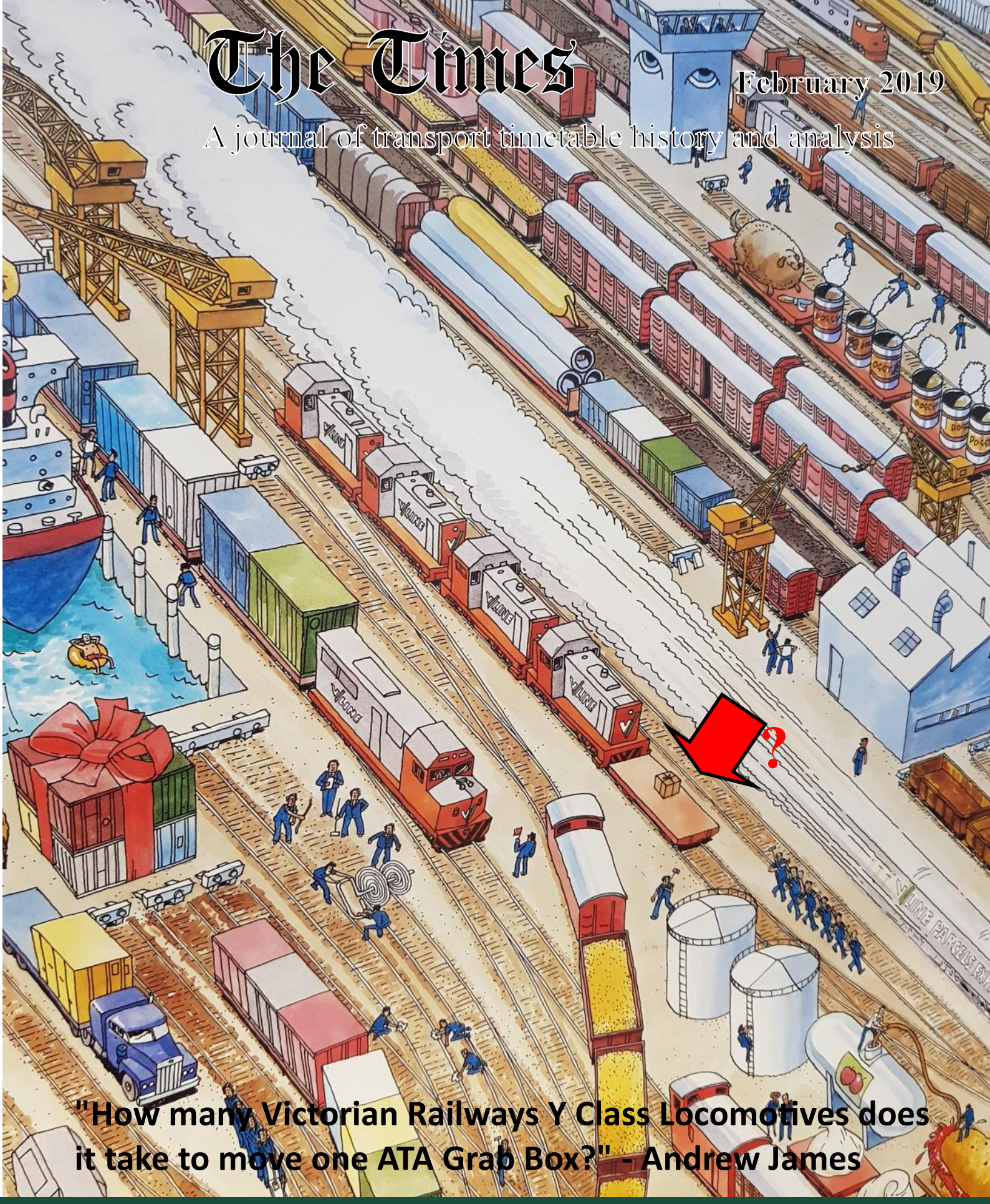
The Times

February 2019

A journal of transport timetable history and analysis



"How many Victorian Railways Y Class Locomotives does it take to move one ATA Grab Box?" - Andrew James

