The North West Rail Link: Winners and losers in the locality of the North West area

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Abstract

The appraisal of large scale transport infrastructure projects by governments tends to focus on the costs and benefits to society as a whole or to broad communities affected by the project. In so doing, it is often believed by members of these communities that the greatest benefits of a scheme are likely to accrue in the immediate environs of the project. This paper examines one specific project (the NSW State Government's proposed North West Rail Link in Metropolitan Sydney) to examine how this project impacts on different spatial areas in the environs of the project in terms of travel times and fares.

Following the election of a new state government in 2011, an extension of the CityRail network into the Hills District of Sydney was announced. Known as the North-West Rail Line (NWRL), it will link Epping to Cudgegong Road beyond Rouse Hill. The project will provide rail access for the first time from the centre of the growing North West region to major employment centres in the North-West and to major centres located between the North-west and Sydney CBD. Currently there are a number of public transport options available for travel to the CBD of Sydney, the most popular being a service that operates from various locations in the NW Hills area and connects directly onto the M2 toll road; with a substantial amount of bus lane priority along its routes into the CBD of Sydney.

The available information suggests existing bus services will be re-directed to the NWRL. This paper examines changes in door to door travel times for different spatial areas in the environs of the proposed new line, comparing existing services with services directed via the NWRL. The paper concludes that there are winners and losers thus challenging the belief that communities close to new infrastructure are the main beneficiaries.

1. Introduction

The NSW Government announced in May 2011 its plan to construct an extension of the CityRail network into the Hills District of Sydney (Minister for Transport 2011a). Known as the North-West Rail Line (NWRL), the NWRL is a 23 kilometre rail line between Epping and Cudgegong Road (Transport for NSW 2011, p.10) with the first 15.5 kilometres to be underground. The project includes construction of eight new stations at Cherrybrook (Franklin Road), Castle Hill, The Hills Centre, Norwest Business Park, Bella Vista, Kellyville (Samantha Riley Drive), Rouse Hill and Cudgegong Road (See Figure). The NWRL Project will include approximately 4,000 park and ride spaces (Transport for NSW 2012a, p.1-3) as well as bus interchange facilities, and will provide rail access for the first time from the growing North West region to major employment centres in Norwest Business Park, Macquarie Park, St Leonards, Chatswood, North Sydney and the CBD.

The provision of rail access through to Rouse Hill will support future residential and commercial development in the North West growth centre. The rail link will serve a catchment of 360,000 residents, which is expected to grow to 485,000 by 2021, and by 2036, the new rail link is expected to service a region with more than 145,000 jobs (NSW Government 2010b).

Figure 1 Proposed NWRL

Source: http://northwestrail.com.au/photo/render_photo/205.jpg

Currently there are a number of public transport options available for travel to the CBD of Sydney, the most popular being a service that operates from various locations in the NW Hills area and connects directly onto the M2 toll road with a substantial amount on bus lane priority along its routes into the centre of Sydney (CDC 2012). Bus services using this link achieve fast journey times into the centre of Sydney and this paper focuses on the future potential for time gains in using the proposed NWRL line instead of this existing fast bus service. This paper is also looking at the some of the distributional effects of new transport infrastructure on affected within-area households. Whilst it would be possible to weight the impacts using the results of a stated preference survey, as has been done for earlier proposals to extend public transport to this area (heavy rail and metro rail services (see Hensher and Rose 2007 and Hensher et al. 2011)), this paper has chosen to quantify the major impacts on existing household by location.

The paper is structured as follows. The next section provides some literature context for the issues underpinning the analysis and discussion in this paper. Section 3 outlines the proposed case study and the nature of the NWRL and this is followed by a section which outlines the methodology adopted. Section 5 reports the findings before turning to discussion and conclusions.

2. Literature Context

Both the NSW and Australian governments are committed to improving public transport. The NSW Government's State Plan (NSW Government 2006, NSW Government 2010a) has objectives to increase use of public transport, and a series of related objectives such as reducing obesity and improving air quality which also rely on increased public transport use. The State Plan is supported by the strategic land use plan for Sydney, the Metropolitan Plan (NSW Government 2010b), which provides principles for the location of new housing and jobs in locations which are accessible by public transport in order to encourage public transport use. With its National Urban Policy released in May 2011, the Australian government (2011) is also taking an increasing interest in urban transport.

Revealed preference research identifies that it is quality of service, broadly defined, that has encouraged people out of their cars onto public transport. Quality of service in this context includes frequency, door to door speed of journey and reliability (Currie and Wallis 2008, Hensher et al. 2010). Whilst these factors are undoubtedly important, the accessibility of a rail station can also be a factor in determining whether rail is the chosen mode. Railway stations are spaced further apart than bus services and getting to the station is an important part of the journey (Rietveld 2000) with some evidence that should the 'access and egress exceed an absolute maximum threshold, users will not use the public transport system' (Krygsman et al. 2004, p. 265, as cited by Givoni and Rietveld 2007).

Travellers view interchange negatively (Hine and Scott 2000) and so a bus journey as an access link to a faster train journey might not be considered preferable to a longer bus journey, especially if the bus journey is not much longer. Whilst door to door time and the certainty of this time or its reliability is important, the cost of the travel to the passenger is also important. In many public transport systems, the interchange penalty is one of time only (i.e., the fare that is charged is independent of the route or number of changes) and this is unwelcome to travellers. In other public transport systems, such as Sydney, the fares policy is such that unless a multi-modal, multi-use ticket is used, transfers from bus to train may mean the traveller pays a fare penalty in addition to the time penalty upon interchange. Moreover, fares elasticities tend to be higher in the rural fringe, likely because fares are higher (journeys typically longer and more distant) and also because of high car ownership levels (Paulley et al. 2006).

