

SUNSHINE LINK Running Fast and reliably in the suburbs
Andrew McLean 11/8/04

There is little doubt that the biggest obstacle to a far superior “Fast Rail” service to Bendigo is the section between Spencer St and Sydenham. It is doubly unfortunate then, that the present “Fast Rail” plans offer no solution to this at all. Although the Bracks government claims that improving speed and reliability through the suburbs is a high priority, their words and deeds show the exact opposite.

\$200 million has been allocated to the Bendigo Fast Rail project, and not one cent of this is to fix the worst problem.

THE PROBLEMS

There are two fundamental problems to overcome if “Fast Rail” services are to have a chance of living up to their name.

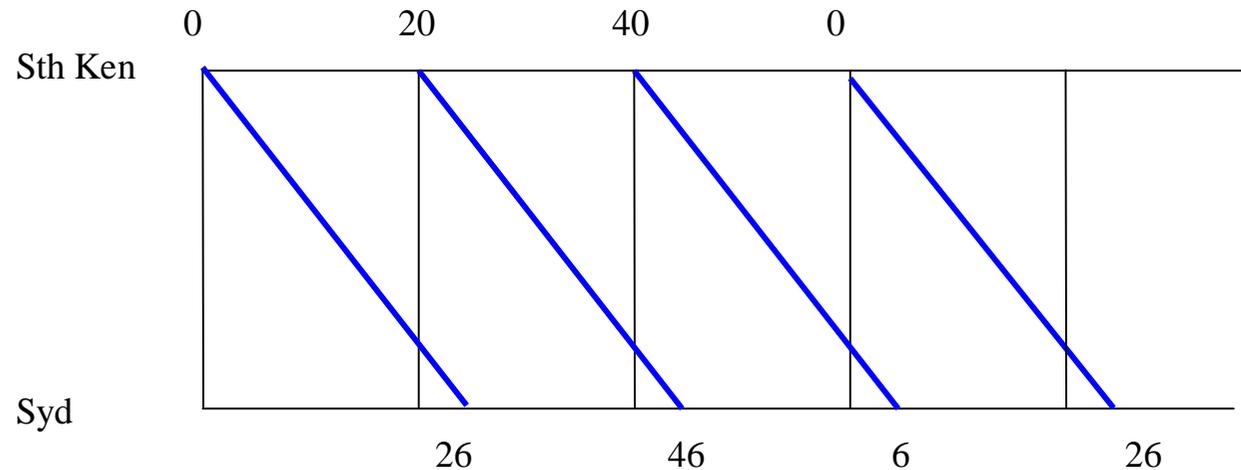
1. Between Sydenham and Sth Kensington, just over 20 km, there is no possibility of overtaking a slow suburban, and
2. Between Sth Kensington and Spencer St, the Bendigo country line has to cross a maze of other lines on “flat” junctions to reach the east side of Spencer St station, where the country platforms are.

Thus any solution must overcome these two impediments

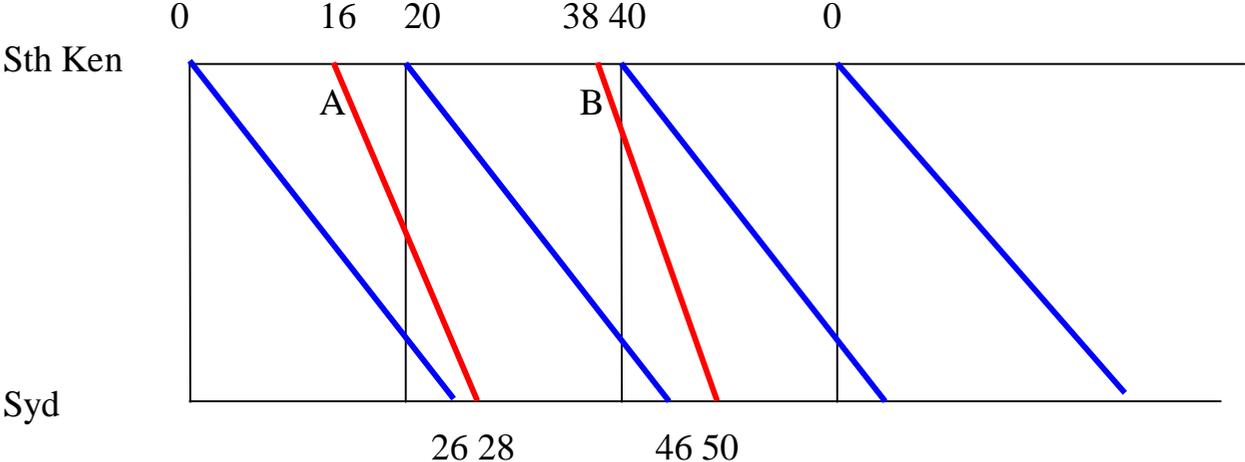
1. OVERTAKING SYDENHAM SUBURBAN TRAINS.