Inside: The Curious Blackwall Railway
Thoughts on tourist railway timetabling
North of Narrabeen

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The Times

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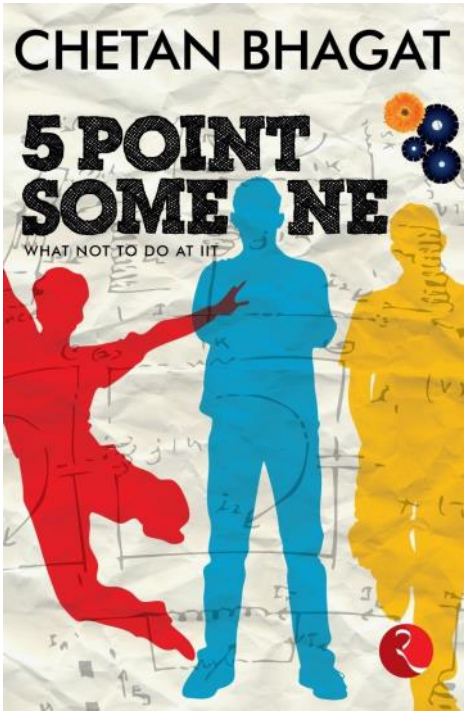
Letter: A footnote on the Delhi Ring Railway

The article in the November Times highlights the paucity of train services between Kirti Nagar and Hazrat Nizam ud-Din. The author, James T Wells, is not the only one to have noted this paucity. Patrons of Wheeler's bookstalls, as found on Indian Railway stations, will be familiar with the boy-meets-girl novels of Chetan Bhagat, which are written in English for the local market. The first of the series, Five point someone, is set on the Delhi campus of the Indian Institute of Technology. The heroine is the daughter of a professor who holds inordinate ambitions that his children will also become professors. We learn that her brother died in a collision with a train on the Delhi Ring Railway, and reason that, with the trains so infrequent, this cannot be other than suicide. Following the tragedy, the daughter manages to wriggle out from under her father's ambitions and pursues a career as a fashion designer.

Ian Manning



A Very Curious Railway—The London and Blackwall

CONRAD SMITH

London and Blackwall Railway

EASTBOUND

Fenchurch Street	.....	.....	.....	.....	0800	0800	0800	0800	0800	0800	and every 15 minutes until	.....	.....	.....	2200	2200	2200	2200	2200	2200	.....
Minories	..	..	..	..	0801	0801	0801	0801	0801	0801		..	..	..	2201	2201	2201	2201	2201	2201	..
Minories	.....	.....	.....	.....	0803	0803	0803	0803	0803	0803		.....	.....	.....	2203	2203	2203	2203	2203	2203	.....
Cannon Street	..	..	..	0803	*0805*	*0805*	*0805*	*0805*	*0805*	*0805*		..	..	2208	*2205*	*2205*	*2205*	*2205*	*2205*	*2205*	..
Shadwell	.....	.....	0803	*0804*	*0806*	*0806*	*0806*	*0806*	*0806*	0807		.....	2203	*2204*	*2206*	*2206*	*2206*	*2206*	*2206*	2207	.....
Stepney	..	0803	*0805*	*0806*	*0808*	*0808*	*0808*	*0808*	0809	..		2203	*2205*	*2206*	*2208*	*2208*	*2208*	*2208*	2209	..	..
Limehouse	.....	*0804*	*0806*	*0807*	*0809*	*0809*	*0809*	0810	.....	.....		*2204*	*2206*	*2207*	*2209*	*2209*	*2209*	2210	.....	.....	.....
West India Dock	..	*0806*	*0808*	*0809*	*0810*	*0810*	0811	..	..	..		*2206*	*2208*	*2209*	*2210*	*2210*	2211	..	..	..	..
Poplar	.....	*0807*	*0809*	*0810*	*0812*	0813	.....	.....	.....	.....		*2207*	*2209*	*2210*	*2212*	2213	.....	.....	.....	.....	.....
Blackwell	..	0808	0810	0811	0813	..	..	..	..	..		2208	2210	2211	2213	..	..	..	..	..	..