3. The proposed rail link

3.1 Location

The study area consists of parts of the Local Government Areas of Hornsby Shire, The Hills Shire and Blacktown City[1]. The study area had a population of 256,552 at the 2011 Census (ABS 2012). Both household incomes and number of cars per household are well above the average for Sydney as whole. At the 2011 census (ABS 2012) median household income ranged between $1744 in Winston Hills and $2302 in Rouse Hill-Beaumont Hills as compared to $1447 for the Sydney Metropolitan area. There was an average of 2.0 cars per household at the census as compared to 1.6 cars per household for Sydney Metropolitan area (ABS 2012). The study area is shown in Figure 1 along with the locations selected for the analysis of travel times and fares which are discussed in more detail below in Section 0.

[1] The study area is the SA3s of Blacktown North and Baulkham Hills and the SA2s of Pennant Hills-Cheltenham, Rouse Hill-Beaumont Hills and Winston Hills, see http://www.abs.gov.au/websitedbs/censushome.nsf/home/map.

3.2 Existing transport services

Public transport in the area presently consists of a network of surface bus routes and overlapping networks of trunk and collector services for the three busway corridors that service the study area. Bus services are currently provided by Hillsbus and Busways The network of surface bus routes connect locations within the study area and connect to major activity centres and the existing rail lines outside the study area (i.e., Blacktown, Westmead, Parramatta and Epping) as shown in Figure 1.

The first busway developed was the M2 busway corridor along a toll road that runs East-West through the region. This corridor connects to the CBD to the East of the study area and, with less frequent services, to the activities centres around Macquarie University, St Leonards and North Sydney. The second and third corridors are marketed as part of the Transitway network and link Rouse Hill to Parramatta and Blacktown. Planning for the Parramatta to Rouse Hill corridor commenced in 1990 when the residential area it services was first released for development (Pund and Fleming 1997) and construction was completed in 2007 in time for the opening of a major regional employment and retail hub at Rouse Hill.

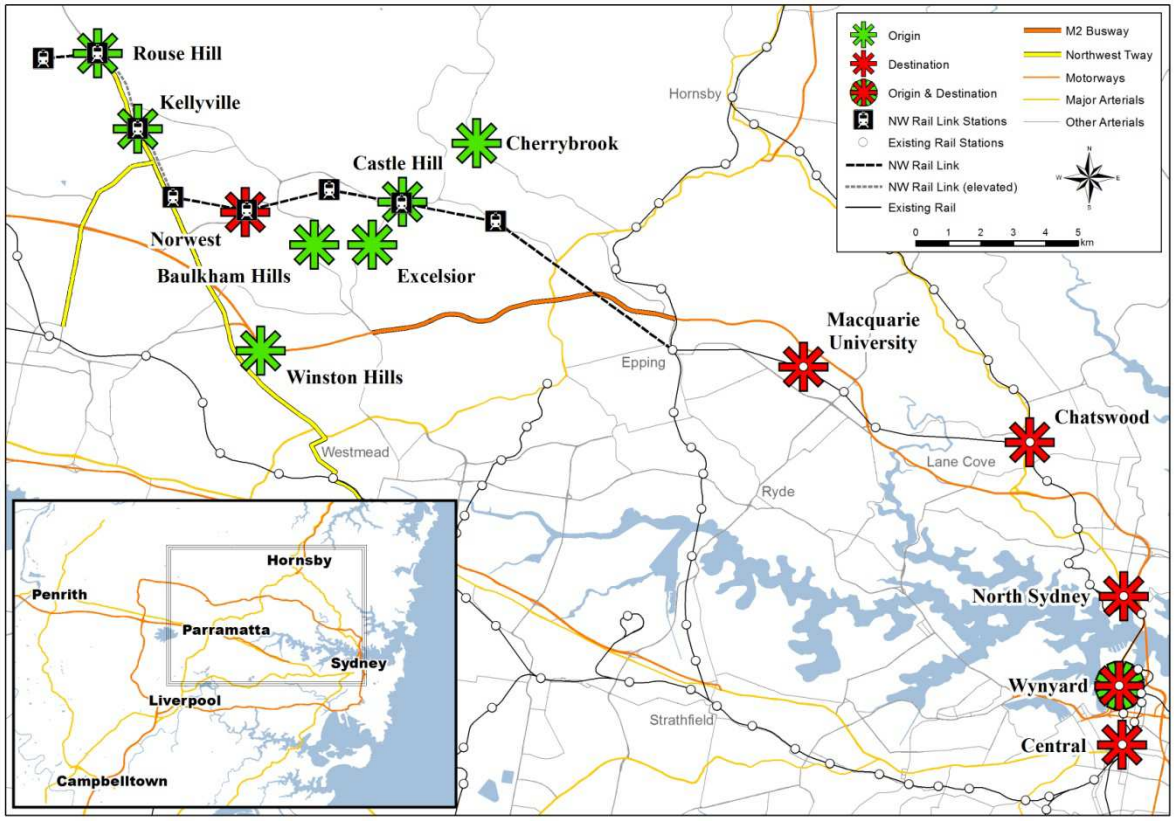

Figure 1 The study area

A number of trunk services are provided on each corridor with some services operating on two corridors. Direct connection between the two Transitway corridors is possible at Burns and an indirect connection between the M2 busway and the Parramatta to Rouse Hill Transitway at Abbot Road, Seven Hills. In addition a large number of routes service areas away from the corridors but travel by the corridors for part of their journey. This network increases the frequency of services on the corridors beyond that provided by the trunk services and provides ‘single seat’ enhanced bus services to destinations remote from the corridors themselves.

