peopletrans

Lindfield Local Centre

Transport Network Model Study

Report - 2013/14

TMA TRANSPORT MODELLERS ALLIANCE

peopletrans

DRAFT

Lindfield Local Centre

Transport Network Model Study

Report

Client: Ku-ring-gai Council
Job Number: 13S170
Issue: A-Dr2
Date: 15/12/14

Quality Record

Issue	Date	Details	Prepared By	Reviewed By	Approved By
A-Dr	8/12/14	Draft	Alan Stewart	Matthew Houlden	Alan Stewart
A-Dr 2	15/12/14	Draft Final	Alan Stewart	Matthew Houlden	Alan Stewart

Table of Contents

Appendices

Tables

Figures

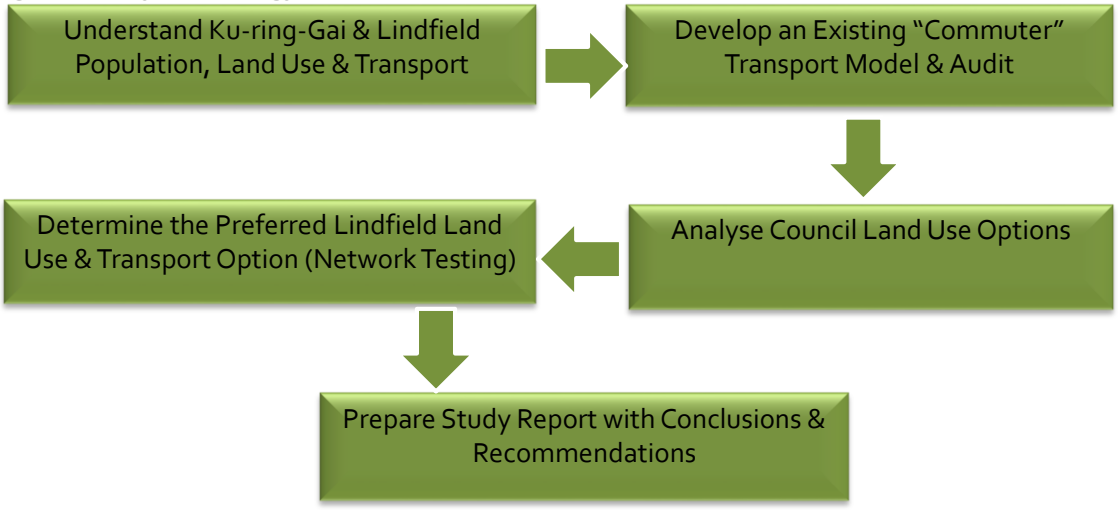
Executive Summary

PeopleTrans, in partnership with Transport Modellers Alliance (TMA) were commission by Ku-ring-gai Council in late 2013 to undertake the Lindfield Transport Network Model Study, the key objectives of which were 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 appoint an Urban Design Consultant to provide more clarity and detail around the built form for this site.
- To develop a transport solution which supports the preferred land use options for the Council owned car park sites and which also accommodates the future anticipated development of the wider Lindfield Town Centre.

PeopleTrans and TMA adopted the methodology outline in Figure 1 for the study, which importantly included the development of a transport modelling tool to assess the impacts of a number of land uses options for the Woodford lane site and surrounds.

Figure 1: Study Methodology Flow Chart



Through consultation with Roads and Maritime Services (RMS), Ku-ring-gai Council and Transport for New South Wales (TfNSW) and on the basis of numerous site observations the following key findings were identified:

- There is a clear disconnect between the east and west sides of Lindfield which is partly attributed to the barrier which the Pacific Highway creates.
- The existing land uses in Lindfield are sporadic and some equitable community benefits could be achieved if these land uses were consolidated in a central location.

[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.

- There are too many risks being taken by pedestrians illegally crossing the Pacific Highway at the signalised pedestrian crossing outside Lindfield station due to the long wait times.
- The intersections of Pacific Highway/Balfour Street and Pacific Highway/Grosvenor Road are operating either at capacity or over capacity during the AM and PM peak periods.

A number of land use options were provided by Ku-ring-gai Council and analysed by PeopleTrans and TMA utilising the functionality of the transport model to determine the existing and future road network operation of Lindfield. These land use options generated various levels of traffic demand as indicated in Table 1.

Table 1: Traffic Generation/Demand Summary – Woodford Lane Site[2]

Land Use Option	AM Traffic Generation	PM Traffic Generation	Sat Traffic Generation
A – Community Facilities, Specialty Retail and Medium Density Residential	164	147	198
B – Community Facilities, Major Retail, Specialty Retail and Medium Density Residential	324	450	519
C-As per B but also including a redeveloped Coles at Balfour Street	**580**	**804**	**1,081**
D – Community Facilities and High Density, Residential	167	144	174
E-Community Facilities, Library, Major Retail, Specialty Retail, Gymnasium, Restaurants	**532**	**861**	**1,045**

PeopleTrans and TMA analysed the road network impacts of all of the above land use Options but focussed ultimately on land use Options B, C & E in formulating traffic management proposals for Lindfield given their higher traffic demands.

Land use Option B, C & E included the development scale and mix as outlined in Table 2 to Table 4.

Table 2: Land Use Option B - Woodford Lane Car Park Site

Option Name	Proposed Land Uses	Scale/Size (Area Sqm GLFA or as stated otherwise)
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)
	TfNSW Commuter Parking	240 spaces

[2] These traffic generation numbers are absolute values and are provided for comparison purposes only. They do not take into account any discounts that might have been applied within the model.

Table 3: Land Use Option C - Woodford Lane Car Park & Balfour Street Coles Site

Option Name	Proposed Land Uses	Scale/Size (Area Sqm GLFA or as stated otherwise)
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
+ Coles Redevelopment	Major Retail - Supermarket	1,900 Net Increase)
	Specialty Retail	3,000
	High Density Residential	110 Units

Table 4: Land Use Option E - Woodford Lane Car Park Site

Option Name	Proposed Land Uses	Scale/Size (Area Sqm GLFA or as stated otherwise)
E	Community Facilities	2,820
	Major Retail - Supermarket	4,150
	Specialty Retail	2,250
	Gymnasium	1,000
	Commuter Parking	246 spaces

Traffic Management Options were developed by PeopleTrans and TMA in order to support these future increases in land use without impacting detrimentally on the operation of the Lindfield road and transport network.

Traffic Management Option 1C (TMM1C) was determined to be the best option to support land use Option C as it offers the best operational road network performance.

The key elements of TMM1C are included in Table 5.

Table 5: Traffic Management Option 1C – Key Elements

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

The cost associated with TMM1C has been estimated to be in the region of $2.5 million when design and construction contingencies are included.

The introduction of a right turn into Beaconsfield Parade from the Pacific Highway, as part of any traffic management options, has significant impacts on northbound Pacific Highway queues and delays during the PM peak period and would not likely be acceptable to RMS.

The Lindfield Community Hub Master Plan should use land use Option B as a benchmark for the Woodford Lane site which could have upward flexibility depending on whether or not Coles redevelop the Balfour Street site and depending on the outcome of further modelling.

The Lindfield Community Hub Master Plan should also consider the inclusion of a pedestrian bridge connecting the site given the fact that this type of facility at Lindfield has proven to be technically feasible.

In relation to the Lindfield Pedestrian Bridge this should be progressed further through RMS's pedestrian bridge program by preparing and submitting an RMS prioritisation/funding application given the planning and approval timeframes associated with this scale and type of infrastructure.

1. Introduction

1.1 Background

The local centre of Lindfield has been the subject of a number of studies over the past 10 years. This was primarily related to the Ku-ring-gai Local Government Area (LGA) Town Centres work which was initiated by the New South Wales (NSW) State Government's requirements to accommodate future population, housing and employment growth across metropolitan Sydney.

In recent times, Transport for New South Wales (TfNSW) have been progressing transport interchange and commuter parking upgrades across New South Wales through the Transport Access Program. This program identified Gordon and Lindfield as sites which would be allocated funding to implement these upgrades.

Of particular note to this study was a TfNSW proposal to provide a net increase of 240 commuter car parking spaces in Lindfield on a Council site in Woodford Lane. The initial discussions conducted with Ku-ring-gai Council resulted in a decision to undertake a master planning study for this site to allow Council to consolidate some of the existing community facilities and to provide a central development/community hub which would provide social and economic benefits for the Lindfield Town Centre as a whole.

PeopleTrans in partnership with Transport Modellers Alliance (TMA) were commissioned in September 2013 to assess the traffic and transport impacts of a number of master planning options for this site in conjunction with future anticipated land use development of the wider Lindfield town centre with an aim of providing a package of transport recommendations in support of these land use options.

1.2 Study Objectives

The objectives of this study, in broad terms, were as follows:

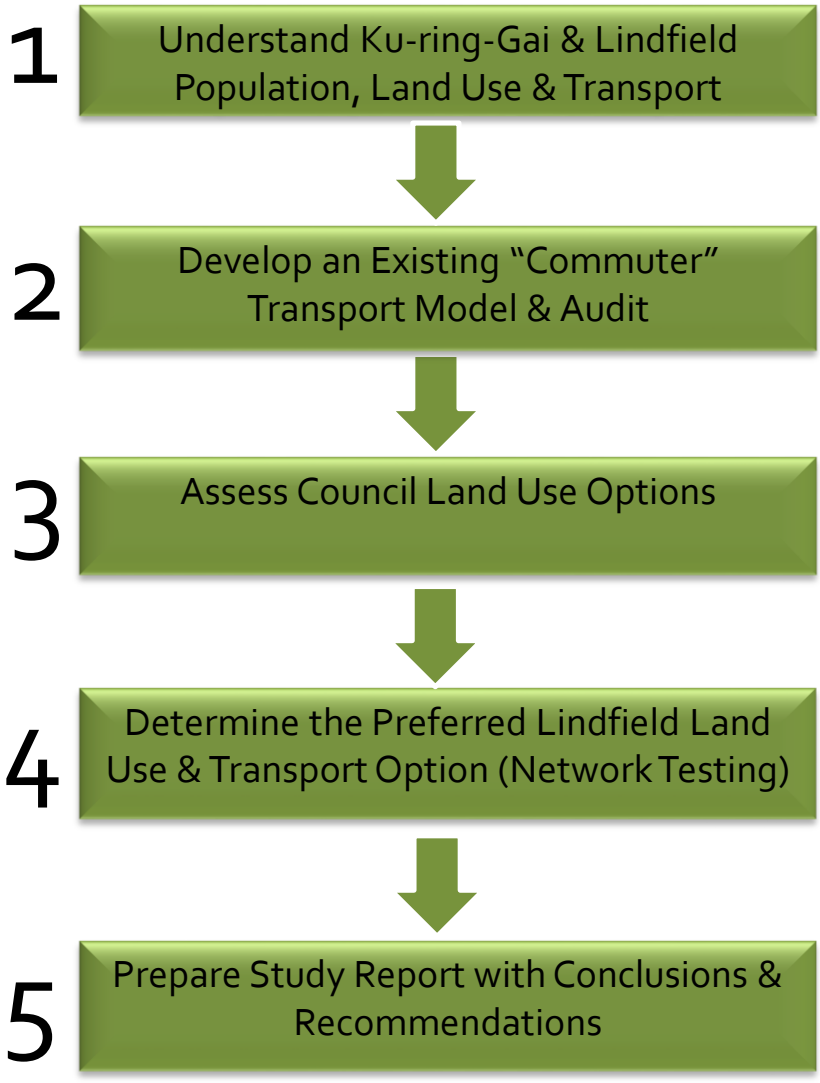
- To determine an acceptable[3] land use scale and mix for Councils key development site west of the Pacific Highway (a preferred option) such that Ku-ring-gai Council could appoint an Urban Design Consultant to provide more clarity around the built form detail.
- To determine, in traffic terms, where best to locate TfNSW's proposed commuter car parking in relation to Councils two key development sites east and west of the Pacific Highway.
- To develop a transport solution which supported the preferred development option for Council's key development sites as well as the future anticipated development of the wider Lindfield Town Centre.

[3] 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 town centre.

1.3 Study Methodology

The methodology adopted for this study is summarised in Figure 1.1 which includes five key steps, one of which importantly includes the development of a transport network model to test the various land use options provided to PeopleTrans by Ku-ring-gai Council.

Figure 1.1: Study Flowchart



This report is structured broadly in line with these five key headings.

1.4 Study Area

The study area includes the extents of the Lindfield Town Centre and is centred on the Pacific Highway from Highfield Road in the north, to Grosvenor Road in the south as indicated in Figure 1.2.

Figure 1.2: Lindfield Town Centre Study Area

1.5 Referenced Documents

The following documents were reviewed in support of this study with key information summarised in Appendix A:

- Ku-ring-gai LEP (Local Centres) 2012
- Ku-ring-gai DCP (Local Centres) 2013
- Ku-ring-gai/Lindfield Public Domain Plan 2010
- Ku-ring-gai Contributions Plan 2010
- Ku-ring-gai Town Centres Parking Management Plan 2008
- Ku-ring-gai Integrated Transport Strategy Final Report 2011
- Ku-ring-gai Councils submission to the new Sydney Metropolitan Strategy 2031
- Lindfield Town Centre Traffic Study (Arup, 2006 and 2008)
- Lindfield Town Centre Traffic Improvement Concept Plan 2008
- Ku-ring-gai Bicycle Plan 2012
- Draft Ku-ring-gai Pedestrian Access and Mobility Plan 2014
- Consultation with Roads and Maritime Services regarding the original Lindfield Town Centre Traffic Improvement Concept Plan 2008.

2. Ku-ring-gai LGA Context

In order to understand Lindfield at the local level, it was determined by PeopleTrans that there was a requirement to firstly understand the broader context of the Ku-ring-gai Local Government Area as it relates to the people who live there and some of their transport habits or characteristics. The details of this broad understanding are provided within this section of the report.

2.1 The People & their Travel Characteristics

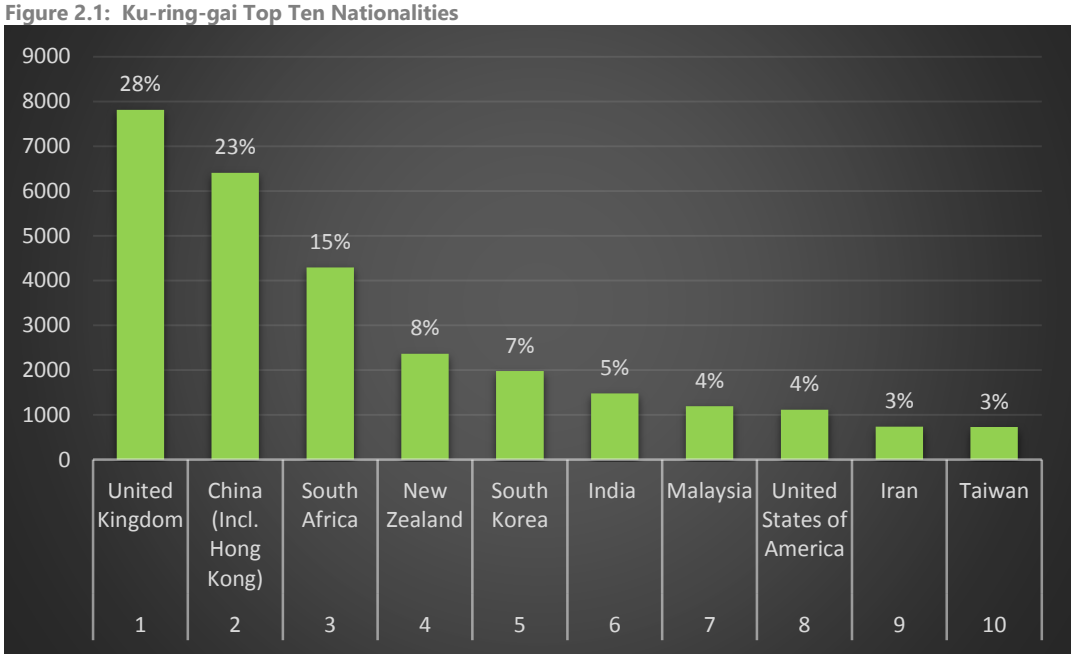
The data presented in the following graphs has been sourced for the Australian Bureau of statistics Census 2011 via http://profile.id.com.au/Ku-ring-gai.

2.1.1 Population & Nationality

In brief, the total population of the Ku-ring-gai LGA, as per Census 2011, is approximately 116,500 with the top three nationalities of people living here being born in the United Kingdom, China (Including Hong Kong) and South Africa as indicated in Figure 2.1.

Of particular note was the 80% increase in Chinese residents over the last 5 years to 2011.

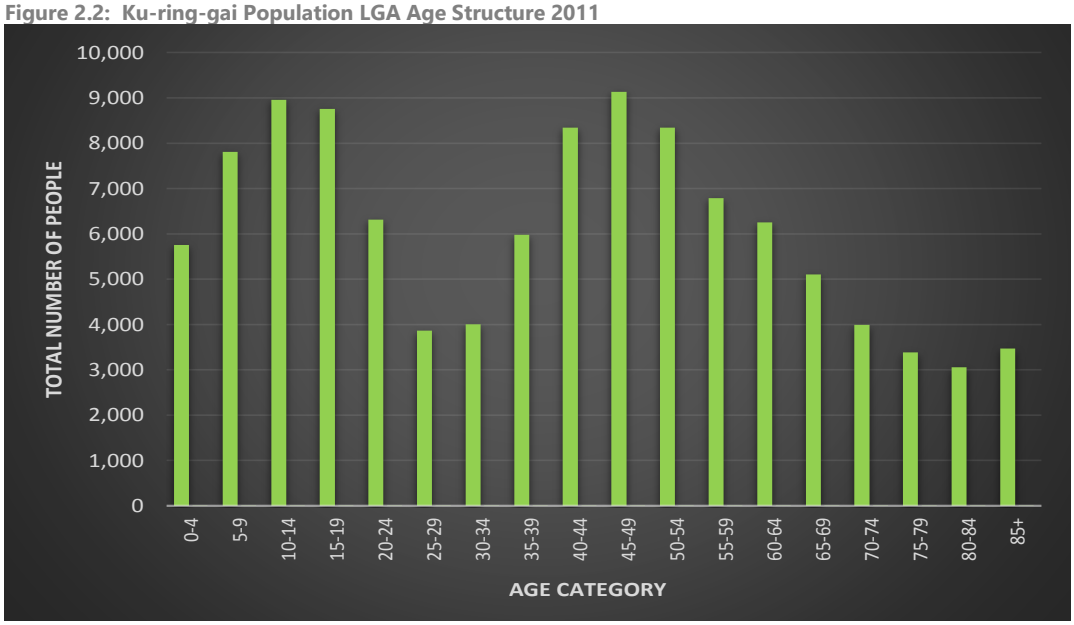
Figure 2.1: Ku-ring-gai Top Ten Nationalities



2.1.2 Age Profile

The 2011 age profile of Ku-ring-gai residents indicates a high proportion of children between the ages of 5-19 (23%) and a high proportion of adults between the ages of 40-54 (24%) as indicated in Figure 2.2 These age groups make up nearly half of the total Ku-ring-gai resident population and could be indicative of parents with children at the many schools on the North Shore and points towards a high level of school related trips being undertaken with the LGA.

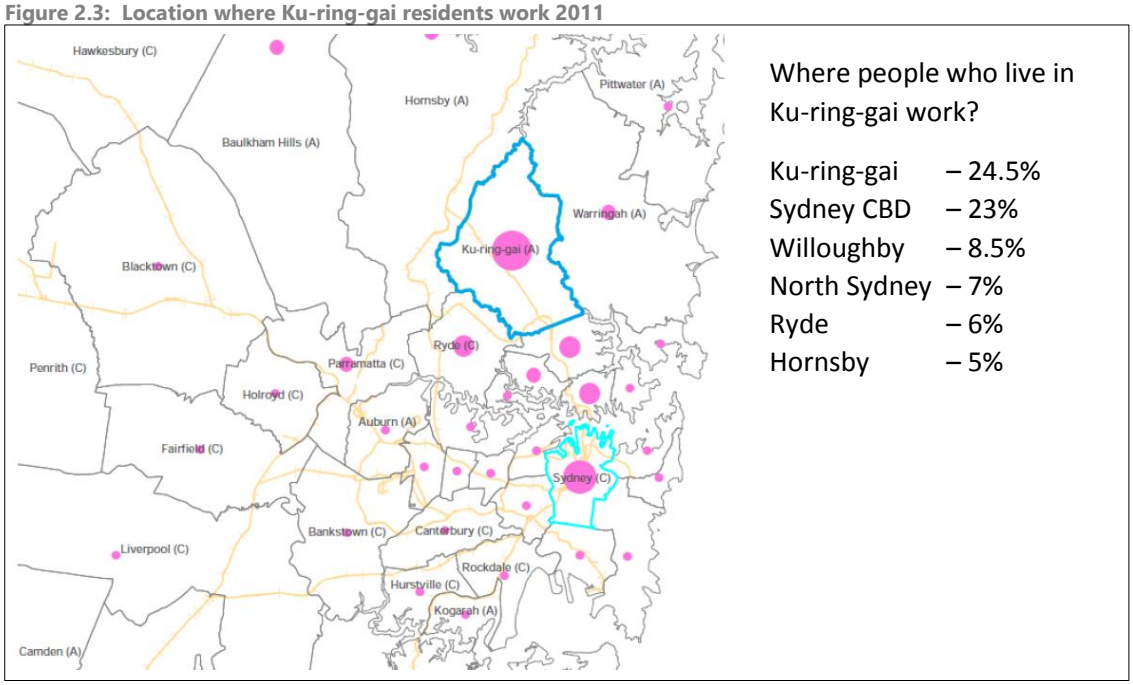
Figure 2.2: Ku-ring-gai Population LGA Age Structure 2011



2.1.3 Where Ku-ring-gai Residents Work?

There are also some 59,000 (54%) people living in Ku-ring-gai who are of a working age between 20 and 64 years old. Figure 2.3 provides an indication of where people living in Ku-ring-gai work relative to the surrounding LGAs.

Figure 2.3: Location where Ku-ring-gai residents work 2011



2.1.4 How Ku-ring-gai Residents travel to work

A comparison of the Journey to Work modes of travel for Ku-ring-gai workers between 2006 and 2011 is provided in Figure 2.4.

