

# **Rail infrastructure capacity constraints in Melbourne: An engineering problem or a political problem?**

Paul Mees

## **ABSTRACT**

It is widely believed that Melbourne's rail system suffers capacity constraints which prevent it providing significantly higher service levels or accommodating higher patronage. The most important bottlenecks are said to be the city loop and the Dandenong line.

This paper examines the claimed capacity constraints on the Melbourne rail system in detail, utilising throughput standards derived from current best practice, but also from past performance and planning in Melbourne. It concludes that the claimed constraints are not substantiated.

The paper then considers the political factors (including 'professional politics') behind the Melbourne rail 'capacity crisis', concluding that political, and not engineering, constraints are the dominant factor.

## **INTRODUCTION**

In 1969 Melbourne's transport planners released the most grandiose capital works plan in the city's history (MTC, 1969). Although most of the money was allocated for roads, rail engineers claimed a share by proposing an underground rail loop.

The city loop was based on the assumption that employment in the city's central business district would grow by around 40%, leading to an increase in CBD-oriented work trips by train from 109,000 in 1964 to 176,000 in 1985. The number of suburban trains entering Flinders Street Station in the busiest hour of the day (the morning peak) would jump from 108 to 181 (MTC, 1969, p. 34), necessitating construction of a hugely expensive underground loop to handle the extra trains and passengers.

## **CRISIS, WHAT CRISIS?**

The plan for the city loop was not without its critics. A team of researchers from the Civil Engineering Department at the University of Melbourne argued that the project was unnecessary, and based on faulty assumptions (Clark et al, 1970). With the wisdom of hindsight, it appears the critics were correct. Employment in Melbourne's core CBD is about the same now as in 1964, while the share of workers travelling by train has fallen.

Train travel to workplaces outside the CBD has fallen more dramatically than travel to the CBD. In 1951, some 153,000 Melburnians took the train to workplaces across the metropolitan area on a normal weekday (MMBW, 1953); rising car ownership saw this figure fall to 147,000 by 1964 (MTC, 1969), despite a large increase in population. By the time of the 1981 census, the decline had accelerated and the number of workers using trains had fallen to only 113,000. A modest recovery in rail patronage during the 1980s and 1990s appears to have been due mainly to increased volumes of students, because the number of workers commuting by train was only 118,500 at the 2001 census. Although recent petrol price rises have probably increased this figure, the number of rail commuters is still substantially below the 1964 and 1951 figures, and daily CBD work trips by train are barely half the level predicted in 1969.

Hardly surprisingly, then, peak period rail services have also declined. Instead of rising to 181, the number of suburban trains arriving at Flinders Street in the busiest hour of the morning peak has fallen from 108 in 1964 to only 87 currently (taken from 2005 Connex timetables). The decline is even more striking when compared to 1929, when Flinders Street saw 116 suburban trains during the busiest hour and an average of 87 trains per hour across a 24-hour weekday (MTPC, 1929, p. 130).

Despite this, the city loop was built. Although it was probably not needed, the loop should at least ensure that Melbourne has enough rail capacity to absorb any conceivable increase in demand. Its planners designed it to accommodate the predicted 1985 traffic of 181 trains per hour, plus “the capacity for expansion beyond the design year” (MTC, 1969, p. 34), so the loop is operating at considerably less than half its design capacity.

Given that the rail system handled a third more suburban trains in peak hour three-quarters of a century ago than it does now, without the added capacity provided by the city loop and modern signalling, observers from outside Melbourne could be forgiven for wondering why this paper is being presented at all. The reason is that there have been repeated claims, from apparently authoritative sources, that the rail system is at capacity in peak period, and could not accommodate more train services without the expenditure of perhaps billions of dollars.

The capacity crisis claim was made public by the Infrastructure Planning Council appointed by the Victorian government in 2000. The Council reported in 2002 that:

There appears to be growing pressure on capacity on the suburban rail system and the 20-year-old city loop. A new signalling system would solve some, but not all, of the anticipated capacity constraints. Other options include a significant expansion of an underground system (IPC, 2002, p. 56).

IPC members told me at the time that they had formed this view based on information provided by government planners and the private rail operators.