A similar trunk bus service is also offered on the second busway (the North West Transitway linking Blacktown and Parramatta to Rouse Hill) developed in the region, but the majority of services on this busway are provided by existing services that have been re-routed to travel via the transit way for part of their journey.

Our evidence is based on a number of key trip start points in the Hills District, representative of the locations of the majority of residents. Focusing on these locations has allowed a comparative assessment of door to door travel times of current bus services and the NWRL project. Section 3.3 below discusses the proposed services following the NWRL becoming operational before a more detailed explanation of the methodology and calculations are presented in Section 4.

3.3 Proposed transport services

Table 1 shows the assumed time-table for the proposed NWRL with new stations being shown in italics. The table omits some stations between Epping and Central which are not part of the NWRL project but these additional stations are included in the analysis below. The actual time table for the NWRL has not been produced yet. The assumed time table presented in **Table 1** is based on the following:

- The Standard Working Timetable (SWTT) of CityRail (October 2011) for the stations between Chatswood to Central
- For Cudgegong to Chatswood, the timings provided by the Stage 1 Environmental Impact Statement (Transport for NSW 2012a, p. 7-58, hereafter referred to as the EIS). This implied a quicker journey time for Epping to Chatswood than the current SWTT and so is incorporated into the time table.
- For stations not specified by either the SWTT or the EIS, timings were estimated based on the distance from Central.

The distances to Central are taken from Appendix B of the Environmental Impact Statement (Transport for NSW 2012b).

Table 1 Assumed time table, adapted from existing time table

		Distance to Central (km)	Peak	Off Peak
Cudgegong		*46.9*	*6:21*	*11:37*
Rouse Hill		*45.0*	*6:24*	*11:40*
Kellyville		*42.5*	*6:28*	*11:44*
Bella Vista		*40.2*	*6:31*	*11:47*
Norwest		*38.0*	*6:34*	*11:50*
Hills Centre		*35.8*	*6:37*	*11:53*
Castle Hill		*33.6*	*6:40*	*11:56*
Cherrybrook		*31.2*	*6:43*	*11:59*
Epping	**arrive**	24.8	6:48	12:04
Epping	**depart**		6:49	12:05
Macquarie University		20.9	6:51	12:07
Chatswood		11.7	7:02	12:18
North Sydney		5.1	7:15	12:30
Wynyard		2.0	7:21	12:36
Town Hall		1.2	7:25	12:40
Central	**arrive**		7:28	12:44

4. Methodology

This paper addresses changes in travel times and fares as a result of the implementation of the NWRL link. The rationale for the selection of eight different locations within the study area is first explained in Section 4.1. This is followed by two sections which describe how the travel times and fares for the new service have been derived.

4.1 Locations selected

Eight locations (all existing bus stops) were chosen within the study area of which seven are origins and one, Norwest, a destination for counter-peak travel. A total of 32 Origin-Destination pairs were selected for the analysis. Origins within the study area were selected as either existing town centres with existing concentrations of residential, employment, retail and services development (Rouse Hill and Castle Hill) or to provide broad geographic coverage of the study area (the intersection of New Line and David Roads Cherrybrook; Burns Transitway station; the intersection of Excelsior Avenue and Old Northern Road Castle Hill and the Baulkham Hills Private Hospital on Windsor Road). Destinations outside the study area were selected as the most important activity centres along the new rail link (Macquarie University, Chatswood, North Sydney, Wynyard and Central Station).In addition, two special cases were examined. Winston Hills lies well to the South of the proposed NWRL link and residents would not be expected to benefit from the new link to the same extent as the other selected origins. To test this, Winston Hills to Wynyard is included in the analysis. Currently direct bus services operate between Winston Hills and Wynyard via the M2 busway (Hillsbus route 614) and indirect services operate via either Parramatta (Hillsbus route T60 or 604 and train) or via the M2 busway (Route 611 or 630).

The other special case selected was the counter flow journey from Wynyard to the Norwest Business Park. This O-D pair was selected to examine possible effects of the new rail line on the level of access for people from outside the study area.

4.2 Estimating travel times

For each O-D pair, the current travel times were estimated for arrival times of approximately 7:30 (to represent the early part of the AM peak) and 12:30 (to represent the off peak). The time of 7:30 is early by Australian standards but, from observation, services are already busy at this time of the morning. Timings were taken from the published time tables (http://www.cdcbus.com.au/HillsBus-Maps.html) or the 131500 website (http://www.131500.com.au/) for travel by bus. Travel times for the new rail link were calculated from the assumed time table shown in Table 1 where the O-D pairs are both located at proposed stations (i.e., Rouse Hill or Castle Hill to Chatswood or North Sydney); this assumes no change in access times for these new stations compared to the existing bus stops.

In constructing travel times it was assumed that bus services would be retimed to arrive five minutes prior to the train departure time and that the bus network would be cast so as to ensure the lowest overall travel time (i.e., bus plus train) for each O-D pair . For example, from Baulkham Hills Private Hospital a bus could travel to either the Hills Centre station or to Norwest. This paper assumes the service would go to the Hills Centre station as this would provide the shortest bus plus train travel time for all O-D pairs. Furthermore, it was assumed that buses would travel along the most direct route by streets currently served by buses even if there were currently no direct services (i.e., between Baulkham Hills Private Hospital and the Hills Centre). In these cases timings were constructed from timings on two existing bus routes. For example, from Winston Hills to Wynyard it was found to be quicker to travel via the Transitway to Westmead and then rail to Wynyard than via the proposed rail link.

