

**Submission
No 27**

INQUIRY INTO SYDENHAM-BANKSTOWN LINE CONVERSION

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**Submission to the Inquiry into the Sydenham-Bankstown Line conversion
held by
the Portfolio Committee of the Legislative Council of the Parliament of NSW
No 6 – Transport and Customer Service**

IF IT AIN'T BROKE, DON'T FIX IT

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Wise counsel from the United States says that if something is not broken, then you should not fix it. So it seems with the Bankstown Line within Sydney's suburban passenger railways. Why should a suburban railway line that provides connections between Bankstown and the Sydney CBD, as well as Redfern, Lidcombe/Olympic Park and Liverpool, be replaced with a metro line that severs these suburban connections, ostensibly to free up City Railway line capacity? This submission offers the Inquiry a wider view of what the Bankstown Line does for its community.

Some History

The Bankstown Line is currently a competent suburban passenger railway, which has been embedded in its community since 1895. It was the second¹, purely suburban passenger, railway built by the NSW Department of Railways. It was opened from Sydenham to Belmore in February 1895, extended to Bankstown in April 1909 and completed to Regents Park in July 1928, where it joined the Lidcombe-Cabramatta Line². Its development overlapped the extension of Sydney's southwestern tramway network³, which eventually reached Canterbury station in July 1921. However, the trams and trains served different parts of Sydney's inner western suburbs: the trams served the higher ground through Newtown, Marrickville, Dulwich Hill and Hurlstone Park; whereas the trains served the land along the Cooks River, including Canterbury Racecourse.

Peak Period Train Loads

In the glory days of 1924⁴, when suburban trains were steam-hauled into and out of Sydney Terminal station, 14 trains arrived during the morning peak hour and 15 trains departed during the afternoon peak hour. Immediately after the Great Depression in 1935⁵, 12-13 trains per hour, carrying 8,130 passengers in the first hour and 6,930 passengers in the second hour during the morning peak period headed towards the Sydney CBD from Bankstown. 16 trains ran during the afternoon peak hour, carrying 13,820 passengers with a load factor of 140%⁶, headed towards Bankstown from the CBD. Distinct industrial and office peak hours in the morning and an intense combined peak hour in the afternoon were features of 1930s' travel.

In the eleven years that elapsed between Sydney being served by steam trains and then being served by electric trains, Sydney's population grew by 26% while suburban railway patronage grew by 37%, notwithstanding the Great Depression. Sydney then basically extended from

¹ The first suburban passenger railway was the North Shore Railway, which was opened from Hornsby to St Leonards in January 1890 and extended from St Leonards to Lavender Bay in May 1893.

² The Lidcombe-Cabramatta Line was built in stages: Lidcombe-Regents Park was opened in November 1912 and Regents Park-Cabramatta was opened in October 1924.

³ The "Green Lines" reached Marrickville in December 1881, Dulwich Hill in August 1889, Hurlstone Park in January 1913 and finally Canterbury in July 1921.

⁴ In 1924/25, when Sydney's population was 0.996 M, suburban trains carried 117.6 M passengers.

⁵ In 1935/36, when Sydney's population was 1.251 M, suburban trains carried 161.1 M passengers.

⁶ There were 606 seats on average in a mid-1930s 8-car train comprising wooden and steel cars.

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Hornsby to Sutherland and from Bondi to Parramatta, with much of Sydney's population crammed into the inner eastern and western suburbs. Thus while suburban patronage was growing faster than the general population, it was still barely growing at 3% per year. This growth was nothing like what had been experienced prior to the Great Depression.

Moving to the 21st Century, we can see contemporary movements in Bankstown Line patronage in Table 1. Over the past 70 years, the Bankstown Line has declined in patronage as other lines have grown in step with Sydney's outward extension to the edge of the Hawkesbury-Nepean boundary. Nevertheless, there has recently been a welcome increase in patronage. Equally importantly, there has been an approximately 50% increase in the seating accommodation of 8-car suburban trains, so that average peak hour load factors have fallen from those of the mid 1930s. Thus if the Bankstown Line were to return to its glory days, it could easily carry more than 17,000 passengers during the morning peak hour at current load factors in current double deck suburban trains, as has been suggested as only being possible on the Metro.