Suburban trains take 26 minutes to travel the 20 km between Sth Kensington and Sydenham, and during the off peak run at a 20 minute frequency. This can be shown on a distance – time graph, commonly used by train timetablers. On this graph, time is shown horizontally and distance vertically. The path of a train then shows as a diagonal line, where the steeper the line, the faster the train.

If suburban trains were to leave Sth Kensington at 00, 20, and 40 past the hour, the graph of suburbans (for the down direction) would look like this:



Let us assume that Fast Rail trains would ideally average 100 km/h between Sth Kensington and Sydenham. This means that their running time for this section would be 12 minutes, 14 minutes faster than a suburban. Clearly, this means leaving Sth Kensington just before a suburban so as not to catch up to the previous one. If there is a minimum time gap at each end of say two minutes, there exists a “window” between the two suburbans where a Fast Train will be unchecked. In the next graph, two Fast Trains are shown (in red), at the extremes of the “window”.



The earliest a Fast Train can leave is 16 minutes after the previous suburban (A), and the latest it can leave is two minutes before the next suburban (B). Thus, for a train averaging 100 km/h, there is only a *two minute* window every 20 minutes. Any other time will see one or both trains delayed

During the off peak, it is therefore at least *theoretically* possible to get a reasonably fast service through in between suburbans, although it would require very “disciplined” timetabling.

During the peak, however, suburban trains run more frequently, at approximately 10 minute intervals. Even if the suburban pattern is staggered (eg 12, 8, 12, 8 instead of 10, 10 etc) it is still impossible to go fast through the suburbs.

The “cheap” solution to this, and one which has been quite rare in Victoria, is for the suburban train to be overtaken at a station. As an example, if Sunshine had more platforms, a suburban could pull into the “back” platform, and 2 minutes later the Fast Train would pass. About a minute later again the suburban would proceed, after a delay of about 3 minutes. This obviously requires extremely high “discipline”, and is much less likely to work for “up” trains, which have come much further, and are more likely to be late.

By far the best solution is obviously separate, parallel tracks for high speed trains.

THREE OR FOUR TRACKS?

Burnley – Box Hill is a good example of how three tracks for suburban traffic is very nearly as effective as four. During the off peak, just two are used, but during the peak the “centre” line, which is signalled bi-directionally, is used as a “fast” track for peak hour expresses.

Having a third track for country fast trains is not nearly as useful. Four are needed, for the simple reason that country expresses run all day in *both* directions. For example, it is easy to imagine hourly trains to Bendigo, Kyneton, Bacchus Marsh and Ballarat all day, or four expresses per hour each way as far as Sunshine in the *off* peak. Clearly these could not all run on just one extra track.

WHERE?

Ideally, “Fast Trains” would have their own tracks right through the suburban area, completely separate from all suburban tracks. This is obviously a long term goal. But having even half of the distance separate would be a huge advantage, as this is long enough to reliably overtake at least one suburban.

There are two basic approaches to this:

- 1) The “country” end, ie Sydenham – Sunshine, and
- 2) The “city” end, ie Sunshine – Spencer St.

SUNSHINE -- SYDENHAM

Any solution here will have to resolve the problem of level crossings. There have only been a very limited number of level crossings in Australia with four running tracks, and the politics of these is rather curious.

If a two track level crossing is expanded to four tracks, and the number of trains remains the same, car travellers are *better* off.