There are currently no direct bus services from the study area to Chatswood. Either bus to bus interchange or bus to train interchange was assumed in the construction of current travel times, depending on which option was quicker.

In estimating travel times, it has been assumed that passengers who travel by bus to access the NWRL will continue to be able to use the same bus stop from which they currently catch the M2 busway services (or the bus stop on the opposite side of the road). It was also assumed that the existing destination bus stops outside the travel are located next to the relevant train station. This means that the analysis can assume no differences in the access and egress times between existing M2 busway services and new NWRL services. If passengers are required to use a different bus stop to access the NWRL or currently alight at a destination bus stop that is not adjacent to a NWRL station (i.e. George Street at Haymarket in the CBD) then access and egress times will differ.

4.3 Estimating fares

Table **2** through to Table 4 show the current fare structure, as of January 2012 (Independent Pricing and Regulatory Tribunal 2011). MyBus fares relate to a discounted 10 advance purchase trips ticket and the per-trip price, shown in italics in

Table **2**, is the discounted price of a bus trip. Purchase of a single ticket, undiscounted, is higher than this by about 10%. There are no return fares for bus travel. Bus fares are calculated according to the number of sections travelled with the approximate distances for each ticket being shown in Table 2.

Table 3 shows the fares for a single train trip by distance and for the weekly pass. The per-trip value is derived on the basis of 10 trips per weekly ticket. Rail services also offer off-peak return fares which are added to Table 3.

Table 4 shows fares for the multi-modal weekly pass and a per-trip price is shown as one-tenth of the full price. The MyMulti 1 ticket is valid for all bus services in Wollongong, Sydney and Newcastle but is only valid for rail services in the inner city (the relevant boundaries for the study area are Chatswood and Croydon stations). The MyMulti 2 ticket is valid for rail travel as far as Hornsby and Seven Hills.

Table 2 Current MyBus fares

	Approximate Distance	Price	*Per trip*
MyBus1	0-3 km	$16.80	*$1.68*
MyBus2	3-8 km	$28.00	*$2.80*
MyBus3	8+ km	$36.00	*$3.60*

Table 3 Current MyTrain fares

Distance	Single	Weekly	*Per trip*	Off-Peak Return	*Per trip*
0-10 km	$3.40	$26.00	*$2.60*	$4.60	*$2.30*
10-20 km	$4.20	$33.00	*$3.30*	$5.80	*$2.90*
20-35 km	$4.80	$39.00	*$3.90*	$6.60	*$3.30*
35-65 km	$6.40	$50.00	*$5.00*	$8.80	*$4.40*

Table 4 Current MyMulti fares

	Weekly	*Per trip*

MyMulti 1	$43.00	*$4.30*
MyMulti 2	$51.00	*$5.10*
MyMulti 3	$60.00	*$6.00*

For the 32 OD pairs under consideration, the lowest current fare is $3.60 using the 10 trip MyBus1 ticket[2], with the exception of trips to Chatswood which would require the use of a MyMulti 2 ticket. The fares following the completion of the NWRL are estimated from the current fares shown in Tables 2 through 4, assuming that the structure of fares is not altered as a result of the NWRL becoming operational. This is a reasonable assumption as the study area is a small part of the greater Metropolitan area. Rail fares are calculated using the distances from Central Station shown in Table 1. A bus fare was added if a direct service by rail was not available and was calculated assuming that the section points on the existing routes are not changed.

In most cases, a combination of a MyTrain weekly ticket and a MyBus 10 trip ticket (for peak trips) or Off-Peak Return and MyBus 10 trip ticket (for off-peak) was the least cost option. However, for some trips a MyMulti ticket would be the lowest cost option. On the Main Western Line, the boundary between the MyMulti 3 and the MyMulti 2 zone lies between Blacktown (34.8 km to Central) and Seven Hills (32.1 km to Central). It was, therefore, assumed that Castle Hill (33.6 km to Central) and Cherrybrook stations would fall into the MyMulti 2 zone, with other stations in the MyMulti 3 zone.

5. Findings

5.1 Comparative travel times

Figure 3 shows the before and after travel times for each of the Origin-Destination pairs. It can be seen that the main beneficiaries in the peak hour will be travellers from the study area to Macquarie University, Chatswood and North Sydney with all O-D pairs showing equivalent or shorter travel times. The three destinations are all important activity centres not currently served well by the M2 busway.

The greatest reduction in travel time is from one hour and one minute to twenty-four minutes for travel from Castle Hill Station to Chatswood. It might be expected that longer trips would show the greatest reduction in travel time (i.e., from Rouse Hill) but the greatest gains are actually for Castle Hill Station. This is probably because the combination of the Transitway and M2 busway already provides a high level of bus priority for Rouse Hill services while other services operate in mixed traffic to the M2 busway. Conversely, travel time savings are lower from areas such as Excelsior Avenue, Baulkham Hills Private Hospital and Cherrybrook (New Line Road at David Road) which are close to the M2 as a short journey in mixed traffic to the M2 busway is replaced by travel by bus in mixed traffic to the nearest NWRL train station.

Travel time savings for trips to the CBD are more ambiguous. Some O-D pairs show savings whilst other O-D pairs show slower travel times with the greatest increase being 18 minutes (from 38 minutes to 56 minutes) for the trip from Baulkham Hills Private Hospital to Wynyard. In the high peak, this increase would be lower travel times and more reliable services, assuming the bus to train connection is reliable, as less of the trip would be in mixed traffic. Trips beyond Wynyard show smaller travel time increases as buses travel in mixed traffic in the CBD.