Table 1: 21st Century Bankstown Line Morning Peak Period and Peak Hour Train Loadings⁷

YEAR	Morning Peak Period (0600-0930 at Central)				Morning Peak Hour (initially 0730-0830 at Central) ⁸			
	Trains	Seats	Pax	LdFc	Trains	Seats	Pax	LdFc
2000	19	16,800	12,800	76%	6	-	5,500	-
2003	20	17,590	13,190	75%	6	-	6,700	-
2005	18	16,380	10,650	65%	6	5,570	5,570	100%
2007	18	15,820	13,410	85%	6	5,260	6,850	130%
2010	17	14,260	12,000	85%	6	5,460	6,630	120%
2012	17	14,870	14,860	100%	6	5,340	8,050	150%
2014	21	18,980	17,030	90%	8	7,240	8,670	120%
2018 ⁹	26	23,170	21,760	95%	10	8,910	10,690	120%

Network Connectivity

The Bankstown Line is part of the much wider network of Sydney's metropolitan and interurban railways. It thus collects passengers from connecting lines and distributes them, either within its own bounds, or passes them onto the Sydney CBD. Furthermore, the Sydney CBD is not the only trip attractor for Sydney's rail passengers, although it is by far the largest¹⁰. There are strings of business districts connected by the suburban railway network:

- Bondi Junction on the Eastern Suburbs Railway;
- North Sydney, St Leonards and Chatswood on the North Shore Line;
- Macquarie Park on the Northwest Metro;
- Bankstown on the Bankstown Line;
- Redfern, Burwood and Olympic Park on the Main Suburban Line;
- Rhodes on the Main Northern Line;
- Liverpool and Campbelltown on the Main Southern Railway; and

⁷ Source: RailCorp, etc Statistical Compendia peak period train average load factors (LdFc) measured at Sydenham.

⁸ The morning peak hour has gradually shifted to 0800-0900.

⁹ Estimated from TfNSW OpenData passenger O-D data and September 2018 TPA peak trains load report.

¹⁰ The 2016 Census reported that the Sydney CBD attracted 15% of the Sydney Region's journey to work.

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- Parramatta/Westmead, Blacktown and Penrith on the Main Western Railway,

although these centres are not all equally attractive to rail passengers. The implications for Sydney's suburban and interurban railways are that only 45% of peak period passengers actually finish their journeys in the Sydney CBD, while another 15% of passengers travel through the CBD to centres of the far side of the CBD¹¹. Thus, 40% of all peak period travel does not even reach the Sydney CBD.

Table 2 relates Bankstown Line morning peak period and all day station entries to changes in annual patronage. It shows that Bankstown Line patronage declined in step with total patronage during the 2000s before recovering during the 2010s.

Table 2: 21st Century Patronage Data for the Bankstown Line and the Sydney Metropolitan and Interurban Railways

Year	Bankstown Line ¹²		Annual Station Entries ¹³			
	Station Entries (Kppd)		(Mppa)			
	AM Peak	Weekday	Bankst'n	Suburban	Interurban	Total
2000	26.36	64.79	-	-	-	272.0
2001	-	-	-	-	-	293.1
2002	-	-	-	-	-	267.1
2003	25.82	60.38	-	-	-	263.7
2004	-	-	-	-	-	263.6
2005	22.23	49.73	-	-	-	259.9
2006	-	-	-	-	-	261.9
2007	23.42	52.34	-	-	-	269.0
2008	-	-	-	-	-	283.3
2009	26.29	58.96	16.1	272.9	19.3	292.2
2010	-	-	-	-	-	289.1
2011	25.57	58.33	16.4	-	-	294.5
2012	-	-	-	-	-	303.5
2013	26.67	58.96	16.2	273.0	33.2	306.2
2014	-	-	-	281.2	32.9	314.1
2015	-	-	-	291.9	34.5	326.4
2016	-	-	-	322.1	38.5	360.6
2017 ¹⁴	29.06	62.97	27.4	325.9	41.0	366.9
2018	32.10	67.66	28.2	345.4	41.4	386.9
2019	-	-	30.6	361.1	41.3	402.4

Figure 1 displays inbound and outbound morning peak period passenger flows modelled from 2017 passenger origin-to-destination movements obtained from the Opal fare system. Roughly one-third of passengers flowing over the Bankstown Line towards the Sydney CBD are present before trains reach Bankstown. Furthermore, if we refer to Table 2 showing historical Bankstown Line patronage data, more than 20% of passengers entering Bankstown Line stations during the morning peak period did not exit in the Sydney CBD. These passengers got

¹¹ These observations hold for 2011 and 2013 travel statistics, from RailCorp's 8th and 9th Statistical Compendia.

