
Anzac Parade corridor future Light Rail system capacity analysis

Addendum Report

Prepared for Randwick City Council | 2 March 2018

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Final

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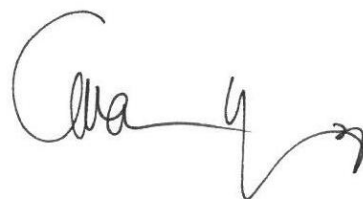
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Signature



Date 2 March 2018

Date 2 March 2018

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Document Control

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1 Introduction

This addendum report has been prepared by EMM Consulting Pty Limited (EMM) for Randwick City Council to review the capacity requirements for the future public transport commuter services in the Anzac Parade corridor.

This report is an addendum intended to be read in conjunction with the original report dated 20 January 2017. This review is in response to DPE's condition that a minimum of 600 additional dwellings be considered in Council's proposed amendment to the Randwick LEP 2012 (RLEP 2012) for the Kingsford and Kensington town centres. These 600 dwellings would be in addition to the 15,150 dwellings currently proposed by Council to be developed by 2031 within the Randwick local government area (LGA). Over this fifteen year future period, it will be important to maintain reasonable future peak hour passenger crowding levels for Anzac Parade public transport services to ensure that the Randwick LGA dwelling growth projections are achievable with minimum levels of car usage for future urban developments.

A base scenario and two future development scenarios are considered in this report:

- Scenario 1 – the base scenario for 2016, which has been updated from the 2011 Census Journey to Work Explorer data (Bureau of Transport Statistics). 2016 is used as this is consistent with the base for the population and employment projections used by Council.
- Scenario 2 – the 2016 base scenario plus the existing proposal by Council for the development of approximately 4,900 new dwellings within the Kensington to Kingsford (K2K) Anzac Parade corridor by 2031, as per the previous report. These would be part of the 15,150 new dwellings proposed for development within the Randwick LGA as a whole by 2031.
- Scenario 3 – the 2016 base scenario and existing proposal by Council plus an additional 600 dwellings required by DPE, coming to a total of 5,500 new dwellings within the K2K Anzac Parade corridor by 2031. These would be part of 15,750 new dwellings proposed for development within the Randwick LGA as a whole by 2031. This scenario is considered in addition to those in the previous report.

The future Light Rail capacity analysis in Chapter 2 calculates the future Light Rail passenger demand for the city-bound and out-bound directions through the Kingsford and Kensington town centre stops for scenarios 2 and 3. Further, the analysis calculates what continuing bus services will need to be retained travelling to and from the City via the Anzac Parade and Todman Avenue routes for either development scenario 2 or 3 to be achieved.

This addendum report also revises the public transport mode share assumptions in line with the ARUP Transport Assessment (28 November 2016) and Stage 2 Transport Modelling Report (18 May 2017). The higher public transport mode share during the peak hour recognises the transport-oriented nature of the new development, new residents attracted to the area by the light rail and the perceived reliability of the light rail as opposed to buses.

2 Future proposed change

2.1 Existing transport network

Detailed analysis of the existing transport network has been undertaken in the original report.

2.2 Dwelling growth projections

The historic dwellings growth distribution for the Randwick LGA is has now been superseded by a future growth forecast for the LGA for the 15 years from 2016 to 2031.

As outlined in Chapter 1, this report considers two future dwellings growth scenarios as shown below:

- Scenario 2 – a forecast of +15,150 dwellings within the LGA over the fifteen year period between 2016 and 2031 distributed between three generic areas: town centre zones, major sites/urban renewal areas and other ‘infill’ areas. The new dwellings would be split approximately 40%/30%/30% respectively between these areas:
 - 6,060 new dwellings in town centres including 4,900 in the K2K areas;
 - 4,545 new dwellings in major sites and/or identified urban renewal areas, and
 - 4,545 new dwellings built as infill developments within existing residential precincts.
- Scenario 3 – a forecast of +15,750 dwellings within the LGA over the same period, involving an additional 600 dwellings in the K2K areas:
 - 6,660 new dwellings in town centres including 5,500 in the K2K areas;
 - 4,545 new dwellings in major sites and/or identified urban renewal areas, and
 - 4,545 new dwellings built as infill developments within existing residential precincts.

The majority of the proposed 4,900 (scenario 2) or 5,500 (scenario 3) new K2K dwellings would be constructed within the Kingsford terminus and Kensington Light Rail stop catchments. The rest of the dwellings would be located within the catchment of the Strachan Street and Carlton Street stops. For the purposes of this report it is assumed that they would be distributed as below:

- Scenario 2 – approximately 1,800 new dwellings within the Kingsford terminus catchment and approximately 1,400 within the Todman Avenue stop catchment.
- Scenario 3 – the additional 600 dwellings would be split evenly between Kingsford and Kensington. Thus, there would be approximately 2,100 new dwellings within the Kingsford terminus catchment and approximately 1,700 within the Todman Avenue stop catchment.

For the purposes of future analysis of the Light Rail system passenger demand from all areas of the Randwick LGA, the following overall LGA distribution of the future predicted urban growth of between

+15,150 and +15,750 dwellings has been predicted by EMM to occur within the following Light Rail catchment areas:

- 35% of new dwellings within the Kensington and Kingsford (Anzac Parade) Light Rail catchment areas (37% for scenario 3);
- 32% of new dwellings within the Randwick, Clovelly, Coogee, Bundock Street and South Coogee (Randwick High Street) Light Rail catchment areas (31% for scenario 3);
- 24% of new dwellings within the Maroubra and other areas of Anzac Parade (south) Light Rail and bus feeder service catchment areas (23% for scenario 3); and
- 9% of new dwellings within the Matraville and other areas of Bunnerong Road (south) Light Rail and bus feeder service catchment areas (9% for scenario 3).

In addition to the predicted Randwick LGA dwelling growth generating further Light Rail passenger travel demand from the Bunnerong Road (south) catchment areas, there is significant additional passenger demand predicted from new dwellings constructed within the Pagewood, Hillsdale and Eastgardens localities within the adjoining Bayside LGA over the same fifteen year period from 2016 to 2031.

The future growth in the local employment based travel demand within the local employment centres adjacent to the Anzac Parade and Bunnerong Road routes through Randwick and the adjoining Bayside LGA is estimated to increase in line with general population growth at a rate of +1% annually. This increases the future Light Rail corridor peak hour travel demand growth in the counter peak direction (except for the future growth in the UNSW student travel movements which requires separate forecasting, as described in Section 3.1).

2.3 Future corridor travel demand

The total locally based future passenger demand for the Anzac Parade corridor (including the Light Rail and the remaining bus services which are continuing to operate) is summarised in Tables 2.1 and 2.2 for both future scenarios for the city-bound and out-bound directions, for the one hour morning and afternoon peak periods. In this analysis, there has been an increase of 20% assumed in the peak hour public transport travel mode share for the period between 2020 (the opening of the Light Rail) and 2031. As mentioned in Chapter 1, this assumption is supported by the transport-oriented nature of the new development, the new residents that would be attracted to the area by the Light Rail and the perceived reliability of the Light Rail as opposed to buses.

Table 2.1 Summary of scenario 2 Anzac Parade corridor peak hour Light Rail travel demand

Calculation of future corridor travel demand (north of Carlton Street)	AM peak hour city-bound	AM peak hour out-bound	PM peak hour city-bound	PM peak hour out-bound
2011 base year travel demand	3,410	1,071	918	2,923
2011 to 2016 growth adjustment (Scenario 1)	237	54	46	194
Total base year 2016 travel demand	3,647	1,125	964	3,117
+4,040 LGA dwellings growth from 2016	418	44	38	358
Total future year 2020 travel demand	4,065	1,169	1002	3,475
+15,150 LGA dwellings growth from 2016	1,722	182	156	1,476
Total future year 2031 travel demand	5,787	1,351	1158	4,951

Table 2.2 Summary of scenario 3 Anzac Parade corridor peak hour Light Rail travel demand

Calculation of future corridor travel demand (north of Carlton Street)	AM peak hour city-bound	AM peak hour out-bound	PM peak hour city-bound	PM peak hour out-bound
2011 base year travel demand	3,410	1,071	918	2,923
2011 to 2016 growth adjustment (Scenario 1)	237	54	46	194
Total base year 2016 travel demand	3,647	1,125	964	3,117
+4,200 LGA dwellings growth from 2016	443	44	38	380
Total future year 2020 travel demand	4,090	1,169	1,002	3,497
+15,750 LGA dwellings growth from 2016	1,806	182	156	1,548
Total future year 2031 travel demand	5,896	1,351	1,158	5,045

2.4 Future corridor requirements for bus and Light Rail services

The interim corridor analysis below in Tables 2.3 and 2.4, which is based on both year 2020 urban development scenarios for the first full year of operation of the Light Rail system, assumes the Light Rail system is operating at the TfNSW proposed initial frequency for the Anzac Parade route which is one tram every eight minutes (7.5 trams per hour) in each direction. This provides interim peak hour passenger capacity for the Light Rail system of 3,495 passengers per hour in each direction, based on 466 persons per tram.

The longer term analysis in Tables 2.3 and 2.4 is based on both year 2031 urban development scenarios for the corridor which assumes the future Light Rail system is operating at the TfNSW proposed maximum frequency for the Anzac Parade route with one tram every 6.5 minutes (9.23 trams per hour) in each direction. This would provide a future maximum peak hour capacity for the Light Rail system of 4,300 passengers per hour in each direction, based on the proposed design capacity of 466 persons per tram.

The future predicted year 2020 and year 2031 travel demand for the Light Rail system below shows that in both the interim and year 2031 situations, for both scenario 2 and 3, the overall future corridor travel demand will significantly exceed the respective capacity of the Light Rail system, such that a significant proportion of the existing corridor bus services would need to be retained, operating in addition to the Light Rail services.

The combined capacity for the future Anzac Parade corridor public transport system linking the K2K area to the Sydney CBD will depend on the proportion of the existing peak hour bus services (primarily express buses) which are to be retained.

In this regard, it will be desirable to maintain the current attractiveness of the K2K area public transport system by avoiding any major increase in the morning peak crowding levels. The adjusted base year corridor travel demand analysis for 2016, in Table 2.1, shows the existing corridor bus services carry 3,647 city-bound passengers per hour during the morning peak hour, which corresponds to an average one hour morning peak period crowding level of 76% for the combined 2016 total (Anzac Parade + Todman Avenue) bus capacity of 4,800 persons with 80 city-bound buses over a one hour period.

To avoid a significant deterioration in the future peak hour public transport 'level of service' for the Anzac Parade corridor (as measured by peak hour passenger crowding levels), it is recommended that the future average morning peak hour passenger crowding level for the route, north of Carlton Street, should not exceed 80%.

Considering scenario 2, for comparison purposes, with the interim (year 2020) and the longer term (year 2031) corridor public transport system operations, the required future number of bus services operating in addition to the Light Rail system are shown in Table 2.3, for a range of future one hour average morning peak period passenger crowding levels, either 80%, 90% or 100%.

Table 2.3 Future combined corridor operating capacity with bus and light rail services for scenario 2

Future system operations	Future one hour peak average crowding level	Required corridor hourly capacity	Light Rail system capacity	Residual bus system capacity	Number of buses per hour
Interim operations (year 2020)	80%	5,081	3,495	1,586	27
	90%	4,517	3,495	1,022	17
	100%	4,065	3,495	570	10
Long term operations (year 2031)	80%	7,234	4,300	2,934	49
	90%	6,430	4,300	2,130	36
	100%	5,787	4,300	1,487	25

The results of the corridor capacity and crowding 'level of service' calculations in Table 2.3 show that for the first year of the Light Rail system operations in 2020, with the proposed (scenario 2) Randwick LGA dwellings growth of +4,040 dwellings over the four year period from 2016 to 2020, approximately 27 of the existing 80 morning peak hour peak direction bus services will need to be maintained to provide the recommended maximum level of service (measured as an 80% one hour peak period average crowding level).

This would generally maintain the existing levels of passenger comfort for local commuters which were provided by the adjusted base year (2016) morning peak hour city-bound bus services where 80 buses per hour operated via the Anzac Parade and Todman Avenue routes to the Sydney CBD.

For the scenario 2 longer term Randwick LGA projected dwellings growth of +15,150 dwellings over a fifteen year period to 2031, well over half of the existing morning peak hour peak direction bus services (49 hourly bus services compared to 80 currently) will need to be maintained travelling through to the Sydney CBD.

This will also effectively maintain an equivalent level of passenger service and comfort in 2031 (measured in terms of the one hour morning peak period average crowding levels) to that which has historically been provided by current (year 2016) morning peak hour city-bound bus services travelling via the Anzac Parade and Todman Avenue routes.

Considering scenario 3 with the interim (year 2020) and the longer term (year 2031) corridor public transport system operations, the required future number of bus services operating in addition to the Light Rail system are shown in Table 2.4, for a range of future one hour average morning peak period passenger crowding levels, either 80%, 90% or 100%.

Table 2.4 Future combined corridor operating capacity with bus and light rail services for scenario 3

Future system operations	Future one hour peak average crowding level	Required corridor hourly capacity	Light Rail system capacity	Residual bus system capacity	Number of buses per hour
Interim operations (year 2020)	80%	5,113	3,495	1,618	27
	90%	4,544	3,495	1,049	18
	100%	4,090	3,495	595	10
Long term operations (year 2031)	80%	7,370	4,300	3,070	52
	90%	6,551	4,300	2,251	38
	100%	5,896	4,300	1,596	27

The results of the corridor capacity and crowding 'level of service' calculations in Table 2.4 show that for the first year of the Light Rail system operations in 2020, with the scenario 3 Randwick LGA dwellings growth of +4,200 dwellings over the four year period from 2016 to 2020, approximately 27 of the existing 80 morning peak hour peak direction bus services will need to be maintained to provide the recommended maximum level of service (measured as an 80% one hour peak period average crowding level).