[2] The MyMulti 1 weekly ticket would be cheaper on a per trip basis if more than 12 bus trips are undertaken per week.

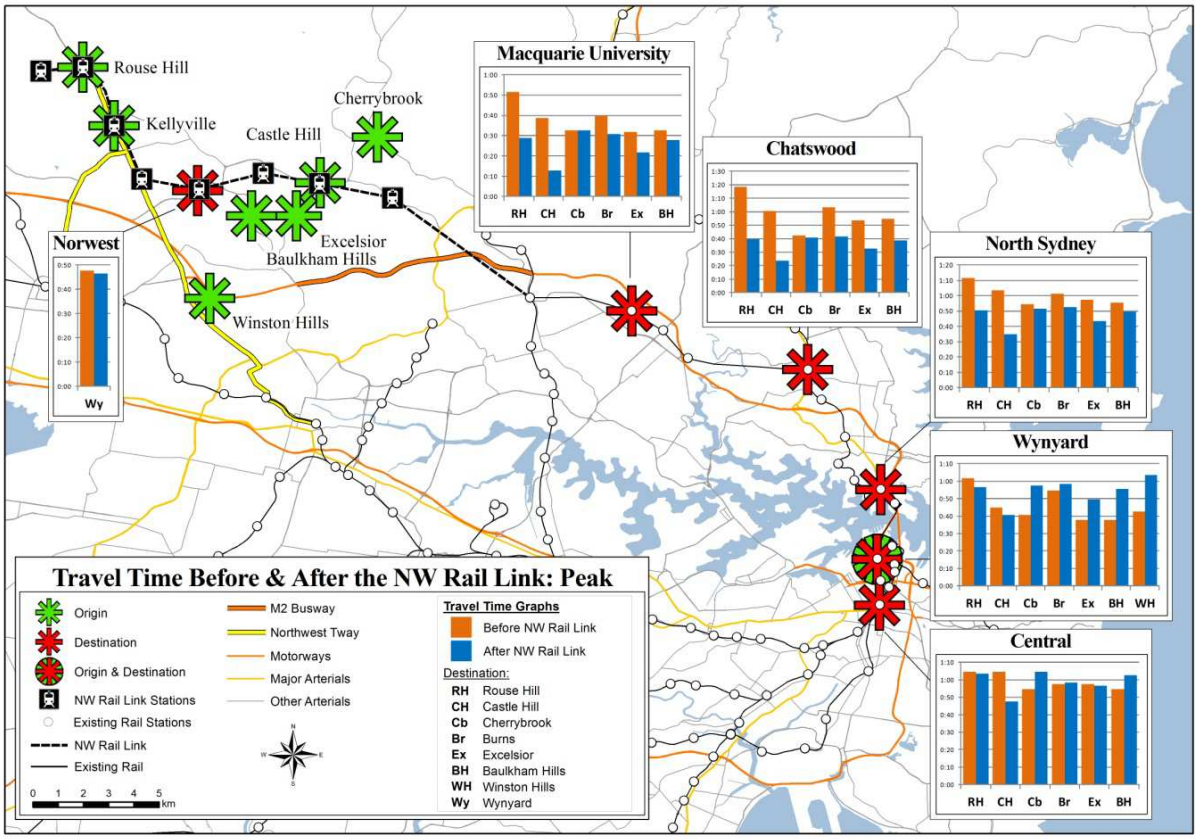

Figure 2 Comparison of peak travel times

Figure 3 shows the equivalent timings for the Off-peak. Existing bus services are faster (and more reliable) in the off-peak than the peak and so the benefits of the new rail link are less obvious. However, with the exception of Cherrybrook[3], services to Macquarie University, Chatswood and North Sydney would still be quicker on the NWRL than the existing services. Travel times to Wynyard tend to be longer with the exception of trips from Castle Hill and Burns. This is particularly the case for travel from Winston Hills, Baulkham Hills Private Hospital and Excelsior Avenue. Only the latter currently has a direct service in the off-peak, but bus services from Winston Hills and Baulkham Hills Private Hospital provide straight forward and well-timed interchange onto the frequent M2 busway services.

However, choice of departure time is limited for these origins by the low frequency in the off-peak. The impact on travel times of the mixed traffic route between the Harbour Bridge and Central station is also lower in the off-peak.

[3] The trip from Baulkham Hills Private Hospital to Macquarie University would also increase by three minutes to 28 minutes.