The State government responded by promising “a pre-feasibility study on addressing capacity constraints of the passenger rail network, including the City Loop, as part of the metropolitan Train Plan” (Victorian Government, 2002, p. 39).

Two years later, no such investigation had apparently occurred, and the promised metropolitan Train Plan had disappeared, as had the Infrastructure Planning Council. The government did release a transport statement called *Linking Melbourne*, which identified the city loop as a capacity constraint which would be investigated – but set no timetable for the investigation (DOI, 2004, pp. 48-9).

Since the release of *Linking Melbourne* in October 2004, the alleged capacity crisis has been widely reported in the media, and offered as a justification for the deteriorating reliability of Melbourne's rail system (e.g. *The Age*, 8<sup>th</sup> August 2005). In addition to the city loop, the Dandenong rail line, which serves one of Melbourne's designated growth corridors, has been identified as a major capacity bottleneck. The 2005/6 Victorian budget allocated a staggering \$25 million over the next few years just to study what should be done on the Dandenong corridor (budget information sheet: transport, 5/3/05).

The most recent media report was on the front page of the *Sunday Age* of 9<sup>th</sup> October. The article quoted a "secret report" by consultants as stating: "Given that existing throughput is at capacity, then the overall existing loop utilisation is close to 100 per cent."

At no point in this process, however, has anyone publicly released any studies or other evidence to show that there really is a capacity crisis.

### **HOW MANY TRAINS CAN THE CITY LOOP CARRY?**

As Vuchic (2005, chapter 2) notes, the capacity of a rail line is determined by the number of tracks and platforms in the peak direction of travel, at the busiest point in the system. In Melbourne's case, the key point is the city centre, and there are nine in-bound tracks and platforms: five through Richmond station, one through Jolimont and three through North Melbourne. This should be compared with Sydney's rail system, which carries almost twice as many passengers as Melbourne's, but has only six tracks entering the city centre.

Each of the nine tracks can accommodate 24 trains per hour (Harrigan, 1962; Clark et al, 1970, p. 12), or a train every 2'30". That this is a modest figure can be seen from a comparison with the Yonge subway line in Toronto, the busiest section of which opened in 1954 and has only one track in each direction. The Yonge line currently carries a train every 2'21" on average in peak period, or 25.5 services per hour (TTC, 2005). Vuchic (2005: 97) notes that sections of the London Underground achieve 38 trains per hour, "while some systems reach only... 24 [trains/hour]" (emphasis added).

So the capacity of the city centre terminal as a whole is 24 times 9, or 216, trains an hour. If each train carried 1000 passengers (550 seated, 450 standing), this would enable 216,000 passengers to enter the city centre in the busiest peak hour. This should be compared with the actual 2001 figure of 118,500 workers per day across Melbourne, of whom fewer than 100,000 entered the city centre at all, let alone in the busiest hour. In fact, the passenger carrying capacity of the city loop is sufficient to permit the entire workforce of the CBD and surrounding areas like Docklands and

Southbank to arrive by train in a single hour, with none using other transport modes or arriving outside this period!

The main reason the impression has been created of a capacity problem is that the city loop is not currently operated in the way it was designed. While there are nine tracks entering the city centre, there are only four tunnels in the city loop: trains from the five remaining tracks were intended to proceed directly to Flinders Street, and then continue through to the other side of the city. The loop was intended to balance the flow of trains from east and west and to augment the ‘direct to Flinders Street’ capacity, not to replace it:

Services would be arranged so that some of the trains on each line would run directly to or from one of the loop lines and the remainder directly to or from... Flinders Street (MTC, 1969, p. 34).

In contravention of these ‘instructions’, current rail timetables schedule all, or most, trains through the loop, with few or none on the remaining direct tracks. For example, there are currently two tracks entering the city centre from the Dandenong and Frankston lines, passing through Caulfield station. In the morning peak, one of these tracks corresponds to a loop line, the other to a direct line to Flinders Street. Currently, all 19 Caulfield trains arriving at Flinders Street between 8:00 and 8:59 run through the loop, utilising around 80% of the capacity of the loop tunnel. If only the capacity of this tunnel is considered, it appears that train numbers can be increased by no more than 25%. But this ignores the fact that none of the capacity of the direct line to Flinders Street is currently being used; the real potential increase in train numbers is therefore 125%, not 25%.