This would generally maintain the existing levels of passenger comfort for local commuters which were provided by the adjusted base year (2016) morning peak hour city-bound bus services where 80 buses per hour operated via the Anzac Parade and Todman Avenue routes to the Sydney CBD.

For the scenario 3 longer term Randwick LGA projected dwellings growth of +15,750 dwellings over a fifteen year period to 2031, well over half of the existing morning peak hour peak direction bus services (52 hourly bus services compared to 80 currently) will need to be maintained travelling through to the Sydney CBD.

This will also effectively maintain an equivalent level of passenger service and comfort in 2031 (measured in terms of the one hour morning peak period average crowding levels) to that which has historically been provided by current (year 2016) morning peak hour city-bound bus services travelling via the Anzac Parade and Todman Avenue routes.

2.5 Future potential increase in tram service frequency

TfNSW has indicated in their submission to DPE that the tram frequency could increase in the future to a combined route (Anzac Parade and Alison Road) frequency of 20 trams per hour (10 trams per hour for each route). A total of 10 trams per hour along the Anzac Parade corridor would potentially increase the maximum tram capacity (licensed limit) to 4,660 passengers per hour. This would have an effective limit of 3728 based on a maximum of 80% crowding. However, this potential increase is not formally included in the project EIS and modification, and represents only a marginal improvement on the currently considered 9.23 trams per hour.

3 Additional factors considered

3.1 Effect of University of NSW student travel demand

Analysis of the effect of UNSW student travel has been considered in the original report.

The additional UNSW student travel movements, outlined in the original report, are potentially significant in terms of the overall corridor passenger crowding levels in the north-bound direction, between Kingsford and the University stop, although the additional student travel demand does not generally affect the morning peak hour corridor movements, north of Carlton Street.

The additional UNSW student travel demand over the Light Rail route north-bound between the Kingsford (Nine Ways) and the UNSW Light Rail stops could significantly increase the future corridor passenger movements and crowding levels (on both buses and Light Rail) during the one hour morning peak travel period. This requires that significant numbers of north-bound buses will still be retained in the Anzac Parade corridor travelling north of Kingsford, as is shown in Table 2.4, where up to 49 buses per hour in the longer term (year 2031) analysis scenario will be required to operate north of Kingsford in addition to the Anzac Parade corridor Light Rail services for scenario 2. Even more significantly, for scenario 3, up to 52 buses per hour in the longer term (year 2031) analysis scenario will be required to operate in addition to the Light Rail.

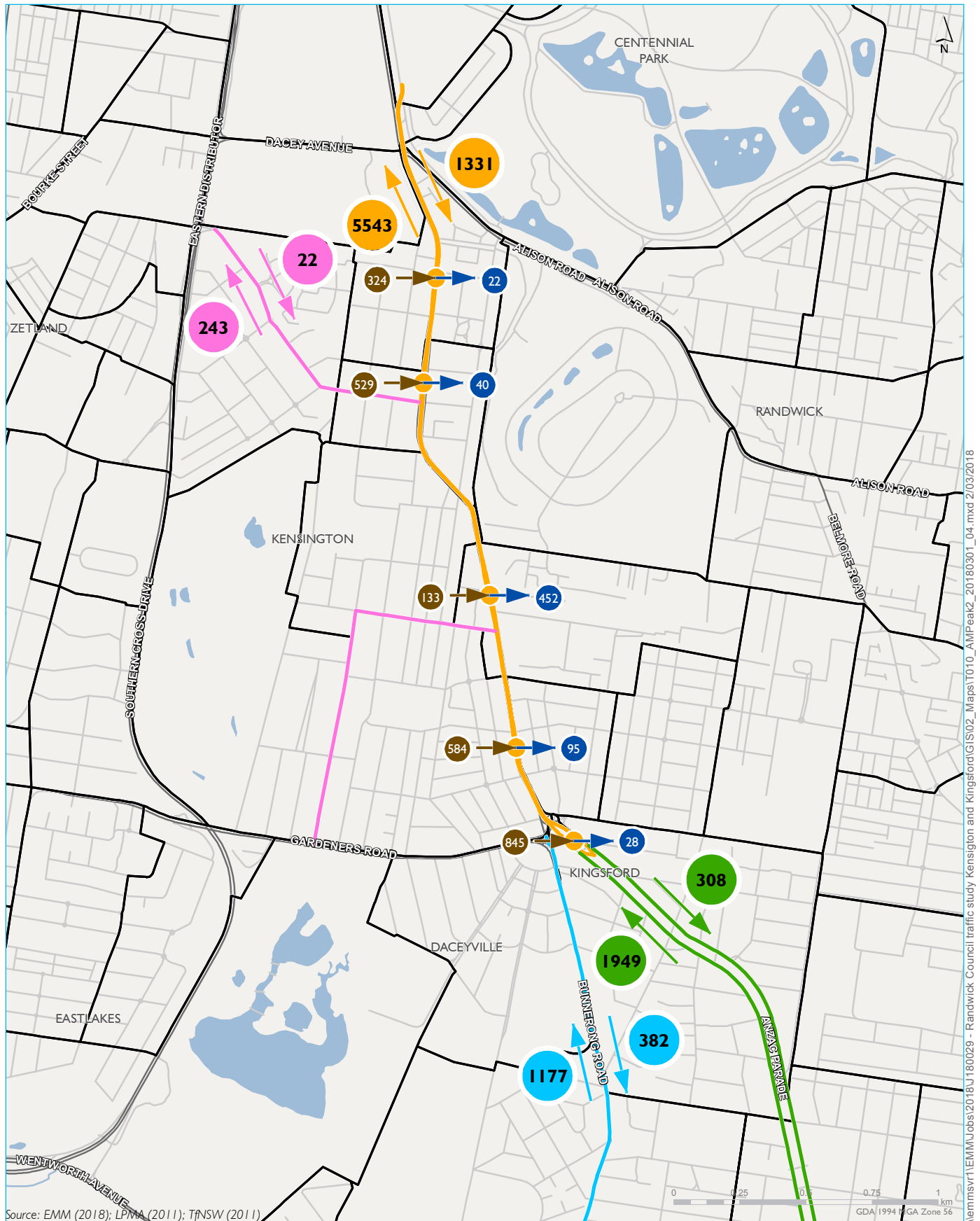
3.2 Capacity for future buses to continue travelling to the Sydney CBD

3.2.1 Peak hourly express bus services

It is understood from the December 2013 CSELR EIS and subsequent announcements that the NSW government is effectively committed to retaining existing express bus services from the Randwick area, in both the Alison Road and the Anzac Parade 'corridors' travelling through to the Sydney CBD.

In this context, it should be noted that the number of north-bound peak hourly express bus services travelling via the Anzac Parade route through Kingsford and Kensington has actually increased from approximately 15 buses per hour in 2011 to approximately 30 buses per hour in November 2016, based on the bus timetables for bus routes X92/4/6/7/9 and L94, for the one hour period 7.45 to 8.45 am at Carlton Street. (This period corresponds to the actual peak one hour morning arrival time of between 8.00 to 9.00 am for buses arriving at the Sydney CBD).

The City of Sydney Council is generally against buses coming into the Sydney CBD. If these existing express buses are retained, together with approximately eight buses per hour travelling on the route 303 via Todman Avenue to the Sydney CBD, the NSW government can relatively easily maintain up to 38 buses per hour travelling through the Kingsford and Kensington areas to the Sydney CBD in a one hour morning peak period. This would meet the interim (2020) future requirement which is identified by this study (Tables 2.3 and 2.4) for future Anzac Parade bus services to operate in addition to the Light Rail system. However, the retention of 38 buses would again be insufficient in the long term (2031) for both scenario 2 and 3.



KEY (excludes UNSW student travel)

- Main road
- Local road
- Watercourse
- Waterbodies
- Light rail station
- Passenger alighting (count)
- Passenger boarding (count)
- Proposed light rail (count)
- Eastern - Day - Todman bus route (count)
- Bunnerong Road (count)
- Anzac Parade (count)

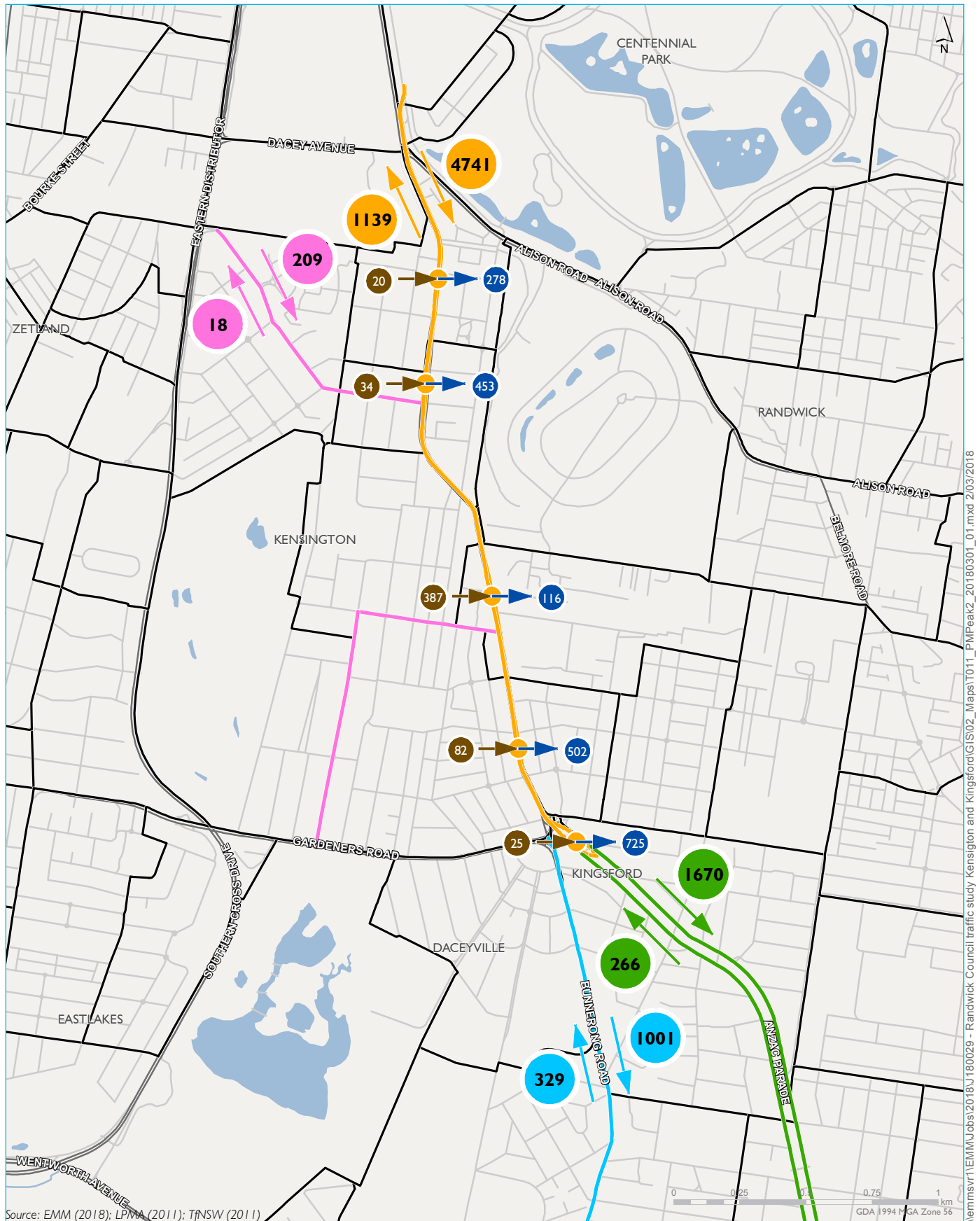
Future (2031) AM peak hour corridor
public transport movements

Scenario 2

Randwick Light Rail

Figure 3.1





KEY (excludes UNSW student travel)

- Main road
- Local road
- Watercourse
- Waterbodies
- Light rail station
- Passenger alighting (count)
- Passenger boarding (count)
- Proposed light rail (count)
- Eastern - Day - Todman bus route (count)
- Bunnerong Road (count)
- Anzac Parade (count)

Future (2031) PM peak hour corridor
public transport movements

Scenario 2

Randwick Light Rail

Figure 4.2



3.3 Comparison with historic crowding levels for Sydney trains and buses

Another potential concern with the future Anzac Parade corridor Light Rail system is that the proposed Light Rail vehicle passenger capacity rates are significantly higher than the previously accepted Sydney public transport benchmark crowding levels for either heavy rail 'double deck train' or bus services.

An analysis of maximum passenger crowding rates has been undertaken in the original report. The proposed 66 m long Randwick Light Rail tram vehicles can have 466 persons/143 m² area available to passengers = 3.3 persons per m², which is about 25% higher than the average of the previously identified maximum crowding levels (which were defined as crush capacity) for either Sydney trains or buses.