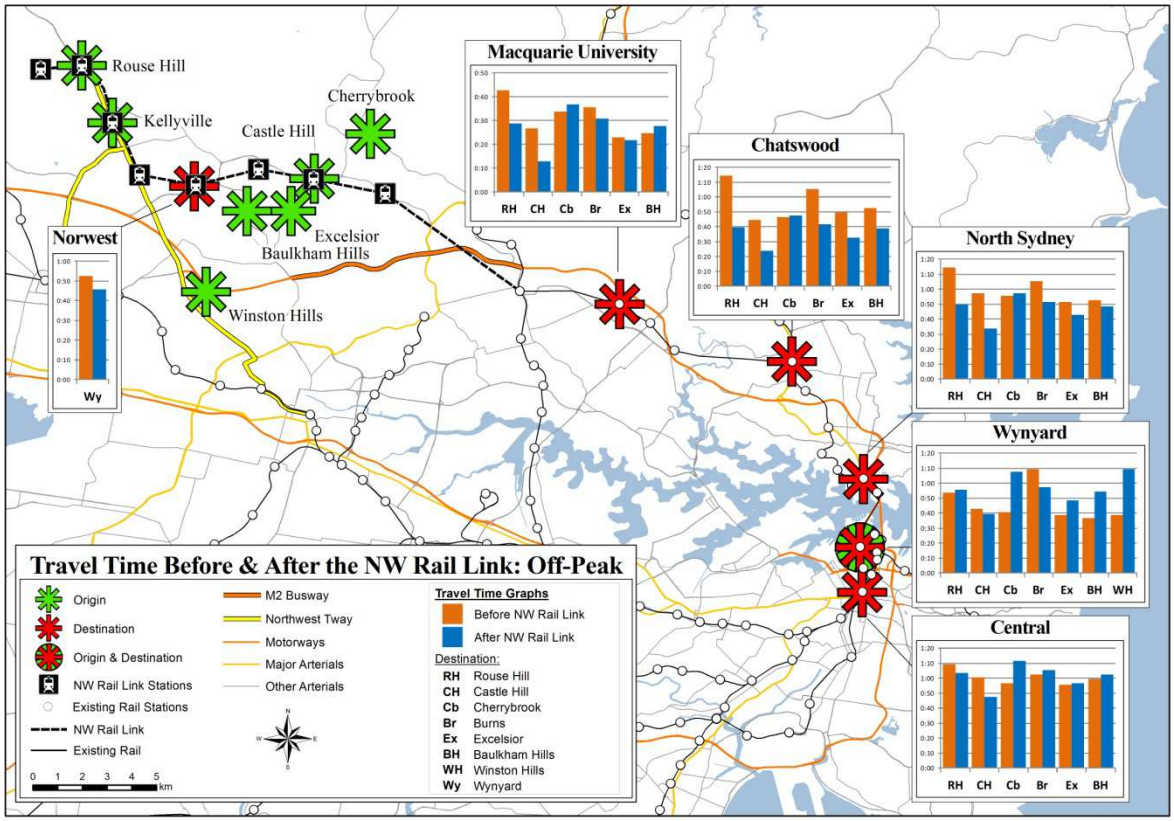

Figure 4 Comparison of off-peak travel times

5.2 Comparative fares

Fares for travel by the NW Rail Link are shown in Tables 5 through 7.

As shown in Table 5, fares will be lower than existing bus fares for travel from Castle Hill in the off-peak as this trip is within the range of three to twenty kilometres where train fares are lower than bus fares. The off peak return ticket also means that off-peak train trips in the range of 20 to 35 kilometres are less expensive than bus and this accounts for the reduction in fares for off-peak trips from Castle Hill and from Rouse Hill to Macquarie University.

Table 5 also shows fare reductions for travel from Rouse Hill and Castle Hill Station to Chatswood in the peak and for all origins to Chatswood in the off-peak, except for Cherrybrook (David Road at New Line Road) to Chatswood which would still require the use of a MyMulti 2 ticket. The greatest reduction would be for travel from Rouse Hill and Castle Hill Station to Chatswood (up to $1.80 in the off-peak) which also saw the greatest reduction in travel times. For all other trips, the need to pay for both a bus and train ticket leads to increases in fares, with the greatest increase being $2.40 for travel from Burns to North Sydney or the CBD. This occurs as bus fares are lower than train tickets in the peak hour for trips beyond 20 km and interchange requires the purchase of separate bus and train tickets or, in some cases, the relatively expensive multimodal ticket.

Table 5 Comparison of fares for travel to selected destinations

To Macquarie University

From	Rouse Hill			Castle Hill			Cherrybrook			Burns Tway			Excelsior			Baulkham Hills Private Hospital		
	Before	After	Difference	Before	After	Difference	Before	After	Difference	Before	After	Difference	Before	After	Difference	Before	After	Difference
Peak	$3.60	$3.90	$0.30	$3.60	$3.30	-$0.30	$3.60	$5.10	$1.50	$3.60	$4.98	$1.38	$3.60	$4.98	$1.38	$3.60	$4.98	$1.38
Off Peak	$3.60	$3.30	-$0.30	$3.60	$2.90	-$0.70	$3.60	$5.10	$1.50	$3.60	$4.58	$0.98	$3.60	$4.58	$0.98	$3.60	$4.58	$0.98

To Chatswood

From	Rouse Hill			Castle Hill			Cherrybrook			Burns Tway			Excelsior			Baulkham Hills Private Hospital		
	Before	After	Difference	Before	After	Difference	Before	After	Difference	Before	After	Difference	Before	After	Difference	Before	After	Difference
Peak	$5.10	$3.90	-$1.20	$5.10	$3.90	-$1.20	$5.10	$5.10	-	$5.10	$5.58	$0.48	$5.10	$5.58	$0.48	$5.10	$5.58	$0.48
Off Peak	$5.10	$3.30	-$1.80	$5.10	$3.30	-$1.80	$$5.10	$5.10	-	$5.10	$4.98	-$0.12	$5.10	$4.98	-$0.12	$5.10	$4.98	-$0.12

To North Sydney

From	Rouse Hill			Castle Hill			Cherrybrook			Burns Tway			Excelsior			Baulkham Hills Private Hospital		
	Before	After	Difference	Before	After	Difference	Before	After	Difference	Before	After	Difference	Before	After	Difference	Before	After	Difference
Peak	$3.60	$5.00	$1.40	$3.60	$3.90	$0.30	$3.60	$5.10	$1.50	$3.60	$6.00	$2.40	$3.60	$5.58	$1.98	$3.60	$5.58	$1.98
Off Peak	$3.60	$4.40	$0.80	$3.60	$3.30	-$0.30	$3.60	$5.10	$1.50	$3.60	$6.00	$2.40	$3.60	$4.98	$1.38	$3.60	$4.98	$1.38