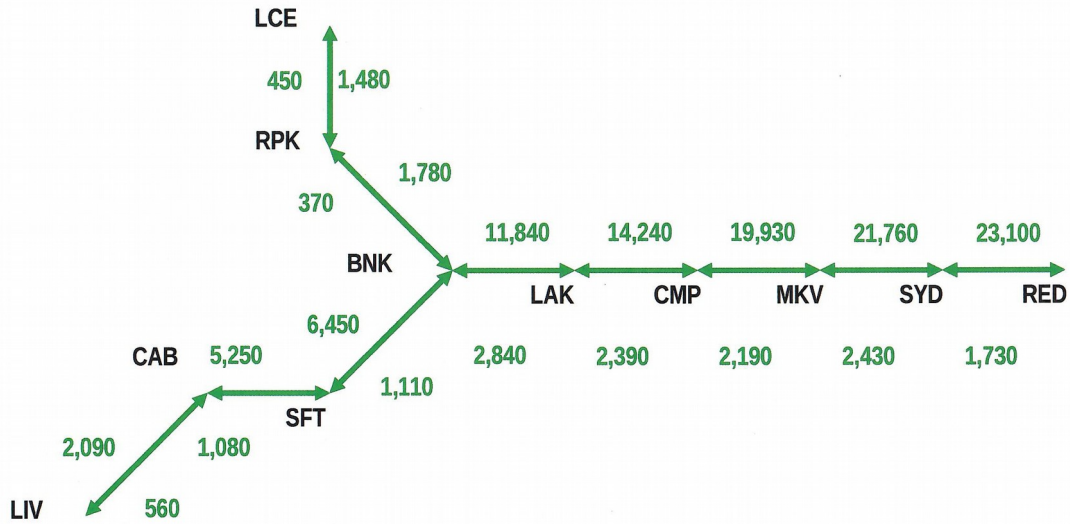
¹² Source: RailCorp, etc Statistical Compendia train station barrier counts.

¹³ Patronage from RailCorp, etc Annual Reports.

¹⁴ Line, Sydney Trains and NSW TrainLink patronage from Opal reports.

off trains somewhere on the Bankstown Line. By and large, Bankstown Line services allow passengers to travel inside and outside the line without transfer.

Figure 1: Schematic Representation of Inbound and Outbound 2017 Bankstown Line Morning Peak Period Passenger Flows¹⁵



Converting the Bankstown Line to metro operations between Sydenham and Bankstown will break these travel opportunities, which are a direct product of current suburban train operations. Furthermore, there is no information as to how transfers would be physically¹⁶ and operationally effected between Metro Bankstown and residual suburban train service to and from Lidcombe and Liverpool, given the Bankstown station's constrained location. In the wider context of catering for suburban CBDs, interposing gratuitous transfers will make travel between the Bankstown Line and adjacent CBDs, such as Olympic Park, Parramatta and Liverpool, less attractive at a time when agencies, such as Infrastructure Australia¹⁷, are posing a 35% increase in rail modal split and a possible 100% increase in rail patronage by 2046.

There are also wider operational implications of metro conversion. Metro conversion will block the efficient transfer of passenger rolling stock between the Illawarra and East Hills Lines, to the south, and the Main Suburban, Main Northern and Main Western Lines. Currently, rolling stock transfers can use the Bankstown Line by entering and leaving it at Sydenham.

Conditions of Carriage

Current 8-car double deck suburban trains offer peak period travellers a high density of seating and standing room, because they have 50% more floor area than equivalent single deck trains. Accordingly, they have a very effective suburban carriage design, which combines a high level of seating for passengers travelling throughout the day and a substantial overload standing capacity for peak period travellers. Table 3 summarises how current suburban and metro trains compare in passenger accommodation levels and what their tolerance is to crowding. All

¹⁵ CAB = Cabramatta, CMP = Campsie, LAK = Lakemba, LCE = Lidcombe, LIV = Liverpool, MKV = Marrickville, RED = Redfern, RPK = Regents Park, SFT = Sefton and SYD = Sydenham.

¹⁶ See appended pictures of the currently constrained Bankstown station site, which is bounded to the west by the Chapel Road overbridge.

¹⁷ See Infrastructure Australia, *Future Cities: Planning for our growing population*, Infrastructure Australia, Canberra, February 2018, especially Chapters 1, 4 and 5.