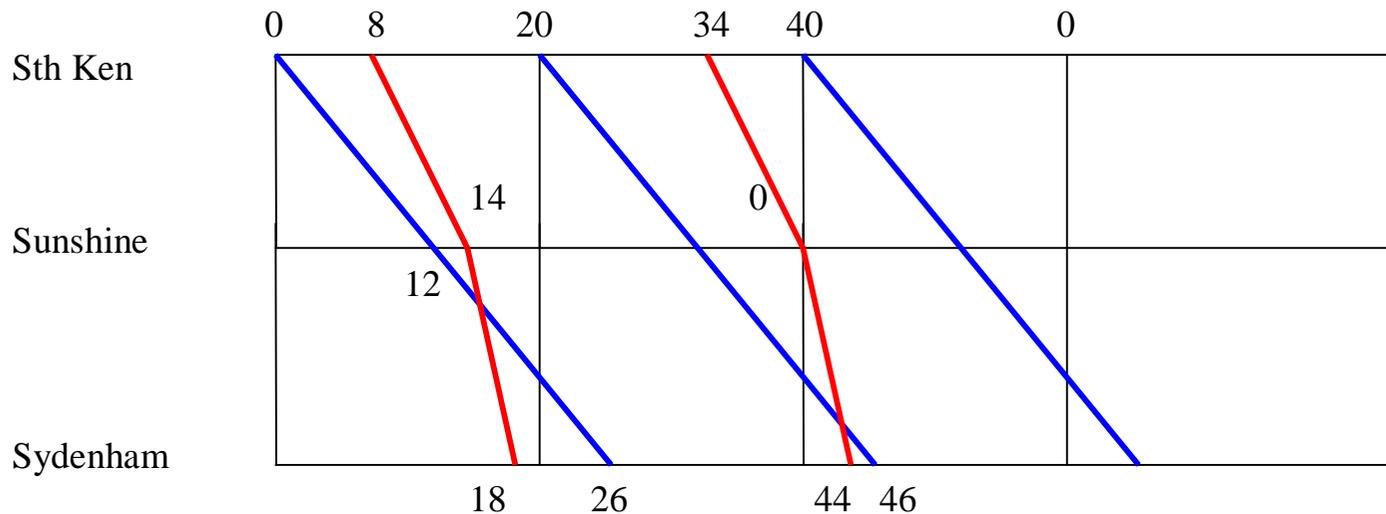
Trains can obviously have the capacity to overtake, and therefore the four track crossing will be closed against road traffic for less time than a two track crossing, as some of the overtakes will occur on or near the crossing, with the booms down only once for the two trains, instead of twice. But this argument seems to hold little favour with politicians, who simply envision “more tracks, more delays.”

This type of thinking makes grade separation almost mandatory for four track sections, and typical costs for a grade separation are \$20 – 40 million.

There are four level crossings between Sunshine and Sydenham (Anderson Rd, Furlong Rd, Main Rd, and Taylors Rd) so the total cost of level crossing elimination would be around \$100 million. \$30 million has been budgeted for Taylors Rd, but the recent fatality at Furlong Rd may see the priority change.

However, if all four crossings could be eliminated, then a section of very fast four track becomes possible.

Suburban trains take 14 minutes for the 11 km from Sunshine to Sydenham, and at 160 km/h a Fast Train would take 4 minutes. Again, a train graph will illustrate the possibilities.



In this situation, a Fast Train can leave Sth Kensington no earlier than 8 minutes after a suburban, and no later than 6 minutes before the next. With a 20 minute suburban frequency, this provides a 6 minute “window” for a much

faster train. With this section of track, Fast Trains could average 100 km/h to Sunshine (as before), but then 160 km/h to Sydenham, for a reduced timing of 10 minutes, Sth Kensington – Sydenham. This is about 7 minutes faster (and potentially far more reliable) than at present.

This improvement would allow the 84 minute target time to be met with only minor improvements in the country.

Although this might appear to be a worthwhile approach, it is not necessarily the *best* approach.