Realistically, the maximum practical crowding level for the proposed 66 m long Randwick trams is probably about 80% of the maximum stated capacity of 466 persons and is about 380 persons per tram. Once an operating tram gets above this level of crowding (which is 2.65 persons per m²), there is going to be a tendency for passengers to wait on the platform and hope the next tram is less crowded rather than try to force their way on.

This practical occupancy limit is recommended to support a public transport focus for future residential growth in Randwick LGA and encourage higher public transport use in preference to car travel by locally based commuters. It is also generally consistent with the currently observed one hour morning peak period passenger crowding levels, which are between 70% and 80% capacity, for the existing network of bus routes serving the Anzac Parade corridor within the Kensington and Kingsford areas.

Based on the survey of buses which was carried out from 7.45 to 8.45 am on Friday 11 November 2016 (Appendix B), approximately 85% of buses had five or fewer people standing. Moreover, of all the buses surveyed, only 8% of all passengers were standing. This suggests that passengers on the Anzac corridor route are currently unaccustomed to frequent standing on public transport. Trams have a total capacity of 466, with a seated capacity of 108 (only 23% of passengers will get seats on a full tram). There is seating for approximately 80% of passengers on a full bus. Therefore, the likelihood of standing during peak hour on a tram is much greater than on a bus. This may again cause fewer commuters to use the light rail rather than private vehicles or express buses.

4 Summary and conclusions

This addendum report has updated the original report and undertaken an overall review of the future Light Rail system capacity to determine the future ability of the additional public transport capacity along the Anzac Parade route to support future residential growth in the Randwick LGA (including the Kensington and Kingsford town centres and other areas further south towards Maroubra, Matraville and La Perouse). This addendum report increases projected public transport mode share to support Council's vision for reduced car usage and increased active transport and public transport usage in the corridor.

It is a significant concern that the proposed Light Rail system capacity will actually be lower than the capacity of the existing peak hour bus services which are currently using Anzac Parade and Todman Avenue and the future corridor public transport system will effectively be operating at full capacity from the commencement of operations in 2019. For scenario 2 – Council's original proposal of 4,900 new dwellings in the K2K area – this will require a significant number of existing peak hourly bus services (up to 49 buses per hour) to be retained if the system is to provide adequate public transport capacity for all the relevant areas of Randwick LGA in the future. For scenario 3 – DPE's requirement for at least 600 new dwellings in the K2K area in addition to Council's proposal – the necessary retention of peak hourly bus services becomes even greater (up to 52 buses per hour).

It might reasonably be anticipated that the City of Sydney will object to over 40 buses per hour continuing to travel through the Sydney CBD. As an alternative, increasing the capacity of the Light Rail with a higher frequency of services is an option which TfNSW is considering. However, the actual feasibility of this is unknown. Previously the proposed tram frequency was reduced by TfNSW due to concerns that intersections may be significantly affected.

4.1 Scenario 2

The currently proposed dwelling targets (scenario 2) for Randwick LGA and the K2K town centres are achievable, subject to the provision of adequate public transport capacity. A significant proportion of the existing corridor bus based public transport system will need to be retained for reasonable corridor morning peak hour average passenger crowding levels to be maintained, in both the interim year 2020 (first full year of the system operations) and the longer term year 2031.

In 2020, with approximately +4,040 additional dwellings forecast to be constructed in Randwick LGA and the peak hour Light Rail (tram) frequency at eight minutes, the future northbound corridor peak passenger loading (between Kingsford and the University stop) will exceed the Light Rail system capacity by nearly 2,000 passengers per hour. Up to 27 buses per hour will be required travelling north of Kingsford through to the Sydney CBD or other equivalent destinations in order to maintain the current levels of crowding.

In 2031, with +15,150 additional dwellings forecast to be constructed in Randwick LGA and the peak hour Light Rail (tram) frequency at 6.5 minutes, the future northbound corridor peak passenger loading (between Kingsford and the University stop) will exceed the Light Rail system capacity by nearly 3,200 passengers per hour. Up to 49 buses per hour will be required travelling north of Kingsford through to the Sydney CBD or other equivalent destinations in order to maintain the current levels of crowding.

4.2 Scenario 3

In addition to the Council's proposal (scenario 2), DPE has required that at least 600 additional dwellings be developed in the K2K area in the period between 2016 and 2031. In 2020, with approximately +4,200

additional dwellings forecast to be constructed in Randwick LGA and the peak hour Light Rail (tram) frequency at eight minutes, the future northbound corridor peak passenger loading (between Kingsford and the University stop) will exceed the Light Rail system capacity by nearly 2,000 passengers per hour, similar to scenario 2. Again, up to 27 buses per hour will be required travelling north of Kingsford through to the Sydney CBD or other equivalent destinations in order to maintain the current levels of crowding.

In 2031, with +15,750 additional dwellings forecast to be constructed in Randwick LGA and the peak hour Light Rail (tram) frequency at 6.5 minutes, the future northbound corridor peak passenger loading (between Kingsford and the University stop) will exceed the Light Rail system capacity by over 3,300 passengers per hour. Up to 52 buses per hour will be required travelling north of Kingsford through to the Sydney CBD or other equivalent destinations in order to maintain the current levels of crowding.

4.3 Future public transport system peak hour passenger crowding levels

If a significant proportion of existing bus services are not maintained concurrently with the Light Rail system operations, the likely consequence will be that the future peak hour passenger crowding levels on the Anzac Parade public transport system will significantly worsen in comparison to the current levels. This will adversely affect the attractiveness and use of public transport travel for existing users and new residents moving to the area.

This outcome would be inconsistent with the TfNSW objectives for providing an improved public transport system for the Anzac Parade route and the public transport focused travel objectives which underlie the draft Planning Strategy for Kensington and Kingsford town centres.

The predicted future morning peak hour travel demand north-bound within the corridor will be significantly influenced by locally based UNSW student travel movements between the Kingsford and University stops. Although the future overall average north-bound passenger crowding level for the future public transport system can be maintained at approximately 80% for the corridor north of Carlton Street, the localised future passenger crowding level would increase to approximately 90% between the Kingsford and University stops.

In the longer term beyond the year 2031, an extension to the Eastern Suburbs (Bondi Junction) heavy rail line would be required. That extension may be required earlier if a significant proportion of peak hour bus services travelling between the Sydney CBD and the Randwick LGA are not retained. The extension would extend either to Kingsford or Maroubra (or even as a loop via Mascot connecting back to the Illawarra line at Sydenham) to ensure adequate public transport capacity can be provided to all relevant areas of Randwick LGA in the future.

4.4 Future capacity constraint to development from the Light Rail system

Due to future constraints on the public transport system operating in the Anzac Parade corridor, it is recommended that future development for the K2K area of Randwick LGA not be above the +4,900 dwellings which has been proposed by Council.

Appendix A

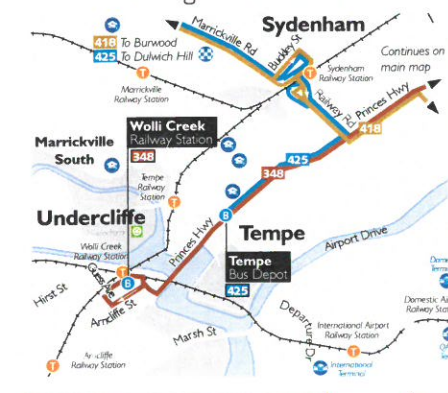
Existing Randwick LGA bus routes map

For route information in this area, refer to Southern Region Guide.



Sydenham & Wolli Creek

Eastern Region Bus Service Inset



Appendix B

Existing corridor bus calibration check

Summary of bus passenger calibration check count for Anzac Parade north of Carlton Street from 7.45 to 8.45 am on Friday 11 November 2016

Bus Loading	Number of buses	Persons per bus	Total Persons
Full plus 20 Standing	4	70	280
Full plus 15 Standing	5	65	325
Full plus 12 Standing	1	62	62
Full plus 10 Standing	1	60	60
Full plus 8 Standing	1	58	58
Full plus 5 Standing	13	55	715
Full plus 2 Standing	4	52	208
Full plus 1 Standing	1	51	51
Full to seated capacity	3	50	150
95% seats occupied	0	47	0
90%	4	45	180
85%	8	43	344
80%	7	40	280
75%	1	37	37
70%	1	35	35
65%	1	33	33
60%	4	30	120
55%	3	27	81
50%	2	25	50
45%	2	23	46
40%	3	20	60
35%	4	17	68
30%	2	15	30
25%	2	13	26
Total all observations	77		3,266

Appendix C

2011 Census Journey to work travel statistics for Randwick LGA

B46 METHOD OF TRAVEL TO WORK BY SEX

Count of employed persons aged 15 years and over

	<i>Males</i>	<i>Females</i>	<i>Persons</i>
One method:			
Train	164	156	320
Bus	5,703	7,259	12,962
Ferry	4	5	9
Tram (includes light rail)	0	5	5
Taxi	157	99	256
Car, as driver	15,799	12,096	27,895
Car, as passenger	938	1,678	2,616
Truck	384	12	396
Motorbike/scooter	630	125	755
Bicycle	963	248	1,211
Other	189	132	321
Walked only	1,721	2,154	3,875
<i>Total one method</i>	<i>26,652</i>	<i>23,969</i>	<i>50,621</i>
Two methods:			
Train and:			
Bus	1,012	966	1,978
Ferry	0	0	0
Tram (includes light rail)	3	3	6
Car, as driver	57	48	105
Car, as passenger	12	41	53
Other	12	3	15
<i>Total</i>	<i>1,096</i>	<i>1,061</i>	<i>2,157</i>
Bus and:			
Ferry	18	9	27
Tram (includes light rail)	14	19	33
Car, as driver	175	206	381
Car, as passenger	59	160	219
Other	104	78	182
<i>Total</i>	<i>370</i>	<i>472</i>	<i>842</i>
Other two methods	152	110	262
<i>Total two methods</i>	<i>1,618</i>	<i>1,643</i>	<i>3,261</i>
Three methods:			
Train and two other methods	106	97	203
Bus and two other methods (excludes train)	43	28	71
Other three methods	16	3	19
<i>Total three methods</i>	<i>165</i>	<i>128</i>	<i>293</i>
Worked at home	1,066	1,428	2,494
Did not go to work	2,074	3,530	5,604
Method of travel to work not stated	372	375	747
Total	31,947	31,073	63,020

This table is based on place of usual residence.

B30 HOUSEHOLD COMPOSITION BY NUMBER OF PERSONS USUALLY RESIDENT(a)

Count of occupied private dwellings(b)

	<i>Family households</i>	<i>Non-family households(c)</i>	<i>Total</i>
Number of persons usually resident:			
One	..	12,994	12,994
Two	13,104	2,942	16,046
Three	6,958	1,106	8,064
Four	6,602	427	7,029
Five	2,374	146	2,520
Six or more	845	65	910
Total	29,883	17,680	47,563

(a) Includes up to three residents who were temporarily absent on Census Night.

(b) Excludes 'Visitors only' and 'Other non-classifiable' households.

(c) Comprises 'Lone person' and 'Group households'.

.. Not applicable

B01 SELECTED PERSON CHARACTERISTICS BY SEX (1 of 2)

Count of persons

	<i>Males</i>	<i>Females</i>	<i>Persons</i>
Total persons	63,367	65,622	128,989
Age groups:			
0-4 years	3,965	3,736	7,701
5-14 years	6,051	5,750	11,801
15-19 years	3,571	3,350	6,921
20-24 years	6,710	6,496	13,206
25-34 years	12,066	12,277	24,343
35-44 years	9,805	10,164	19,969
45-54 years	7,791	8,025	15,816
55-64 years	6,007	6,307	12,314
65-74 years	3,918	4,365	8,283
75-84 years	2,525	3,336	5,861
85 years and over	957	1,817	2,774
Counted on Census Night:			
At home	60,920	63,341	124,261
Elsewhere in Australia	2,447	2,282	4,729
Indigenous persons:			
Aboriginal	878	848	1,726
Torres Strait Islander	37	36	73
Both Aboriginal and Torres Strait Islander(a)	28	16	44
Total	943	900	1,843
Birthplace:			
Australia	34,298	35,265	69,563
Elsewhere(b)	24,032	25,613	49,645
Language spoken at home:			
English only	39,107	40,809	79,916
Other language(c)	18,278	20,484	38,762
Australian citizen	45,854	49,705	95,559

This table is based on place of usual residence unless otherwise stated.

(a) Applicable to persons who are of both Aboriginal and Torres Strait Islander origin.

(b) Includes 'Australian External Territories', 'Inadequately described', and 'At sea'.

(c) Includes 'Inadequately described' and 'Non-verbal, so described'.

(d) Comprises 'Pre-school', 'Infants/Primary' (including Government, Catholic, Other Non Government), 'Secondary' (including Government, Catholic, Other Non Government), 'Technical or Further Educational Institution (including TAFE Colleges)', and 'University or other Tertiary Institutions'. Excludes persons who did not state which type of educational institution they were attending.

(e) Applicable to persons aged 15 years and over.

(f) Data are based on place of enumeration.

(g) Includes 'Visitors only' and 'Other non-classifiable' households, 'Non-private dwellings' and 'Migratory, off-shore and shipping' SA1s.