A similar situation applies on the Burnley loop, serving trains from the Belgrave, Lilydale and Glen Waverley lines and carrying 21 trains arriving at Flinders Street between 8:00 and 8:59 am. The additional direct line to Flinders Street only carries 8 trains, so spare capacity exists for an additional 19 trains an hour through Burnley. The loop line through North Melbourne station sees 18 trains between 8:00 and 8:59 am, but is one of three in-bound lines through that station. The other two lines are used by only 3 suburban trains in the busiest hour, although they also accommodate 8 country services terminating at Spencer Street station. Again, less than half the available capacity is being utilised. The only loop line without additional ‘direct to Flinders Street’ capacity is the Clifton Hill loop, which serves a single platform per direction at Jolimont station, but this line only sees 11 trains between 8:00 and 8:59 at present.<sup>1</sup>

So provided services are timetabled and operated competently, there is no part of the city loop or other central city terminal facilities that is in danger of approaching its train-carrying capacity in the foreseeable future.

---

<sup>1</sup> The capacity of this Clifton Hill line is limited, in the morning peak only, by the design of the loop tunnel entrance, which requires trains entering the tunnel to cross the path of out-bound trains from Flinders Street station. As with the other lines discussed above, this is only a problem if operators insist on running all city-bound trains through the loop: the simplest solution is to run additional services direct to Flinders Street and on to the Western suburbs. The problem does not occur during the evening peak, because the city loop runs in the reverse direction.

## HOW MANY TRAINS CAN THE DANDENONG LINE CARRY?

This brings us to the Dandenong rail line, which apart from the loop is the principal capacity constraint claimed for the rail network. The section said to be at capacity is the two tracks covering the 19 km between Dandenong and Caulfield: there are four tracks on the 11 km section between Caulfield and the city. There are also three tracks and platforms at Dandenong station, and at Oakleigh, between Dandenong and Caulfield.

*Linking Melbourne* discussed providing a third track between Dandenong and Caulfield, similar to that provided in the 1980s on the Frankston line between Moorabbin and Caulfield. Vuchic (2005, p. 133) notes that three-track lines are rare internationally, because they offer little flexibility. It may also be significant that service levels on the Frankston line are actually lower now than before the third track was constructed (see below), suggesting that it was probably not needed.

As above, the following discussion focuses on the morning peak, which is busier than the afternoon peak, and the busiest hour. In 1970, 11 Dandenong line suburban trains arrived at Flinders Street Station between 8:00 and 8:59 am (Clark et al, 1970, p. 18), plus two country services (one each from Warragul and Leongatha). According to the current suburban timetable, only 9 Dandenong line trains arrive during this hour, plus a single country train (the Leongatha line has been closed), so the total has fallen from 13 trains to 10. Services on the Frankston line, which shares the four tracks between Caulfield and Richmond with Dandenong services, have also dropped from 13 to 10 since 1970, despite construction of the third track between Caulfield and Moorabbin.

As with the city loop, historical data suggests that there is no capacity problem currently, but for the record the capacity of the two-track section of the Dandenong line should be calculated – even if only to save the Victorian government \$25 million! Vuchic (2005, p. 138) notes that a two-track rail line provides maximum capacity with ‘all stops’ timetabling. Under such operations, the Dandenong line could accommodate up to 24 trains in the busiest hour, compared with 10 currently, but this would mean no express running between Dandenong and Caulfield, even for country trains.

The service pattern actually offered currently does not correspond to any of the scheduling systems identified by Vuchic (2005). All trains cover the whole section of line from Dandenong to the city; some stop all stations and others run express – but there are three different patterns of express running. There is no regular service interval. The result is a timetable that is confusing, and difficult to remember, for passengers, and more difficult to operate than necessary.

A more logical pattern of operation is ‘zonal service’ (Vuchic, 2005), as found on Perth’s (two-track) Northern Suburbs line, for example. On the Perth line, two services are operated at regular intervals: express trains which run to the end of the line, and stopping trains that run to the station at which express running finishes, which has a third track and platform to accommodate terminating services. This system allows 16 services per hour without even approaching the capacity of the line.