Figure 2.4: Ku-ring-gai LGA Journey to Work Mode Data 2006 and 2011 Census

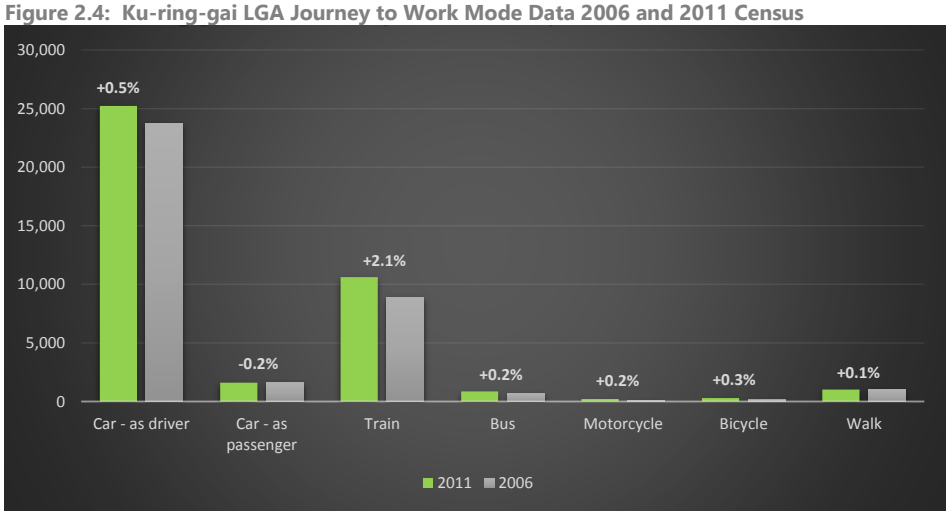
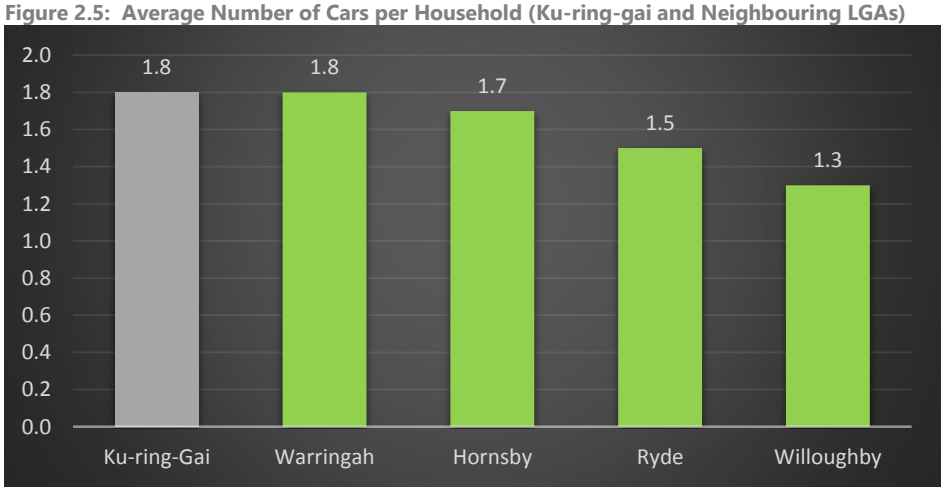


Figure 2.4 indicates positive increases in the use of more sustainable modes of travel with walking, cycling, motorcycling, buses and particularly train use increasing over the last 5-year period to 2011. Although train use increased by only just over 2% that is equivalent to an additional 1,700 people catching the train to work. This also still has to be viewed in the light of private car use which also increased by 0.5% since 2006 which is equivalent to approximately 1,500 more people driving to work.

2.1.5 Car Ownership of Ku-ring-gai Residents

More than 60% of Ku-ring-gai residents have access to 2 or more cars. The average cars per household is 1.8 as indicated in Figure 2.5 .

Figure 2.5: Average Number of Cars per Household (Ku-ring-gai and Neighbouring LGAs)



Source: Bureau of Transport Statistics, 2011/12, 5 year pooled Household Travel Survey Data Set

Figure 2.5 indicates that Ku-ring-gai has one of the highest car ownership rates in this part of Sydney.

2.1.6 The Travel Speeds of Major Roads on which Ku-ring-gai Residents Drive to Work

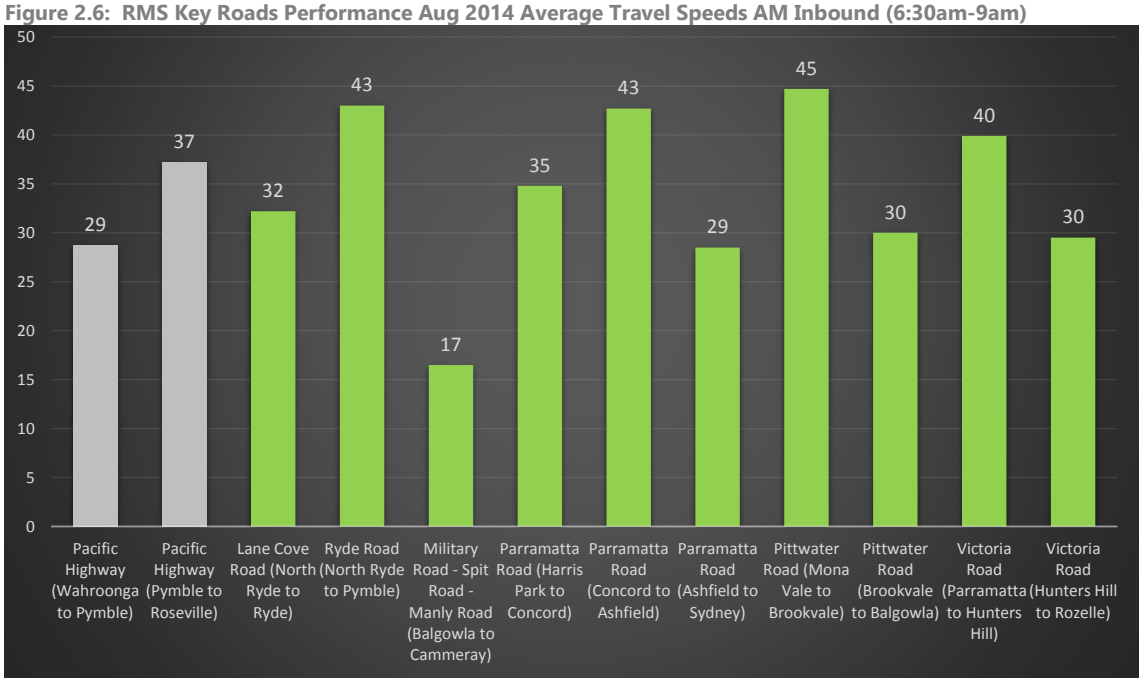
The NSW Roads and Maritime Services undertakes quarterly travel time surveys along 124 of the State's key arterial roads across Sydney, Newcastle and Wollongong and prepares "The Key Roads Performance Report" which outlines how well the road network in Greater Sydney is performing during the morning and afternoon peak periods.

Trip times for the Key Roads performance report (August 2014) were calculated using weekday traffic information from 1 June 2014 to 31 August 2014 (excluding public holidays).

Figure 2.6 provides a comparison of the average travel times of a number of congested arterial roads across Sydney relative to the Pacific Highway which passes directly through the Ku-ring-gai LGA and the local centre of Lindfield.

It is important to note that there are a number of other major arterial roads in Sydney managed by Roads and Maritime Services (RMS) operating at a poorer level of performance than the Pacific Highway through the Ku-ring-gai LGA.

Figure 2.6: RMS Key Roads Performance Aug 2014 Average Travel Speeds AM Inbound (6:30am-9am)



Source: RMS Quarterly Key Roads Performance Report 1 June 2014- 31 August 2014

2.2 Land Uses & State Government Targets

2.2.1 Density

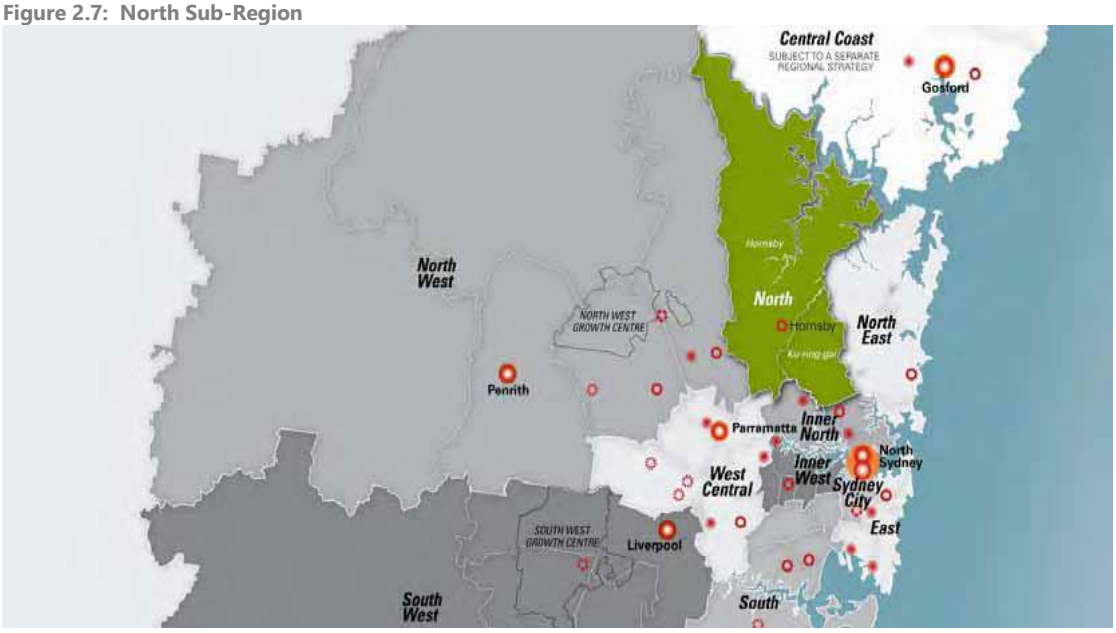
The Ku-ring-gai LGA has a land area of 8,514 hectares or 85km2 which equates to a population density of some 13.50 persons per hectare.

In order to give this some context the Sydney CBD has a population density of some 70 persons per hectare, although these figures, if compared directly, need to take into account the relative proportions of protected open space within each LGA.

2.2.2 NSW Government Land Use Targets

The currently adopted NSW Metropolitan Strategy outlines housing and employment targets for Ku-ring-gai through the North Sub-Regional Strategy. This region includes the Ku-ring-gai and Hornsby LGAs as indicated in Figure 2.7.

Figure 2.7: North Sub-Region



Source: NSW North Sub-Regional Strategy 2007

The targets set out in the North sub-regional strategy included an additional 21,000 dwellings and 13,500 additional jobs to 2031 with an allocation across the two LGAs as indicated in Table 2.1.

Table 2.1: Current North Sub-Regional Housing & Employment Targets

Category	Ku-ring-gai	Hornsby	Total
Housing	10,000	11,000	21,000
Employment	4,500	9,000	13,500

In April 2013 the NSW State Government released the new draft Metropolitan Strategy for Sydney to 2031. This strategy sets out the NSW State Government's vision for Sydney by providing a framework for housing development and job creation over the next 20 years.

The Strategy incorporates high level objectives, policies and actions to facilitate investment and growth.

Importantly, it also recommends new sub-regional areas and provides outline population, housing and employment targets for each of the new sub-regions. The Ku-ring-gai LGA is proposed with Hornsby, Manly, Pittwater and Warringah as part of the new North Sub-region with initial targets as indicated in Figure 2.8 and Table 2.2.

Figure 2.8: Proposed North Sub-Region

Table 2.2: Proposed Draft North Sub-Region Targets

Category	Current	2021 Target	2031 Target
Population	529,000	573,000 (+8%)	610,000 (+15%)
Housing	204,000	223,000 (+9%)	241,000 (+18%)
Employment	186,000	208,000 (+12%)	225,000 (+21%)

Although there is some uncertainty around what the new housing and employment targets for each of the five LGAs will be there is still certainty that additional housing and employment is required into the future and that Councils should continue to encourage and promote development and employment opportunities as they arise.

3. Understanding Local Lindfield

PeopleTrans developed a strong understanding of Lindfield at a local level through numerous site visits during varying times of the weekday and weekend in mid to late 2013 as well as undertaking an issues workshop with Transport Stakeholders, reviewing a number of Council reports and policies and undertaking extensive transport surveys throughout the entire study area.

This section of the report focusses on the following:

- The Lindfield people and their travel characteristics.
- The public transport services available to the people of Lindfield.
- The active travel options available to the people of Lindfield.

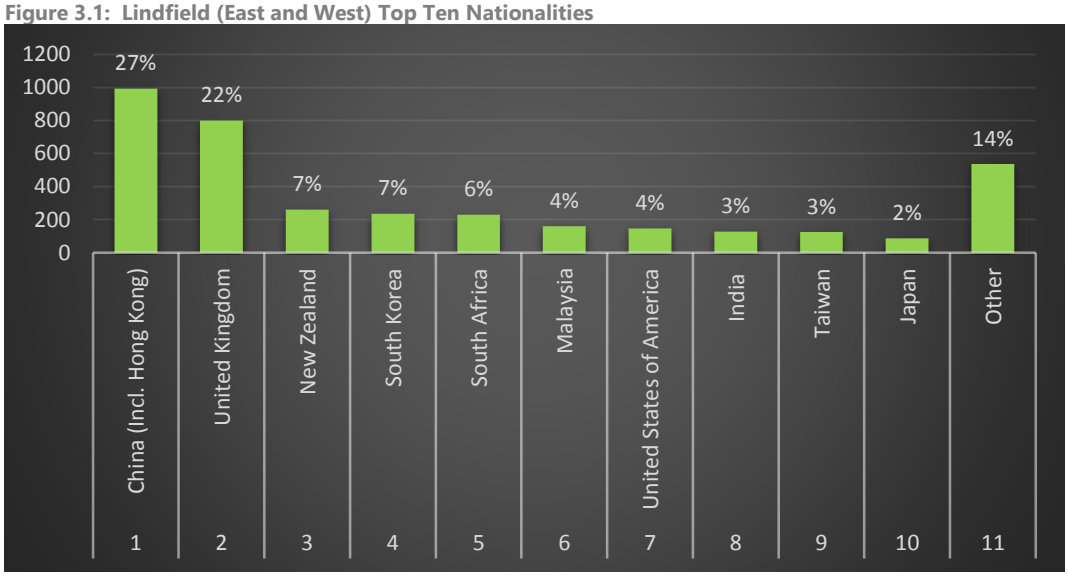
3.1 The People & their Travel Characteristics

The data presented in the following graphs has been sourced from a combination of the Australian Bureau of statistics Census 2011 via http://profile.id.com.au/Ku-ring-gai and the NSW Bureau of Transport Statistics (BTS) which operates as a Centre of Excellence within the Planning and Programs Division of Transport for NSW, providing objective and credible transport data, advice and analysis. http://visual.bts.nsw.gov.au/jtwbasic/#1711,1713

3.1.1 Population & Nationality

In brief, the total population of Lindfield (East & West), as defined in Census 2011, is approximately 12,500 with the top three nationalities of people living in Lindfield being born in China (Including Hong Kong), United Kingdom and New Zealand as indicated in Figure 3.1.

Figure 3.1: Lindfield (East and West) Top Ten Nationalities



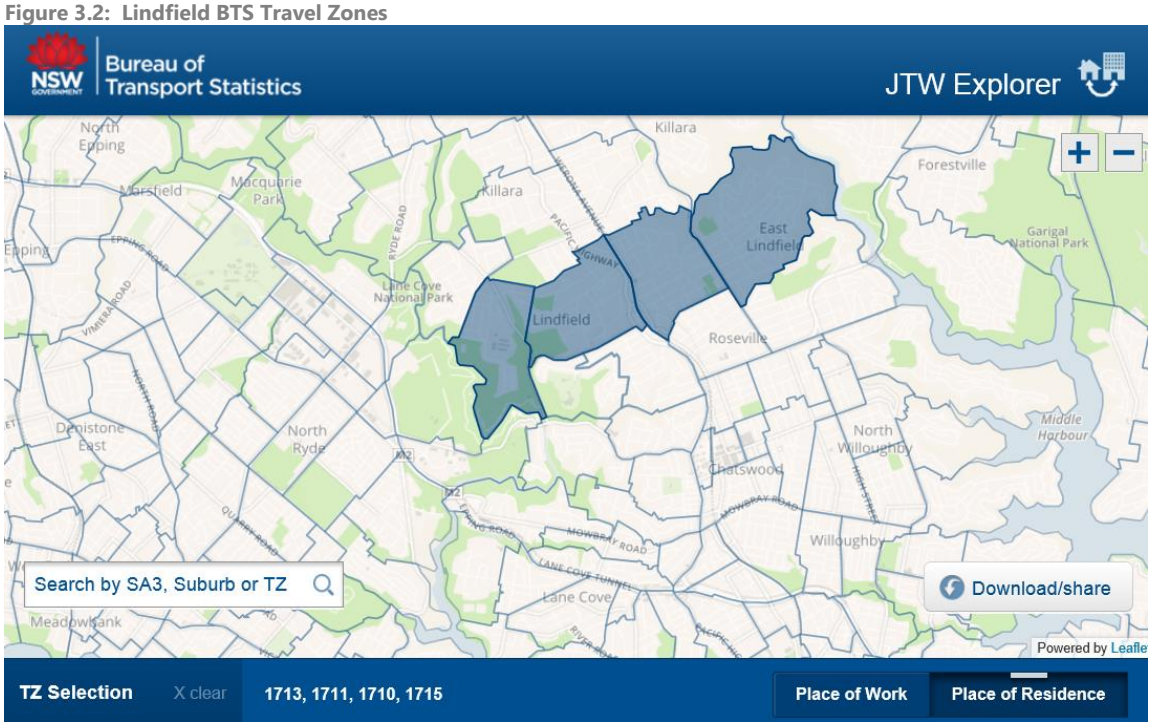
Source: Australian Bureau of statistics Census 2011

Unlike Ku-ring-gai as a whole, Lindfield has more people from China/Hong Kong than from the United Kingdom.

3.1.2 Lindfield Travel Zones

Travel Zones 1710, 1711, 1713 and 1715 have been selected as a best fit for Lindfield based on the travel zones identified by BTS as indicated in Figure 3.2.

Figure 3.2: Lindfield BTS Travel Zones



3.1.3 Where Lindfield Residents Work?

Residents within the selected travel zones place of work is outlined in Figure 3.3.

Figure 3.3: Where do Lindfield Residents Work? – 2011 – TZ1710, 1711, 1713, 1715

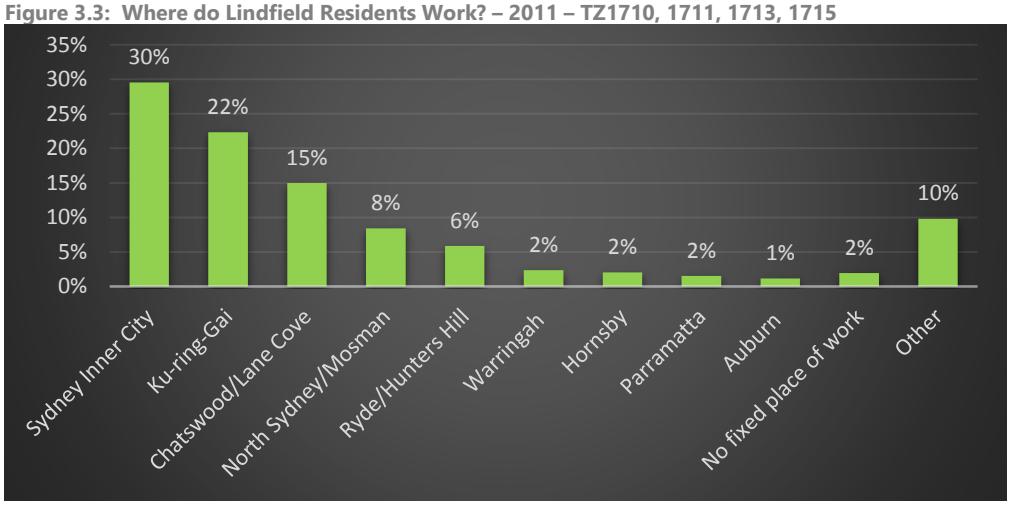


Figure 3.3 indicates that over half of the working residents of Lindfield work either in the Sydney CBD or within Ku-ring-gai itself with Chatswood and North Sydney being the next most popular employment locations.

3.1.4 Where People Working in Lindfield Live?

Where the workers of Lindfield live is outlined in Figure 3.4.

Figure 3.4: Where do Workers in Lindfield Live? – 2011 – TZ 1710, 1711, 1713, 1715

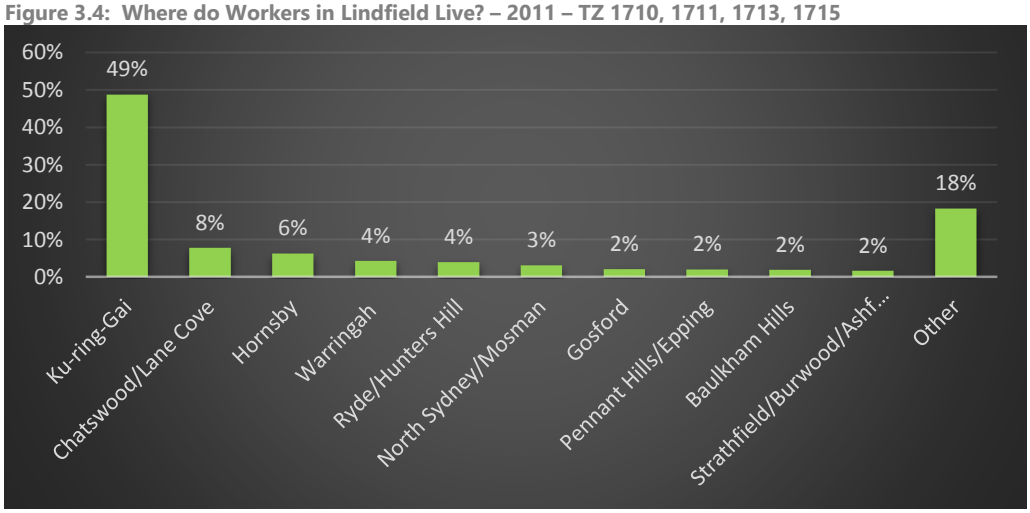
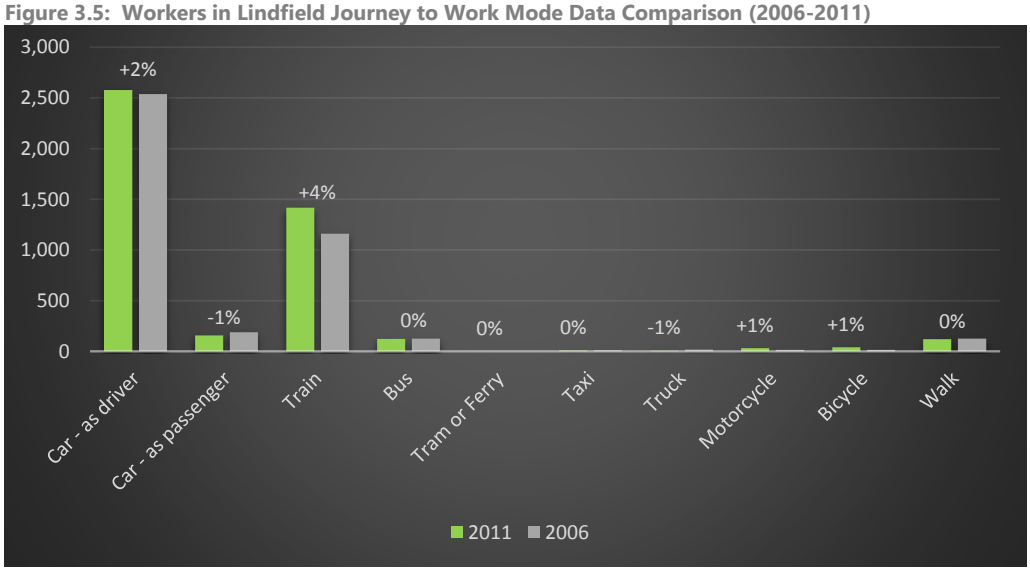


Figure 3.4 indicates that almost half of the people who work in Lindfield live within Ku-ring-gai making it a very local centre. The other half of the workers are spread across a number of surrounding Sydney LGA's apart from Gosford which is a definite outlier.