Appendix D

AM and PM peak hour passenger boarding for 2011 and 2016 dwellings scenarios

AM Peak Period Light Rail Journey to work trips from Anzac Parade bus catchment analysis (2011 Census)

Zone	Description	Inbound trips towards CBD			* Corridor and		Outbound Trips towards Randwick			* Corridor and	
		Total Trips	%Bus	Trips by Bus	Peak Hour Factor 0.35	Per Tram Passenger Departures 2011	Total Trips	%Bus	Trips by Bus	Peak Hour Factor 0.35	Per Tram Passenger Arrivals 2011
614 N 614 S	611 Carlton	1619	33	534	215	23	384	11	42	17	2
	613 Todman (central)	1222	33	403	162	18	451	11	50	20	2
	Todman (south)	347	27	94	38	4	232	12	28	11	1
	UNSW (west)	347	27	94	38	4	232	12	28	11	1
	615 UNSW (main campus)	463	29	134	54	6	6024	14	843	339	37
	617 Strachan (west)	1491	28	417	168	18	776	13	101	41	4
	618 Strachan (east)	665	33	219	88	10	599	14	84	34	4
	420 Kingsford SW Daceyville	293	21	62	25	3	295	2	6	2	0
	621 Kingsford SE	1242	26	323	130	14	246	5	12	5	1
	620 Kingsford East	898	24	216	87	9	391	9	35	14	2
612 616 637 636 638 642 643 644	619 Kingsford NE	1413	33	466	188	20	12	14	2	1	0
	612 Todman West 303 Bus	1401	21	294	118	13	494	8	40	16	2
	616 Tunstall Street 303 Bus	735	28	206	83	9	16	13	2	1	0
	637 Maroubra Anzac W	787	35	275	111	12	1532	14	214	86	9
	636 Maroubra Anzac E	1671	35	585	235	26	383	14	54	22	2
	638 Maroubra Storey Street	1167	20	233	94	10	346	8	28	11	1
	642 Maroubra Fitzgerald NW	1220	29	354	142	15	789	10	79	32	3
	643 Maroubra Fitzgerald NE	973	20	195	78	8	195	8	16	6	1
	644 Maroubra Beach	1274	25	319	128	14	345	14	48	19	2
	645 Heffron	762	24	183	74	8	19	5	1	0	0
624 E 627 E	646 Fitzgerald SE	762	24	183	74	8	168	5	8	3	0
	647 Malabar north	1084	18	195	79	9	274	9	25	10	1
	626 Malabar south	713	17	121	49	5	391	7	27	11	1
	624 E Beauchamp E	460	22	101	41	4	72	12	9	3	0
	627 E Franklin E	594	16	95	38	4	101	9	9	4	0
	630 Long Bay	29	12	3	1	0	1252	4	50	20	2
	631 Bilga Crescent	709	15	106	43	5	89	5	4	2	0
	633 Little Bay	809	12	97	39	4	438	6	26	11	1
	629 E Chifley east	930	16	149	60	6	160	7	11	5	0
	632 E Phillip Bay east	500	11	55	22	2	99	10	10	4	0
624 W 627 W 629 W 632 W	640 Maroubra west	1758	22	387	156	17	563	10	56	23	2
	624 W Beauchamp W	460	22	101	41	4	72	12	9	3	0
	627 W Franklin W	594	16	95	38	4	101	9	9	4	0
	629 W Chifley west	930	16	149	60	6	160	7	11	5	0
	632 W Phillip Bay west	500	11	55	22	2	99	10	10	4	0
	421 Pagewood north	532	16	85	34	4	130	0	0	0	0
	423 Eastgardens	0	0	0	0	0	2955	17	502	202	22
	424 Hillsdale north	1332	23	306	123	13	818	5	41	16	2
	425 Hillsdale south	1448	22	319	128	14	152	5	8	3	0
	625 Matraville north	693	18	125	50	5	1263	3	38	15	2
428 429	628 Matraville south	982	14	137	55	6	217	5	11	4	0
	428 Botany Industrial north	3	0	0	0	0	730	2	15	6	1
	429 Botany Industrial south	0	0	0	0	0	1961	3	59	24	3
Total Catchment Trips		35812		8471	3410	369	26026		2660	1071	116
Anzac Parade bus interchange						142					27
Bunnerong Road bus interchange						77					33
Todman route 303 bus trips						22					2
Total Walk Up Trips						129					54

Zones in the local walk up catchment

Note * Includes additional 15% bus rail feeder trips. Corridor and Peak Hour Factors are 70% of public transport trips are in the CBD -Randwick Corridor and 50% of these occur in a 1 hour peak period (am peak)

Hourly Movements	Boardings	Total
Northbound		
Anzac Parade S	1308	
Bunnerong Road	708	2016
Nine Ways	429	2445
Strachan Street	256	2702
University	92	2793
Todman Ave	200	2993
Carlton Street	215	3208
Total Anzac Pde		3208
To CBD via Todman		201
Total To CBD		3410

Hourly Movements	Boardings total	
Southbound		
Anzac Parade S	249	
Bunnerong Road	309	559
Nine Ways	22	581
Strachan Street	74	655
University	351	1006
Todman Ave	31	1037
Carlton Street	17	1054
Total Anzac Pde		1054
From CBD via Todma		17
Total from CBD		1071

PM Peak Period Light Rail Journey to work trips from Anzac Parade bus catchment analysis (2011 Census)

Zone	Description	Inbound trips towards CBD			* Corridor and	Per Tram Passenger	Outbound Trips towards Randwick			* Corridor and	Per Tram Passenger
		Total Trips	%Bus	Trips by Bus	Peak Hour Factor 0.3		Total Trips	%Bus	Trips by Bus	Peak Hour Factor 0.3	
614 N 614 S	611 Carlton	384	11	42	15	2	1619	33	534	184	20
	613 Todman (central)	451	11	50	17	2	1222	33	403	139	15
	Todman (south)	232	12	28	10	1	347	27	94	32	4
	UNSW (west)	232	12	28	10	1	347	27	94	32	4
	615 UNSW (main campus)	6024	14	843	291	32	463	29	134	46	5
	617 Strachan (west)	776	13	101	35	4	1491	28	417	144	16
	618 Strachan (east)	599	14	84	29	3	665	33	219	76	8
	420 Kingsford SW Daceyville	295	2	6	2	0	293	21	62	21	2
	621 Kingsford SE	246	5	12	4	0	1242	26	323	111	12
	620 Kingsford East	391	9	35	12	1	898	24	216	74	8
612 616 637 636 638 642 643 644	619 Kingsford NE	12	14	2	1	0	1413	33	466	161	17
	612 Todman West 303 Bus	494	8	40	14	1	1401	21	294	102	11
	616 Tunstall Street 303 Bus	16	13	2	1	0	735	28	206	71	8
	637 Maroubra Anzac W	1532	14	214	74	8	787	35	275	95	10
	636 Maroubra Anzac E	383	14	54	18	2	1671	35	585	202	22
	638 Maroubra Storey Street	346	8	28	10	1	1167	20	233	81	9
	642 Maroubra Fitzgerald NW	789	10	79	27	3	1220	29	354	122	13
	643 Maroubra Fitzgerald NE	195	8	16	5	1	973	20	195	67	7
	644 Maroubra Beach	345	14	48	17	2	1274	25	319	110	12
	645 Heffron	19	5	1	0	0	762	24	183	63	7
624 E 627 E	646 Fitzgerald SE	168	5	8	3	0	762	24	183	63	7
	647 Malabar north	274	9	25	9	1	1084	18	195	67	7
	626 Malabar south	391	7	27	9	1	713	17	121	42	5
	624 E Beauchamp E	72	12	9	3	0	460	22	101	35	4
	627 E Franklin E	101	9	9	3	0	594	16	95	33	4
	630 Long Bay	1252	4	50	17	2	29	12	3	1	0
	631 Bilga Crescent	89	5	4	2	0	709	15	106	37	4
	633 Little Bay	438	6	26	9	1	809	12	97	33	4
	629 E Chifley east	160	7	11	4	0	930	16	149	51	6
	632 E Phillip Bay east	99	10	10	3	0	500	11	55	19	2
624 W 627 W 629 W 632 W	640 Maroubra west	563	10	56	19	2	1758	22	387	133	14
	624 W Beauchamp W	72	12	9	3	0	460	22	101	35	4
	627 W Franklin W	101	9	9	3	0	594	16	95	33	4
	629 W Chifley west	160	7	11	4	0	930	16	149	51	6
	632 W Phillip Bay west	99	10	10	3	0	500	11	55	19	2
	421 Pagewood north	130	0	0	0	0	532	16	85	29	3
	423 Eastgardens	2955	17	502	173	19	0	0	0	0	0
	424 Hillsdale north	818	5	41	14	2	1332	23	306	106	11
	425 Hillsdale south	152	5	8	3	0	1448	22	319	110	12
	625 Matraville north	1263	3	38	13	1	693	18	125	43	5
428 429	628 Matraville south	217	5	11	4	0	982	14	137	47	5
	428 Botany Industrial north	730	2	15	5	1	3	0	0	0	0
	429 Botany Industrial south	1961	3	59	20	2	0	0	0	0	0
Total Catchment Trips		26026		2660	918	99	35812		8471	2923	317
Anzac Parade bus interchange						23					121
Bunnerong Road bus interchange						29					66
Todman route 303 bus trips						2					19
Total Walk Up Trips						46					111

Hourly
Movements
Northbound

Boardings Total

Anzac Parade S	214	
Bunnerong Road	265	479
Nine Ways	19	498
Strachan Street	64	562
University	301	862
Todman Ave	27	889
Carlton Street	15	903
Total Anzac Pde		903
To CBD via Todman	14	
Total To CBD		918

Hourly
Movements
Southbound

Boardings total

Anzac Parade S	1121	
Bunnerong Road	607	1728
Nine Ways	368	2096
Strachan Street	220	2316
University	79	2394
Todman Ave	171	2566
Carlton Street	184	2750
Total Anzac Pde		2750
From CBD via Todma	173	
Total from CBD		2923

Note * Includes additional 15% bus rail feeder trips. Corridor and Peak Hour Factors are 70% of public transport trips are in the CBD -Randwick Corridor and 50% of these occur in a 1 hour peak period (am peak)

AM Peak Period Light Rail Journey to work trips (2011 to 2016 growth increment)

Zone	Description	Inbound trips towards CBD			* Corridor and	Per Tram Passenger	Assume 5% Growth			* Corridor and	Per Tram Passenger
		Total Trips	%Bus	Trips by Bus	Peak Hour Factor 0.35		Total Trips	%Bus	Trips by Bus	Peak Hour Factor 0.35	
614 N 614 S	611 Carlton	115	33	38	15	2	19	11	2	1	0
	613 Todman (central)	115	33	38	15	2	23	11	2	1	0
	Todman (south)	115	27	31	12	1	12	12	1	1	0
	UNSW (west)	115	27	31	12	1	12	12	1	1	0
	615 UNSW (main campus)			0	0	0	301	14	42	17	2
	617 Strachan (west)	38	28	11	4	0	39	13	5	2	0
	618 Strachan (east)	38	33	13	5	1	30	14	4	2	0
	420 Kingsford SW Daceyville	38	21	8	3	0	15	2	0	0	0
	621 Kingsford SE	38	26	10	4	0	12	5	1	0	0
	620 Kingsford East	38	24	9	4	0	20	9	2	1	0
612 616 637 636 638 642 643 644	619 Kingsford NE	38	33	13	5	1	1	14	0	0	0
	612 Todman West 303 Bus			0	0	0	25	8	2	1	0
	616 Tunstall Street 303 Bus			0	0	0	1	13	0	0	0
	637 Maroubra Anzac W	143	35	50	20	2	77	14	11	4	0
	636 Maroubra Anzac E	143	35	50	20	2	19	14	3	1	0
	638 Maroubra Storey Street	143	20	29	12	1	17	8	1	1	0
	642 Maroubra Fitzgerald NW	143	29	41	17	2	39	10	4	2	0
	643 Maroubra Fitzgerald NE	143	20	29	12	1	10	8	1	0	0
	644 Maroubra Beach	143	25	36	14	2	17	14	2	1	0
	645 Heffron			0	0	0	1	5	0	0	0
624 E 627 E	646 Fitzgerald SE			0	0	0	8	5	0	0	0
	647 Malabar north			0	0	0	14	9	1	0	0
	626 Malabar south	20	17	3	1	0	20	7	1	1	0
	624 E Beauchamp E			0	0	0	4	12	0	0	0
	627 E Franklin E			0	0	0	5	9	0	0	0
	630 Long Bay			0	0	0	63	4	3	1	0
	631 Bilga Crescent			0	0	0	4	5	0	0	0
	633 Little Bay	666	12	80	32	3	22	6	1	1	0
	629 E Chifley east	14	16	2	1	0	8	7	1	0	0
	632 E Phillip Bay east	9	11	1	0	0	5	10	0	0	0
624 W 627 W 629 W 632 W	640 Maroubra west			0	0	0	28	10	3	1	0
	624 W Beauchamp W			0	0	0	4	12	0	0	0
	627 W Franklin W			0	0	0	5	9	0	0	0
	629 W Chifley west	14	16	2	1	0	8	7	1	0	0
	632 W Phillip Bay west	3	11	0	0	0	5	10	0	0	0
	421 Pagewood north			0	0	0	7	0	0	0	0
	423 Eastgardens			0	0	0	148	17	25	10	1
	424 Hillsdale north	125	23	29	12	1	41	5	2	1	0
	425 Hillsdale south			0	0	0	8	5	0	0	0
	625 Matraville north	115	18	21	8	1	63	3	2	1	0
428 429	628 Matraville south	115	14	16	6	1	11	5	1	0	0
	428 Botany Industrial north			0	0	0	37	2	1	0	0
	429 Botany Industrial south			0	0	0	98	3	3	1	0
Total Catchment Trips		2627		590	237	26	1301		133	54	6
Anzac Parade bus interchange						14					1
Bunnerong Road bus interchange						3					2
Todman route 303 bus trips						0					0
Total Walk Up Trips						9					3