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current double deck suburban trains offer in excess of five seats per metre length of train, which is sufficient to seat all peak period, but not peak hour, passengers. Sydney's compact suburban trains allow passengers to easily distribute themselves along the lengths of platforms within two minutes of stepping onto a platform. All suburban trains provide at least 190 square metres of standing area, which is largely provided in large door vestibules and end compartments. Moreover, stand-backs are provided adjacent to the large doorways (all wider than 1600 mm) from the T-sets onwards, so that passengers can stand out of the flow of entering and leaving passengers. Furthermore, these wide doors can easily handle 16 passengers per second entering or leaving a train. Thus, average station dwell times should not exceed 30 seconds, including the 10 seconds lost during door opening and closing.

Table 3: Suburban and Metro Rolling Stock Accommodation Comparisons

Attribute	Suburban Trains ¹⁸					Metro ¹⁹
	K-set	C-set	T-set	M-set	A-set	SD
Train Type						
Maximum speed (km/h)	115	115	130	130	130	100
Number of cars	8	8	8	8	8	6
Length (m)	163.1	163.1	162.2	163.1	162.8	127.0
Number of doors	16	16	16	16	16	18
Number of seats	896	896	840	904	894	378
Seats/metre	5.49	5.49	5.18	5.54	5.49	2.98
Standing area (m ²)	192.4	192.4	208.0	205.2	213.0	190.3
Maximum standees ²⁰	768	768	832	820	852	761
Seated + standees	1664	1664	1672	1728	1746	1139
Total pax/metre	10.20	10.20	10.31	10.59	10.72	8.97
Maximum Load factor ²¹	186%	186%	199%	191%	195%	301%

Metro trains are currently 30 metres, or so, shorter than suburban trains. Metro trains offer barely 40% of the seating offered by suburban trains so that even at current Bankstown Line morning peak period patronage, only an average of 45% of passengers would be seated. During the morning peak hour, only an average of 35% of passengers would be seated, almost at maximum loadings throughout the whole of the peak hour. Why should 65% of Bankstown Line passengers be forced to stand when only 16% of passengers currently do so?

The contentious issue is how crowded should trains be during peak hours. Trains do not load uniformly over their lengths, notwithstanding exhortations to passengers. Passengers do not prefer the front and rear cars and they are often influenced by where they entered their origin station or where they exited their destination station. Thus, assuming that passengers occupy all seats and stand uniformly throughout a train is probably an overestimate of the capacity of a suburban or metro train. We still need a rational way to estimate the maximum load that a suburban or metro train could carry. JJ Fruin wrote a design guide for pedestrian spaces in 1971²². He postulated that the level of crowding is related to how closely people will let others impinge upon their personal space. He also proposed Levels of Service appropriate to the

¹⁸ Sources: CityRail, *CityRail Rollingstock*, CityRail, Sydney, 1996, RailCorp, *Passenger Fleet: Rolling Stock Diagram Book – RS00_0000_00MP*, RailCorp, Sydney, April 2008 and Cooke D, Estell D, Seckold K, Beckhaus J, Halgren S & Bennett D, *Coaching Stock of the NSW Railways, Volume 3*, Eveleigh Press, Sydney, 2012.

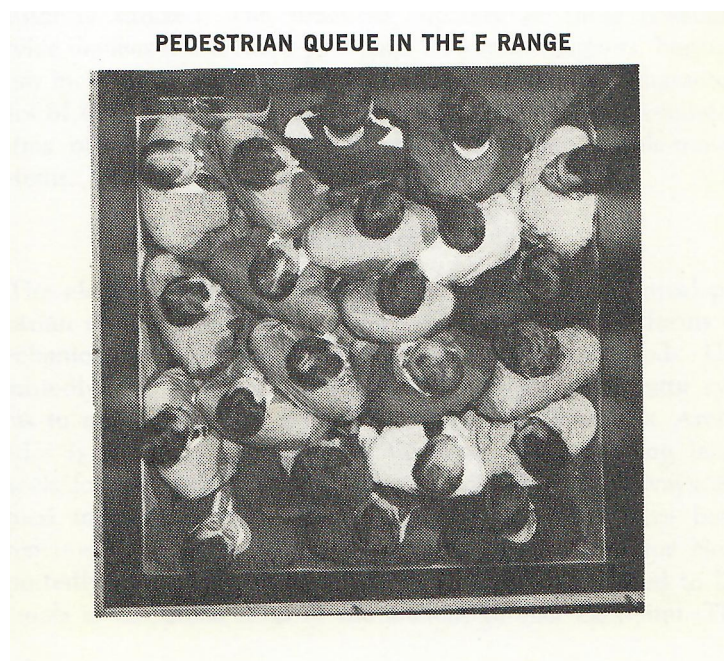
¹⁹ Source: Beckhaus J, *Transport for New South Wales Metro Rollingstock*, Railway Digest, September 2019, pp42-45.