Mode of Travel to Work

A comparison of the Journey to Work modes of travel for Lindfield workers between 2006 and 2011 is provided in Figure 3.5.

Figure 3.5: Workers in Lindfield Journey to Work Mode Data Comparison (2006-2011)



Source: Australian Bureau of statistics Census 2011

Figure 3.5 indicates similar positive changes in the use of sustainable modes of transport to that of Ku-ring-gai as a whole with increases in train, motorcycle and bicycle use.

3.2 Land Use

The existing land uses within the Lindfield Town Centre are identified in Figure 3.6.

Figure 3.6: Lindfield Town Centre Existing Land Use Map

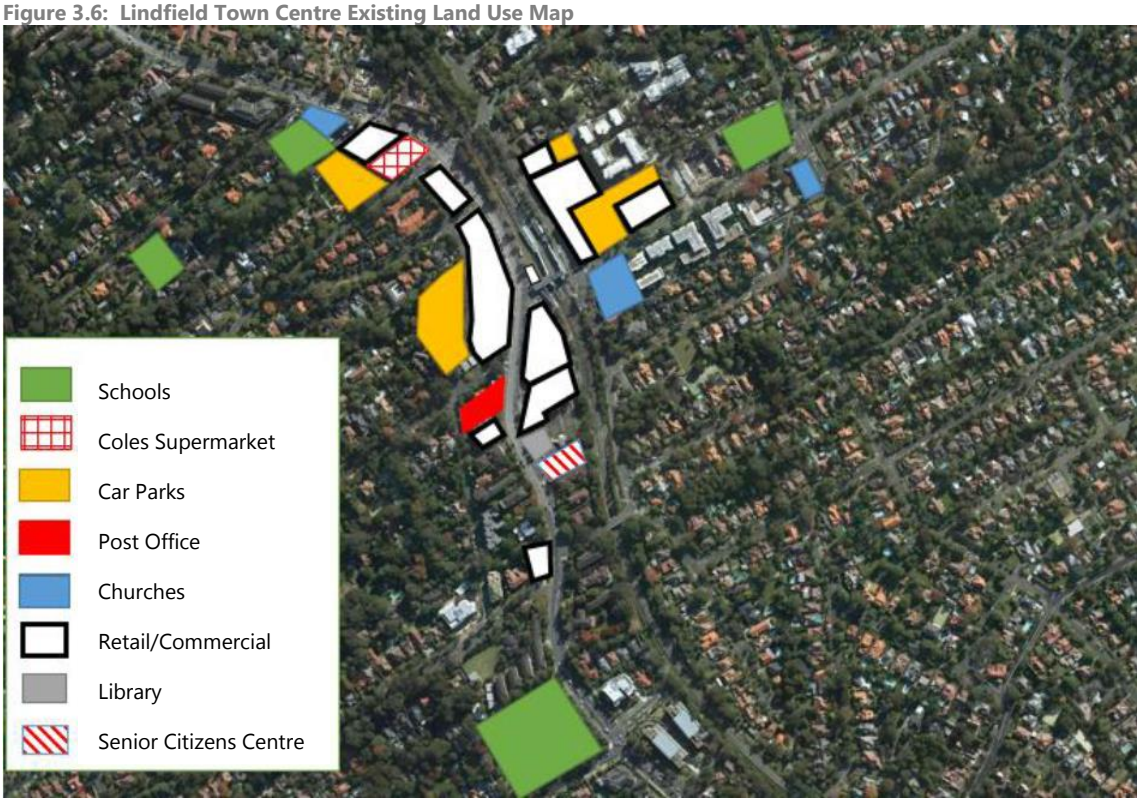


Figure 3.6 indicates relatively simply how the community facilities (library and seniors citizens centre) are at the furthest point from the major supermarket, Coles with the post office located on the western side of Pacific Highway. Consolidation of these land uses into a central community hub would allow more equitable access for all of the Lindfield community.

3.3 Public Transport

There are primarily two forms of public transport available to the Lindfield community being trains and buses.

3.3.1 Trains

Lindfield station is located on the North Shore train line providing very good access to wider parts of Sydney. During the AM & PM peak 2-hour period there can be as many as 20 train services departing Lindfield Station towards the Sydney CBD as indicated in Table 3.1. On average the trip into the Sydney CBD from Lindfield Station is approximately 25 minutes.

Table 3.1: Lindfield Rail Services

Route	Route Description	Services Departing Lindfield Station		
		Weekday AM Peak (7:00am to 9:00am)	Weekday PM Peak (4:30pm to 6:30pm)	Saturday Midday Peak (11:00am to 1:00pm)
T1	Southbound	12 Services	20 services	8 services
T1 and Limited Inter-City Services	Northbound	13 services	14 services	8 services

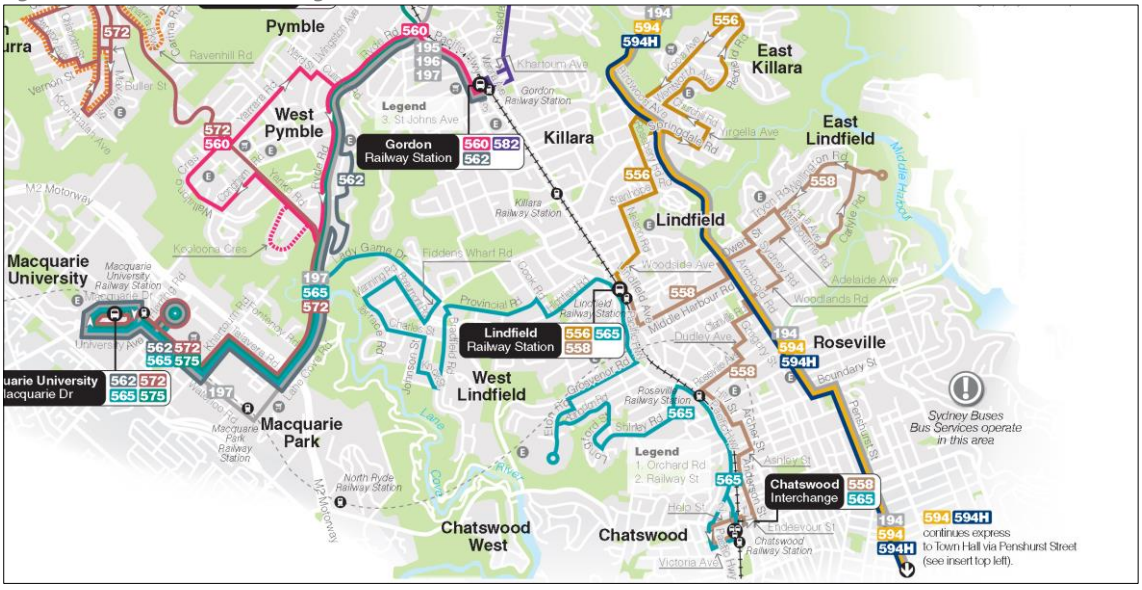
In a southbound direction, the first train departs at 4:43am on weekdays and 4:18am on Saturdays. In a northbound direction, the first train departs at 4:54am on weekdays and 5:40am on Saturdays.

3.3.2 Buses

The bus routes in Lindfield operate at a relatively local level and provide access from East Killara (Route 556), East and West Lindfield (Routes 558 & 565) to Lindfield Station and slightly further afield from Lindfield Station to Chatswood (Routes 558 & 565) and Macquarie Park (Route 565).

These bus routes are indicated graphically in Figure 3.7 with further peak hour service details provided in Table 3.2.

Figure 3.7: Bus Routes Servicing Lindfield



There are two bus stops directly outside the Lindfield Train Station on the west side and two bus stops directly outside Lindfield Train Station on the east side which have safe pedestrian access.

Table 3.2: Buses Servicing Lindfield

Route	Route Description	Services Departing Lindfield Station		
		Weekday AM Peak (7:00am to 9:00am)	Weekday PM Peak (4:30pm to 6:30pm)	Saturday Midday Peak (11:00am to 1:00pm)
556	Lindfield to East Killara to Lindfield (Loop)	3 services	3 services	3 services
558	Lindfield to Chatswood	2 services	2 services	1 service
565	Chatswood to Macquarie University via Lindfield	5 services	6 services	2 services
	Macquarie University to Chatswood via Lindfield	7 services	5 services	2 services

Source: transportnsw.info – accessed 13/5/14

In addition to the regular daytime routes, Lindfield is serviced by bus route N90, a nightrider service which runs from 12:30am to 5:00am. This bus runs from Sydney CBD (Town Hall) to Hornsby via Chatswood.

3.4 Taxis

There is one taxi rank in Lindfield which is located on the east side of Lindfield Station on Lindfield Avenue (refer Figure 3.8). This taxi rank was observed to be typically utilised by waiting taxis (a maximum of 8 taxis were observed at any one time), but appears to be used primarily as a dispatch location rather than used for pickup of passengers at Lindfield Station.

Figure 3.8: Lindfield Avenue Taxi Rank

3.5 Kiss & Ride Parking/Activity

There is informal kiss-and-ride activity taking place in Woodford Lane. This is an attractive location as it can be easily accessed to and from the north and south off the Pacific Highway. Although this location is relatively close to Lindfield Station there may be opportunities to provide additional kiss & ride parking closer to the station in the future. Other observed kiss-and-ride locations were as follows:

- Pacific Highway – northbound vehicles often stop near the pedestrian crossing, drop off their passenger(s) and then continue northbound on the Pacific Highway.

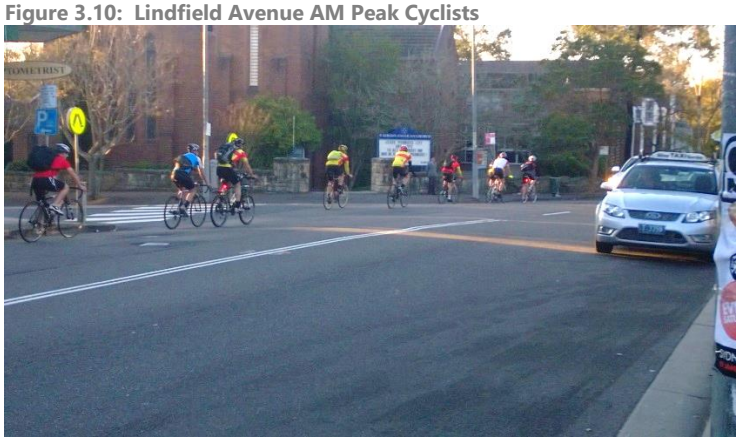
- Tryon Place –southbound vehicles on Pacific Highway often turn into Tryon Place, drop off their passenger(s) and then continue southbound on Pacific Highway.
- Lindfield Avenue/Kochia Lane – southbound vehicles often stop on Lindfield Avenue near Kochia Lane, drop off their passenger(s) and then either continue southbound on Lindfield Avenue or turn into Kochia Lane.
- Chapman Lane –westbound vehicles on Tryon Road often turn into Chapman Lane, drop off their passengers and then continue to Havilah Road.

3.6 Cyclists

Lindfield is not currently a key destination for cyclists with little evidence of parked bicycles at the train station or at other locations within the town centre. It was however identified that Lindfield Avenue plays an important role as a commuter cycling route through Lindfield as evidenced in Figure 3.9 and Figure 3.10.

Figure 3.9: Lindfield Avenue AM Peak Cyclists

Figure 3.10: Lindfield Avenue AM Peak Cyclists



One issue identified during the existing conditions assessment was the designated bicycle route linking east and west Lindfield via Balfour Street/Havilah Road which would only really cater for the more experienced cyclist due to the narrow road geometry and relatively high traffic volumes.

The existing Ku-ring-gai bicycle network is indicated in Figure 3.11.

Figure 3.11: Existing Ku-ring-gai Bicycle Network Extract

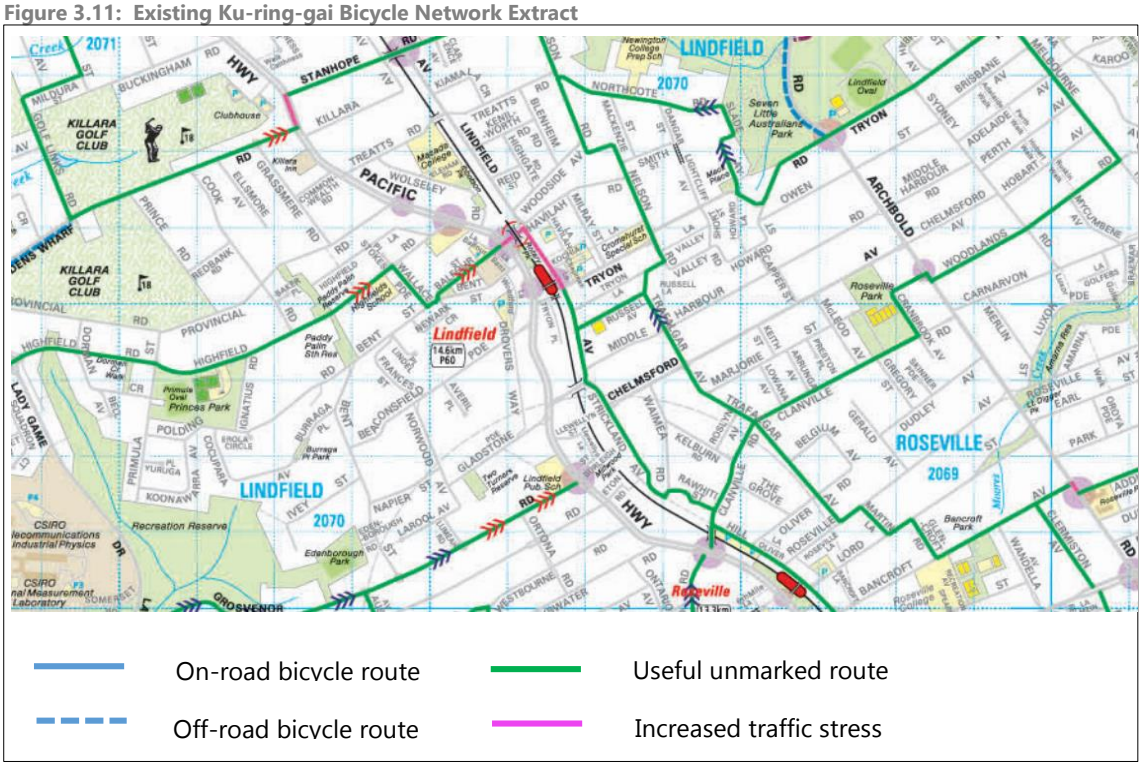


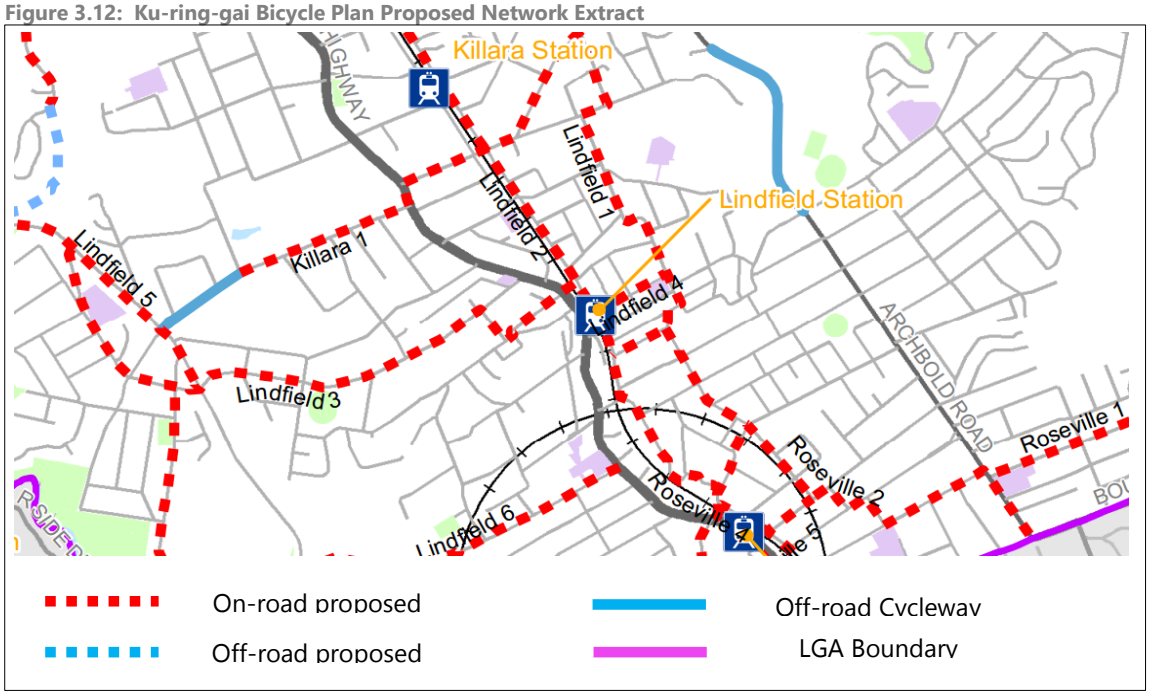
Figure 3.11 indicates a section of Lindfield Avenue between Havilah Road and Tryon Road as having "increased traffic stress".

The 2012 Ku-ring-gai bicycle plan proposes that the useful unmarked bicycle routes in Figure 3.2 be formalised with the addition of the Kochia Lane link between Lindfield Avenue and Nelson Road.

It also formally names the various cycle routes in Lindfield (refer to Figure 3.12) as follows:

- Lindfield 1/Roseville 2 – Nelson Road/Russell Avenue (between Stanhope Road - Lindfield Avenue)
- Lindfield 2/Roseville 4 - Lindfield Avenue/Strickland Avenue (between Havilah Road - Clanville Road)
- Lindfield 3 - Lindfield Avenue/Strickland Avenue (between Havilah Road - Clanville Road)
- Lindfield 4 - Kochia Lane (between Pacific Highway-Nelson Road)
- Lindfield 6 - Grosvenor Road/Austral Avenue/Eton Rd (between Lady Game Drive - Abingdon Road).

Figure 3.12: Ku-ring-gai Bicycle Plan Proposed Network Extract



3.7 Pedestrian Facilities/Movement & Safety

3.7.1 Facilities

Pedestrian footpaths are typically located on both sides of all roads within the study area.

There are three signal controlled pedestrian crossings of the Pacific Highway as follows:

- Balfour Street/Pacific Highway intersection.
- Mid-Block signalised pedestrian crossing adjacent to Lindfield Station.
- Grosvenor Road/Pacific Highway intersection.

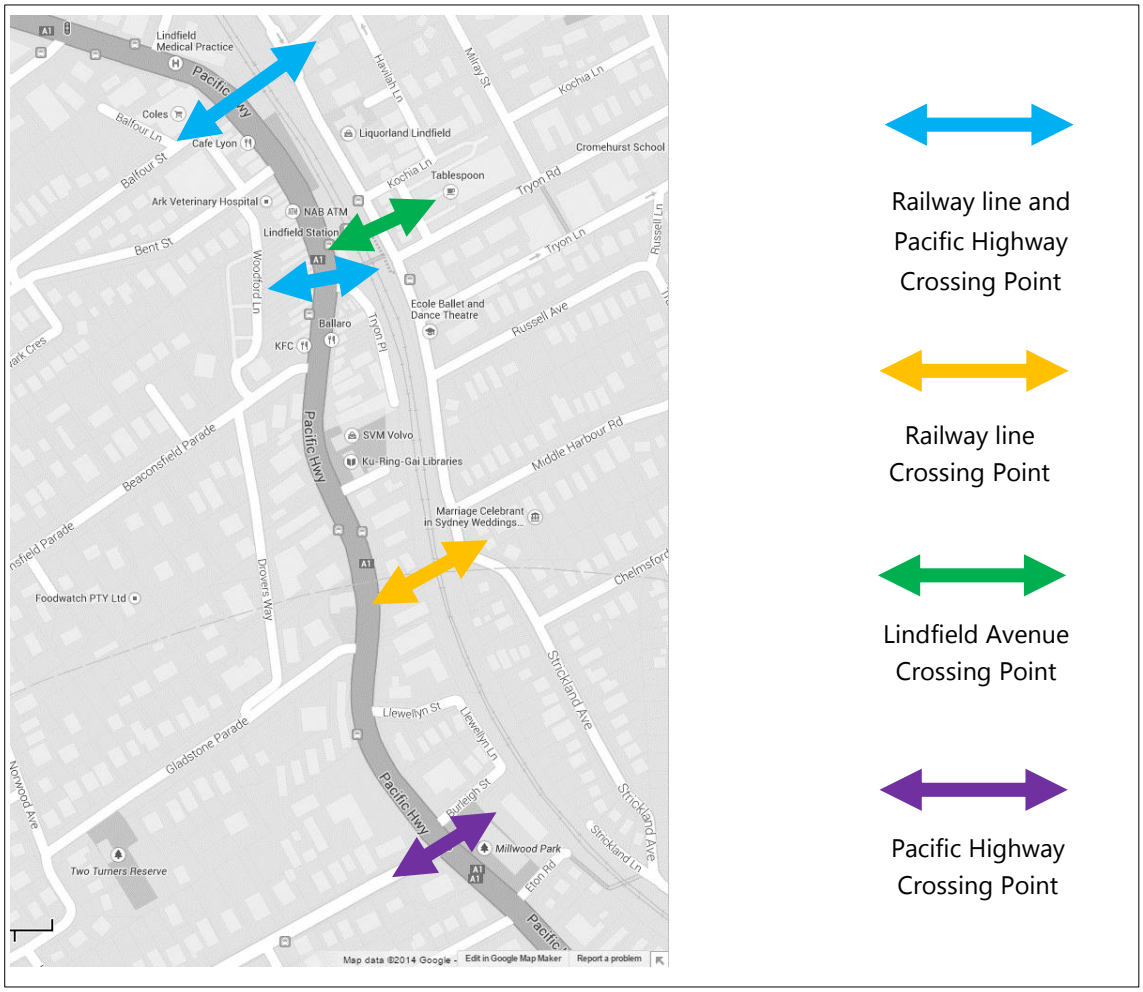
On the east side of Lindfield station a signalised pedestrian crossing is provided on Lindfield Avenue between Tryon Road and Kochia Lane.