Zones in the local walk up catchment

Note * Includes additional 15% bus-rail feeder trips. Corridor and Peak Hour Factors are 70% of public transport trips are in the CBD -Randwick Corridor and 50% of these occur in a 1 hour peak period (am peak)

Hourly Movements	Boardings	Total
Northbound		
Anzac Parade S	129	
Bunnerong Road	27	157
Nine Ways	16	173
Strachan Street	9	182
University	12	194
Todman Ave	28	222
Carlton Street	15	237
Total Anzac Pde		237
To CBD via Todman	0	
Total To CBD		237
Hourly Movements	Boardings total	
Southbound		
Anzac Parade S	12	
Bunnerong Road	15	28
Nine Ways	1	29
Strachan Street	4	33
University	18	50
Todman Ave	2	52
Carlton Street	1	53
Total Anzac Pde		53
From CBD via Todman	1	
Total from CBD		54

PM Peak Period Light Rail Journey to work trips (2011 to 2016 Growth Increment)

Zone	Description	Inbound trips towards CBD			* Corridor and		Outbound Trips towards Randwick			* Corridor and	
		Total Trips	%Bus	Trips by Bus	Peak Hour Factor 0.3	Per Tram Passenger Departures 2011	Total Trips	%Bus	Trips by Bus	Peak Hour Factor 0.3	Per Tram Passenger Arrivals 2011
614 N 614 S	611 Carlton	19	11	2	1	0	115	33	38	13	1
	613 Todman (central)	23	11	2	1	0	115	33	38	13	1
	Todman (south)	12	12	1	0	0	115	27	31	11	1
	UNSW (west)	12	12	1	0	0	115	27	31	11	1
	615 UNSW (main campus)	301	14	42	15	2			0	0	0
	617 Strachan (west)	39	13	5	2	0	38	28	11	4	0
	618 Strachan (east)	30	14	4	1	0	38	33	13	4	0
	420 Kingsford SW Daceyville	15	2	0	0	0	38	21	8	3	0
	621 Kingsford SE	12	5	1	0	0	38	26	10	3	0
	620 Kingsford East	20	9	2	1	0	38	24	9	3	0
	619 Kingsford NE	1	14	0	0	0	38	33	13	4	0
	612 Todman West 303 Bus	25	8	2	1	0			0	0	0
637 636 638 642 643 644	616 Tunstall Street 303 Bus	1	13	0	0	0			0	0	0
	Maroubra Anzac W	77	14	11	4	0	143	35	50	17	2
	Maroubra Anzac E	19	14	3	1	0	143	35	50	17	2
	Maroubra Storey Street	17	8	1	0	0	143	20	29	10	1
	Maroubra Fitzgerald NW	39	10	4	1	0	143	29	41	14	2
	Maroubra Fitzgerald NE	10	8	1	0	0	143	20	29	10	1
	Maroubra Beach	17	14	2	1	0	143	25	36	12	1
	645 Heffron	1	5	0	0	0			0	0	0
	646 Fitzgerald SE	8	5	0	0	0			0	0	0
	647 Malabar north	14	9	1	0	0			0	0	0
	626 Malabar south	20	7	1	0	0	20	17	3	1	0
	624 E Beauchamp E	4	12	0	0	0			0	0	0
629 E 632 E 624 W 627 W 629 W 632 W	627 E Franklin E	5	9	0	0	0			0	0	0
	630 Long Bay	63	4	3	1	0			0	0	0
	631 Bilga Crescent	4	5	0	0	0			0	0	0
	633 Little Bay	22	6	1	0	0	666	12	80	28	3
	Chifley east	8	7	1	0	0	14	16	2	1	0
	Phillip Bay east	5	10	0	0	0	9	11	1	0	0
	640 Maroubra west	28	10	3	1	0			0	0	0
	Beauchamp W	4	12	0	0	0			0	0	0
	Franklin W	5	9	0	0	0			0	0	0
	Chifley west	8	7	1	0	0	14	16	2	1	0
	Phillip Bay west	5	10	0	0	0	3	11	0	0	0
	421 Pagewood north	7	0	0	0	0			0	0	0
423 424 425 625 628 428 429	423 Eastgardens	148	17	25	9	1			0	0	0
	424 Hillsdale north	41	5	2	1	0			0	0	0
	425 Hillsdale south	8	5	0	0	0			0	0	0
	625 Matraville north	63	3	2	1	0	115	18	21	7	1
	628 Matraville south	11	5	1	0	0	115	14	16	6	1
	428 Botany Industrial north	37	2	1	0	0			0	0	0
	429 Botany Industrial south	98	3	3	1	0			0	0	0
Total Catchment Trips		1301		133	46	5	2502		561	194	21
Anzac Parade bus interchange						1					12
Bunnerong Road bus interchange						1					1
Todman route 303 bus trips						0					0
Total Walk Up Trips						2					8

Hourly
Movements
Northbound

Boardings
Total

Anzac Parade S
Bunnerong Road
Nine Ways
Strachan Street
University
Todman Ave
Carlton Street
Total Anzac Pde
To CBD via Todman
Total To CBD

11
13
1
3
15
1
1
45
45
1
46

24
25
28
43
44
45
45

Hourly
Movements
Southbound

Boardings
total

Anzac Parade S
Bunnerong Road
Nine Ways
Strachan Street
University
Todman Ave
Carlton Street
Total Anzac Pde
From CBD via Todman
Total from CBD

111
14
14
8
11
24
13
194
0
194

124
138
146
157
181
194
194


Note * Includes additional 15% bus-rail feeder trips. Corridor and Peak Hour Factors are 70% of public transport trips are in the CBD -Randwick Corridor and 50% of these occur in a 1 hour peak period (am peak)

Appendix E

AM and PM peak hour passenger boardings for scenario 2

AM Peak Period Light Rail Journey to work trips (Interim +4040 dwellings growth increment)

Zone	Description	Inbound trips towards CBD			* Corridor and	Per Tram Passenger	Assume 15% Growth			* Corridor and	Per Tram Passenger		
		Total Trips	%Bus	Trips by Bus	Peak Hour Factor		Departures 2020	Total Trips	%Bus	Trips by Bus		Peak Hour Factor	Arrivals 2020
614 N 614 S	611 Carlton	117	36	42	17	2	15	12	2	1	0		
	613 Todman (central)	206	36	74	30	3	18	12	2	1	0		
	Todman (south)	206	30	62	25	3	9	13	1	0	0		
	UNSW (west)	45	30	13	5	1	9	13	1	0	0		
	UNSW (main campus)	0	32	0	0	0	241	15	36	15	2		
	Strachan (west)	215	31	67	27	3	31	14	4	2	0		
	Strachan (east)	215	36	78	31	3	24	15	4	1	0		
	Kingsford SW Daceyville	0	24	0	0	0	12	2	0	0	0		
	Kingsford SE	197	29	57	23	2	10	6	1	0	0		
	Kingsford East	197	27	53	21	2	16	10	2	1	0		
619 Kingsford NE	197	36	71	28	3	0	15	0	0	0			
612 Todman West 303 Bus	45	21	9	4	0	20	8	2	1	0			
616 Tunstall Street 303 Bus	45	28	12	5	1	1	13	0	0	0			
637 Maroubra Anzac W	94	35	33	13	1	61	14	9	3	0			
636 Maroubra Anzac E	94	35	33	13	1	15	14	2	1	0			
638 Maroubra Storey Street	45	20	9	4	0	14	8	1	0	0			
642 Maroubra Fitzgerald NW	45	29	13	5	1	32	10	3	1	0			
643 Maroubra Fitzgerald NE	45	20	9	4	0	8	8	1	0	0			
644 Maroubra Beach	45	25	11	4	0	14	14	2	1	0			
645 Heffron	45	24	11	4	0	1	5	0	0	0			
646 Fitzgerald SE	138	24	33	13	1	7	5	0	0	0			
647 Malabar north	138	18	25	10	1	11	9	1	0	0			
626 Malabar south	138	17	23	9	1	16	7	1	0	0			
624 E Beauchamp E	45	22	10	4	0	3	12	0	0	0			
627 E Franklin E	45	16	7	3	0	4	9	0	0	0			
630 Long Bay	0	12	0	0	0	50	4	2	1	0			
631 Bilga Crescent	45	15	7	3	0	4	5	0	0	0			
633 Little Bay	141	12	17	7	1	18	6	1	0	0			
629 E Chifley east	138	16	22	9	1	6	7	0	0	0			
632 E Phillip Bay east	45	11	5	2	0	4	10	0	0	0			
640 Maroubra west	45	22	10	4	0	23	10	2	1	0			
624 W Beauchamp W	45	22	10	4	0	3	12	0	0	0			
627 W Franklin W	45	16	7	3	0	4	9	0	0	0			
629 W Chifley west	138	16	22	9	1	6	7	0	0	0			
632 W Phillip Bay west	45	11	5	2	0	4	10	0	0	0			
421 Pagewood north	0	16	0	0	0	0	5	0	0	0			
423 Eastgardens	727	20	145	59	6	118	17	20	8	1			
424 Hillsdale north	0	23	0	0	0	0	33	5	2	1			
425 Hillsdale south	22	22	5	2	0	0	6	5	0	0			
625 Matraville north	45	18	8	3	0	51	3	2	1	0			
628 Matraville south	139	14	20	8	1	9	5	0	0	0			
428 Botany Industrial north	0	0	0	0	0	29	2	1	0	0			
429 Botany Industrial south	0	0	0	0	0	78	3	2	1	0			
Total Catchment Trips		4214		1037	418	45	1041		110	44	5		
Anzac Parade bus interchange						12					1		
Bunnerong Road bus interchange						10					1		
Todman route 303 bus trips						1					0		
Total Walk Up Trips						23					2		

 Zones in the local walk up catchment

Note * Includes +15% additional bus-rail feeder trips. Corridor and Peak Hour Factors are 70% of public transport trips are in the CBD -Randwick Corridor and 50% of these occur in a 1 hour peak period (am peak)

Hourly Movements	Boardings	Total
Northbound		
Anzac Parade S	108	
Bunnerong Road	93	201
Nine Ways	73	274
Strachan Street	58	332
University	5	337
Todman Ave	55	392
Carlton Street	17	409
Total Anzac Pde		409
To CBD via Todman	9	
Total To CBD		418
Hourly Movements	Boardings total	
Southbound		
Anzac Parade S	10	
Bunnerong Road	12	22
Nine Ways	1	23
Strachan Street	3	27
University	15	42
Todman Ave	1	43
Carlton Street	1	44
Total Anzac Pde		44
From CBD via Todm	1	
Total from CBD		44

PM Peak Period Light Rail Journey to work trips (Interim +4040 dwellings growth increment)

Zone	Description	Inbound trips towards CBD			* Corridor and Peak Hour Factor 0.3	Per Tram Passenger Departures 2020	Outbound Trips towards Randwick			* Corridor and Peak Hour Factor 0.3	Per Tram Passenger Arrivals 2020
		Total Trips	%Bus	Trips by Bus			Total Trips	%Bus	Trips by Bus		
614 N	611 Carlton	15	12	2	1	0	117	36	42	15	2
	613 Todman (central)	18	12	2	1	0	206	36	74	26	3
	Todman (south)	9	13	1	0	0	206	30	62	21	2
	614 S UNSW (west)	9	13	1	0	0	45	30	13	5	0
	615 UNSW (main campus)	241	15	36	12	1	0	32	0	0	0
	617 Strachan (west)	31	14	4	1	0	215	31	67	23	2
	618 Strachan (east)	24	15	4	1	0	215	36	78	27	3
	420 Kingsford SW Daceyville	12	2	0	0	0	0	24	0	0	0
	621 Kingsford SE	10	6	1	0	0	197	29	57	20	2
	620 Kingsford East	16	10	2	1	0	197	27	53	18	2
614 S	619 Kingsford NE	0	15	0	0	0	197	36	71	24	3
	612 Todman West 303 Bus	20	8	2	1	0	45	21	9	3	0
	616 Tunstall Street 303 Bus	1	13	0	0	0	45	28	12	4	0
	637 Maroubra Anzac W	61	14	9	3	0	94	35	33	11	1
	636 Maroubra Anzac E	15	14	2	1	0	94	35	33	11	1
	638 Maroubra Storey Street	14	8	1	0	0	45	20	9	3	0
	642 Maroubra Fitzgerald NW	32	10	3	1	0	45	29	13	4	0
	643 Maroubra Fitzgerald NE	8	8	1	0	0	45	20	9	3	0
	644 Maroubra Beach	14	14	2	1	0	45	25	11	4	0
	645 Heffron	1	5	0	0	0	45	24	11	4	0
624 E	646 Fitzgerald SE	7	5	0	0	0	138	24	33	11	1
	647 Malabar north	11	9	1	0	0	138	18	25	9	1
	626 Malabar south	16	7	1	0	0	138	17	23	8	1
	624 E Beauchamp E	3	12	0	0	0	45	22	10	3	0
	627 E Franklin E	4	9	0	0	0	45	16	7	2	0
	630 Long Bay	50	4	2	1	0	0	12	0	0	0
	631 Bilga Crescent	4	5	0	0	0	45	15	7	2	0
	633 Little Bay	18	6	1	0	0	141	12	17	6	1
	629 E Chifley east	6	7	0	0	0	138	16	22	8	1
	632 E Phillip Bay east	4	10	0	0	0	45	11	5	2	0
624 W	640 Maroubra west	23	10	2	1	0	45	22	10	3	0
	624 W Beauchamp W	3	12	0	0	0	45	22	10	3	0
	627 W Franklin W	4	9	0	0	0	45	16	7	2	0
	629 W Chifley west	6	7	0	0	0	138	16	22	8	1
	632 W Phillip Bay west	4	10	0	0	0	45	11	5	2	0
	421 Pagewood north	5	0	0	0	0	0	16	0	0	0
	423 Eastgardens	118	17	20	7	1	727	20	145	50	5
	424 Hillsdale north	33	5	2	1	0	0	23	0	0	0
	425 Hillsdale south	6	5	0	0	0	22	22	5	2	0
	625 Matraville north	51	3	2	1	0	45	18	8	3	0
624 S	628 Matraville south	9	5	0	0	0	139	14	20	7	1
	428 Botany Industrial north	29	2	1	0	0	0	0	0	0	0
	429 Botany Industrial south	78	3	2	1	0	0	0	0	0	0
	Total Catchment Trips	1041		110	38	4	4214		1037	358	39
	Anzac Parade bus interchange					1					10
	Bunnerong Road bus interchange					1					9
	Todman route 303 bus trips					0					1
	Total Walk Up Trips					2					19