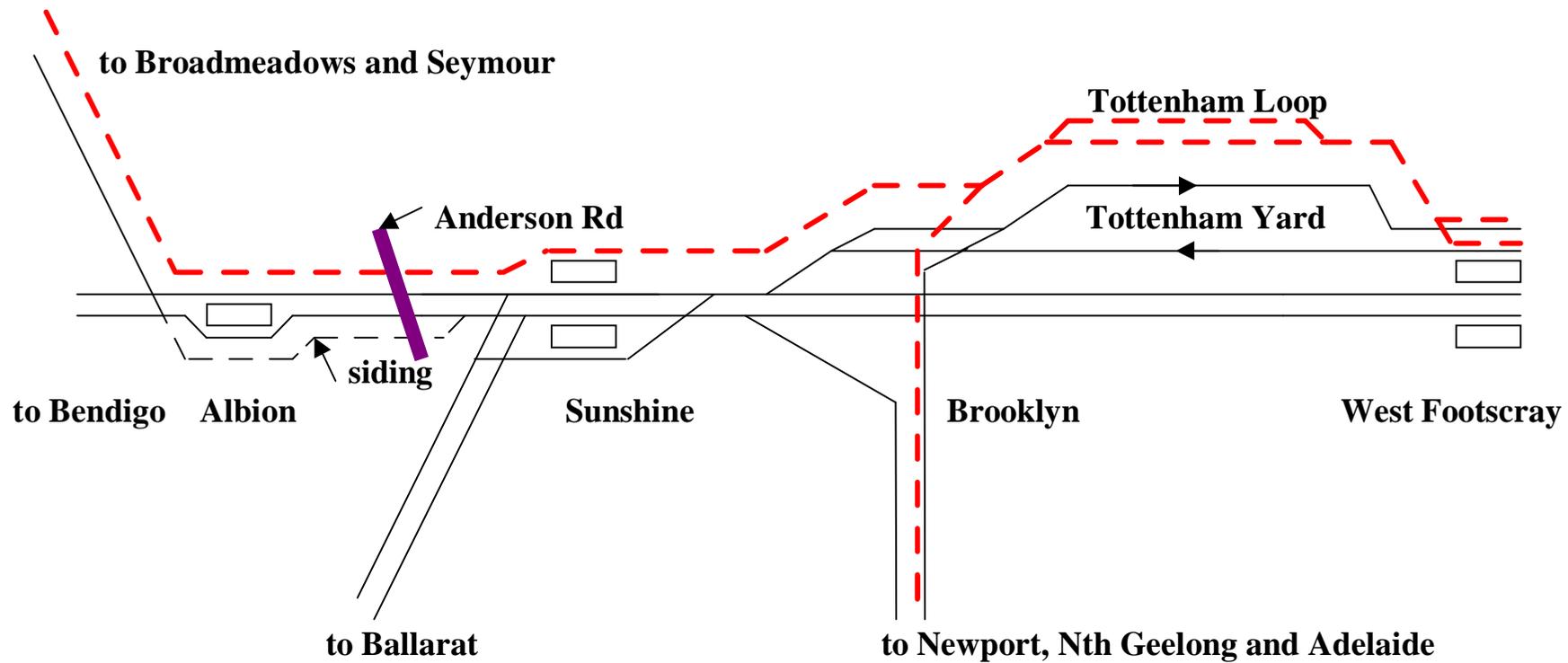
SPENCER ST – SUNSHINE

As well as the need to overtake Sydenham suburban trains, Fast Trains need to avoid the many flat crossings and junctions between Sth Kensington and Spencer St. There are two sensible approaches to this.

- 1) Use the Nth Melbourne flyover to avoid crossing the suburban lines on the level, or
- 2) Terminate on the western side of Spencer St (Platforms “15 and 16”) thus avoiding the need to cross the suburban tracks in the first place.

ALBION – WEST FOOTSCRAY

From Albion to Sunshine there are 3 running tracks, 2 broad and 1 standard. There is also a siding on the down side of the line for much of the distance, and there are therefore four tracks across Anderson Rd. At Sunshine the two lines from Ballarat join in. Importantly, the back platform at Sunshine can only be used by Ballarat line trains. There used to be a fourth platform (making the up platform an island) for the standard gauge line, but this has been demolished. From Sunshine to West Footscray there are also two goods lines which separate to pass either side of the Tottenham yards. These two broad gauge lines combine with the standard gauge line at West Footscray to become double, dual gauge track which runs parallel to the passenger lines past Middle Footscray.



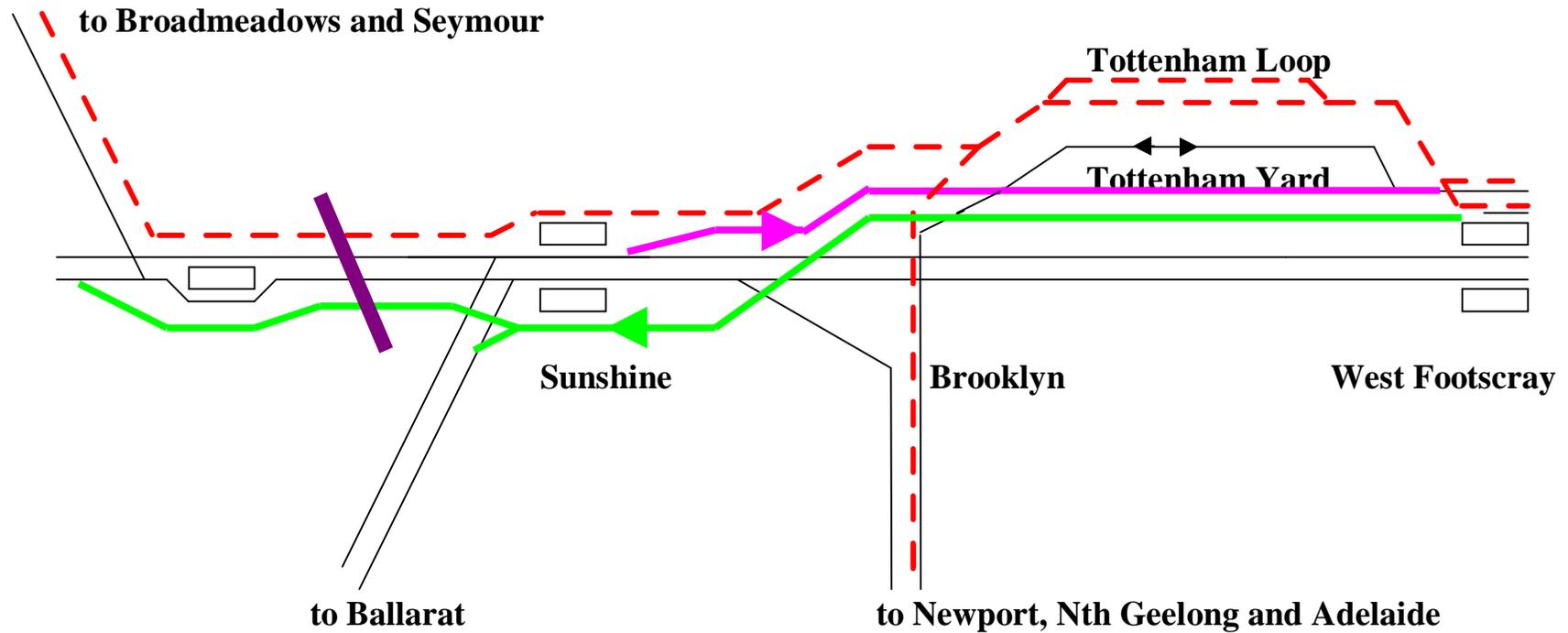
Existing Layout.