There are three locations which provide pedestrian and vehicle access between the east and west sides of Lindfield as follows:

- Balfour Street Underpass and the intersection of Pacific Highway / Balfour Street.
- Pedestrian Bridge/Concourse across the railway line at Lindfield Station which incorporates disabled access lifts and ramps. This links with a signalised pedestrian crossing across Pacific Highway and Lindfield Avenue on each side of the station.
- Strickland Avenue Road overbridge.
- Signalised intersection of Pacific Highway / Grosvenor Road.

These locations are indicated in Figure 3.13.

Figure 3.13: Existing Study Area Pedestrian Crossing Points



3.7.2 Lindfield Pedestrian Movement (AM/PM/Saturday Peak Hours)

During the AM & PM weekday peak hours the movement of people and general pedestrian activity is defined primarily by the arrival and departure times of the trains. The mid-block signalised pedestrian crossing of the Pacific Highway directly outside the station poses a safety risk due to the long pedestrian wait time (150 second cycle times) and narrowness of the central median island where pedestrians take risks in crossing the Pacific Highway during the red pedestrian phase. This was observed to occur particularly during the PM peak period.

The Bureau of Transport Statistics provided PeopleTrans with the latest Lindfield Station barrier count data collected Thursday 15/8/2013.

A summary of the AM and PM count data is provided in Table 3.3, Figure 3.14 and Figure 3.15.

Table 3.3: Summary of AM and PM Peak Barrier Count Data 15/8/13

Peak Period	Data Value	Entries	Exits	Total
AM	Lindfield 3.5hr 06:00-09:30	2,298	529	2,827
	Lindfield 1hr 07:30-08:30	1,283	271	1,554
	AM Peak Hr % of Total	55.8%	51.2%	55.0%
PM	Lindfield 3.5hr 15:00-18:30	594	1,871	2,465
	Lindfield 1hr 15:30-16:30	202	770	972
	PM Peak Hr % of Total	34.0%	41.2%	39.4%

Table 3.3 indicates that the AM peak hour occurs between 7:30am and 8:30am. During that time, a total of 1,283 people entered Lindfield Station representing 55.8% of the AM peak period total. The PM peak hour occurred between 3:30pm and 4:30pm. During that time there were a total of 770 people exiting Lindfield Station representing 41.2% of the PM peak period total.

The analysis of the AM and PM peak period barrier counts is indicated in Figure 3.14 and Figure 3.15.

Figure 3.14: Summary of AM Peak Period Barrier Count Data

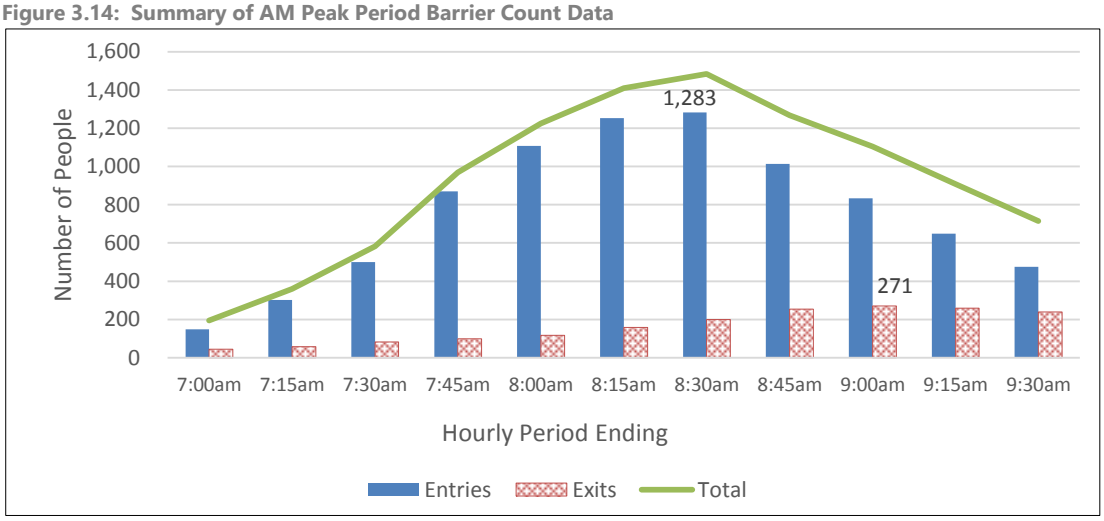


Figure 3.14 indicates that the dominant flow at Lindfield Station is inbound during the AM peak period. Inbound flows account for approximately 81% of the total movements at the station during that time.

Figure 3.15: Summary of PM Peak Period Barrier Count Data

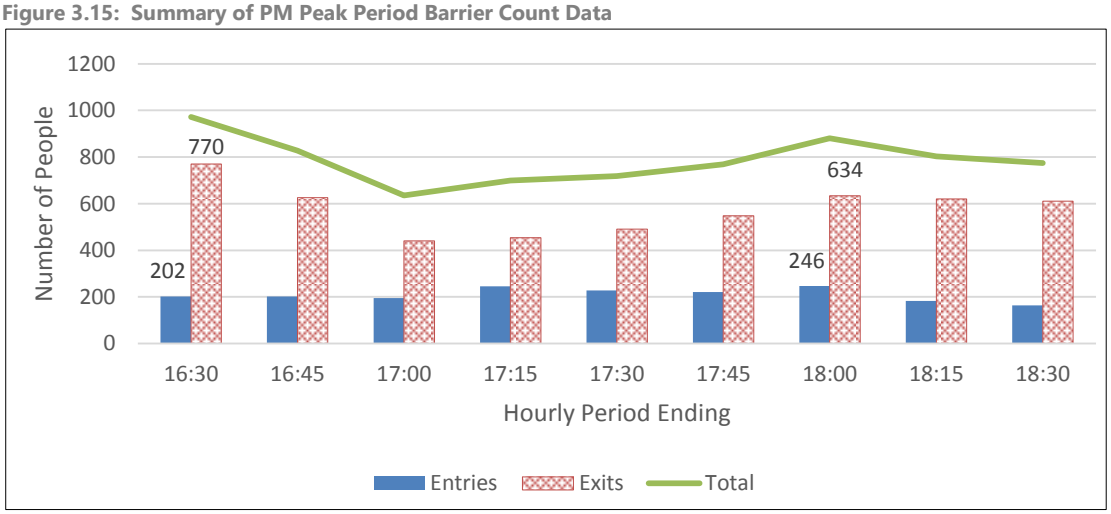


Figure 3.15 indicates that the entries and exit flows are generally evenly spread over the course of the PM peak period. During the PM peak period, exit flows account for approximately 76% of total movements at the station during that time.

PeopleTrans undertook sample pedestrian surveys at both entry/exit points of the Lindfield Train Station during the AM, PM and Saturday peak periods, the purpose of which, was to better understand the distribution of pedestrians entering and exiting the station to and from Lindfield Town Centre.

Using a combination of barrier count data, sample counts at Lindfield Station and general observations, a summary of the AM & PM peak hour pedestrian flows at Lindfield Station has been prepared as indicated in Figure 3.16.

Figure 3.16: Weekday AM/PM Peak Hour Flows

Peak Hour	People In	People Out	Total
AM	1,283	271	1,554
PM	202	770	972

Notes: Values relate to the inbound AM Peak Hour. Flows are assumed to be reversed for the outbound flows and for the PM peak hour.

3.8 Car Parking

Public car parking is provided on-street as well as in a number of off-street car parks as summarised in Table 3.4.

Table 3.4: Summary of Existing Off-Street Car Parks

Location	Restriction	Number of Spaces
Woodford Lane Car Park – Access from Beaconsfield Parade and Bent Street	Time Restricted	72
	Unrestricted	40
Tryon Road Car Park – Access from Tryon Road	Time Restricted	138
Havilah Lane Car Park – Access from Havilah Lane	Time Restricted	25
Balfour Street Car Park (Privately owned, publically available)	Mixture of Time Restricted and Unrestricted	113

Source: Ku-ring-gai Council Town Centres Parking Management Plan 2010

It should be noted that the Havilah Lane car park has recently been sold by Council and as such may not be accessible at the completion of this study.

A number of off-street parking spaces are also provided at the rear of private properties, on rooftops and in basements such as the Lindfield Executive Centre.

4. Transport Stakeholder Consultation/Issues Identification

4.1 Workshop Outcomes

A Transport stakeholder workshop was undertaken on 20 September 2013, the purpose of which, was for the stakeholders to identify any particular things that they believed were important to be considered as part of this study but also to further identify any existing land use and transport issues.

This meeting was attended by members of the Roads & Maritime Services, Transport for New South Wales and Ku-ring-gai Council.

A summary of the key issues identified as a result of this workshop are provided in Table 4.1 with minutes of the meeting contained in Appendix B of this report.

Table 4.1: Existing Issues Summary

Category	Identified Issue
Land Use	♦ Existing community facilities are spaced out across the Local Centre. ♦ There is a clear disconnect between the east and west side of Lindfield resulting from the barrier of Pacific Highway and the railway line.
Pedestrians	♦ Pedestrian crossing (safety) across Pacific Highway – potential above grade crossing (not part of initial scope). ♦ Disabled access, check draft PAMP for existing issues. ♦ Intersection of Havilah Road / Lindfield Avenue and the underpass is difficult to cross.
Bicycles	♦ No major issues at the moment but the community hub is expected to become a destination for cyclists.
Taxis	♦ No major issues identified. Taxi rank is primarily used as a lay-up before getting calls for jobs.
Train	♦ No major issues identified. New timetable coming in late October 2013
Parking	♦ 240 space commuter car park – preference to all be together but if significant constraints, they could be split. ♦ Clearways – how could any changes impact Lindfield – include consideration of other parking issues along the highway. ♦ Motorcycles and scooter parking consideration for new car park.
Kiss and Ride	♦ Informal Kiss & Ride operating in Woodford Lane. ♦ Tryon Place also used as well as the west side of Pacific Highway (small amount). ♦ Could the existing pedestrian crossing on Pacific Highway be relocated to Tryon Place?
Buses	♦ No major issues identified in the study area. ♦ Potential for bus lanes on Pacific Highway if no parking (if warranted).
Loading / Heavy Vehicles	♦ No major issues identified.
Cars and Road Network	♦ Bent Lane / Balfour Street – narrow, two way access. ♦ Consideration of Council traffic scheme and necessary input from RMS if anything changes as a result of our study. What changes would be required if scheme is implemented.

The key standout issues identified through this workshop were as follows:

- The intersection of Balfour Street/Pacific Highway is operating at capacity.
- The intersection of Grosvenor Road/Pacific Highway is operating at capacity
- There is a clear pedestrian disconnect between the east and west sides of Lindfield resulting from the barrier of Pacific Highway and the Railway Line.
- The long wait times at the mid-block signalized pedestrian crossing on the Pacific Highway on the west side of Lindfield outside the train station is causing pedestrians to take risks crossing this busy arterial road as illustrated in the video links in Figure 4.1 and Figure 4.2.

Figure 4.1: Lindfield Pacific Highway Video 1

Figure 4.2: Lindfield Pacific Highway Video 2

Video 1 is available from the link http://www.peopletrans.com.au/images/lindfield/Pacific_Hwy_Ped_X-ing_Weekday_PM_Peak_1.mp4.

Video 2 is available from the link http://www.peopletrans.com.au/images/lindfield/Pacific_Hwy_Ped_X-ing_Weekday_PM_Peak_2.mp4.

Both videos will be available on the PeopleTrans website until 30 June 2015. Videos can be provided after that date on request.

5. Existing Commuter Model Development

5.1 Transport Surveys/Commuter Model Input Data

The reliability of any traffic model outputs is solely dependent on the data which is input into the model.

In this regard, PeopleTrans & TMA took particular care in undertaking comprehensive surveys of the study area utilising the latest survey technology to ensure that a level of confidence could be placed on the input data ensuring ultimately that decisions made based on the modelling results could be relied upon.

In addition to this, TMA also sourced important traffic signal Sydney Coordinated Adaptive Traffic System (SCATS) data from RMS as input into the simulation of the traffic signals along the Pacific Highway.

The following survey datasets were obtained for the Lindfield Local Centre Transport Model Network Study:

- SCATS Intersection Diagnostic Monitoring (IDM) data for all three traffic signal locations along the Pacific Highway.
- Travel time surveys.
- Intersection/Car Parks Traffic Volumes (Including pedestrian volumes at traffic signal intersections.)
- Bus Patronage & Dwell Times.
- Pedestrian Volumes – (Pacific Highway mid-block signalised pedestrian crossing and observations throughout the study area)

5.1.1 SCATS IDM Data

RMS provided PeopleTrans with SCATS IDM data, Traffic Control System (TCS) graphics plots, traffic signal offset data and SCATS traffic count data for key traffic signals within the study area (i.e. TCS894, TCS994, TCS1184 and TCS1901) corresponding to the weekday AM, PM and Saturday traffic survey days and time periods.

This information defines the operation of the existing traffic signals and is used in the model to simulate existing traffic signal operating conditions.

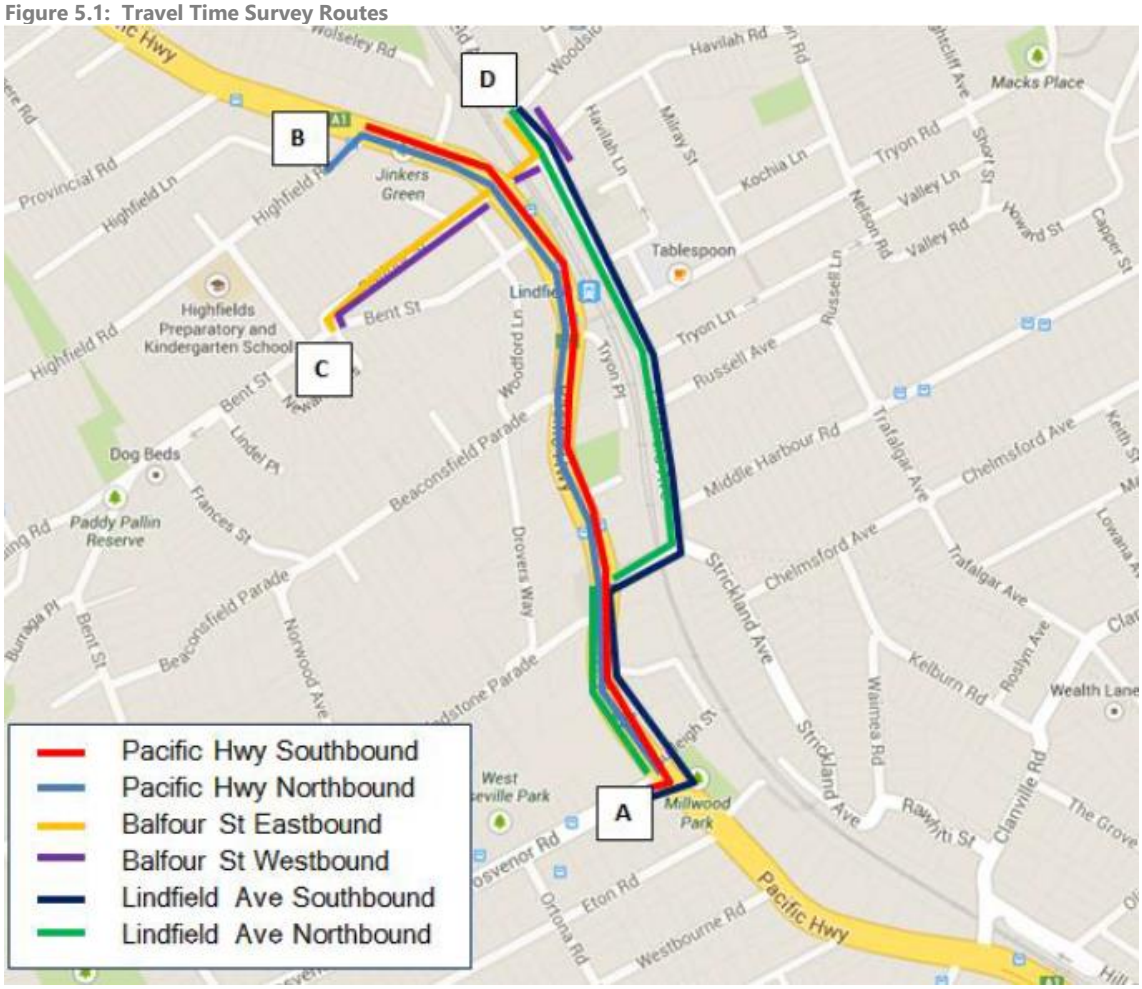
5.1.2 Travel Time Surveys

Travel time surveys were undertaken along the following 3 routes through Lindfield as indicated in Figure 5.1:

- Pacific Highway Northbound (Between Grosvenor Street and Highfield Road) A-B
- Pacific Highway Southbound (Between Highfield Road and Grosvenor Street) B-A
- Lindfield Avenue Northbound (Between Woodside Avenue & Grosvenor Street via Strickland Avenue) A-D
- Lindfield Avenue Southbound (Between Grosvenor Street and Woodside Avenue via Strickland Avenue) D-A
- Havilah Road/Balfour Road Eastbound (Between Woodside Avenue and Bent Street) C-D
- Havilah Road/Balfour Road Eastbound (Between Bent Street and Woodside Avenue) D-C

Travel times were used to validate the accuracy of the model when comparing modelled data against observed data.

Figure 5.1: Travel Time Survey Routes



5.1.3 Intersection Turning Counts & Car Park In/Out Counts

The intersection and car park traffic surveys were undertaken by Sky High utilising video technology for the following peak periods:

- Tuesday 10th September 2013, 7:00am to 9:00am and 4:30pm to 6:30pm
- Saturday 14th September 2013, 11:00am to 1:00pm.

These surveys were undertaken at 26 intersections including in and out traffic movements at key car parks throughout the Lindfield study area as indicated in Table 5.1.

Table 5.1: Summary of Intersection Counts

Location Description	Details of Movements
1. Pacific Highway and Balfour Street – four-way TCS	Full turning movements
2. Pacific Highway and Strickland Avenue – three-way priority	Full turning movements
3. Lindfield Ave and Balfour Street – channelised three-way priority	Full turning movements
4. Lindfield Ave and Havilah Road – left-in-left-out – two movements only	Turns only
5. Lindfield Avenue and Strickland Avenue – three-way priority	Full turning movements
6. Pacific Highway and Beaconsfield Parade – left-in-left-out priority (STOP)	Left turns only
7. Pacific Highway and Bent Street – left-in-left-out priority (STOP)	Left turns only
8. Pacific Highway and Highfield Road – three-way TCS	Full turning movements
9. Balfour and Bent streets and Newark Crescent (east arm) – four-way priority	Full turning movements
10. Beaconsfield Parade and Drovers Way (Woodford Lane) – four-way priority	Turns only
11. Bent Street and Woodford Lane – three-way priority	Turns only
12. Balfour Street and Balfour Lane – three-way priority	Turns only
13. Lindfield Avenue and Tryon Road – three-way priority	Full turning movements
14. Lindfield Avenue and Russell Avenue – three-way priority	Turns only
15. Lindfield Avenue and Middle Harbour Road – three-way priority	Turns only
16. Tryon Road and Nelson Road – staggered four-way priority	Full turning movements
17. Tryon Road and Milray Street – three-way priority	Full turning movements
18. Pacific Highway and Gladstone Parade – three-way priority (right turns are banned with buses permitted to make the right turn from Highway to Gladstone)	Turns only - two left turns and buses turning in
19. Pacific Highway and Grosvenor Road and Burleigh Street – staggered four-way intersection	Full turning movements
20. Havilah Road and Milray Street – three-way priority	Full turning movements
21. Bent Street and Bent Lane - three-way priority	Turns only
22. Pacific Highway mid-block pedestrian crossing at Lindfield Station	Two way pedestrian movements
A. Public car park west of Balfour Lane – also denoted as a Coles Car Park – this is a three way priority access	Turns only
B. Havilah Lane at Havilah Road – three-way priority but Havilah Lane is one-way so there are four movements here	Left out and right out only
C. Lindfield Avenue and Kochia Lane – one-way eastbound – collect turning movements into the lane (i.e. left turn from Lindfield Avenue and right turn form Lindfield Avenue)	Left out and right out only
D. Chapman Lane and Tryon Road– three-way priority	Turns only

The surveys of key intersections along Pacific Highway were classified to include light vehicles, trucks, buses and pedestrians.

Bicycle volumes were also recorded through a review of the videos taken at each intersection and this volume information was also input into the transport model.

Figure 5.2 has been prepared to provide a high level summary of the traffic volumes through Lindfield on the key traffic routes of the Pacific Highway and Lindfield Avenue during the AM, PM and Saturday peak periods.