WESTBOUND

Blackwell	.....	.....	.....	.....	.....	0800	0800	0800	0800	0800	and every 15 minutes until	.....	.....	.....	.....	.....	2200	2200	2200	2200	2200
Engine Stop	..	..	..	..	..	0801	0801	0801	0801	0801		..	..	..	..	..	2201	2201	2201	2201	2201
Engine Stop	.....	.....	.....	.....	.....	0802	0802	0802	0802	0802		.....	.....	.....	.....	.....	2202	2202	2202	2202	2202
Poplar	..	..	..	..	0802	*0803*	*0803*	*0803*	*0803*	*0803*		..	..	..	..	2202	*2203*	*2203*	*2203*	*2203*	*2203*
West India Dock	.....	.....	.....	0802	*0804*	*0805*	*0805*	*0805*	*0805*	*0805*		.....	.....	.....	2202	*2204*	*2205*	*2205*	*2205*	*2205*	*2205*
Limehouse	..	..	0802	*0803*	*0805*	*0806*	*0806*	*0806*	*0806*	*0806*		..	..	2202	*2203*	*2205*	*2206*	*2206*	*2206*	*2206*	*2206*
Stepney	.....	0802	*0803*	*0804*	*0806*	*0807*	*0807*	*0807*	*0807*	0808		.....	2202	*2203*	*2204*	*2206*	*2207*	*2207*	*2207*	*2207*	2208
Shadwell	0802	*0804*	*0805*	*0806*	*0808*	*0809*	*0809*	*0809*	0810	..		2202	*2204*	*2205*	*2206*	*2208*	*2209*	*2209*	*2209*	2210	..
Cannon Street	*0803*	*0805*	*0806*	*0807*	*0809*	*0810*	*0810*	0811	.....	.....		*2203*	*2205*	*2206*	*2207*	*2209*	*2210*	*2210*	2211	.....	.....
Minories	*0805*	*0807*	*0808*	*0809*	*0811*	*0812*	0813	..	..	..		*2205*	*2207*	*2208*	*2209*	*2211*	*2212*	2213	..	..	..
Fenchurch Street	0806	0808	0809	0810	0812	0813	.....	.....	.....	.....		2206	2208	2209	2210	2212	2213	.....	.....	.....	.....

ABOVE IS A TIMETABLE IN traditional style (with passing time in italics) to show the services as provided by the London and Blackwall Railway in 1848.

This seems to show nine separate services eastbound and ten westbound every quarter of an hour, but with impossibly tight margins between successive columns. In fact it shows the world's first (and last) express cable-hauled railway consisting entirely of slip carriages.

From 1840 to 1849 an intensive service was provided over 3¼ miles (5¼ km) between the City and the docks of London. No locomotive was used: traction was provided on each of two parallel tracks by a very long rope, one for each track, wound over enormous drums near each end of the line. Carriages were attached whilst the rope was stationary and released from the rope at speed, making every 'train' a slip coach or coaches.

This technology borrowed from the well-established rope haulage of colliery 'chauldron' waggons which abounded in the north east of England as witnessed by George Stephenson himself as a boy. Conveyance of coal from colliery to sea relied as much on gravity as on stationary steam engines, as did this unique suburban railway.

At a time when steam locomotives were but one possibility for traction – 'atmospheric' railways and horse traction were other alternatives – rope-worked inclines were in use for trains in and out of Euston station in London and Lime Street station in Liverpool: indeed London to Liverpool trains were rope-worked at both ends of their locomotive-hauled journeys as the London and Blackwall Railway opened in 1840.