Note: Schematic, not to scale, some lines omitted for clarity

Legend:

- Existing broad gauge
- - - - Existing standard gauge
- - - - Existing dual gauge

The next diagram shows one possibility.

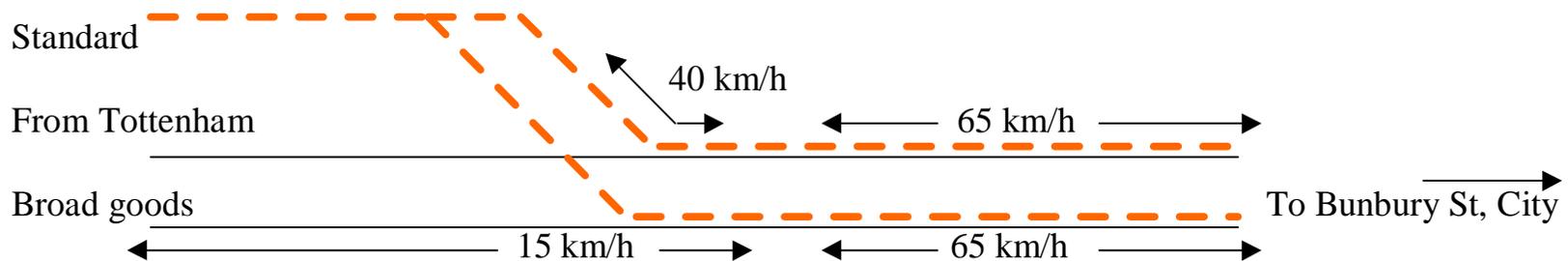


The new down line (green) replaces the present down goods line, but is straightened out. It crosses the suburban lines on a “half flyover” (it is already up in the air) and uses the back platform at Sunshine. The line is then joined up to the existing siding, which is upgraded. The line rejoins the suburban line just beyond Albion station, avoiding the present 80 km/h curve. The new up line (purple) leaves the up suburban line just on the up

side of Sunshine , and runs parallel to the down line to West Footscray. The existing up goods line becomes bidirectional. There is one level crossing, Anderson Rd.

WEST FOOTSCRAY

At West Footscray at present, two low speed broad gauge goods lines merge with one not quite as low speed standard gauge line to become double track dual gauge, as in the diagram.



Unfortunately, “fixed” end-of-dual-gauge points were used, with resulting speed limits of 40 km/h (standard) and an amazing 15 km/h (broad). The speed limit on the dual gauge track itself is 65 km/h for both gauges. Because there is effectively no signalling on the broad gauge goods lines through Tottenham, the same 15 km/h limit applies.