Figure 5.2: Pacific Highway & Lindfield Avenue Peak Hour Traffic Flows

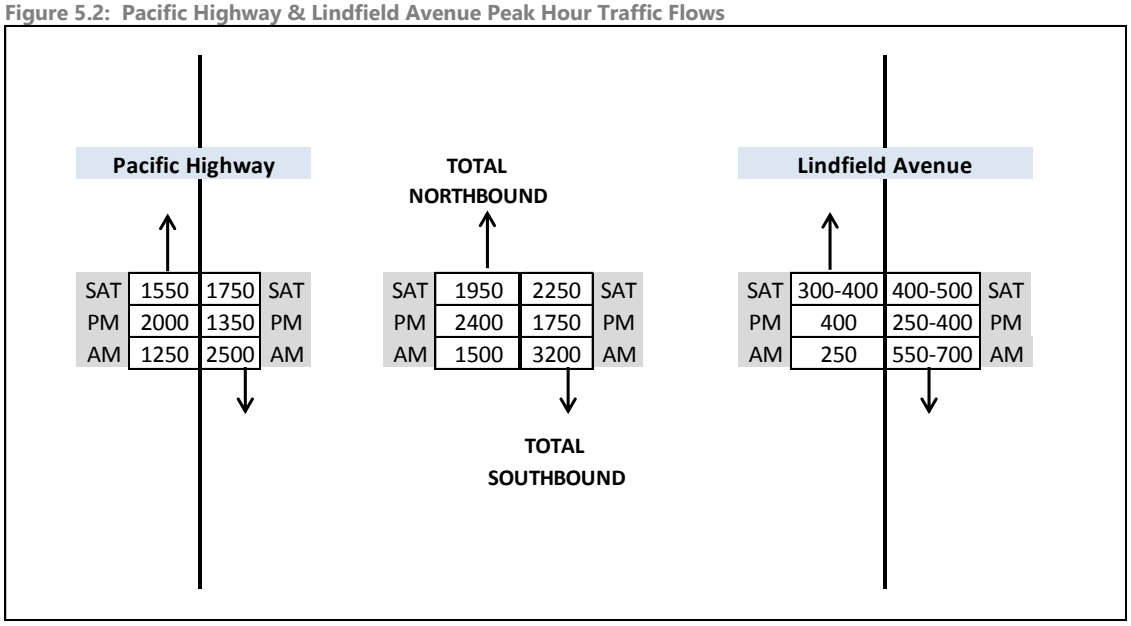


Figure 5.2 indicates distinct tidal flows through Lindfield during the AM & PM peak period on both the Pacific Highway and Lindfield Avenue. When analysed together there is significantly more southbound traffic travelling through Lindfield during the AM peak hour than there is northbound traffic in the PM peak hour. This is a typical trend in Sydney where drivers tend to be in less of hurry in the evenings when returning from work where the peak period is more spread as opposed to when they are travelling to work in the morning where traffic is very intensely focused over a short number of hours.

Further details of these surveys for the AM, PM and Saturday peak hours are contained in Appendix C of this report.

5.1.4 Bus Patronage & Dwell Time Surveys

Bus stop dwell times and patronage surveys were undertaken at the key bus stops on the western side (Pacific Highway) and eastern side (Lindfield Avenue) of Lindfield Railway Station in order to determine average bus dwell times for the model. Bus timetables were also obtained and input into the model. The bus patronage surveys indicated relatively low bus use at the bus stops outside Lindfield Station.

5.1.5 Pedestrian Movement Surveys

Pedestrian surveys at key intersections along the Pacific Highway were supplemented with focussed pedestrian surveys undertaken at Lindfield Station and at both nearby pedestrian crossings during the weekday and Saturday peak periods. During the surveys, the following was recorded:

- Volume of pedestrians.
- Sample origin and destination information along with volumes to shopping areas, car parks and along Pacific Highway.
- Locations where pedestrians crossed at signalised intersections.
- Locations where pedestrians crossed study area roads informally.
- The operation of the pedestrian zebra crossing at the intersection of Lindfield Avenue and Tryon Road.

The information was input, where possible, into the Commuter model so that it could reflect the observed pedestrian behaviour.

5.2 The Lindfield Base Transport Model

Commuter was selected as the most suitable transport modelling platform for Lindfield as it has the ability to specifically model the movement of people throughout the network for all modes of transport.

Transport Modellers Alliance (TMA), a joint partner on this project, prepared the base transport models for Lindfield which formed the basis for assessing the impacts of various land use proposals provided to the study team by Ku-ring-gai Council.

The models were developed utilising industry standards with the calibration and validation undertaken against set criteria stipulated in the *"RMS Traffic Modelling Guidelines, February 2103".*

The time periods of the models, coincided with the peak periods of traffic flow on the Pacific Highway which were established from the SCATS 24-Hour count data provided by RMS as indicated in Table 5.2.

Table 5.2: Lindfield Modelled Time Periods

Time Period	AM	PM	Saturday
Warm Up	06:45-07:00	16:15-16:30	10:45-11:30
Calibration	07:00-08:00	16:30-18:30	11:30-13:30

In summary the model included 70 areas, 44 transition zones and 52 parking zones as indicated in Figure 5.3.

Figure 5.3: Lindfield Transport Model Zones

The video link below demonstrates the extents and operation of the existing Lindfield Commuter Model during part of the AM peak period.

Figure 5.4: Lindfield Pacific Highway Commuter Video AM Base Model

The video of the AM base model is available from the link http://www.peopletrans.com.au/images/lindfield/Lindfield-AM-Base-Model.wmv.

The video will be available on the PeopleTrans website until 30 June 2015. Videos can be provided after that date on request.

Further details of the existing AM, PM and Saturday Lindfield commuter model/s development process are contained in a separate report titled *"Lindfield Local Centre Base Model Development Report, December 2013".*

5.3 Commuter Model Independent Audit

Azalient provided ongoing support to TMA during the development of the existing AM, PM and Saturday Lindfield Transport Models. These models were also independently audited by aDanner consulting as per the requirement stipulated in the RMS's Traffic Modelling Guidelines.

The objective of the audit was to check and verify the Lindfield Town Centre base models (AM, PM and Saturday shopping peaks) and assess if these models:

- Attained general standards for model calibration / validation and
- Could be used as a platform to achieve the client requirements for the intended model purpose.

The audit checked the following major aspects of the Lindfield Commuter simulation models:

- Model Inputs
- Repeatability of Results
- Model Outputs
- Model Operation

The outcome of the model audit was that there were no significant issues to warrant this model not being used for testing future Lindfield land use options. Details of this are included in a separate report titled "*Audit Report: Lindfield Town Centre Model, V1, 16th February 2014".*

Further to this, both the model development report together with the actual base models and the model audit report were provided to RMS for their review and in-principle approval. In-principle approval was provided by RMS in late February 2014.

6. Lindfield Existing Road Network Operation

6.1 Introduction

The operation of the key intersections within the study area have been assessed using the Commuter Base models for the AM, PM and Saturday peak periods.

The commonly used measure of intersection performance, as defined by RMS, is vehicle delay. COMMUTER determines the average delay that vehicles encounter and provides a measure of the level of service.

Table 6.1 shows the criteria that COMMUTER adopts in assessing the level of service.

Table 6.1: RMS Level of Service Criteria

Level of Service (LOS)	Average Delay per vehicle (secs/veh)	Traffic Signals, Roundabout	Give Way & Stop Sign
A	0 to 14	Good operation	Good operation
B	15 to 28	Good with acceptable delays and spare capacity	Acceptable delays and spare capacity
C	29 to 42	Satisfactory	Satisfactory, but accident study required
D	43 to 56	Near capacity	Near capacity, accident study required
E	57 to 70	At capacity, at signals incidents will cause excessive delays	At capacity, requires other control mode
F	Greater than 70	Extra capacity required	Extreme delay, major treatment required

Table 6.1 to 6.3 present a summary of the existing operation of the Lindfield study intersections which are graphically presented in Figures 6.1 to 6.3.

6.2 Lindfield - Existing AM Peak Hour Operating Conditions

During the AM peak hour (07:15am-08:15am) in Lindfield general traffic delays occur at the intersections of Highfield Road/Pacific Highway, Balfour Street/Pacific Highway and Grosvenor Road/Pacific Highway with southbound queuing on the Pacific Highway on the approaches to these intersections associated with the heavy southbound tidal traffic flow.

On occasions queueing on the Pacific Highway from the Balfour Street/Pacific Highway intersection can extend as far back as Highfield Road. The Grosvenor Road approach also experiences large delays and queuing primarily as a result of the high traffic activity associated with Lindfield Primary School.

Interestingly, the effect of the traffic signal intersections to the north and south of the Lindfield Town Centre when Pacific Highway traffic is stopped creates intermittent periods of calm within the centre of Lindfield during what is typically a very heavily trafficked period of the day.

This is indicated in the video link as Figure 6.1.

Figure 6.1: Pacific Highway Pedestrian Crossing Weekday AM Video

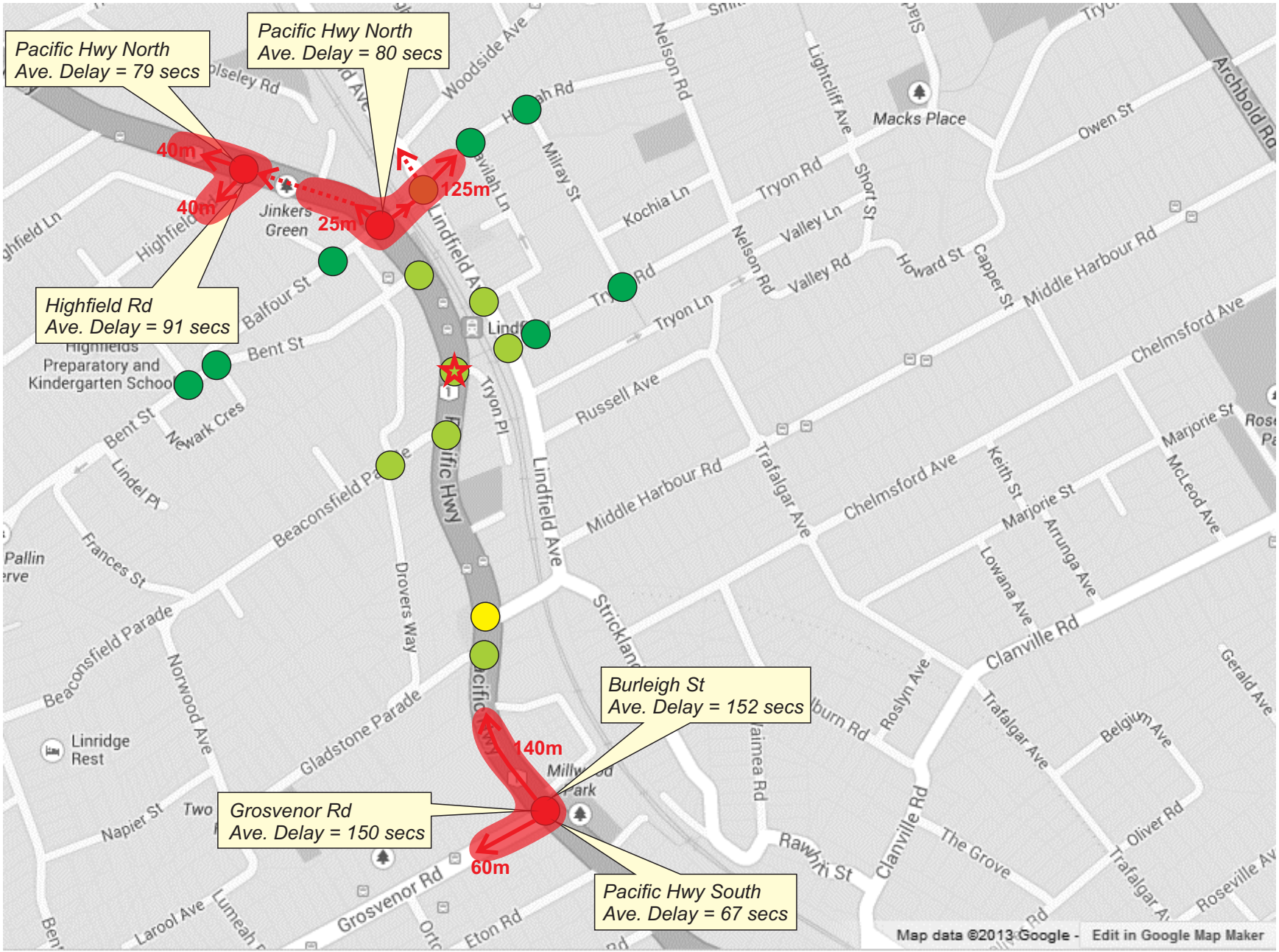
The video is available from http://www.peopletrans.com.au/images/lindfield/Pacific_Hwy_Ped_X-ing_Weekday_AM_Peak.mp4.

The video will be available on the PeopleTrans website until 30 June 2015. Videos can be provided after that date on request.

The intersection operation of all study intersections during the AM peak hour is provided in Table 6.2 which is also presented graphically in Figure 6.2.

Table 6.2: Existing AM Peak Hour Operating Conditions

Intersection Name		Approach Description	LOS	Delay (Sec)	Average Que (No Vehicles)	Maximum Que (No Vehicles)
Pacific Hwy / Grosvenour Rd / Burleigh St	Grosvenor Rd	E22	F	150.1	10.62	28
	Pacific Hwyw (s)	W30_	E	66.72	4.99	31
	Burghleigh St	__E32_	F	151.66	1.04	5
	Pacific Hwyw (N)	_S1	C	30.28	24.61	90
Pacific Highway / Tyron Place	Pacific Hwy (S)	_N1_	A	2.71	0.21	9
	Tyron Pl	W2	B	21.34	0.01	1
	Pacific Hwy (N)	S27_	B	21.65	1.66	34
Pacific Hwy / Strickland Ave	Pacific Hwy (s)	N6	A	0	0	0
	Strickland Ave	W5_	C	37.74	1.55	11
	Pacific Hwy (N)	S4_	A	9.87	0	0
Pacific Hwy / Beaconsfield Parade	Beaconsfield Parade	N12	B	19.88	0.17	2
	Pacific Hwy (s)	_N1_2	A	0	0	0
Pacific Hwy / Bent St	Bent Street	E23__	B	15.75	0.07	2
	Pacific Hwy (s)	_N3_	A	0	0	0
Pacific Hwy / Balfour St	Balfour St (W)	_N25__	D	55.45	2.07	14
	Pacific Hwy (S)	N3_	C	30.6	5.14	44
	Balfour St (E)	E20	D	46.42	21.62	67
	Pacific Hwy (N)	_W18_	F	80.05	3.91	9
Pacific Hwy / Highfield Rd	Highfield Rd	E29_	F	90.57	6.18	24
	Pacific Hwy (S)	W22	A	3.58	0.47	23
	Pacific HWY (N)	E28	F	78.97	6.72	49
Lindfield Ave / Balfour St / Havilah Rd	Balfour St	E26__	A	8.29	0.02	3
	Lindfield Ave (S)	_N15_	A	14.42	0.36	6
	Lindfield Ave (S) Slip lane	_N15_2	B	24.25	0.68	4
	Havilah RD	W13	B	24.44	0.05	2
	Lindfield Ave (N)	S26	B	22.8	1.42	11
Balfour St / Bent St / Newark Cres	Bent Street (W)	E24	A	10.3	0	1
	Newark Cres	N24	A	7.9	0	0
	Bent Street (E)	__W20_	A	0.97	0	0
	Balfour St	__S24_	A	5.13	0.01	2
Bent St / Woodford Ln / Bent Ln	Bent St (W)	_E22_	A	8.62	0	1
	Woodford Ln	N46	A	6.8	0	1
	Bent St (E)	W20__	A	11.51	0	2
	Balfour Ln	_S22	A	9.9	0.01	1
Beaconsfield Parade / Drovers Way / Woodford Ln	Beaconsfield Prd (W)	_E21_	A	7.75	0	2
	Drovers Way	_N20	A	11.15	0	1
	Beaconsfield Prd (E)	W1__	B	15.5	0.02	2
	Woodford Ln	_S20_2	A	4.47	0	2
Lindfield Ave / Kochia Ln	Lindfield Ave (S)	_N12_	A	11.89	1.45	7
	Lindfield Ave (N)	_S15_2	B	17.17	1.67	12
Lindfield Ave / Tryon Rd	Lindfield Ave (S)	N11_	A	13.54	0.5	7
	Tryon Rd	W10_	B	25.53	0.48	6
	Lindfield Ave (N)	_S14_2	A	11.67	1.14	8
Tryon Rd / Chapman Ln (Car Park Entry)	Tryon Rd (W)	E10	A	3.87	0.01	2
	Tryon Rd (E)	W10_2	A	0	0	0
	Chapman Ln	_E30_	A	1.46	0.03	2
Gladstone Prd / Pacific Hwy	Gladstone Prd	E4	B	21.29	0.04	3
	Pacific Hwy (S)	N7	A	6.87	0.1	6
Tryon Rd / Milray St	Tryon Rd (W)	_E11	A	4.02	0.26	6
	Tryon Rd (E)	W17	A	8.08	0.01	3
	Milray St	S16_	A	4.97	0.03	1
Havilah Rd / Milray St	Havilah Rd (W)	E16	A	6.86	0	0
	Milray St	__N16	A	6.67	0	1
	Havilah Rd (E)	W15	A	6.77	0	0
Balfour Ln / Balfour St	Balfour Ln	__S25	A	8.14	0.04	3
Havilah Rd / Havilah Ln	Havilah Rd (W)	E15	A	14.32	0	0
	Havilah Ln	__N14	A	10.19	0	1
	Havilah Rd (E)	W14	A	4.91	0	0



peopletrans

Level of Service (LOS) (worst delay approach)

- LOS A (0-14secs)
- LOS B (15-28 secs)
- LOS C (29-42 secs)
- LOS D (43-56 secs)
- LOS E (57-70 secs)
- LOS F (>70 secs)
- Average queue length (m)
- Occasional queues (m)
- Pedestrian delay (safety issue)
- Hotspot

13S170 Lindfield Transport Network Model Study 2013/14 Ku-ring-gai Council	Figure 6.2 Existing Network Performance Weekday AM Peak Hour (7:15am-8:15am)	Date: 28/03/14	Issue: Final

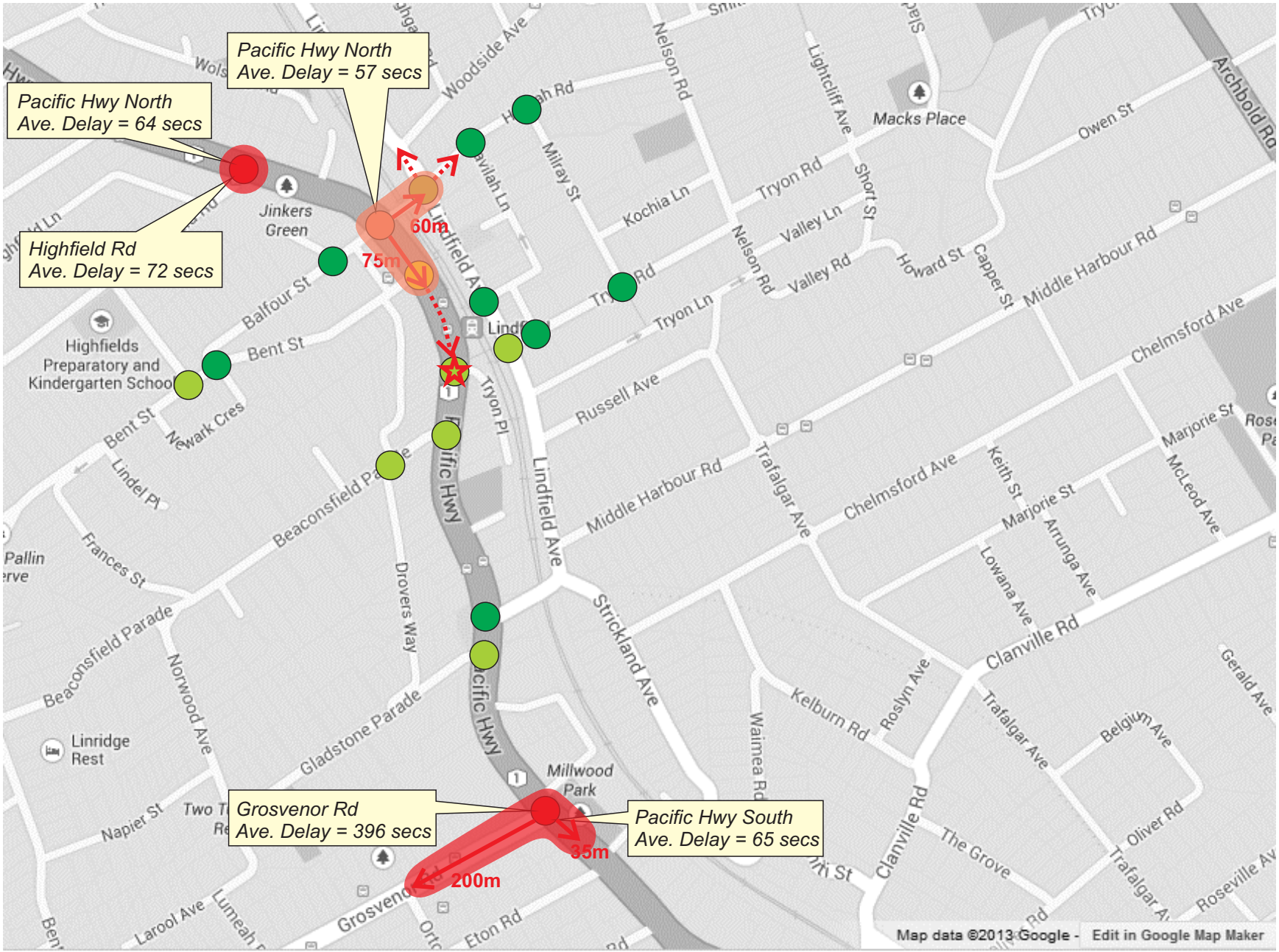
6.3 Lindfield - Existing PM Peak Hour Operating Conditions

During the PM peak hour (4:30pm-5:30pm) in Lindfield general traffic delays also occur at the intersections of Highfield Road/Pacific Highway, Balfour Street/Pacific Highway and Grosvenor Road/Pacific Highway but to a lesser extent than the AM peak period partly because trips are distributed more evenly across the hour during the PM peak but also because the level of northbound peak hour traffic is approximately 25% less that the southbound peak hour traffic on the Pacific Highway. There are however still northbound queues on the approaches to these intersections associated with the heavy northbound tidal traffic flow on the Pacific Highway. The Grosvenor Road approach also continues to experience long queues and delays during the PM peak hour.

The intersection operation of all study intersections during the PM peak hour is provided in Table 6.3 which is also presented graphically in Figure 6.3.