Hourly Movements Northbound	Boardings	Total
Anzac Parade S	9	
Bunnerong Road	11	19
Nine Ways	1	20
Strachan Street	3	23
University	13	36
Todman Ave	1	37
Carlton Street	1	37
Total Anzac Pde		37
To CBD via Todman	1	
Total To CBD		38
Hourly Movements Southbound	Boardings total	
Anzac Parade S	92	
Bunnerong Road	80	172
Nine Ways	62	235
Strachan Street	50	284
University	5	289
Todman Ave	47	336
Carlton Street	15	350
Total Anzac Pde		350
From CBD via Todrn	8	
Total from CBD		358

Note * Includes +15% bus-rail feeder trips. Corridor and Peak Hour Factors are 70% of public transport trips are in the CBD -Randwick Corridor and 50% of these occur in a 1 hour peak period (am peak)

AM Peak Period Light Rail Journey to work trips (Ultimate +15150 dwellings growth increment)

					* Corridor and	Assume 15% Growth			* Corridor and		
Zone	Description	Inbound trips towards CBD			Peak Hour Factor 0.35	Per Tram Passenger Departures 2031	Outbound Trips towards Randwick			Peak Hour Factor 0.35	Per Tram Passenger Arrivals 2031
		Total Trips	%Bus	Trips by Bus			Total Trips	%Bus	Trips by Bus		
614 N 614 S	611 Carlton	440	43.2	190	77	8	58	14.4	8	3	0
	613 Todman (central)	771	43.2	333	134	15	68	14.4	10	4	0
	Todman (south)	771	36	278	112	12	35	15.6	5	2	0
	UNSW (west)	167	36	60	24	3	35	15.6	5	2	0
	615 UNSW (main campus)	0	38.4	0	0	0	904	18	163	65	7
	617 Strachan (west)	808	37.2	301	121	13	116	16.8	20	8	1
	618 Strachan (east)	808	43.2	349	140	15	90	18	16	7	1
	420 Kingsford SW Daceyville	0	28.8	0	0	0	44	2.4	1	0	0
	621 Kingsford SE	737	34.8	256	103	11	37	7.2	3	1	0
	620 Kingsford East	737	32.4	239	96	10	59	12	7	3	0
619 Kingsford NE	737	43.2	318	128	14	2	18	0	0	0	
612 Todman West 303 Bus		167	21	35	14	2	74	8	6	2	0
616 Tunstall Street 303 Bus		167	28	47	19	2	2	13	0	0	0
637 Maroubra Anzac W		354	35	124	50	5	230	14	32	13	1
636 Maroubra Anzac E		354	35	124	50	5	57	14	8	3	0
638 Maroubra Storey Street		167	20	33	13	1	52	8	4	2	0
642 Maroubra Fitzgerald NW		167	29	48	19	2	118	10	12	5	1
643 Maroubra Fitzgerald NE		167	20	33	13	1	29	8	2	1	0
644 Maroubra Beach		167	25	42	17	2	52	14	7	3	0
645 Heffron		167	24	40	16	2	3	5	0	0	0
646 Fitzgerald SE		517	24	124	50	5	25	5	1	1	0
647 Malabar north		517	18	93	37	4	41	9	4	1	0
626 Malabar south		517	17	88	35	4	59	7	4	2	0
624 E	Beauchamp E	167	22	37	15	2	11	12	1	1	0
627 E	Franklin E	167	16	27	11	1	15	9	1	1	0
630 Long Bay		0	12	0	0	0	188	4	8	3	0
631 Bilga Crescent		167	15	25	10	1	13	5	1	0	0
633 Little Bay		530	12	64	26	3	66	6	4	2	0
629 E	Chifley east	517	16	83	33	4	24	7	2	1	0
632 E	Phillip Bay east	167	11	18	7	1	15	10	1	1	0
640 Maroubra west		167	22	37	15	2	84	10	8	3	0
624 W	Beauchamp W	167	22	37	15	2	11	12	1	1	0
627 W	Franklin W	167	16	27	11	1	15	9	1	1	0
629 W	Chifley west	517	16	83	33	4	24	7	2	1	0
632 W	Phillip Bay west	167	11	18	7	1	15	10	1	1	0
421 Pagewood north		0	16	0	0	0	20	0	0	0	0
423 Eastgardens		2726	20	545	219	24	443	17	75	30	3
424 Hillsdale north		0	23	0	0	0	123	5	6	2	0
425 Hillsdale south		84	22	18	7	1	23	5	1	0	0
625 Matraville north		167	18	30	12	1	189	3	6	2	0
628 Matraville south		523	14	73	29	3	33	5	2	1	0
428 Botany Industrial north		0	0	0	0	0	110	2	2	1	0
429 Botany Industrial south		0	0	0	0	0	294	3	9	4	0
Total Catchment Trips		15804		4277	1722	187	3904		453	182	20
Anzac Parade bus interchange						44					4
Bunnerong Road bus interchange						38					5
Todman route 303 bus trips						4					0
Total Walk Up Trips						101					10

Zones in the local walk up catchment

Note * Includes +15% additional bus-rail feeder trips. Corridor and Peak Hour Factors are 70% of public transport trips are in the CBD -Randwick Corridor and 50% of these occur in a 1 hour peak period (am peak)

Hourly		
Movements	Boardings	Total
Northbound		
Anzac Parade S	404	
Bunnerong Road	349	753
Nine Ways	327	1081
Strachan Street	261	1342
University	24	1366
Todman Ave	246	1612
Carlton Street	77	1689
Total Anzac Pde		1689
To CBD via Todman	33	
Total To CBD		1722
Hourly		
Movements	Boardings total	
Southbound		
Anzac Parade S	37	
Bunnerong Road	46	84
Nine Ways	4	88
Strachan Street	14	103
University	68	170
Todman Ave	6	176
Carlton Street	3	180
Total Anzac Pde		180
From CBD via Todrn	3	
Total from CBD		182

PM Peak Period Light Rail Journey to work trips (Ultimate +15150 dwellings growth increment)

Zone	Description	Inbound trips towards CBD			* Corridor and		Per Tram Passenger	Outbound Trips towards Randwick			* Corridor and		Per Tram Passenger
		Total Trips	%Bus	Trips by Bus	Peak Hour Factor	0.3		Total Trips	%Bus	Trips by Bus	Peak Hour Factor	0.3	
614 N	611 Carlton	58	14.4	8	3	0	440	43.2	190	66	7		
	613 Todman (central)	68	14.4	10	3	0	771	43.2	333	115	12		
	Todman (south)	35	15.6	5	2	0	771	36	278	96	10		
	614 S UNSW (west)	35	15.6	5	2	0	167	36	60	21	2		
	615 UNSW (main campus)	904	18	163	56	6	0	38.4	0	0	0		
	617 Strachan (west)	116	16.8	20	7	1	808	37.2	301	104	11		
	618 Strachan (east)	90	18	16	6	1	808	43.2	349	120	13		
	420 Kingsford SW Daceyville	44	2.4	1	0	0	0	28.8	0	0	0		
	621 Kingsford SE	37	7.2	3	1	0	737	34.8	256	88	10		
	620 Kingsford East	59	12	7	2	0	737	32.4	239	82	9		
	619 Kingsford NE	2	18	0	0	0	737	43.2	318	110	12		
612	Todman West 303 Bus	74	8	6	2	0	167	21	35	12	1		
	616 Tunstall Street 303 Bus	2	13	0	0	0	167	28	47	16	2		
637	Maroubra Anzac W	230	14	32	11	1	354	35	124	43	5		
	636 Maroubra Anzac E	57	14	8	3	0	354	35	124	43	5		
	638 Maroubra Storey Street	52	8	4	1	0	167	20	33	12	1		
	642 Maroubra Fitzgerald NW	118	10	12	4	0	167	29	48	17	2		
	643 Maroubra Fitzgerald NE	29	8	2	1	0	167	20	33	12	1		
	644 Maroubra Beach	52	14	7	2	0	167	25	42	14	2		
	645 Heffron	3	5	0	0	0	167	24	40	14	1		
	646 Fitzgerald SE	25	5	1	0	0	517	24	124	43	5		
647	Malabar north	41	9	4	1	0	517	18	93	32	3		
	626 Malabar south	59	7	4	1	0	517	17	88	30	3		
624 E	Beauchamp E	11	12	1	0	0	167	22	37	13	1		
627 E	Franklin E	15	9	1	0	0	167	16	27	9	1		
630	Long Bay	188	4	8	3	0	0	12	0	0	0		
	631 Bilga Crescent	13	5	1	0	0	167	15	25	9	1		
	633 Little Bay	66	6	4	1	0	530	12	64	22	2		
629 E	Chifley east	24	7	2	1	0	517	16	83	29	3		
632 E	Phillip Bay east	15	10	1	1	0	167	11	18	6	1		
640	Maroubra west	84	10	8	3	0	167	22	37	13	1		
	624 W Beauchamp W	11	12	1	0	0	167	22	37	13	1		
627 W	Franklin W	15	9	1	0	0	167	16	27	9	1		
629 W	Chifley west	24	7	2	1	0	517	16	83	29	3		
632 W	Phillip Bay west	15	10	1	1	0	167	11	18	6	1		
421	Pagewood north	20	0	0	0	0	0	16	0	0	0		
	423 Eastgardens	443	17	75	26	3	2726	20	545	188	20		
424	Hillsdale north	123	5	6	2	0	0	23	0	0	0		
	425 Hillsdale south	23	5	1	0	0	84	22	18	6	1		
625	Matraville north	189	3	6	2	0	167	18	30	10	1		
	628 Matraville south	33	5	2	1	0	523	14	73	25	3		
428	Botany Industrial north	110	2	2	1	0	0	0	0	0	0		
	429 Botany Industrial south	294	3	9	3	0	0	0	0	0	0		
Total Catchment Trips		3904		453	156	17	15804		4277	1476	160		
Anzac Parade bus interchange						3					37		
Bunnerong Road bus interchange						4					32		
Todman route 303 bus trips						0					3		
Total Walk Up Trips						9					87		

Hourly
Movements
Northbound

Boardings
Total

Anzac Parade S	32	
Bunnerong Road	40	72
Nine Ways	4	76
Strachan Street	12	88
University	58	146
Todman Ave	5	151
Carlton Street	3	154
Total Anzac Pde		154
To CBD via Todman	2	
Total To CBD		156

Hourly
Movements
Southbound

Boardings
total

Anzac Parade S	346	
Bunnerong Road	300	646
Nine Ways	281	926
Strachan Street	224	1150
University	21	1171
Todman Ave	211	1382
Carlton Street	66	1447
Total Anzac Pde		1447
From CBD via Todrn	28	
Total from CBD		1476

Note * Includes +15% bus-rail feeder trips. Corridor and Peak Hour Factors are 70% of public transport trips are in the CBD -Randwick Corridor and 50% of these occur in a 1 hour peak period (am peak)

Appendix F

AM and PM peak hour passenger boardings for scenario 3

AM Peak Period Light Rail Journey to work trips (Interim +4200 dwellings growth increment)