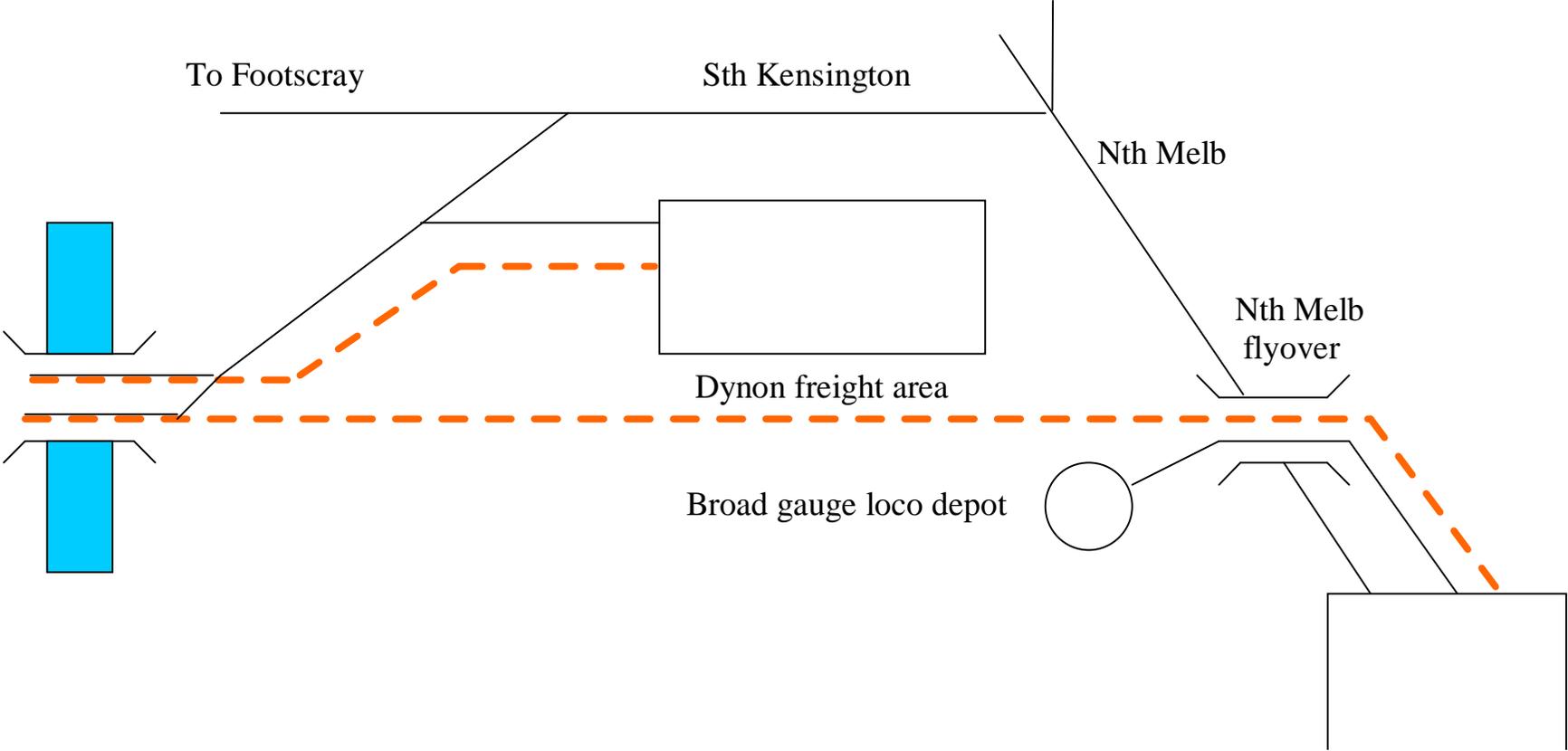
Fixed points can be easily replaced by what might be termed “half-points”, with one moving blade rather than the two of a normal pair of points. This allows full speed on one gauge, and 80 km/h on the other. (Some of the new pointwork for the Fast Rail project allows diverging at 80 km/h. The previous best was 65 km/h.)

BUNBURY ST

The dual gauge track runs parallel to the suburban lines as far as Footscray, where it enters the Bunbury St tunnel and passes to the south of the suburban lines. It then crosses the Maribyrnong River where the gauges split again. The speed limit on the dual gauge track can be raised to 80 km/h easily. Importantly, proper pointwork would dramatically reduce the time spent travelling on the dual gauge section.

MARIBYRNONG RIVER – SPENCER ST

Just east of the Maribyrnong River bridge the gauges split, with more incredibly low speed limits. Although the tracks get complicated as they are entering the terminal area, the ones of interest are shown below:



Maribyrnong River

Spencer St

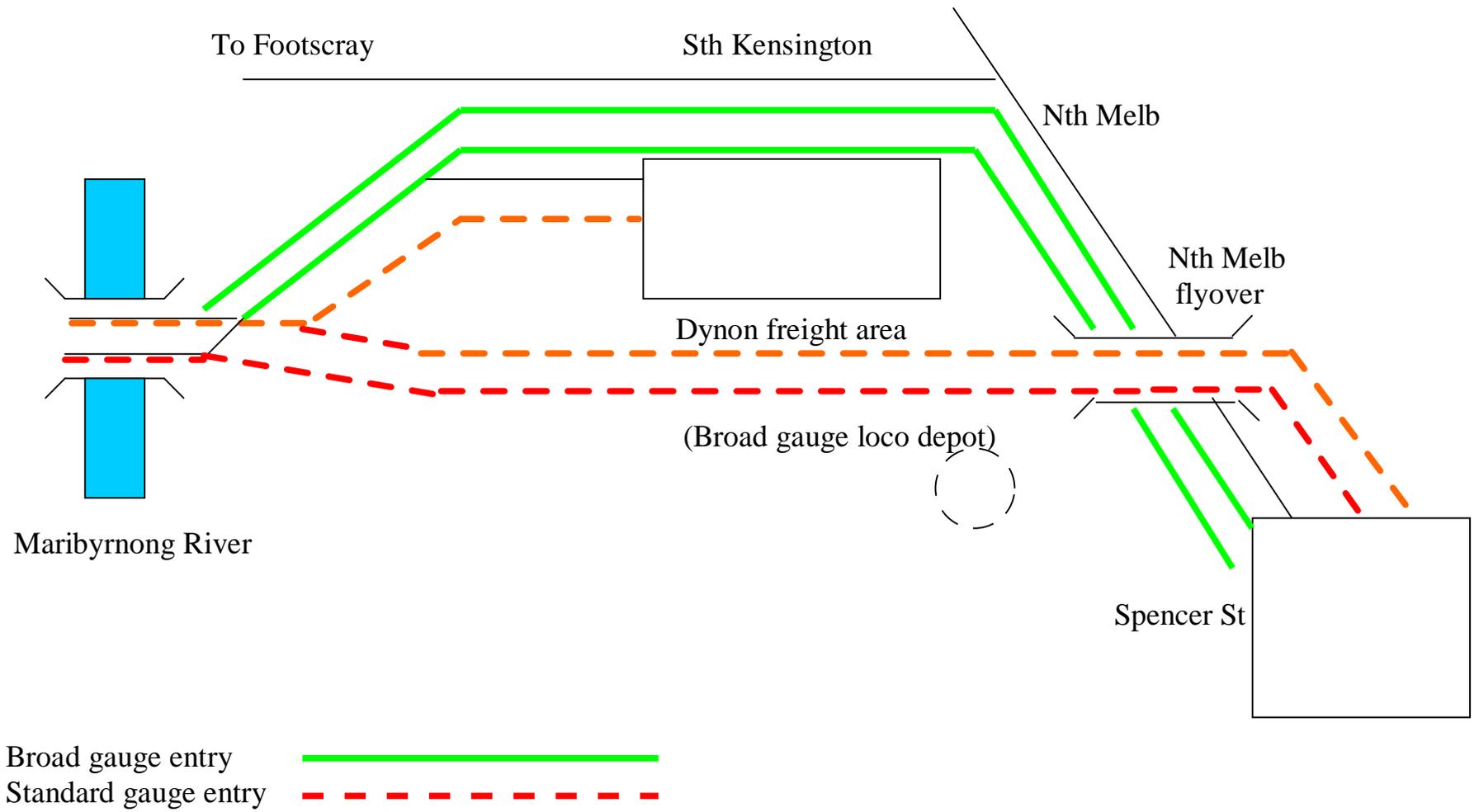
There are two possible routes in: via Sth Kensington, and via the existing standard gauge route and over the Nth Melbourne flyover. This flyover is double track, with one of each gauge at present. The standard gauge track has three trains each way: the two XPTs to Sydney, and The Overland to Adelaide. The broad gauge track is used by locomotives running to and from the loco depot. As loco-hauled trains are progressively replaced by V'Locity sets, and broad gauge trains to Shepparton and Albury become standardised, this track will see less and less use.

This route could easily become double standard gauge. East of Dynon, this line would effectively be a dedicated Fast Train main line.

An alternative to a standard gauge entry via the present standard gauge route is a broad gauge route via Sth Kensington. The simplest version of this would see an extra broad gauge track laid from the junction just east of the Maribyrnong River bridge to Sth Kensington, where trains would rejoin the existing passenger network.