Table 6.3: Existing PM Peak Hour Operating Conditions

Intersection Name		Approach Description	LOS	Delay (Sec)	Average Que (No Vehicles)	Maximum Que (No Vehicles)
Pacific Hwy / Grosvenour Rd / Burleigh St	Grosvenor Rd	E22	F	395.6	33	44
	Pacific Hwyw (s)	W30_	E	64.6	6.17	40
	Burghleigh St	__E32_	A	0	1.38	3
	Pacific Hwyw (N)	_S1	A	3.7	1.8	20
Pacific Highway / Tyron Place	Pacific Hwy (S)	_N1_	A	7.6	2.01	30
	Tyron Pl	W2	B	16.29	0	0
	Pacific Hwy (N)	S27_	B	24.57	1.88	20
Pacific Hwy / Strickland Ave	Pacific Hwy (s)	N6	A	0	0	0
	Strickland Ave	W5_	A	14.03	0.19	6
	Pacific Hwy (N)	S4_	A	6.81	0	0
Pacific Hwy / Beaconsfield Parade	Beaconsfield Parade	N12	B	28.12	0.27	3
	Pacific Hwy (s)	_N1_2	A	0	0	0
Pacific Hwy / Bent St	Bent Street	E23__	C	36.67	1.53	5
	Pacific Hwy (s)	_N3_	A	0	0	0
Pacific Hwy / Balfour St	Balfour St (W)	_N25__	D	51.65	1.35	8
	Pacific Hwy (S)	N3_	D	43.97	12.62	72
	Balfour St (E)	E20	C	35.05	9.56	42
	Pacific Hwy (N)	_W18_	E	57.28	3.13	9
Pacific Hwy / Highfield Rd	Highfield Rd	E29_	F	71.68	3.82	20
	Pacific Hwy (S)	W22	A	5.82	1.91	34
	Pacific HWY (N)	E28	E	64.11	0.96	16
Lindfield Ave / Balfour St / Havilah Rd	Balfour St	E26__	A	8.29	0.01	2
	Lindfield Ave (S)	_N15_	B	17.72	0.76	10
	Lindfield Ave (S) Slip lane	_N15_2	B	16.45	0.6	4
	Havilah RD	W13	A	14.29	0.02	2
	Lindfield Ave (N)	S26	B	18.47	0.31	6
Balfour St / Bent St / Newark Cres	Bent Street (W)	E24	A	10.39	0	0
	Newark Cres	N24	A	12.31	0	1
	Bent Street (E)	__W20_	A	4.75	0	2
	Balfour St	__S24_	A	5.7	0.01	2
Bent St / Woodford Ln / Bent Ln	Bent St (W)	_E22_	A	8.79	0	1
	Woodford Ln	N46	A	6.86	0	1
	Bent St (E)	W20__	B	16.13	0	1
	Balfour Ln	_S22	A	10.87	0.04	1
Beaconsfield Parade / Drovers Way / Woodford Ln	Beaconsfield Prd (W)	_E21_	A	7.64	0	0
	Drovers Way	_N20	A	10.95	0.01	1
	Beaconsfield Prd (E)	W1__	B	20.37	0.05	2
	Woodford Ln	_S20_2	A	4.48	0.01	2
Lindfield Ave / Kochia Ln	Lindfield Ave (S)	_N12_	A	11.32	0.72	6
	Lindfield Ave (N)	_S15_2	A	10.57	0.24	5
Lindfield Ave / Tryon Rd	Lindfield Ave (S)	N11_	A	10.7	0.32	6
	Tryon Rd	W10_	B	21.2	0.23	4
	Lindfield Ave (N)	_S14_2	A	13.5	0.99	6
Tryon Rd / Chapman Ln (Car Park Entry)	Tryon Rd (W)	E10	A	3.73	0.01	1
	Tryon Rd (E)	W10_2	A	0	0	0
	Chapman Ln	_E30_	A	1.37	0.03	2
Gladstone Prd / Pacific Hwy	Gladstone Prd	E4	B	23.79	0.07	3
	Pacific Hwy (S)	N7	A	6.68	0.38	15
Tryon Rd / Milray St	Tryon Rd (W)	_E11	A	4.41	0.28	6
	Tryon Rd (E)	W17	A	7.57	0.01	2
	Milray St	S16_	A	5.71	0.01	1
Havilah Rd / Milray St	Havilah Rd (W)	E16	A	7.1	0	0
	Milray St	__N16	A	6.46	0	0
	Havilah Rd (E)	W15	A	4.77	0	0
Balfour Ln / Balfour St	Balfour Ln	__S25	A	5.61	0.02	2
Havilah Rd / Havilah Ln	Havilah Rd (W)	E15	A	12.29	0	0
	Havilah Ln	__N14	A	10.04	0	1
	Havilah Rd (E)	W14	A	4.15	0	0



peopletrans

Level of Service (LOS) (worst delay approach)

- LOS A (0-14secs)
- LOS B (15-28 secs)
- LOS C (29-42 secs)
- LOS D (43-56 secs)
- LOS E (57-70 secs)
- LOS F (>70 secs)
- Average queue length (m)
- Occasional queues (m)
- Pedestrian delay (safety issue)
- Hotspot

13S170 Lindfield Transport Network Model Study 2013/14 Ku-ring-gai Council	Figure 6.3 Existing Network Performance Weekday PM Peak Hour (4:30pm-5:30pm)	Date: 28/03/14	Issue: Final

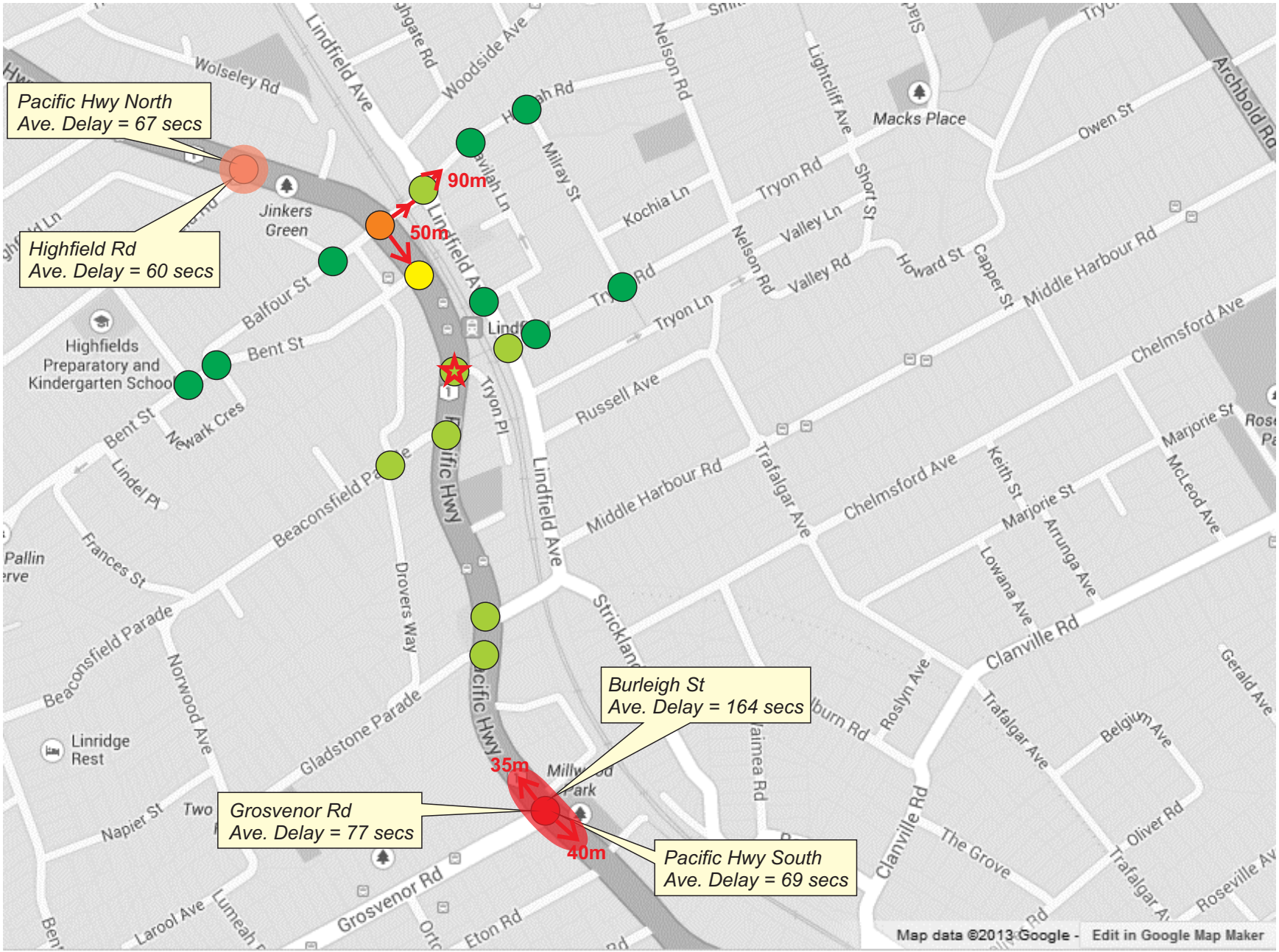
6.4 Lindfield - Existing Saturday Peak Hour Operating Conditions

As expected during the Saturday peak hour (11:00am-12:00pm) in Lindfield general traffic delays are much lower than the AM and PM peak hours which is distinctly noticeable at the intersections of Highfield Road/Pacific Highway and Balfour Street/Pacific Highway. There does however continue to be queues and delays at the Grosvenor Road/Burleigh Street/Pacific Highway intersection during the Saturday peak hour, primarily due to the phasing favouring the Pacific Highway with Burleigh Street only called every other cycle.

The intersection operation of all study intersections during the Saturday peak hour is provided in Table 6.4 which is also presented graphically in Figure 6.4.

Table 6.4: Existing Saturday Peak Hour Operating Conditions

Intersection Name		Approach Description	LOS	Delay (Sec)	Average Que (No Vehicles)	Maximum Que (No Vehicles)
Pacific Hwy / Grosvenour Rd / Burleigh St	Grosvenor Rd	E22	F	76.6	5.52	21
	Pacific Hwyw (s)	W30_	E	68.7	6.75	39
	Burghleigh St	__E32_	F	163.5	0.58	3
	Pacific Hwyw (N)	_S1	A	5.03	5.82	39
Pacific Highway / Tyron Place	Pacific Hwy (S)	_N1_	A	5.11	2.62	27
	Tyron Pl	W2	A	0	0	0
	Pacific Hwy (N)	S27_	B	25.23	2.1	21
Pacific Hwy / Strickland Ave	Pacific Hwy (s)	N6	A	0	0	0
	Strickland Ave	W5_	B	26.58	0.93	11
	Pacific Hwy (N)	S4_	A	8.92	0	0
Pacific Hwy / Beaconsfield Parade	Beaconsfield Parade	N12	B	23.12	0.17	3
	Pacific Hwy (s)	_N1_2	A	0	0	0
Pacific Hwy / Bent St	Bent Street	E23__	C	33.09	1.04	5
	Pacific Hwy (s)	_N3_	A	0	0	0
Pacific Hwy / Balfour St	Balfour St (W)	_N25__	D	51.52	1.2	9
	Pacific Hwy (S)	N3_	C	34.37	8.57	61
	Balfour St (E)	E20	D	42.8	14.46	53
	Pacific Hwy (N)	_W18_	D	53.54	3.11	9
Pacific Hwy / Highfield Rd	Highfield Rd	E29_	E	60.29	2.67	11
	Pacific Hwy (S)	W22	A	7.49	2.06	25
	Pacific HWY (N)	E28	E	66.98	1.34	21
Lindfield Ave / Balfour St / Havilah Rd	Balfour St	E26__	A	8.28	0.01	2
	Lindfield Ave (S)	_N15_	B	15.3	0.53	9
	Lindfield Ave (S) Slip lane	_N15_2	B	16.05	0.57	4
	Havilah RD	W13	B	16.75	0.04	1
	Lindfield Ave (N)	S26	B	19.66	0.7	6
Balfour St / Bent St / Newark Cres	Bent Street (W)	E24	A	11.24	0	0
	Newark Cres	N24	A	13.13	0	1
	Bent Street (E)	__W20_	A	0.68	0	0
	Balfour St	__S24_	A	4.86	0	2
Bent St / Woodford Ln / Bent Ln	Bent St (W)	_E22_	A	0	0	0
	Woodford Ln	N46	A	8.3	0	1
	Bent St (E)	W20__	A	12.8	0	1
	Balfour Ln	_S22	A	11.39	0.04	1
Beaconsfield Parade / Drovers Way / Woodford Ln	Beaconsfield Prd (W)	_E21_	A	6.03	0	0
	Drovers Way	_N20	A	11.74	0	0
	Beaconsfield Prd (E)	W1__	B	18.04	0.03	2
	Woodford Ln	_S20_2	A	5.06	0	1
Lindfield Ave / Kochia Ln	Lindfield Ave (S)	_N12_	A	10.28	0.92	6
	Lindfield Ave (N)	_S15_2	A	13.05	0.75	9
Lindfield Ave / Tryon Rd	Lindfield Ave (S)	N11_	A	8.42	0.11	5
	Tryon Rd	W10_	B	20.77	0.29	5
	Lindfield Ave (N)	_S14_2	A	10.01	0.55	7
Tryon Rd / Chapman Ln (Car Park Entry)	Tryon Rd (W)	E10	A	3.98	0.01	2
	Tryon Rd (E)	W10_2	A	0	0	0
	Chapman Ln	_E30_	A	1.2	0.06	3
Gladstone Prd / Pacific Hwy	Gladstone Prd	E4	B	22.36	0.02	2
	Pacific Hwy (S)	N7	A	7.12	0.26	12
Tryon Rd / Milray St	Tryon Rd (W)	_E11	A	3.79	0.04	5
	Tryon Rd (E)	W17	A	7.66	0	3
	Milray St	S16_	A	4.26	0.02	2
Havilah Rd / Milray St	Havilah Rd (W)	E16	A	6.4	0	0
	Milray St	__N16	A	5.88	0	1
	Havilah Rd (E)	W15	A	5.8	0	0
Balfour Ln / Balfour St	Balfour Ln	__S25	A	5.4	0.01	2
Havilah Rd / Havilah Ln	Havilah Rd (W)	E15	A	14.13	0	0
	Havilah Ln	__N14	A	11.34	0.02	2
	Havilah Rd (E)	W14	A	6.18	0	0



peopletrans

Level of Service (LOS) (worst delay approach)

- LOS A (0-14secs)
- LOS B (15-28 secs)
- LOS C (29-42 secs)
- LOS D (43-56 secs)
- LOS E (57-70 secs)
- LOS F (>70 secs)
- Average queue length (m)
- Occasional queues (m)
- Pedestrian delay (safety issue)
- Hotspot

13S170 Lindfield Transport Network Model Study 2013/14 Ku-ring-gai Council	Figure 6.4 Existing Network Performance Saturday Peak Hour (11:00am-12:00pm)	Date: 28/03/14	Issue: Final

7. Lindfield Future Land Uses

7.1 Future Land Uses

In November 2013 Ku-ring-gai Council provided PeopleTrans with details of the future land uses anticipated for the local centre of Lindfield over the next 10 years. These land uses formed the basis of the transport assessment and are summarised below.

7.1.1 Future Baseline Development Sites

(1) Approved DAs (Mixed Use Site M1).
(2) Anticipated Council Town Centre LEP development take up (Includes residential sites R1-R13 and mixed use sites M2 & M3).

7.1.2 Woodford Lane Car Park Development Site

(1) Woodford Lane Car Park site development Option A
(Community Facilities/Secondary Retail/Medium Density Residential/Commuter Parking)
(2) Woodford Lane Car Park site development Option B
(Community Facilities/Major Retail/Medium Density Residential/Commuter Parking)
(3) Woodford Lane Car Park site development Option C
(Community Facilities/High Density Residential/Commuter Parking)

In April 2014 Ku-ring-gai Council provided PeopleTrans with further land use options for the Woodford Lane car park site as follows:

(4) Woodford Lane Car Park site development Option D
(Community Facilities/Major Retail/Medium Density Residential/Commuter Parking) +
Existing Coles Redevelopment Site M4 (Expanded Retail & New Residential)
(5) Woodford Lane Car Park site development Option E
(Community Facilities/Gymnasium/Major Retail/Specialty Retail/Medium Density Residential/
Commuter Parking)

The above sites have been annotated by PeopleTrans and are indicated spatially in Figure 7.1. The Lindfield Local Centre LEP is also provided as Figure 7.2.

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

Date: 25/02/2014

Version: Final

Ku-ring-gai Local Environmental Plan (Local Centres) 2012

FIGURE 7.2 Land Zoning

Map -LINDFIELD

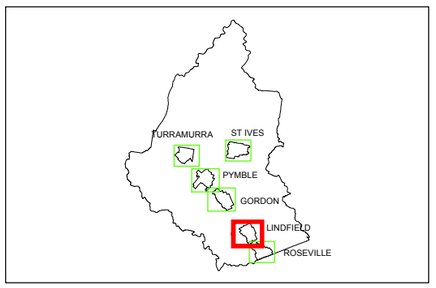
Zone

- B2 Local Centre
- B4 Mixed Use
- B5 Business Development
- E2 Environmental Conservation
- E4 Environmental Living
- R2 Low Density Residential
- R3 Medium Density Residential
- R4 High Density Residential
- RE1 Public Recreation
- SP1 Special Activities
- SP2 Infrastructure

Cadastre

Cadastre 12/02/2013 © Land & Property Management Authority

This information is a representation of Ku-ring-gai Local Environmental Plan (Local Centres) 2012 as published in the NSW government Gazette on 25 January 2013 - No reliance is to be placed upon this Plan. For precise information reference should be made to the original documentation.



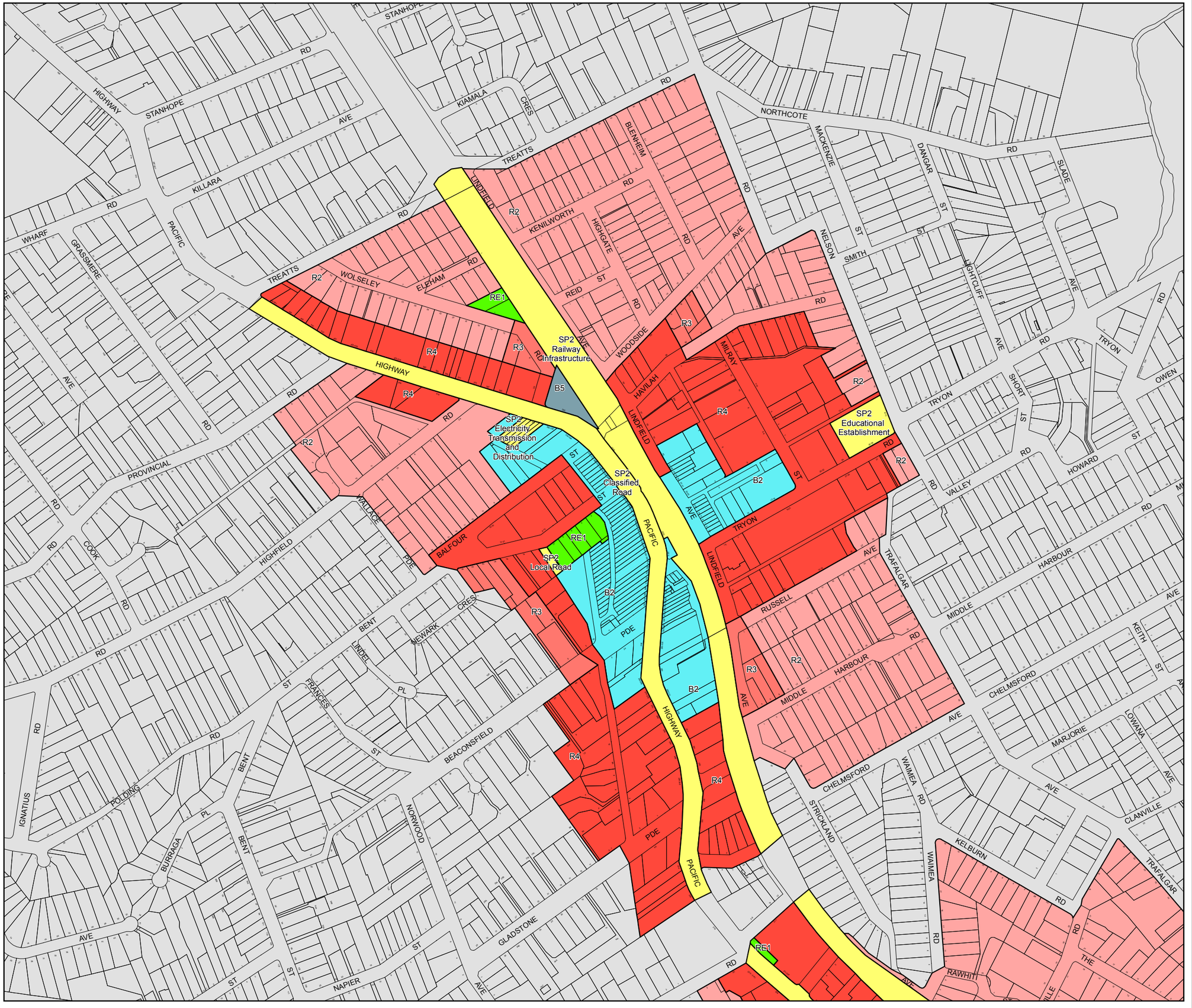
N

0 50 100 150 200 Metres

Scale: 1:5,500 @ A3

Projection: GDA 1994 MGA Zone 56

Map identification number: LZN_LINDFIELD _005_20130212



7.2 Future Land Use Development Schedules

The actual or proposed land use details for the approved DA and LEP sites in Lindfield together with details of proposed land use Options A, B & D for the Woodford Lane car park site are provided in Table 7.1 and Table 7.2. Additional land use Options C & E for the Woodford Lane car park site are provided in Table 7.3.

Table 7.1: Approved DA & LEP sites

Site Description	Proposed Land Uses	Scale/Size (Area Sqm GLFA or as stated otherwise)
M1 North	Retail – Gourmet Grocer	1,045
	Specialty Retail - Cafe	243
	Commercial	100
	Residential	65 Units
M1 South	Retail - Supermarket	1,237
	Specialty Retail	697
	Residential	112 Units
M2	Retail	2,056
	Residential	62 Units
M3	Retail	2,083
	Residential	31 Units
R1,R3,R8,R9,R10	High Density Residential	608 Units
R2,R4-7,R11-13	High Density Residential	99 Units

Table 7.1 has been used as the basis for establishing AM, PM and Saturday future baseline models for Lindfield.