Zone	Description	Inbound trips towards CBD			* Corridor and	Per Tram Passenger	Assume 4% Growth			* Corridor and	Per Tram Passenger		
		Total Trips	%Bus	Trips by Bus	Peak Hour Factor		Departures 2020	Total Trips	%Bus	Trips by Bus		Peak Hour Factor	Arrivals 2020
614 N 614 S	611 Carlton	162	36	58	24	3	15	12	2	1	0		
	613 Todman (central)	251	36	90	36	4	18	12	2	1	0		
	Todman (south)	206	30	62	25	3	9	13	1	0	0		
	UNSW (west)	45	30	13	5	1	9	13	1	0	0		
	615 UNSW (main campus)	0	32	0	0	0	241	15	36	15	2		
	617 Strachan (west)	248	31	77	31	3	31	14	4	2	0		
	618 Strachan (east)	248	36	89	36	4	24	15	4	1	0		
	420 Kingsford SW Daceyville	0	24	0	0	0	12	2	0	0	0		
	621 Kingsford SE	229	29	66	27	3	10	6	1	0	0		
	620 Kingsford East	197	27	53	21	2	16	10	2	1	0		
619 Kingsford NE	197	36	71	28	3	0	15	0	0	0			
612 Todman West 303 Bus	45	21	9	4	0	20	8	2	1	0			
616 Tunstall Street 303 Bus	45	28	12	5	1	1	13	0	0	0			
637 Maroubra Anzac W	94	35	33	13	1	61	14	9	3	0			
636 Maroubra Anzac E	94	35	33	13	1	15	14	2	1	0			
638 Maroubra Storey Street	45	20	9	4	0	14	8	1	0	0			
642 Maroubra Fitzgerald NW	45	29	13	5	1	32	10	3	1	0			
643 Maroubra Fitzgerald NE	45	20	9	4	0	8	8	1	0	0			
644 Maroubra Beach	45	25	11	4	0	14	14	2	1	0			
645 Heffron	45	24	11	4	0	1	5	0	0	0			
646 Fitzgerald SE	138	24	33	13	1	7	5	0	0	0			
647 Malabar north	138	18	25	10	1	11	9	1	0	0			
626 Malabar south	138	17	23	9	1	16	7	1	0	0			
624 E	Beauchamp E	45	22	10	4	0	3	12	0	0	0		
627 E	Franklin E	45	16	7	3	0	4	9	0	0	0		
630 Long Bay		0	12	0	0	0	50	4	2	1	0		
631 Bilga Crescent		45	15	7	3	0	4	5	0	0	0		
633 Little Bay		141	12	17	7	1	18	6	1	0	0		
629 E	Chifley east	138	16	22	9	1	6	7	0	0	0		
632 E	Phillip Bay east	45	11	5	2	0	4	10	0	0	0		
640 Maroubra west		45	22	10	4	0	23	10	2	1	0		
624 W	Beauchamp W	45	22	10	4	0	3	12	0	0	0		
627 W	Franklin W	45	16	7	3	0	4	9	0	0	0		
629 W	Chifley west	138	16	22	9	1	6	7	0	0	0		
632 W	Phillip Bay west	45	11	5	2	0	4	10	0	0	0		
421 Pagewood north		0	16	0	0	0	5	0	0	0	0		
423 Eastgardens		727	20	145	59	6	118	17	20	8	1		
424 Hillsdale north		0	23	0	0	0	33	5	2	1	0		
425 Hillsdale south		22	22	5	2	0	6	5	0	0	0		
625 Matraville north		45	18	8	3	0	51	3	2	1	0		
628 Matraville south		139	14	20	8	1	9	5	0	0	0		
428 Botany Industrial north		0	0	0	0	0	29	2	1	0	0		
429 Botany Industrial south		0	0	0	0	0	78	3	2	1	0		
Total Catchment Trips		4402		1101	443	48	1041		110	44	5		
Anzac Parade bus interchange						12					1		
Bunnerong Road bus interchange						10					1		
Todman route 303 bus trips						1					0		
Total Walk Up Trips						25					2		

Zones in the local walk up catchment

Note * Includes +15% additional bus-rail feeder trips. Corridor and Peak Hour Factors are 70% of public transport trips are in the CBD -Randwick Corridor and 50% of these occur in a 1 hour peak period (am peak)

Hourly Movements	Boardings	Total
Northbound		
Anzac Parade S	108	
Bunnerong Road	93	201
Nine Ways	77	277
Strachan Street	67	344
University	5	350
Todman Ave	61	411
Carlton Street	24	434
Total Anzac Pde		434
To CBD via Todman	9	
Total To CBD		443
Hourly Movements	Boardings total	
Southbound		
Anzac Parade S	10	
Bunnerong Road	12	22
Nine Ways	1	23
Strachan Street	3	27
University	15	42
Todman Ave	1	43
Carlton Street	1	44
Total Anzac Pde		44
From CBD via Todm	1	
Total from CBD		44

PM Peak Period Light Rail Journey to work trips (Interim +4200 dwellings growth increment)

Zone	Description	Inbound trips towards CBD			* Corridor and Peak Hour Factor 0.3	Per Tram Passenger Departures 2020	Outbound Trips towards Randwick			* Corridor and Peak Hour Factor 0.3	Per Tram Passenger Arrivals 2020
		Total Trips	%Bus	Trips by Bus			Total Trips	%Bus	Trips by Bus		
614 N 614 S	611 Carlton	15	12	2	1	0	162	36	58	20	2
	613 Todman (central)	18	12	2	1	0	251	36	90	31	3
	Todman (south)	9	13	1	0	0	206	30	62	21	2
	UNSW (west)	9	13	1	0	0	45	30	13	5	0
	615 UNSW (main campus)	241	15	36	12	1	0	32	0	0	0
	617 Strachan (west)	31	14	4	1	0	248	31	77	27	3
	618 Strachan (east)	24	15	4	1	0	248	36	89	31	3
	420 Kingsford SW Daceyville	12	2	0	0	0	0	24	0	0	0
	621 Kingsford SE	10	6	1	0	0	229	29	66	23	2
	620 Kingsford East	16	10	2	1	0	197	27	53	18	2
612 616 637 636 638 642 643 644	619 Kingsford NE	0	15	0	0	0	197	36	71	24	3
	612 Todman West 303 Bus	20	8	2	1	0	45	21	9	3	0
	616 Tunstall Street 303 Bus	1	13	0	0	0	45	28	12	4	0
	637 Maroubra Anzac W	61	14	9	3	0	94	35	33	11	1
	636 Maroubra Anzac E	15	14	2	1	0	94	35	33	11	1
	638 Maroubra Storey Street	14	8	1	0	0	45	20	9	3	0
	642 Maroubra Fitzgerald NW	32	10	3	1	0	45	29	13	4	0
	643 Maroubra Fitzgerald NE	8	8	1	0	0	45	20	9	3	0
	644 Maroubra Beach	14	14	2	1	0	45	25	11	4	0
	645 Heffron	1	5	0	0	0	45	24	11	4	0
624 E 627 E	646 Fitzgerald SE	7	5	0	0	0	138	24	33	11	1
	647 Malabar north	11	9	1	0	0	138	18	25	9	1
	626 Malabar south	16	7	1	0	0	138	17	23	8	1
	624 E Beauchamp E	3	12	0	0	0	45	22	10	3	0
	627 E Franklin E	4	9	0	0	0	45	16	7	2	0
	630 Long Bay	50	4	2	1	0	0	12	0	0	0
	631 Bilga Crescent	4	5	0	0	0	45	15	7	2	0
	633 Little Bay	18	6	1	0	0	141	12	17	6	1
	629 E Chifley east	6	7	0	0	0	138	16	22	8	1
	632 E Phillip Bay east	4	10	0	0	0	45	11	5	2	0
624 W 627 W 629 W 632 W	640 Maroubra west	23	10	2	1	0	45	22	10	3	0
	624 W Beauchamp W	3	12	0	0	0	45	22	10	3	0
	627 W Franklin W	4	9	0	0	0	45	16	7	2	0
	629 W Chifley west	6	7	0	0	0	138	16	22	8	1
	632 W Phillip Bay west	4	10	0	0	0	45	11	5	2	0
	421 Pagewood north	5	0	0	0	0	0	16	0	0	0
	423 Eastgardens	118	17	20	7	1	727	20	145	50	5
	424 Hillsdale north	33	5	2	1	0	0	23	0	0	0
	425 Hillsdale south	6	5	0	0	0	22	22	5	2	0
	625 Matraville north	51	3	2	1	0	45	18	8	3	0
428 429	628 Matraville south	9	5	0	0	0	139	14	20	7	1
	428 Botany Industrial north	29	2	1	0	0	0	0	0	0	0
	429 Botany Industrial south	78	3	2	1	0	0	0	0	0	0
Total Catchment Trips		1041		110	38	4	4402		1101	380	41
Anzac Parade bus interchange						1					10
Bunnerong Road bus interchange						1					9
Todman route 303 bus trips						0					1
Total Walk Up Trips						2					22

Hourly Movements Northbound	Boardings	Total
Anzac Parade S	9	
Bunnerong Road	11	19
Nine Ways	1	20
Strachan Street	3	23
University	13	36
Todman Ave	1	37
Carlton Street	1	37
Total Anzac Pde		37
To CBD via Todman	1	
Total To CBD		38

Hourly Movements Southbound	Boardings total	
Anzac Parade S	92	
Bunnerong Road	80	172
Nine Ways	66	238
Strachan Street	57	295
University	5	300
Todman Ave	52	352
Carlton Street	20	372
Total Anzac Pde		372
From CBD via Todrn	8	
Total from CBD		380

Note * Includes +15% bus-rail feeder trips. Corridor and Peak Hour Factors are 70% of public transport trips are in the CBD -Randwick Corridor and 50% of these occur in a 1 hour peak period (am peak)

AM Peak Period Light Rail Journey to work trips (Ultimate +15750 dwellings growth increment)

					* Corridor and	Assume 15% Growth			* Corridor and		
Zone	Description	Inbound trips towards CBD			Peak Hour Factor 0.35	Per Tram Passenger Departures 2031	Outbound Trips towards Randwick			Peak Hour Factor 0.35	Per Tram Passenger Arrivals 2031
		Total Trips	%Bus	Trips by Bus			Total Trips	%Bus	Trips by Bus		
614 N 614 S	611 Carlton	564	43.2	244	98	11	58	14.4	8	3	0
	613 Todman (central)	895	43.2	387	156	17	68	14.4	10	4	0
	Todman (south)	771	36	278	112	12	35	15.6	5	2	0
	UNSW (west)	167	36	60	24	3	35	15.6	5	2	0
	615 UNSW (main campus)	0	38.4	0	0	0	904	18	163	65	7
	617 Strachan (west)	897	37.2	334	134	15	116	16.8	20	8	1
	618 Strachan (east)	897	43.2	388	156	17	90	18	16	7	1
	420 Kingsford SW Daceyville	0	28.8	0	0	0	44	2.4	1	0	0
	621 Kingsford SE	827	34.8	288	116	13	37	7.2	3	1	0
	620 Kingsford East	737	32.4	239	96	10	59	12	7	3	0
619 Kingsford NE	737	43.2	318	128	14	2	18	0	0	0	
612 Todman West 303 Bus		167	21	35	14	2	74	8	6	2	0
616 Tunstall Street 303 Bus		167	28	47	19	2	2	13	0	0	0
637 Maroubra Anzac W		354	35	124	50	5	230	14	32	13	1
636 Maroubra Anzac E		354	35	124	50	5	57	14	8	3	0
638 Maroubra Storey Street		167	20	33	13	1	52	8	4	2	0
642 Maroubra Fitzgerald NW		167	29	48	19	2	118	10	12	5	1
643 Maroubra Fitzgerald NE		167	20	33	13	1	29	8	2	1	0
644 Maroubra Beach		167	25	42	17	2	52	14	7	3	0
645 Heffron		167	24	40	16	2	3	5	0	0	0
646 Fitzgerald SE		517	24	124	50	5	25	5	1	1	0
647 Malabar north		517	18	93	37	4	41	9	4	1	0
626 Malabar south		517	17	88	35	4	59	7	4	2	0
624 E	Beauchamp E	167	22	37	15	2	11	12	1	1	0
627 E	Franklin E	167	16	27	11	1	15	9	1	1	0
630 Long Bay		0	12	0	0	0	188	4	8	3	0
631 Bilga Crescent		167	15	25	10	1	13	5	1	0	0
633 Little Bay		530	12	64	26	3	66	6	4	2	0
629 E	Chifley east	517	16	83	33	4	24	7	2	1	0
632 E	Phillip Bay east	167	11	18	7	1	15	10	1	1	0
640 Maroubra west		167	22	37	15	2	84	10	8	3	0
624 W	Beauchamp W	167	22	37	15	2	11	12	1	1	0
627 W	Franklin W	167	16	27	11	1	15	9	1	1	0
629 W	Chifley west	517	16	83	33	4	24	7	2	1	0
632 W	Phillip Bay west	167	11	18	7	1	15	10	1	1	0
421 Pagewood north		0	16	0	0	0	20	0	0	0	0
423 Eastgardens		2726	20	545	219	24	443	17	75	30	3
424 Hillsdale north		0	23	0	0	0	123	5	6	2	0
425 Hillsdale south		84	22	18	7	1	23	5	1	0	0
625 Matraville north		167	18	30	12	1	189	3	6	2	0
628 Matraville south		523	14	73	29	3	33	5	2	1	0
428 Botany Industrial north		0	0	0	0	0	110	2	2	1	0
429 Botany Industrial south		0	0	0	0	0	294	3	9	4	0
Total Catchment Trips		16320		4487	1806	196	3904		453	182	20
Anzac Parade bus interchange						44					4
Bunnerong Road bus interchange						38					5
Todman route 303 bus trips						4					0
Total Walk Up Trips						111					10

Zones in the local walk up catchment

Note * Includes +15% additional bus-rail feeder trips. Corridor and Peak Hour Factors are 70% of public transport trips are in the CBD -Randwick Corridor and 50% of these occur in a 1 hour peak period (am peak)

Hourly Movements	Boardings	Total
Northbound		
Anzac Parade S	404	
Bunnerong Road	349	753
Nine Ways	340	1093
Strachan Street	290	1384
University	24	1408
Todman Ave	267	1675
Carlton Street	98	1773
Total Anzac Pde		1773
To CBD via Todman	33	
Total To CBD		1806