To Wynyard

From	Rouse Hill			Castle Hill			Cherrybrook			Burns Tway			Excelsior			Baulkham Hills Private Hospital		
	Before	After	Difference	Before	After	Difference	Before	After	Difference	Before	After	Difference	Before	After	Difference	Before	After	Difference
Peak	$3.60	$5.00	$1.40	$3.60	$3.90	$0.30	$3.60	$5.10	$1.50	$3.60	$6.00	$2.40	$3.60	$5.58	$1.98	$3.60	$5.58	$1.98
Off Peak	$3.60	$4.40	$0.80	$3.60	$3.30	-$0.30	$3.60	$5.10	$1.50	$3.60	$6.00	$2.40	$3.60	$4.98	$1.38	$3.60	$4.98	$1.38

To Central Station

From	Rouse Hill			Castle Hill			Cherrybrook			Burns Tway			Excelsior			Baulkham Hills Private Hospital		
	Before	After	Difference	Before	After	Difference	Before	After	Difference	Before	After	Difference	Before	After	Difference	Before	After	Difference
Peak	$3.60	$5.00	$1.40	$3.60	$3.90	$0.30	$3.60	$5.10	$1.50	$3.60	$6.00	$2.40	$3.60	$5.58	$1.98	$3.60	$5.58	$1.98
Off Peak	$3.60	$4.40	$0.80	$3.60	$3.30	-$0.30	$3.60	$5.10	$1.50	$3.60	$6.00	$2.40	$3.60	$4.98	$1.38	$3.60	$4.98	$1.38

5.3 Comparison of fares and travel times for the special cases

The comparison of fares and travel times for the two special cases of Winston Hills to Wynyard and Wynyard to Norwest are shown separately in Tables 6 and 7. From Winston Hills, travel to Wynyard would be substantially longer without the M2 busway and would incur an interchange fare penalty. As a result it may not be desirable to remove existing M2 bus services between Winston Hills and the CBD since travellers from this part of the study area are unlikely to experience many benefits from the new rail link. The counter flow trip from Wynyard to the employment area of Norwest suggests that people outside the study area travelling to this destination will benefit from the faster (and more reliable) direct train service but at the expense of higher fares. Whether counter flow trips to other locations in the study area would be faster or slower will depend on their relative proximity to the existing M2 busway and the NWRL.

Table 6 Comparison of fares and travel times for Winston Hills to Wynyard

	Winston Hills to Wynyard					
	Travel Time			Fares		
	Before	After	Difference	Before	After	Difference
Peak	0:43	1:04	0:21	$3.60	$5.10	$1.50
Off Peak	0:39	1:10	0:31	$3.60	$5.10	$1.50

Table 7 Comparison of fares and travel times for Wynyard to Norwest

	Wynyard to Norwest (counter peak)					
	Travel Time			Fares		
	Before	After	Difference	Before	After	Difference
Peak	0:48	0:47	-0:01	$3.60	$5.00	$1.40
Off Peak	0:53	0:46	-0:07	$3.60	$4.40	$0.80

6. Discussion and Conclusions

In conclusion, the NWRL link does not deliver accessibility benefits to all of its catchment area. The combination of lower fares per kilometre for most train trips and the provision for the first time of a direct service to Chatswood (and St Leonards) means that the biggest beneficiaries of the new rail link will be people travelling to these areas. This is an unambiguous increase in accessibility to these destinations for people in the study area located close to the new rail link.

In almost all cases, passengers to Macquarie University, St Leonard's and North Sydney gain from a faster journey but at a higher cost in fares. In contrast, passengers travelling to Wynyard from origins more distant from the NWRL and/or close to the Transitway/M2 busway unambiguously lose. This loss will be crystallised if two-thirds of the M2 services are curtailed, as is currently suggested (Minister for Transport 2011b).

For Rouse Hill and Excelsior, the benefits of the NWRL are not as large as would have been the case if the bus Transitway had not been built. The presence of the Transitway, in providing a route for buses which is not in mixed traffic, not only increased speeds but also reliability – which means the NWRL is not providing a faster and/or more reliable service. This highlights the benefits of previous investment in bus infrastructure which has allowed bus services to have a dedicated right of way.

When the current bus services spend considerable time in mixed traffic, speeds are slower and reliability is poorer. Many of the differences between the before and after times reflect this. For example, passengers previously close to the M2 may suffer from congestion in the CBD now, but travelling by bus to access a NWRL station would mean their bus service spends more time in mixed traffic which is not always offset by the greater speed or reliability of the dedicated route for rail.

For fares, the outcome is mixed but this is a consequence of the fare structure. Very short trips and very long trips are less expensive by bus, and the interchange between bus and train is penalised relative to 'single seat' trips. Whilst Sydney is planning to have a smartcard in the future –the Opal –it is not clear yet if the fare system will also change to eradicate these anomalies.