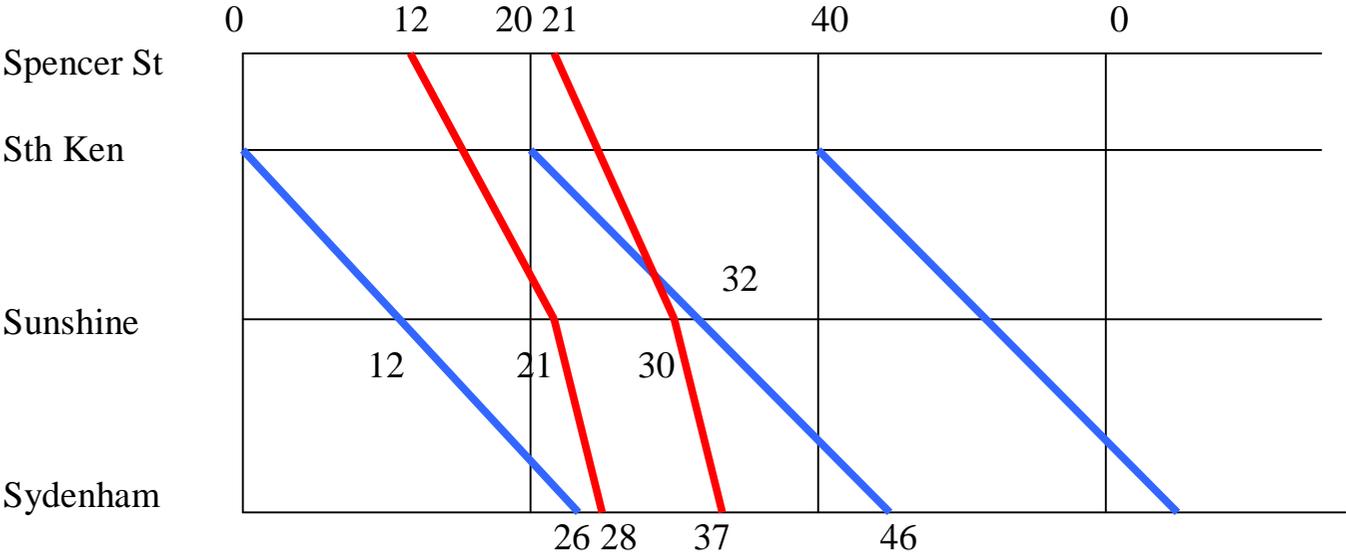
Because there will obviously be a continued drift of broad gauge freight to standard, any remaining broad gauge freight can share the two "passenger" lines. (There are very few broad gauge freights during the day.)

A more ambitious plan sees the existing freight lines from Sth Kensington past Spencer St upgraded to allow fast passenger services, with an extra island platform at Spencer St nearest Docklands. Trains using this platform would continue round to Flinders St.



Trains running on standard gauge via Dynon could reach Sunshine in 7 minutes. Running on broad gauge via Sth Kensington would take 8 – 9 minutes. (Say 9)

Again, we can see the possibilities on a graph.
 Fast trains have been given 9 minutes to Sunshine, then 7 minutes to Sydenham (average here 100 km/h)



Here, the critical section is Sunshine – Sydenham. There is a 9 minute window between just not catching up to one suburban at Sydenham, and just beating the next one out of Sunshine.

CONCLUSIONS

Running fast in the suburbs is theoretically possible with a 20 minute frequency to Sydenham, where there is a nominal 2 minute “window” each 20 minutes. In practice, and particularly for up trains, this is not sufficient for reliable running.

The ideal situation is separate, parallel tracks all the way, which would allow running times of about 12 minutes at any time.

Grade separation between Sunshine and Sydenham (say 4 crossings @ \$30 million each) would allow quadruplication and therefore proper high speed running in this section, and provide a 6 minute window every 20 minutes.

Separate tracks between Sunshine and Spencer St would allow a 9 minute window every 20 minutes. Building extra tracks here would provide an equal benefit to Ballarat trains, whereas extra tracks near Sydenham provides none.

Sunshine – Spencer St would also allow a proper, fast service to the Airport to run via Albion at very little cost other than the branch to the Airport itself.

“Fast Trains” of either gauge can be separate from standard gauge freight traffic between Sunshine and West Footscray, and east of the Maribyrnong, having effectively their own tracks. (Broad gauge fast trains would share tracks with a few, low priority broad gauge freights.) As freight moves from broad to standard, the amount of freight using the present broad gauge goods line will diminish.

This leaves the section past Middle Footscray, and through the Bunbury St tunnel, shared with high priority interstate freight. At present this traffic is seriously delayed by unnecessarily slow pointwork, resulting in an effective 40 km/h restriction over the entire section.

High speed end-of-dual-gauge pointwork would dramatically reduce the delays on this section, and increase capacity markedly.

The section of track through Bunbury St tunnel is too valuable for it to be “locked up” by any one operator. If 24 freights ran per day (average 1 per hour) each way, and each freight occupied the tunnel section for 5 minutes, the tunnel section would still be completely free for high speed passenger traffic for the other 55 minutes.

In practice, a suburban-free line to Sunshine allows fast trains to be “bunched”.

This means that services not serving the same market can run in “flights”, leaving the tunnel free for much of the time.

As an example, Ballarat trains could run 2 minutes after Bendigo trains, followed by a Sunbury local followed by a Melton local. This would be 4 trains in 6 minutes. (Say) 20 minutes later, a Kyneton and a Bacchus Marsh train would leave 2 minutes apart.

The section between Spencer St and Sunshine is both the problem and the solution.

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