Because the two-track section of the Dandenong line is shorter than the Perth Northern Suburbs line, and because third platforms are available for terminating trains at both Oakleigh and Dandenong, a similar arrangement should permit either:

- a higher service frequency ‘two zonal’ service, or
- a ‘three zonal’ operation, allowing a limited number of expresses to Dandenong as well as to Oakleigh.

In either case, around 20 services per hour, or twice the current level, can be provided.

### **SO WHAT IS THE PROBLEM?**

If there is ample spare capacity on the Melbourne city loop and the Dandenong line, why is it not being utilised? And why are those responsible for operating and planning the rail system asserting that a capacity problem exists, when it can easily be shown that there is no problem?

The answers lie in the distant and recent history of public transport administration in Melbourne. Mees (2000) recounts how Melbourne’s rival rail, tram and bus operators failed to respond to the challenge presented by rising car ownership after World War II. Instead of re-inventing public transport to create a ‘go anywhere, anytime’ service that could compete with the convenience of the car, operators and planners continued to compete with each other, and gradually fell into the passive position of offering rationalisations for failure. One of the most popular was the claim that there had been insufficient investment in infrastructure, and this idea can be seen as the origin of proposals like the City Loop and extra tracks on the Dandenong line.

Privatisation in 1999 was supposed to remedy this situation, by bringing the dynamism of private enterprise to bear on the task of reinventing public transport. Incentives to increase patronage were built into the franchise agreements, through provisions tying subsidies to patronage levels. As a result, privatisation was widely praised in the two years between the inauguration of the system and the commencement of its demise. It turned out that the private operators were no more capable of marketing public transport to car travellers than their bureaucratic predecessors, but they proved very successful at marketing themselves to the State government and regulators (Mees, 2005).

The result was a large financial bailout in 2003-4, which has roughly doubled subsidy levels compared with public operation (Auditor-General, 2005, p. 25, fig. 2E). Significantly, not only are subsidy levels much higher than provided for under the 1999 franchise agreements, but they are no longer tied to patronage growth, and so the current operators have little incentive to seek new patrons – especially in peak periods, which are most expensive to serve.

The current privatised arrangements in Melbourne present a classic ‘moral hazard’ problem. All of the key players – government, regulator, operators – have an incentive to consciously or unconsciously collude against the public interest, by rationalising inaction instead of genuinely improving the effectiveness of public transport (Mees, 2005). In such an environment, the regular assertion of non-existent constraints on rail capacity becomes easy to understand.

## REFERENCES

Auditor-General of Victoria (2005) *Franchising Melbourne's train and tram system*, Government Printer, Melbourne.

Clark, N., Richards, I. & Ogden, K. W. (1970) *Analysis of Melbourne's Proposed Underground Railway*, Bulletin No. 4, Transport Section, Civil Engineering Dept., University of Melbourne.

DOI (2004) *Linking Melbourne*, Victorian Government, Melbourne.

Harrigan, Leo (1962) *Victorian Railways to '62*, VR, Melbourne.

IPC (Infrastructure Planning Council) (2002) *Final Report August 2002*, Victorian Government, Melbourne.

Mees, P. (2000) *A Very Public Solution: Transport in the Dispersed City*, Melbourne University Press, Melbourne.

Mees, P. (2005) 'Privatisation of rail and tram services in Melbourne: What went wrong?', *Transport Reviews* 25(4), 443-449.

MMBW (1953) *Melbourne Metropolitan Planning Scheme 1954: Surveys and Analysis*, Government Printer, Melbourne.

MTC (1969) *Melbourne Transportation Study, Volume 3: The Transportation Plan*, Government Printer, Melbourne.

MTPC (1929) *Plan of General Development: Melbourne*, Government Printer, Melbourne.

TTC (2005) *Service Summary: September*, available at [www.ttc.ca](http://www.ttc.ca)

Victorian Government (2002) *Investing for Our Future: Response to the IPC Final Report*, Melbourne.

Vuchic, V. R. (2005) *Urban Transit: Operations, Planning and Economics*, John Wiley & Sons, New Jersey.