Hourly Movements	Boardings total	
Southbound		
Anzac Parade S	37	
Bunnerong Road	46	84
Nine Ways	4	88
Strachan Street	14	103
University	68	170
Todman Ave	6	176
Carlton Street	3	180
Total Anzac Pde		180
From CBD via Todrn	3	
Total from CBD		182

PM Peak Period Light Rail Journey to work trips (Ultimate +15750 dwellings growth increment)

Zone	Description	Inbound trips towards CBD			* Corridor and		Per Tram Passenger	Outbound Trips towards Randwick			* Corridor and		Per Tram Passenger
		Total Trips	%Bus	Trips by Bus	Peak Hour Factor	0.3		Total Trips	%Bus	Trips by Bus	Peak Hour Factor	0.3	
614 N	611 Carlton	58	14.4	8	3	0	564	43.2	244	84	9		
	613 Todman (central)	68	14.4	10	3	0	895	43.2	387	133	14		
	Todman (south)	35	15.6	5	2	0	771	36	278	96	10		
	614 S UNSW (west)	35	15.6	5	2	0	167	36	60	21	2		
	615 UNSW (main campus)	904	18	163	56	6	0	38.4	0	0	0		
	617 Strachan (west)	116	16.8	20	7	1	897	37.2	334	115	12		
	618 Strachan (east)	90	18	16	6	1	897	43.2	388	134	14		
	420 Kingsford SW Daceyville	44	2.4	1	0	0	0	28.8	0	0	0		
	621 Kingsford SE	37	7.2	3	1	0	827	34.8	288	99	11		
	620 Kingsford East	59	12	7	2	0	737	32.4	239	82	9		
614 S	619 Kingsford NE	2	18	0	0	0	737	43.2	318	110	12		
	612 Todman West 303 Bus	74	8	6	2	0	167	21	35	12	1		
	616 Tunstall Street 303 Bus	2	13	0	0	0	167	28	47	16	2		
	637 Maroubra Anzac W	230	14	32	11	1	354	35	124	43	5		
	636 Maroubra Anzac E	57	14	8	3	0	354	35	124	43	5		
	638 Maroubra Storey Street	52	8	4	1	0	167	20	33	12	1		
	642 Maroubra Fitzgerald NW	118	10	12	4	0	167	29	48	17	2		
	643 Maroubra Fitzgerald NE	29	8	2	1	0	167	20	33	12	1		
	644 Maroubra Beach	52	14	7	2	0	167	25	42	14	2		
	645 Heffron	3	5	0	0	0	167	24	40	14	1		
624 E	646 Fitzgerald SE	25	5	1	0	0	517	24	124	43	5		
	647 Malabar north	41	9	4	1	0	517	18	93	32	3		
	626 Malabar south	59	7	4	1	0	517	17	88	30	3		
	624 E Beauchamp E	11	12	1	0	0	167	22	37	13	1		
	627 E Franklin E	15	9	1	0	0	167	16	27	9	1		
	630 Long Bay	188	4	8	3	0	0	12	0	0	0		
	631 Bilga Crescent	13	5	1	0	0	167	15	25	9	1		
	633 Little Bay	66	6	4	1	0	530	12	64	22	2		
	629 E Chifley east	24	7	2	1	0	517	16	83	29	3		
	632 E Phillip Bay east	15	10	1	1	0	167	11	18	6	1		
624 W	640 Maroubra west	84	10	8	3	0	167	22	37	13	1		
	624 W Beauchamp W	11	12	1	0	0	167	22	37	13	1		
	627 W Franklin W	15	9	1	0	0	167	16	27	9	1		
	629 W Chifley west	24	7	2	1	0	517	16	83	29	3		
	632 W Phillip Bay west	15	10	1	1	0	167	11	18	6	1		
	421 Pagewood north	20	0	0	0	0	0	16	0	0	0		
	423 Eastgardens	443	17	75	26	3	2726	20	545	188	20		
	424 Hillsdale north	123	5	6	2	0	0	23	0	0	0		
	425 Hillsdale south	23	5	1	0	0	84	22	18	6	1		
	625 Matraville north	189	3	6	2	0	167	18	30	10	1		
624 S	628 Matraville south	33	5	2	1	0	523	14	73	25	3		
	428 Botany Industrial north	110	2	2	1	0	0	0	0	0	0		
	429 Botany Industrial south	294	3	9	3	0	0	0	0	0	0		
Total Catchment Trips		3904		453	156	17	16320		4487	1548	168		
Anzac Parade bus interchange						3					37		
Bunnerong Road bus interchange						4					32		
Todman route 303 bus trips						0					3		
Total Walk Up Trips						9					95		

Hourly		
Movements	Boardings	Total
Northbound		
Anzac Parade S	32	
Bunnerong Road	40	72
Nine Ways	4	76
Strachan Street	12	88
University	58	146
Todman Ave	5	151
Carlton Street	3	154
Total Anzac Pde		154
To CBD via Todman		2
Total To CBD		156

Hourly		
Movements	Boardings total	
Southbound		
Anzac Parade S	346	
Bunnerong Road	300	646
Nine Ways	292	937
Strachan Street	249	1186
University	21	1207
Todman Ave	229	1436
Carlton Street	84	1520
Total Anzac Pde		1520
From CBD via Todrn		28
Total from CBD		1548

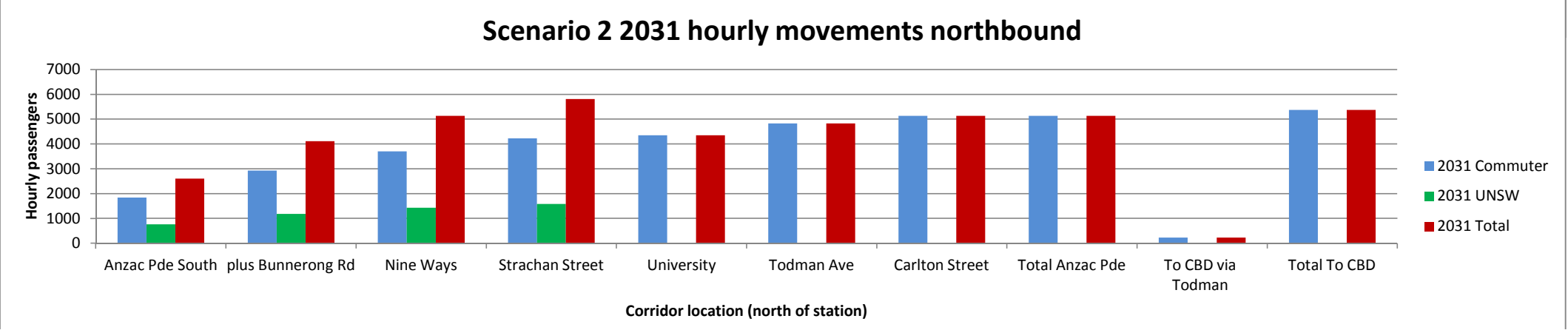
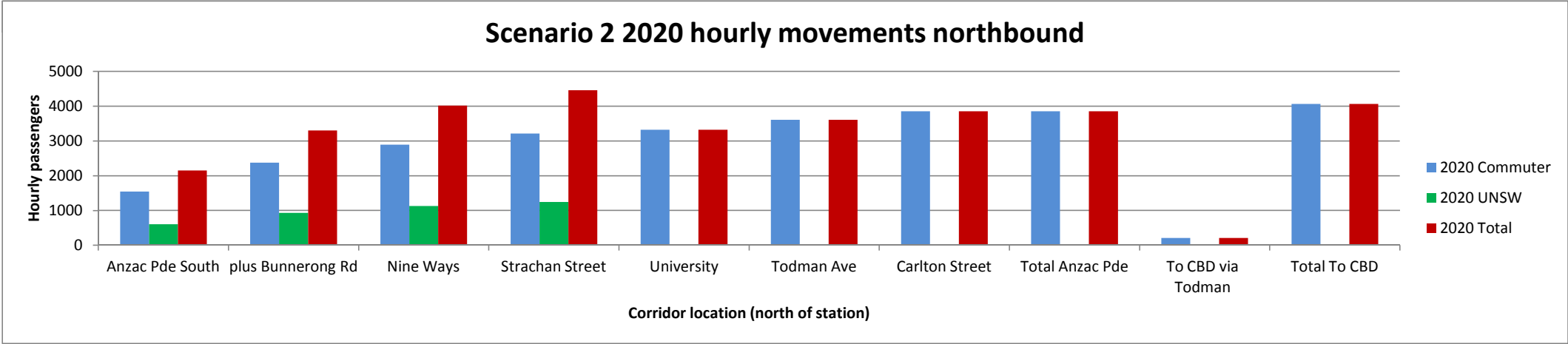
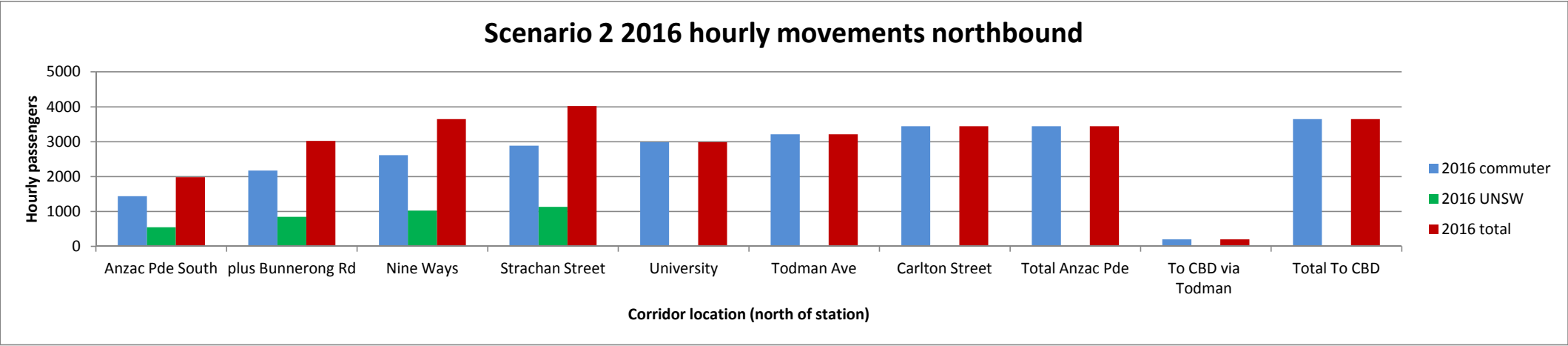
Note * Includes +15% bus-rail feeder trips. Corridor and Peak Hour Factors are 70% of public transport trips are in the CBD -Randwick Corridor and 50% of these occur in a 1 hour peak period (am peak)

Appendix G

Summary tables of future corridor travel demand growth projections

Summary of Northbound Corridor Volumes Final Kingsford Route Option with PT travel mode share increase

SCENARIO 2	Base	Growth to	Growth to	Growth to			
	2011	2016	2020	2031			
Hourly movements northbound					2016 commut	2016 UNSV	2016 total
Anzac Pde South	1308	129	108	404	1437	549	1986
plus Bunnerong Rd	2016	157	201	753	2173	847	3020
Nine Ways	2445	173	274	1081	2618	1027	3645
Strachan Street	2702	182	332	1342	2883	1135	4018
University	2793	194	337	1366	2988		2988
Todman Ave	2993	222	392	1612	3215		3215
Carlton Street	3208	237	409	1689	3446		3446
Total Anzac Pde	3208	237	409	1689	3446		3446
To CBD via Todman	201	0	9	33	201		201
Total To CBD	3410	237	418	1722	3647		3647
					2020 Commu	2020 UNSV	2020 Total
					1545	604	2149
					2374	932	3305
					2891	1130	4021
					3215	1249	4464
					3325		3325
					3607		3607
					3855		3855
					3855		3855
					210		210
					4065		4065
					2031 Commu	2031 UNSV	2031 Total
					1841	769	2610
					2926	1186	4112
					3698	1438	5136
					4226	1589	5815
					4354		4354
					4828		4828
					5134		5134
					5134		5134
					234		234
					5369		5369



SCENARIO 3	Base	Growth to	Growth to	Growth to			
	2011	2016	2020	2031			
Hourly movements northbound					2016 comn	2016 UNSV	2016 total
Anzac Pde South	1308	129	108	404	1437	549	1986
plus Bunnerong Rd	2016	157	201	753	2173	847	3020
Nine Ways	2445	173	277	1093	2618	1027	3645
Strachan Street	2702	182	344	1384	2883	1135	4018
University	2793	194	350	1408	2988		2988
Todman Ave	2993	222	411	1675	3215		3215
Carlton Street	3208	237	434	1773	3446		3446
Total Anzac Pde	3208	237	434	1773	3446		3446
To CBD via Todman	201	0	9	33	201		201
Total To CBD	3410	237	443	1806	3647		3647
					2020 Comn	2020 UNSV	2020 Total
					1545	604	2149
					2374	932	3305
					2895	1130	4025
					3228	1249	4476
					3337		3337
					3626		3626
					3880		3880
					3880		3880
					210		210
					4090		4090
					2031 Comr	2031 UNSV	2031 Total
					1949	769	2717
					3127	1186	4313
					3988	1438	5426
					4611	1589	6200
					4745		4745
					5301		5301
					5653		5653
					5653		5653
					243		243
					5896		5896