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

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

Table 7.2 was the first set of land use information provided to PeopleTrans in November 2013 for the Woodford Lane site with land use Options A and D primarily focussed on community and residential uses and land use Option B including a retail supermarket in addition to community and residential uses.

Table 7.3 was additional land use information provided to PeopleTrans in April 2014 and includes a much higher level of development intensity for the Woodford Lane car park site than proposed in land use Options A, B & D.

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

Table 7.2 and Table 7.3 have been used as the basis for assessing the relative impacts of each option against the future baseline but also in developing suitable transport management measures in support of these land use options.

It is important to note that the proposals for the Tryon Road car park site include provision of a Village Green or local park as illustrated in Figure 7.3 where the current at-grade car parking would be provided underground. For the purposes of this study it has been assumed that from a traffic generation perspective there would be no change at this site.

Figure 7.3: Artists Impression of Lindfield Village Green

Source: Ku-ring-gai Council

PeopleTrans have undertaken more detailed traffic analysis for this site which is the subject of a separate report titled *"Lindfield Village Green, Transport, Parking and Access Assessment, 18th August 2014"*.

8. Operational Assessment of Future Baseline & Proposed Land Use Options A, B & D

A detailed description of the modelling methodology and assumptions adopted for this study are included in Appendix E of this report.

This section of the report presents the operational assessment of the Lindfield future baseline and land use Options A, B and D as detailed in Table 7.1 and Table 7.2 and provides a comparison to the existing road network performance together with the development of the initial road infrastructure enhancements or mitigation measures for Lindfield (Traffic Management Measures 1).

The future demands for the future baseline and land use Options A, B & D, prior to any discounting, are included in Table 8.1.

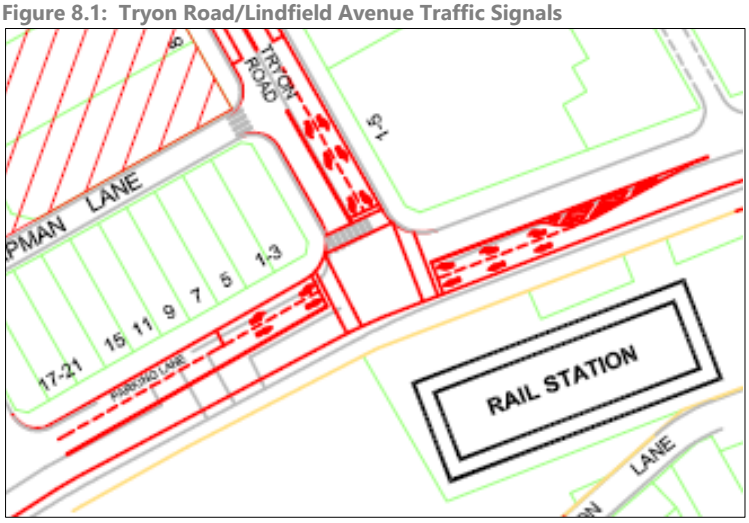
Table 8.1: Traffic Generation Summary – Woodford Lane Site

Option	AM Traffic Generation	PM Traffic Generation	Sat Traffic Generation
A – Community Facilities, Secondary Retail and Medium Density Residential	164	147	198
B – Community Facilities, Major Retail, Secondary Retail and Medium Density Residential	324	450	519
D – Community Facilities and High Density, Residential	167	144	174

8.1 Future Baseline Operational Assessment

The future baseline assessment included mixed use sites M1-M3 and residential sites R1-R13 from a land use perspective but also included committed infrastructure projects which Ku-ring-gai Council indicated would primarily include the signalisation of Tryon Road/Lindfield Avenue as indicated in Figure 8.1.

Figure 8.1: Tryon Road/Lindfield Avenue Traffic Signals



The future baseline is in effect the new existing situation for Lindfield as this is based on committed or strongly anticipated future land use development and infrastructure and is regarded as a short term future inevitability.

The results of the future baseline assessment indicate that the impact on the operation of the road network during the AM and PM peak period would be minimal but a significant level of congestion is likely to occur during the Saturday peak periods, primarily as a consequence of the high trip generation associated with the new and existing retail sites on Lindfield Avenue as indicated in Figures 8.2 to Figure 8.4.

Detailed modelling results for the AM, PM and Saturday future baseline are included in Appendix F of this report.

8.2 Future Land Use Option A, B & D Operational Assessment

The land use Options A, B & D assessment included those land uses in Table 7.2 over and above those provided in the future baseline.

As expected the impact of land use Options A, B & D on the operation of the road network indicates increases in congestion across all time periods.

8.2.1 Comparison of Impacts

The "vehicle hours travelled (VHT)" modelling output parameter has been used to compare the relative impacts of the proposed land uses against the existing and future baseline road network performance. VHT is a good indicator for identifying congestion on the road network with higher levels of vehicle hours travelled indicating that vehicles spend more time on the road network or in other words experience higher levels of delay.

Figures 8.2 to 8.4 provide details of the vehicle kilometres travelled over the modelled time periods for the existing, future baseline and land use Options A, B & D.

Figure 8.2: Vehicle Hours Travelled – AM Models

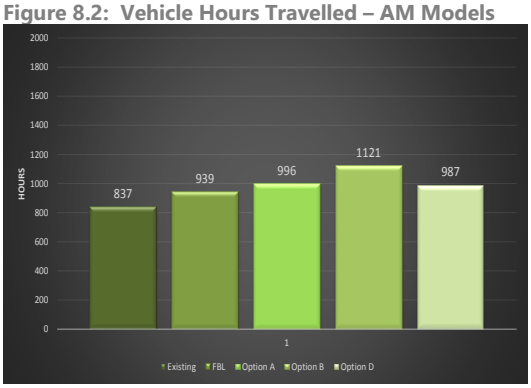


Figure 8.3: Vehicle Hours Travelled – PM Models

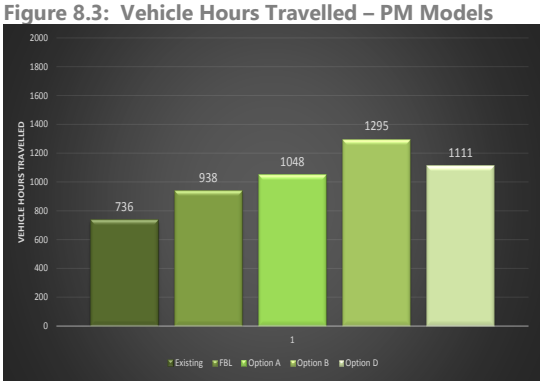


Figure 8.4: Vehicle Hours Travelled – Sat Models

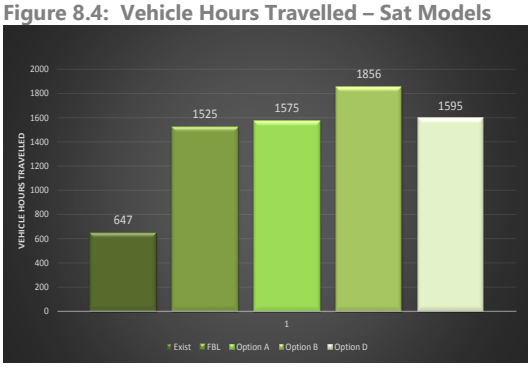


Figure 8.2 to Figure 8.4 indicate that land use Option B has the highest level of increased congestion when compared against all other land use options.

Full detailed modelling results for land use Options A, B and D can be provided on request.

In February 2014 on the basis of the above results and in discussion with Ku-ring-gai Council a decision was made to develop road network mitigation measures corresponding to land use Option B for the Woodford Lane car park site on the basis that this option would generate the most amount of traffic and would therefore generate the most impacts.

The rationale for this decision was that if a traffic and transport plan could be developed which supported land use Option B then this traffic and transport plan would easily be able to support land use Options A & D. Land use Option B also provided a good balance of community, retail and residential development for the local centre of Lindfield.

8.3 Road Network Enhancements to Support Land Use Option B

PeopleTrans & TMA used the previous 2008 Lindfield concept traffic management plan (refer Appendix G) as a starting point for developing the 2014 road network plan for Lindfield in support of land use Option B. This plan was reviewed in order to understand the rationale behind the development of some of the proposals contained within it.

In principle, the 2008 road network proposals pointed towards similar issues that currently exist in Lindfield with the proposals very much focussed around the intersections of Balfour Street/Pacific Highway and Grosvenor Road/Pacific Highway.

TMA also utilised the Lindfield transport model as it related to the impacts of land use Option B to develop further or alternative improvements to the network which, through an iterative process, resulted in the development of Traffic Management Measures 1 (TMM1) as indicated in Appendix H.

TMM1 is brief included the following elements:

- Banned right turn from Havilah Street to Pacific Highway at the Balfour Street/Pacific Highway Intersection.
- Reconfiguration of the phasing at the Balfour Road/Pacific Highway Intersection.
- Signalisation of Strickland Avenue/Pacific Highway Intersection.
- Signalisation of Tryon Place/Pacific Highway Intersection.
- Signalisation of Tryon Road/Lindfield Avenue Intersection including removal of peak period parking on the approaches to the intersection[4].
- Removal of Saturday peak period parking on the Pacific Highway between Beaconsfield Parade and Balfour Street.
- New link road between Drovers Way and Bent Street

Although in operational terms this road network plan was able to support the proposals of land use Option B it was identified by the study team that it did not offer any additional access benefits for the

[4] The removal of peak period parking on the northern approach of Lindfield Avenue is only required up to Kochia Lane.

Woodford Lane site. For example a retail use on the Woodford Lane site would, in the main, have to share access with the existing Coles site on Balfour Street.

8.4 Land Use Option B + TMM1 Operational Assessment

The results of the above assessment are presented at a high level as a comparison of vehicle hours travelled across the network for the AM, PM and Saturday peak hours as indicated in Figure 8.5 to Figure 8.7.

Figure 8.5: Vehicle Hours Travelled – AM Models

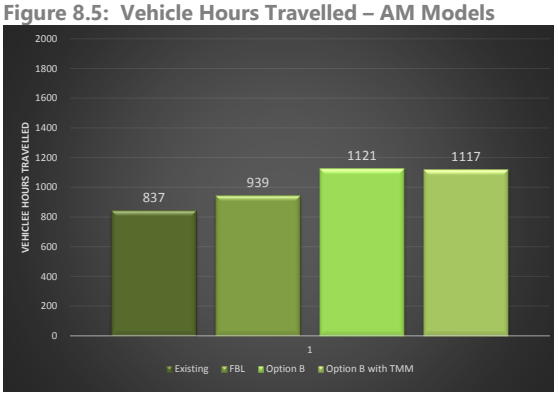


Figure 8.6: Vehicle Hours Travelled – PM Models

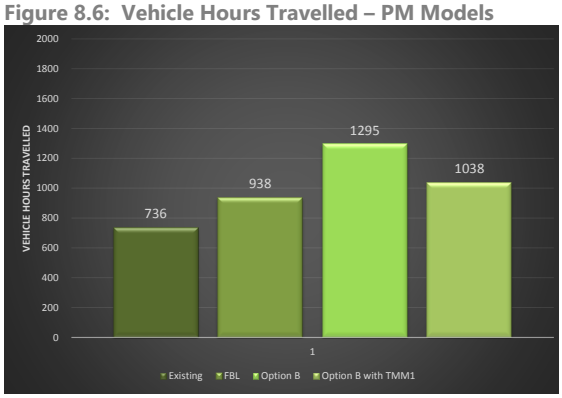


Figure 8.7: Vehicle Hours Travelled – Sat Models

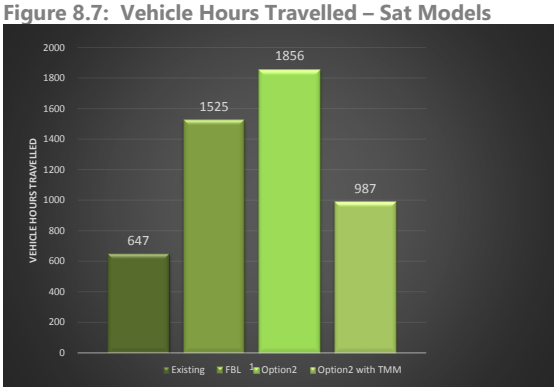


Figure 8.5 to Figure 8.7 indicate that the congestion is reduced with the introduction of traffic management/mitigation measures.

There is minimal improvement during the AM peak period but with more distinctive improvements achieved during the PM and particularly the Saturday peak periods.

Importantly the road network operation with TMM1 during the AM, PM and Saturday peak hours would achieve improved or similar levels to those of the future baseline.

Detailed modelling results for the AM, PM and Saturday land use Option B+TMM1 are included in Appendix I of this report.

8.5 Commuter Car Parking Location Assessment

At an earlier stage in the study TMA and PeopleTrans had indicated that the location of commuter parking should all be contained on the western side of the Pacific Highway given some of the early

indications of congestion on Lindfield Avenue during the PM and Saturday peak periods for the future baseline models.

In order to confirm this or otherwise TMA modelled TMM1 with land use Option B but with the commuter car parking split between the Woodford Lane site (140 car spaces) and the Village Green site (100 spaces) and compared these results as indicated in Table 8.2.

Table 8.2: Commuter Car Parking Modelling Assessment Results

Model Criteria	AM		PM		SAT	
	All Parking - West	Parking Split – East & West	All Parking - West	Parking Split – East & West	All Parking - West	Parking Split – East & West
VHT	1,085.53	1,083.80	1,009.36	988.85	901.49	883.96
VKT	25,981.20	26092.33	24,709.7	24,600.49	25,674.09	25,604.20
No. Stops	43,492	44,338	33,645	32,769	38,996	37,639

Table 8.2 indicates that containing all of the 240 commuter car spaces on the western side of the Pacific Highway in comparison to proportioning 140 commuter car spaces on the western side of Pacific Highway and 100 commuter car spaces on the eastern side of the Pacific Highway on the Village Green site has little to no effect on network performance.

During both the PM and Saturday peak periods there was an observed 2% improvement in network performance with the car parking split between the west and east sites as indicated in Figure 8.8 and Figure 8.9.

Figure 8.8: Vehicle Hours Travelled – PM Models

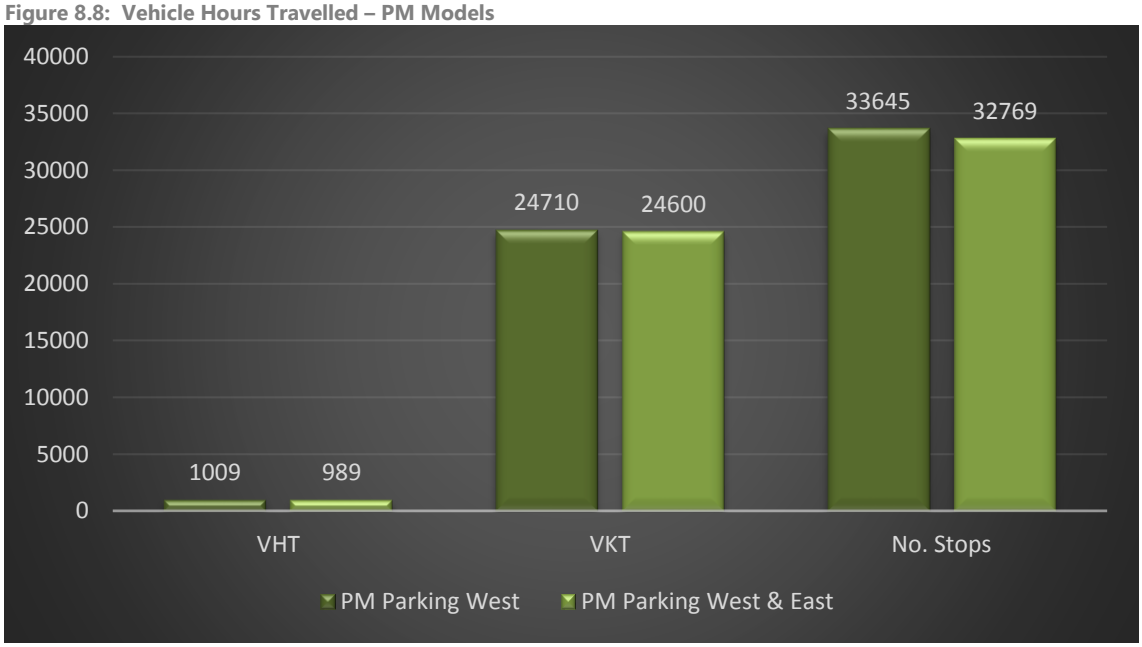
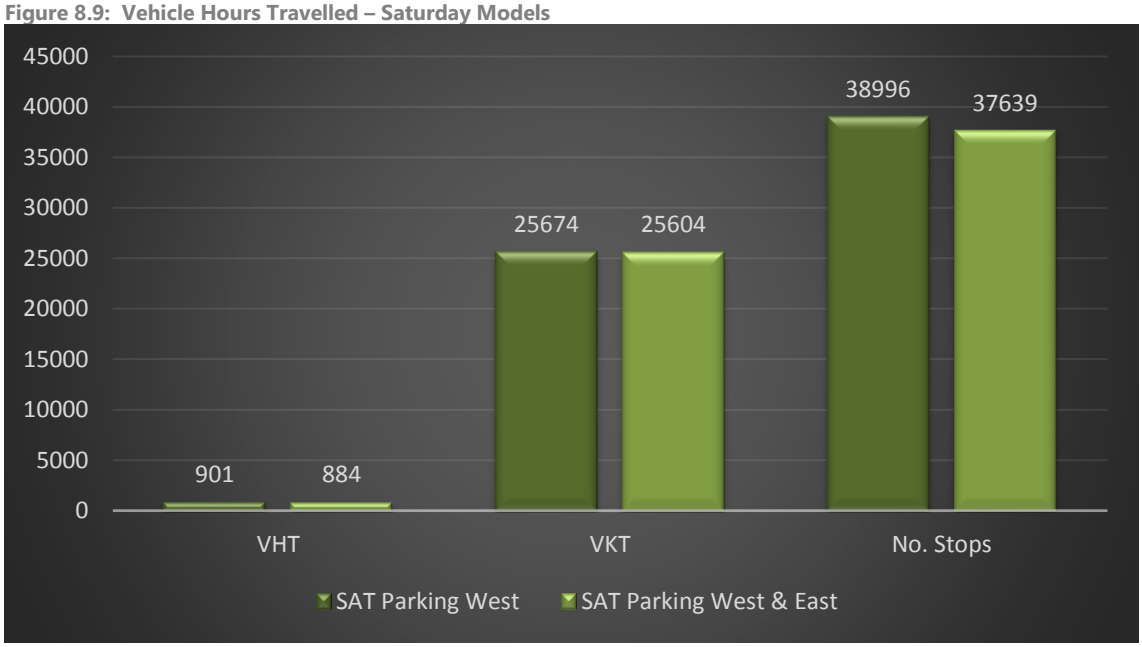


Figure 8.9: Vehicle Hours Travelled – Saturday Models



The potential for providing commuter parking in the Lindfield Village Green basement car park is yet to be resolved with TfNSW. Should TfNSW agree to the provision of commuter car parking within the Village Green basement car park this analysis indicates that it would not have an adverse effect on road network performance.

On the basis of the above and in consultation with Ku-ring-gai Council it was determined that for the purposes of this study that all future modelling should include all 240 commuter car parking spaces on the western side of the Pacific Highway on the Woodford Lane site.

9. Further Development of Road Network Options and Stakeholder Consultation

9.1 Road Network Options Development

PeopleTrans developed a series of additional road network options for the Lindfield Local Centre based on the knowledge developed through the course of the study and in order to achieve the best outcome for the development sites as far as access and connectivity were concerned as indicated in Table 9.1.

Table 9.1: Additional Road Network Options

Traffic Management Option No.	Description/Key Element
TMM1	As described in Section 8.4
TMM1A	Traffic Signals at Beaconsfield Parade (No right turn in from Pacific Highway) Right turn achieved via G-Turn through Tryon Place
TMM1B	Traffic Signals at Beaconsfield Parade (No right turn in from Pacific Highway/No left out of Beaconsfield Parade onto Pacific Highway)/Bent Lane & Woodford Lane one way/Access to Pacific Highway maintained via Bent Street between Bent Lane & Pacific Highway
TMM1C	Traffic Signals at Beaconsfield Parade (No right turn in from Pacific Highway)/Bent Lane & Woodford Lane one way/Bent Street closed between Bent Lane & Pacific Highway
TMM1D	TMM1C with minor changes to the location of the pedestrian crossings of the Pacific Highway at Tryon Place and Beaconsfield Parade as a result of a pedestrian overbridge.

Details of these traffic management options are included in Appendix J of this report.

9.2 Stakeholder Consultation

On 14 April 2014 a second Transport Stakeholder Workshop was undertaken where details of the study together with the traffic management options described in Table 9.1 were presented and discussed.

The comments received from this meeting in relation to these traffic management options and the study in general are summarised in Table 9.2.

Table 9.2: Stakeholder Consultation Summary

Item No.	Roads & Maritime Services	Ku-ring-gai Council	TfNSW-PPD	Bike North
1	Support Traffic Management Measures 1	Support as many pedestrian crossings of the Pacific Highway	Support pedestrian changes on the east side.	Preserve the arrangements and integrity of the existing KMC Bike Plan 2012
2	Support 2-phase operation at Tryon Lane / Pacific Highway with banned right turn into Tryon Lane.	Woodford Lane re-alignment is feasible	Support one way in Bent Street	Provide enhancements to bike routes into the study area and more particularly to the Woodford Lane site.
3	Do not support traffic signals at Beaconsfield Parade/Pacific Highway	Support for one way Bent Street	Support one way in Woodford Lane	Improve routes for bicycles across the railway line and Pacific Highway. Balfour Street route not particularly safe for most cyclists. Incorporated bicycle crossings at new signal intersections.
4	Do not support closely spaced intersection due to the see through affect and queueing across intersections impacting on pedestrian crossings.	Support for closure of Bent Street at Pacific Highway.	Questioned access to Kiss & Ride in Tryon Lane from the south. Implies that Kiss & Ride should either be promoted in Lindfield Avenue from the south or incorporated as part of the Woodford Lane site.	Provide contra-flow bike lanes where one way roads are proposed
5	Change of mid-block pedestrian crossing will result in pedestrians and vehicles interacting more.	Support for grade separated pedestrian crossing of the Pacific Highway subject to it being technically and economically feasible.	Support for closure of Bent Street at Pacific Highway.	Provide bicycle parking and end of trip facilities at the Woodford Lane redevelopment site.
6		Traffic Management Measures 1A-1D could consider a right turn into Beaconsfield Parade from the Pacific Highway subject to modelling.	Construction of a grade separated pedestrian crossing across the Pacific Highway should be the subject of further investigations.	
7		Do not support G-Turn in Traffic Management Measures 1A, not a desirable route for heavy vehicles.		
8		Cycle routes not to be compromised.		