²⁰ Measured at 4 persons per square metre of standing area, JJ Fruin's Level of Service E of crowding.

²¹ Load factor is given by the percentage of total passengers to the numbers of seats.

spaces that people were using. Thus Level of Service F, at five persons per square metre, would be tolerated in a lift, or some other confined space, such as the doorways of a suburban or metro train. Figure 2 shows what Level of Service F in a lift would look like.

Figure 2: Crowding at Level of Service F (five persons per square metre)²³



It is thus suggested that Level of Service E, at four persons per square metre, be taken as the practical limit on how crowded a peak hour train should be throughout its length. This level of crowding would leave some space for passengers to filter through when entering or exiting a train. It was applied to Table 3 to calculate the maximum numbers of passengers that could stand in different suburban and metro trains.

However, we still need a practical capacity guide for planning peak hour train services. If a standing density of two passengers per square metre was applied, then the non-uniformity of passenger loading along the length of a train would be factored in. This would lead to an average peak hour load factor of roughly 150% for suburban trains, which would be more than adequate for Bankstown Line trains.

It should be noted that TfNSW has claimed a capacity of 1200 passengers in a metro train, which is approaching lift-like crowding. This raises questions as to how metro station stops might be managed when passengers have difficulty filtering through on-board crowds.

Travel Times

We are not aware of any Metro travel time estimates between Sydenham and Bankstown, so we have had to infer travel times from the Northwest Metro, timetable scrutiny and judicious train performance simulation.

We obtained travel times between Chatswood and Epping by comparing suburban train performance before 2018 with current 2019 metro train performance. We also ran comparative

²² See Fruin JJ, *Pedestrian planning and design*, Metropolitan Association of Urban Designers and Environmental Planners, Inc, New York, 1971.

²³ See Fruin JJ, *op cit*, p87.

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train performance simulations²⁴ to gauge the effect of retiring K-sets (and C-sets). The nett 2013 Working Timetable K-set travel times were 15 minutes in each direction of travel. These times could have been reduced to 14 minutes in each direction if T-set travel times were adopted. Official Northwest Metro travel times are 14 minutes in each direction of travel, but July 2019 on-board observations suggest outturn travel times are more likely to be 14½ to 15 minutes. This is because station dwell times are widening to 40 seconds as a result of door opening and closing times exceeding 20 seconds.

What are the implications for metro trains running between Sydenham and Bankstown? Bankstown Line stations are closer together than Epping-Chatswood stations. The higher initial acceleration of metro trains should lead to 1-2 minutes shorter running times than those offered by all-stops K-sets or C-sets²⁵. However, the observed extension of Metro station dwell times could easily absorb these time gains.

Peak period limited-stops Bankstown Line travel times are currently 6-7 minutes shorter than all-stops travel times. However, the 4 trains per hour service frequency is much lower than the 15 trains per hour peak frequency currently being offered by the Northwest Metro. If suburban trains were to run at 16 trains per hour, which they once did (and could still do so in the future) then all trains would have to run all-stops. Metro trains would then only be at best 2 minutes (ie 10%) faster than suburban trains between Sydenham and Bankstown, if not less. However, the one-third of passengers wishing to travel beyond Bankstown would still be faced with indeterminate transfer times between metro and suburban services.

City Railway Line Capacity

The ostensible reason for converting the Bankstown Line to metro operation was that City Railway line capacity could be freed up for growth in other suburban services. Under the current timetable, the City Railway is not yet running to capacity, although it is pushing closer to the current target of 20 trains per hour in each direction.

Continuing growth in Sydney CBD patronage will inevitably consume current line capacity. Therefore, railways within the CBD, and possibly on its approaches, will have to be resignalled. Sydney Trains is already embarking on the Sydney Automatic Train Protection Project to improve safety and to provide the framework for future increases in line capacity from 20 trains per hour to, say, 24 trains per hour (a 20% increase). This should be more than sufficient to cater for medium term Bankstown Line patronage. Furthermore, Sydney Trains' CEO, Howard Collins, has publicly called for more investment to boost the suburban railways' capabilities by 40%²⁶. The money not spent on converting the Bankstown Line could be profitably spent on upgrading Sydney Trains' signalling. Thus, the tools are to hand for the Bankstown Line to offer capacity into the future to carry passengers at acceptable peak hour levels of accommodation and to leave space for the growth of other suburban train services, without recourse to Metro conversion.

