDEN ON BOTH SIDES.
CREATE 3 LANE APPROACH OVER 66m

COLES SITE

COUNCIL DEVELOPMENT SITES

COLES DEVELOPMENT SITE

'KISS & RIDE' PARKING

SATURDAY PEAK PARKING RESTRICTIONS

PHASES

A

E

B

E2

D

PROPOSED SIGNAL PHASING:
PACIFIC HIGHWAY/TRYON LANE/BEACONSFIELD PDE

1.

2.

No.	BY	DATE	DESCRIPTION	APPD.
TMM1D	B.L.	27/01/16	REVISED TO INCLUDE GROSVENOR ROAD DESIGN	A.S.
TMM1D	A.S.	23/12/15	REVISED FOLLOWING MODELLING OF SJB FINAL LAND USE OPTION 2	A.S.
REV. 1	A.S.	19/09/14	REVISED FOLLOWING MODELLING OF COLES - BALFOUR ST REDEVELOPMENT SITE	A.S.
	A.S.	17/02/14	ORIGINAL ISSUE	A.S.

A1 Original | Co-ordinate System: MGA Zone 56 | Height Datum: A.H.D.

CLIENT

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DRAWN G.W. JARRETT
DESIGNED A. STEWART
DRG CHECK A. STEWART
DESIGN CHECK
APPROVED

LINDFIELD TRANSPORT NETWORK STUDY 2014/15
DRAFT CONCEPT PLAN

TRAFFIC MANAGEMENT MEASURES 1D

OF

DRG No.

LINDFIELD AVENUE/TRYON ROAD INTERSECTION: TRAFFIC SIGNALS TO REPLACE BOTH EXISTING PRIORITY JUNCTION AND PEDESTRIAN SIGNALS AT STATION ENTRANCE

PACIFIC HIGHWAY/STRICKLAND AVE INTERSECTION: NEW TRAFFIC SIGNALS

SHARED ZONE / 'KISS & RIDE'

TRYON PLACE PRECINCT: EXTENSION OF TRYON PLACE SOUTHWARD TO NEW CONNECTING ROAD

LEFT TURN BAY EXTENSIONS

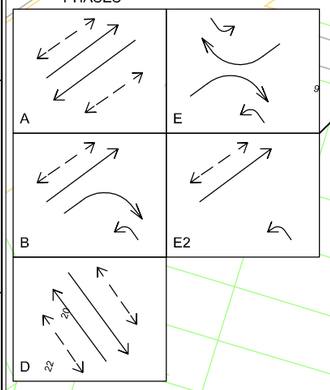
RAIL STATION

NEW TRAFFIC SIGNALS TO FACILITATE SAFER CROSSING OF PACIFIC HIGHWAY AND 'KISS & RIDE" FACILITY

EXTEND RIGHT TURN BAY BY 20m TO 55m

TRAFFIC SIGNAL PHASING/TIMING AMENDMENTS.
PLUS BANNED RIGHT TURN FROM BALFOUR STREET EAST TO PACIFIC HIGHWAY

PHASES

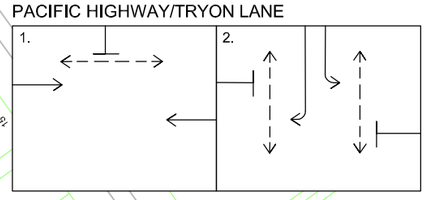


COLES SITE

LEFT TURN BAY EXTENSION

BEACONSFIELD PARADE TO BENT STREET: LOCAL ROAD CONNECTION BETWEEN BEACONSFIELD PARADE AND BENT STREET

PROPOSED SIGNAL PHASING:
PACIFIC HIGHWAY/TRYON LANE



- COUNCIL DEVELOPMENT SITES
- COLES DEVELOPMENT SITE
- 'KISS & RIDE' PARKING
- SATURDAY PEAK PARKING RESTRICTIONS

No.	BY	DATE	DESCRIPTION	APPD.
REV. 1	A.S.	19/09	REVISED FOLLOWING MODELLING OF COLES - BALFOR ST REDEVELOPMENT SITE	A.S.
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LINDFIELD TRANSPORT NETWORK STUDY 2013/14
DRAFT CONCEPT PLAN

TRAFFIC MANAGEMENT MEASURES 1

(REV. 1)

OF

DRG No.