The key outcomes of this meeting pointed towards TMM1C as best catering for the needs of all users within the Lindfield Local Centre.

It was also determined at this meeting that the technical feasibility of a pedestrian overbridge to improve connectivity between the east and west sides of Lindfield was to be investigated further.

This investigation has been undertaken and is presented as a separate report titled *"Feasibility Report, Lindfield Pedestrian Bridge, Issue C Final, 13 August 2014".*

10. Operational Assessment of Proposed Land Use Options C and E

10.1 Background

In April 2014 Ku-ring-gai Council provided PeopleTrans with two additional land use options for the Woodford Lane site as detailed in Table 7.3 of this report.

Both of these additional land use options had significantly higher demands than the previous land use options as indicated in Table 10.1. These are referred to as land use Options C and E for the purposes of this study.

Table 10.1: Traffic Generation Summary – Woodford Lane Site

Land Use Option	AM Traffic Generation	PM Traffic Generation	Sat Traffic Generation
A – Community Facilities, Specialty Retail and Medium Density Residential	164	147	198
B – Community Facilities, Major Retail, Specialty Retail and Medium Density Residential	324	450	519
C-As per B but also including a redeveloped Coles at Balfour Street	**580**	**804**	**1,081**
D – Community Facilities and High Density, Residential	167	144	174
E-Community Facilities, Library, Major Retail, Specialty Retail, Gymnasium, Restaurants	**532**	**861**	**1,045**

Ku-ring-gai Council also indicated a requirement to assess the inclusion of a right turn from Pacific Highway into Beaconsfield Parade as part of the assessment of land use Options C and E which resulted in the development of TMM1E as indicated in Figure 10.1.

10.2 Land Use Option C Assessment

TMA prepared the new demands for Land Use Option C and applied these to the AM, PM and Saturday commuter models including TMM1. The results from this assessment indicated a requirement to slightly modify TMM1 to include new phasing at the Balfour Street/Pacific Highway intersection as indicated in Table 10.1, banning of the right turn from Bent Street and a reconfiguration of the Coles access. This resulted in the development of TMM1-Rev 1 as indicated in Appendix K.

Figure 10.1: Balfour Street/Pacific Highway – Proposed 5 phases (A-B-D-E-E2)

In view of the comments received from Transport Stakeholders relating to Traffic Management Option 1C and PeopleTrans general understanding of the merits of this option it was determined that the demands from land use Option C be applied to TMM1C and that the operation of the road network be compared against that of TMM1-Rev1. This would establish operationally a preferred traffic management option for Lindfield.

The results of the above assessment are presented as previously as a comparison of vehicle hours travelled across the network for the AM, PM and Saturday peak hours as indicated in Figure 10.2.

Figure 10.2: VHT Comparison – TMM1 V TMM1C

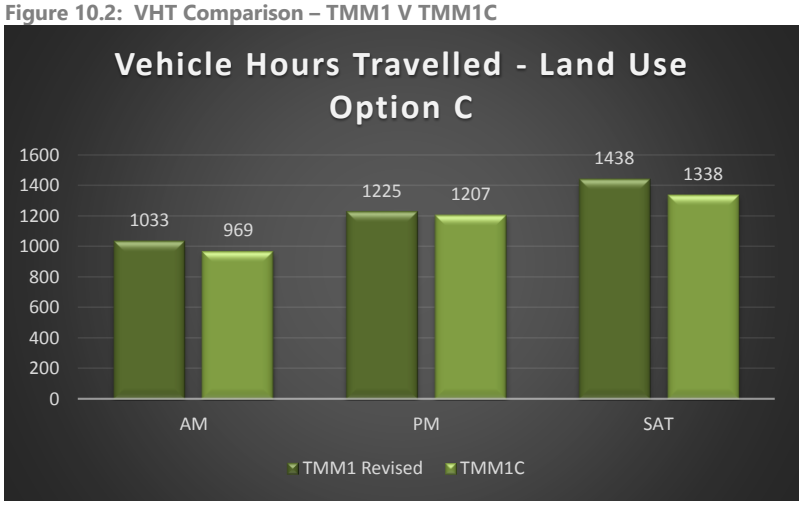


Figure 10.2 indicates that in general TMM1C performs better that TMM1-Rev 1 for the AM, PM and Saturday peak hours primarily because TMM1C takes pressure off the Balfour Street/Pacific Highway intersection.

Detailed modelling results for the AM, PM and Saturday land use Option C+TMM1 compared against land use Option C+TMM1C are included in Appendix L of this report.

The concept plan of Traffic Management Option TMM1C is included in Appendix N.

10.3 Land Use Option E Assessment

Land use Option E was a high intensity option generating 50% more trips than land use Option B during the AM peak hour, 80% more trips during the PM peak hour and 90% more trips during the Saturday peak hours.

Traffic Management Option E included all elements of TMM1C except that a right turn bay was included on the Pacific Highway southbound approach to Beaconsfield Parade. This also resulted in the reduction of northbound traffic lanes on the Pacific Highway from three to two lanes in order to accommodate the right turn bay. Details of TMM1E are included in Figure 10.3.

The operational assessment of land use Options C & E with traffic management Option E (right turn into Beaconsfield Parade) indicated significant issues on the Pacific Highway northbound approach to Beaconsfield Parade during the PM peak hour with unacceptably long queues and delays as indicated in Figure 10.4.

Detailed modelling results for the AM, PM and Saturday land use Option E+TMM1E compared against land use Option C+TMM1E are included in Appendix M of this report.

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

SHARED ZONE / 'KISS & RIDE'

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

PACIFIC HIGHWAY/STRICKLAND AVE INTERSECTION: NEW TRAFFIC SIGNALS

LEFT TURN BAY EXTENSIONS

RAIL STATION

INTRODUCE RIGHT TURN BAY

TWO LANE APPROACH

LEFT LANE ENDS

PACIFIC HIGHWAY/GROSVENOR ROAD INTERSECTION: MINOR CAPACITY IMPROVEMENT: EXTENSION OF PARKING RESTRICTIONS ON GROSVENOR ROAD

EXTEND RIGHT TURN BAY BY 20m TO 55m

POTENTIAL PEDESTRIAN THOROUGHFARE

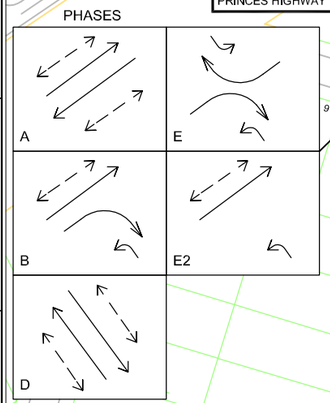
BENT STREET CLOSED

CONVERT TO ONE WAY

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.

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

PHASES



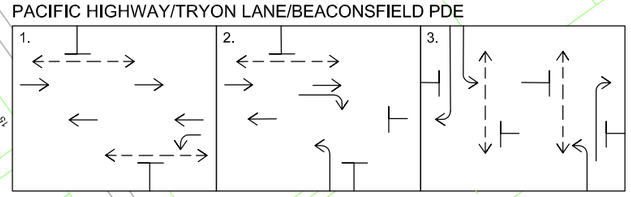
POTENTIAL WIDENING OF BENT LN

REALIGN WOODFORD LANE FOR EASE OF ACCESS TO RETAIL

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/BEACONSFIELD PDE



COUNCIL DEVELOPMENT SITES

COLES DEVELOPMENT SITES

'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

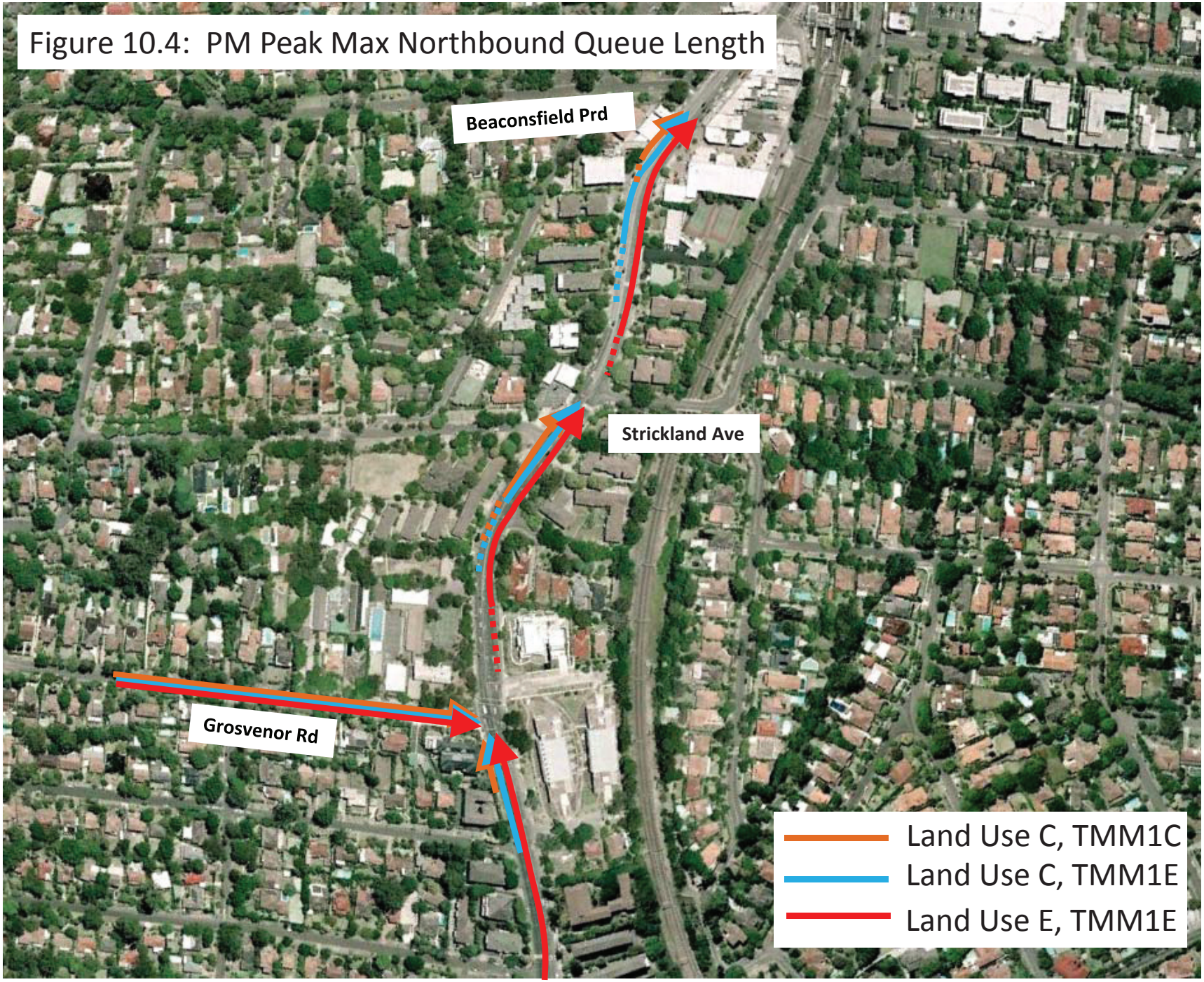
LINDFIELD TRANSPORT NETWORK STUDY 2013/14
DRAFT CONCEPT PLAN

TRAFFIC MANAGEMENT MEASURES 1E

OF

DRG No.

Figure 10.4: PM Peak Max Northbound Queue Length



11. Strategic Cost Estimates

11.1 Preferred Traffic & Transport Plan

The cost estimates within this section of the report are based on traffic & transport management measures 1C (TMM1C) which are the preferred package of transport measures supporting land use Option B in Lindfield.

These costs are provided for feasibility planning purposes only and should not be relied for other purposes unless verified by a suitably qualified civil engineer or quantity surveyor. Rates have been sourced from similar 2014 projects.

The cost estimates relate to the external civil works required to support the proposed Woodford Lane land use Option B.

The following items have not been included within the cost estimates prepared below:

- Property acquisition. (i.e. Bent Lane Widening or Woodford Lane re-alignment)
- Relocation of services.
- Any on-going maintenance.
- Open cuttings for TCS signal conduit installation across the Pacific Highway.
- Provision of lighting for any new infrastructure.

11.1.1 Civil/Traffic Measures

Table 11.1: Lindfield Civil Works Fee Summary

Item No.	Item Description	Category	Cost Estimate
1.	New Traffic Signals - Tryon Place/Pacific Highway TCS992	Traffic Signals (New)	$250,000
2.	New Traffic Signals - Beaconsfield Parade/Pacific Highway TCS XXX (Including Beaconsfield Parade Widening West Side)	Traffic Signals (New)	$250,000
3.[1]	New Traffic Signals - Strickland Avenue/Pacific Highway TCSXXX	Traffic Signals (New)	$250,000
4.	Traffic Signal Adjustments - Balfour Street/Pacific Highway TCS 894	Traffic Signals (Adjust)	$20,000
5.[1]	New Traffic Signals - Tryon Road/Lindfield Avenue TCSXXX	Traffic Signals (New)	$250,000
6.	Grosvenor Street Widening (South side) - TCS	Road Widening/Traffic Signal (Adjust)	$44,125
7.	Tryon Place Extension- 4.5m wide road	New Road	$67,825
8.[1]	Bent Street to Drovers Way – 6.0m wide road	New Road	$282,250
9.	Woodford Lane Re-alignment- 4.5m wide road (East of Bent Street)	New Road	$85,275
10.	Bent Lane Widening 3.0m (Between Balfour Street and Bent Street)	Road Widening	$67,125
	Sub-Total 1		**$1,566.600**

Notes

[1] The costs for items 3, 5 & 8 are included as part of Ku-ring-gai's Developer Contribution Plan

11.1.2 Sustainable Transport Measures (Buses, Bicycles & Pedestrians)

Table 11.2: Lindfield Sustainable Transport Fee Summary

Item No.	Item Description	Category	Cost Estimate
1.	Pacific Highway Bus Stops – Relocation to Departure Side of Tryon Place/Pacific Highway Intersection & Associated Bus Stop Environment Improvements	Buses	$20,000
2.	Woodford Lane/Bent Lane Contra-Flow Cycleway	Bicycles	$35,000
3.	Bicycle Parking Rails (East & West Side of Lindfield Station) x 30	Bicycles	$27,000
4.	Tryon Lane Shared Zone	Pedestrians/Public Domain	$500,000
5.	Bent Street Closure/Pedestrianisation	Pedestrians/Public Domain	$50,000
6.	Kochia Lane Closure/Pedestrianisation	Pedestrians/Public Domain	$50,000
	Sub-Total 2		**$682,000**

Notes:
1. Pedestrian footpaths associated with new roads have been costed within Table 11.1.

11.1.3 Lindfield Pedestrian Overbridge

The cost estimates indicated in Table 11.3 were prepared by Robert Bird Group as part of the Lindfield Pedestrian Bridge feasibility study.

Table 11.3: Lindfield Pedestrian Bridge Fee Summary

Item No.	Item Description	Category	Cost Estimate
1.	Site establishment and disestablishment, overheads and margin	Pedestrians/Cyclist / Public Domain	$500,000
2.	Demolition, diversions and temporary works		$425,000
3.	Services relocations / Land purchase		$500,000
4.	Ramps and stairs		$270,000
5.	Lifts (2 off)		$600,000
6.	Bridge structure		$680,000
7.	Professional fees, approvals, permits, reports etc.		$300,000
	Sub-Total 3		**$3,275,000**
	TOTAL including contingency and GST		**$2.7 Million to $4.6 Million**

A consolidated table of costs are provided in Appendix O.

12. Conclusions & Recommendations

12.1 Conclusions

Based on the assessment undertaken by PeopleTrans and TMA as part of this study the following conclusions are made:

12.1.1 Existing Situation

- Lindfield is classified as a local centre within the Ku-ring-gai Local Government Area with a population of approximately 12,500 people with almost half (49%) of the residents originating from China, Hong Kong and the United Kingdom.
- The dominant mode of transport for residents of Lindfield on their journey to work is the private car followed by the train and then by bus although the Census 2011 data shows a small shift towards more train, motorcycle and bicycle use over the last 5 years.
- There is a good mix and variety of land uses available for the residents of Lindfield although it is noted that some of the key land uses are spread out with accessibility between these land uses on the east and west sides of Lindfield difficult due to the Pacific Highway.
- Trains, buses and taxis currently operate satisfactorily in Lindfield.
- There is spare capacity on buses servicing Lindfield Station which should be able to meet future demand associated with any land use intensification.
- Lindfield is not currently a key destination for cyclists but does provide a key commuter route along Lindfield Avenue during the AM & PM peak periods.
- Crossing the Pacific Highway along the designated bicycle route on Balfour Street/Havilah Road could only be regarded as a route for experienced cyclists. Safer crossing facilities of the Pacific Highway for cyclists need to be considered.
- There is a lot of informal kiss & ride activity occurring on the eastern and western sides of Lindfield which should be formalised and provided as close to the station as possible, noting that this should not compromise public transport, cyclist and pedestrian space, which to a degree, should have a level of priority over kiss & ride parking.
- The Pacific Highway is a barrier/deterrent to pedestrian accessibility between the east and west sides of Lindfield which is exacerbated by the long wait times at the existing mid-block signalised pedestrian crossing adjacent to Lindfield Station.
- Pedestrians using this crossing, particularly during the PM peak period are putting themselves at risk by crossing illegally against the red pedestrian signal. The long pedestrian wait times are a contributing factor to this activity.
- There is some existing AM, PM and Saturday peak period operational road network capacity in Lindfield as a whole.
- The intersections of Balfour Street/Pacific Highway and Grosvenor Road/Pacific Highway operate at or over capacity during the AM and PM weekday peak hours.

12.1.2 Future Land Use Analysis

- The operational analysis of splitting the commuter parking between the Village Green and Community Hub sites, east and west of the Pacific Highway, in comparison to the commuter car parking being located solely on the Community Hub site, west of the Pacific Highway indicated did not distinguish a clear preference on traffic grounds of where commuter car parking is best located.
- Land use Option B provided a moderate level of future traffic demand for the local centre of Lindfield and could be adequately supported by Traffic Management Option 1.
- Land use Option C provided much higher levels of future traffic demand for the local centre of Lindfield and was best supported by Traffic Management Option 1C.
- Traffic Management Option 1C is also likely to be supported by RMS over other traffic management options developed as part of this study as it provides the best future road network performance.
- The cost associated with TMM1C is in the region of $2.5 million when design and construction contingencies are included.
- Land use Option E provided similarly high levels of future traffic demand as land use Option C for the local centre of Lindfield.
- The introduction of a right turn from the Pacific Highway into Beaconsfield Parade in conjunction with land use Option E, results in unacceptably high queues and delays on the Pacific Highway northbound approach during the PM peak period and is unlikely to be acceptable to RMS. The queues, in this case, extend approximately 850m back from the intersection of Grosvenor Road.
- The introduction of a right turn from the Pacific Highway into Beaconsfield Parade in conjunction with land use Option C has a similar effect on queueing and delays on the Pacific Highway northbound approach.
- A pedestrian bridge over the Pacific Highway linking the east and west sides of Lindfield is technically feasible and meets all other criteria set by RMS in determining the need for such a facility.

12.2 Recommendations

Based on the assessment undertaken by PeopleTrans and TMA as part of this study the following recommendations are made:

- Although the traffic analysis indicates that the 240 TfNSW commuter car parking spaces could be located either entirely on the western side of the Pacific Highway (on the Woodford Lane site) or partially on the eastern side of the Pacific Highway (on Lindfield Village Green site) with little impact on road network operation, given the desire to maintain a village character on the east side of Lindfield and our general observations and understanding of the future retail land uses on Lindfield Avenue PeopleTrans would recommend that all 240 TfNSW commuter car parking spaces be located on the Woodford Lane site.
- If there is no expansion of the existing Coles site then Traffic Management Option 1 could adequately support land use Option B for the local centre of Lindfield.

- Should the existing Coles site expand, as per the detail provided in this study, in conjunction with the proposed Woodford Lane car park site development (i.e. Land use Option C) then Traffic Management Option 1C, as indicated in Appendix N and Table 12.1, should be adopted as the preferred future road network/transport plan for the local centre of Lindfield.
- Traffic Management Option 1C provides a good balance between road network operational performance and accessibility but also provides a number of other opportunities to improve the public domain.

Table 12.1: Traffic Management Option 1C – Summary Table (reproduced)

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

Table 12.2: Woodford Lane Car Park Site (Land Use Option C) (reproduced)

Option Name	Proposed Land Uses	Scale/Size (Area Sqm GLFA or as stated otherwise)
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)
	TfNSW Commuter Parking	240 spaces
+ Coles Redevelopment	Major Retail - Supermarket	1,900 Net
	Specialty Retail	3,000
	High Density Residential	110 Units

- In terms of transport planning the Lindfield Community Hub Master Plan should use Land Use Option B as a benchmark for the Woodford Lane site which could have some upward flexibility, the level of which, could only be determined by undertaking further modelling.
- The Lindfield Community Hub Master Plan should make width provision for a contra-flow cycle lane along Woodford Lane/Bent Lane as a potential cycle link between Strickland Avenue and Balfour Street.
- The Lindfield Community Hub Master Plan should also make provision for bicycle parking given that this site would become an attractive destination for all users.
- The introduction of a right turn from Pacific Highway into Beaconsfield Parade should not be supported by Ku-ring-gai Council unless it can be demonstrated, without reducing

footpath widths or introducing tidal flow on the Pacific Highway, that this will not have significant impacts on Pacific Highway traffic during weekday AM, weekday PM or Saturday peak periods.

- The Lindfield pedestrian bridge should be progressed further as it would provide numerous community benefits, particularly if connected to a retail development on the Woodford Lane site.

12.3 Next Steps

- Traffic Management Option 1C should be referred to RMS for concurrence and to highlight some of the changes recommended in this option.
- In order to improve road network operational performance, Traffic Management Option 1C should be further refined and modelled to include the widening of Grosvenor Road and potential intersection improvements at Lindfield Avenue/Havilah Road.
- In order to determine what degree of upward land use flexibility could occur at the Woodford Lane site over and above what is proposed for land use Option B, further modelling should be undertaken.
- An RMS prioritisation/funding application, through RMS's pedestrian bridge program, should be prepared and submitted by Ku-ring-gai Council given the planning and approval timeframes associated with this scale and type of infrastructure.