In June 2012, the NSW announced 'Sydney's Rail Future' (Transport for NSW 2012c) and this promoted some changes which are not included in this paper. First, all trains from the NW will terminate at Chatswood and none will run through to the CBD. This means that all travellers from the NW to the centre of Sydney will need to change and it is estimated that this will attract a time penalty of 3 minutes. This is likely to affect two-thirds of all travellers as one-third of all passengers are expected to alight at or before reaching Chatswood. However, the analysis of this paper suggests that this destination is one where travellers do significantly gain from the NWRL. A second change is the proposal to use single-deck carriages in place of the existing double-deck fleet. Single-deck rolling stock gives advantages in boarding and alighting times, and it is estimated that these changes, and others brought about by the change in rolling stock, will shorten the journey time from Cudgegong to Chatswood by an additional 4 minutes (from 41 to 37 minutes). Third, 'Sydney's Rail Future' proposes a second harbour crossing, eventually, to link Chatswood through to the CBD and this would bring both direct services and a similar additional decrease in travel times. But this plan for a second harbour crossing is well into the future, with no proposed date as yet.

A consequence of these changes for non- NWRL travellers is that existing passengers between Hornsby and Epping will lose direct services to Chatswood and St Leonards, but will benefit from a greater number of direct services to Strathfield. Travellers between Epping and Chatswood will lose their direct connection to the CBD. These knock-on changes have not been quantified in this paper but will clearly have an impact. The analysis of this paper ignores potential changes to the distribution of jobs and housing that might occur as a result of the building of the NWRL project such as the creation of associated Transport Oriented Development around the stations.

Finally, this paper has considered how residents might use the NWRL once built, based on the assumption that bus services will be re-directed as access services to stations on the new link. The choice of locations, whilst representative of a range of locations, do not cover all possible origins and destinations. Nevertheless, the analysis has shown that there are a range of outcomes. It might be expected that unambiguous gainers would switch to the NWRL but for other bus passengers, where there is time and cost trade-offs, and car users, this analysis does not offer guidance as to their choice.

References

Australian Government 2011, *Our Cities, Our Future - A National Urban Policy for a productive, sustainable and liveable future*, Australian Government, Canberra.

Our Cities, Our Future - A National Urban Policy for a productive, sustainable and liveable future

ABS 2012, *2011 Census Quick Stats*. Accessed from http://www.abs.gov.au/websitedbs/censushome.nsf/home/map.

CDC 2012, *Hillsbus District Bus Guide*, *Effective from March 2012*. Accessed from http://www.cdcbus.com.au/IgnitionSuite/uploads/docs/10621%20Region%204%20Network%20Guide%20Page%202%5B1%5D.pdf.

Currie and Wallis 2008, 'Effective ways to grow urban bus markets – a synthesis of evidence', *Journal of Transport Geography*, vol. 16, no. 6, pp. 419-429.

Givoni, M. and Rietveld, P. 2007, 'The access journey to the railway station and passengers' satisfaction with rail travel', *Transport Policy*, vol. 14, no. 5, pp. 357-365.

Hensher, D.A. and Rose, J.M. 2007, 'Development of Commuter and Non-Commuter Mode Choice Models for the Assessment of New Public Transport Infrastructure Projects: A Case Study', *Transport Research Part A*, vol. 41, no. 5, pp. 428-443.

Hensher, D.A., Mulley C. and Yahya, N 2010, 'Passenger experience with quality enhanced bus service: The Tyne and Wear 'Superoute' service', *Transportation*, vol. 37, no. 2, pp. 239-256.

Hensher, D.A., Rose, J.M. and Collins, A. 2011, 'Identifying Commuter Preferences for Existing Modes and a Proposed Metro in Sydney, Australia', *Public Transport: Planning and Operations*, vol. 3, no. 2, pp. 109-147.

Hine, J. and Scott, J. 2000, 'Seamless, accessible travel: users' views of the public transport journey and interchange', *Transport Policy*, vol. 7, no. 3, pp. 217–226.

Independent Pricing and Regulatory Tribunal 2011, *CityRail and Metropolitan and Outer Metropolitan Bus Services: Prices and Services Report 2011*, IPART, Sydney.

Minister for Transport 2011a, T*ender called for major design works for North West Rail Link*, media release, 15 May 2011.

Minister for Transport 2011b, *160 Buses off Sydney CBD streets thanks to North West Rail Link*, media release, 12 December 2011.

NSW Government 2006, *State Plan: A New Direction for NSW*, NSW Government, Sydney. November 2006.

NSW Government 2010a, *NSW State Plan 2010*, NSW Government, Sydney.

NSW Government 2010b, *Metropolitan Plan for Sydney 2036*, NSW Government, Sydney, December 2010.

Paulley, N., Balcombe, R., Mackett, R., Titheridge, H., Preston J.,Wardman, M., Shires, J. and White, P. 2006, 'The demand for public transport: The effects of fares, quality of service, income and car ownership', *Transport Policy*, vol. 13, no. 4, pp. 295-306.

Pund, G., and D. Fleming 1997, 'Planning and Delivering Effective Bus Services in a New Residential Area', *Australian Planner*, vol. 34, no.2, pp. 78–82.

Rietveld, P. 2000, 'The accessibility of railway stations: the role of the bicycle in The Netherlands', *Transportation Research Part D*, vol. 5, no. 1, pp. 71–75.

Transport for NSW 2011, *Standard Working Timetable 2010, version 3.42, reprint from Monday 24 October 2011, Book 1: Mondays to Fridays*.

Transport for NSW 2012a, *Environmental Impact Statement: Stage 1-Major Civil Construction Works*, Transport for NSW, Sydney.

Transport for NSW 2012b, *Appendix B: Geographical Long Section of Environmental Impact Statement Stage 1-Major Civil Construction Works Incorporating Staged Infrastructure Modification Assessment*, Transport for NSW, Sydney.

Transport for NSW 2012c, *Sydney's Rail Future*, Transport for NSW, Sydney.