²⁴ We used the MTRAIN model, which was initially developed in 1970 at the then NSW Department of Railways to model train performance and to simulate signal system behaviour. Since its initial development it has been successfully applied throughout Australia and on assignment outside Australia. Furthermore, it has been continuously validated and maintained since it was PC-ised in 1989.

²⁵ Using the performance of Melbourne's Alstom Xtrapolis trains as a proxy, since no train performance data is publicly available for Metro trains.

²⁶ See O'Sullivan M, *Quickest, cheapest way to boost Sydney's train services*, Sydney Morning Herald, Wednesday 13 March 2019.

Possible Population and Employment Changes

All the indications are that Sydney will continue to grow, as will its employment. The NSW Department of Planning, Industry and Environment made some predictions about local government population changes within the Sydney region²⁷. The City of Canterbury-Bankstown covers much of the population catchment of the Bankstown Line (and the East Hills Line). Its population is expected to grow by more than 140,000 people (40%) over the 20 years from the 2016 Census to 2036. Also in 2018, Infrastructure Australia examined different growth scenarios in Sydney and Melbourne since 2016. The most bullish forecasts for the future use of use of public transport for the journey to work in Sydney suggested that the level of public transport would increase and that the Parramatta CBD would grow in importance as an employment centre relative to the Sydney CBD. However, the Sydney Region's employment levels might not grow as fast as its population (say 35%).

Faced with this Delphic advice, Bankstown Line peak hour travel to the Sydney CBD may only grow by 30% (say to 13,900). However, there could be a significant backhaul of passengers²⁸ towards Parramatta, particularly since there is already a direct railway connection from Berala to Auburn.

Strategic Directions

In the longer term, if Sydney's railways are to capture more passengers in and out of peak periods, then the railway network must have to expand to serve new travel markets, by building new suburban and metro railways. For example, the proposed Western Metro should be designed to promote higher density infill population growth north of Parramatta Road, by providing a new east-west link between the Sydney and Parramatta CBD and catalysing population and employment growth around Olympic Park.

Similarly, an often-touted rail link connecting, say, Hurstville, Kingsgrove, Lakemba and Strathfield could provide more cross-regional public transport travel opportunities to promote the development of Parramatta. In a similar vein, the Southwestern Metro could possibly be redirected from Bankstown towards Ramsgate to promote infill population growth in the Rockdale area.

Metro developments, where the technology is appropriate, should be directed to developing new urban rail patronage markets, not to pillaging existing markets.

Summary

- If the Bankstown Line were to run at 16 trains per hour, as in 1935, it could easily carry more than 17,000 passengers at current load factors in current double deck suburban trains during the morning peak hour, matching the claims of the metro.
- Sydney's trains serve more than the Sydney CBD during peak periods: 40% of passengers exit before the CBD; 45% exit within the CBD; and 15% travel beyond the CBD.
- Bankstown Line train services cater for internal and external travel without transfer, which would be broken by metro conversion.
- There is no information as to how the proposed metro would handle transfers to suburban train services at Bankstown.

²⁷ 2016 State and NSW Local Government Area population projections as at May 2018.

²⁸ Currently less than 3,000 passengers during the peak hour and probably schoolchildren.

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- Metro conversion would block efficient suburban train rolling stock transfers around Sydney.
- Why replace suburban train services that seat over 80% of peak hour passengers with metro trains that only seat 35% of peak hour passengers at current levels of service?
- On the evidence of the Northwest Metro, travel times on Bankstown metro trains would at best be 10% faster, and at worst no faster, than current suburban trains.
- Foreshadowed technological developments of Sydney's suburban railways will provide capacity for future patronage growth, without recourse to metro conversion.
- There will still be a need to build new suburban and metro railways to serve a Sydney Region whose population could grow by 50% in the foreseeable future.

This Inquiry should look beyond the flawed metro conversion of the competent suburban Bankstown Line. The real issue is how to expand the capacity and extent of Sydney's current suburban railways to serve a metropolitan region, which is expected to grow by 50% in the foreseeable future. In that time the Sydney Region will acquire more CBDs, which will only flourish if they are served by more suburban and metro railways.

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