Originally called the Commercial Railway in its Act of Parliament, as noted in Wikipedia, 'the engineer of the line was intended to be John Rennie, but the project's City financiers favoured Robert Stephenson, believing that they would also benefit from the knowledge and wisdom of his respected father George. Although, because of the Act, Robert Stephenson had to follow Rennie's route and use the obscure track gauge of 5ft ½in (1537mm) [perhaps not so obscure – the nearby Eastern Counties Railway had been laid to the 5ft (1524mm) gauge in 1839, yet to be converted to standard gauge in 1844], he was free to choose his own method of propulsion. Drawing on his experience with the Camden Incline on the London and Birmingham Railway he decided upon cable haulage from stationary steam engines.

The railway was on brick arches as far as the West India Docks, and then on an embankment before entering a shallow cutting near the Blackwall terminus at Brunswick Wharf. [...] The line opened on 6 July 1840, and the company changed its name to the London and Blackwall Railway on completion of an extension to Fenchurch Street, just within the City boundary, in 1841'.

This was, of necessity, a stand-alone operation. Its concept was inimical to junctions or integration with any other

NEW TERMINUS OF THE BLACKWALL RAILWAY, AT FENCHURCH-STREET.

railway, and so by 1849, with mounting pressure to connect with the emerging national network, it was inevitable that the whole system would be converted to standard-gauge steam locomotive operation. Only then did intermediate stations gain direct services one to another.

My own experiences of cable traction come to mind: as a young commuter in 1967 my car journey crossed the still-working Bowes incline on a colliery railway operated by the then-nationalised National Coal Board on its own line from collieries to the Tyne River. Here the coal cascaded from the chauldron waggons from the staithes (high-level timber-built sidings along the river's quaysides) into collier vessels below bound for London. The steel cable ran in its own channel in the road level crossing over which I drove, rising only to buffer beam height at its attachment to a series of loaded or empty waggons, depending upon direction. As soon as this locomotiveless 'train' had passed, the rearmost waggon pulling on more steel rope, the flagman (there were no gates) waved the traffic to resume along the old Great North Road at High Fell; the hawser could be seen slithering in its trough as I drove over it.

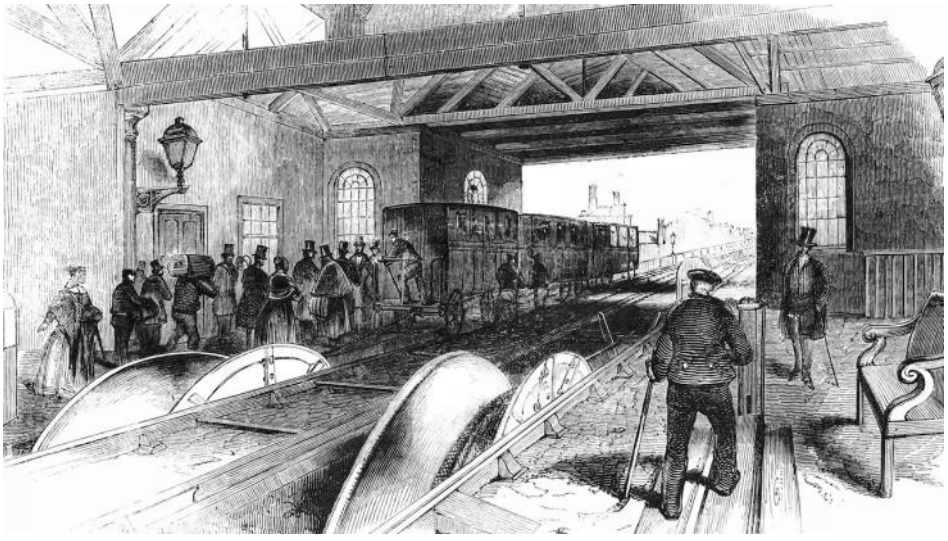
More recently, I have been able to sample riding the cable streetcars of San Francisco, and was struck by the 'grip' operated by the streetcar's driver, looking very much like a signalman's lever. Its release would allow the streetcar to glide to a halt either at a passenger stop or at traffic lights, or even to give way to other road users. In this respect it resembles operation of the London and Blackwall Railway where a carriage or carriages would be 'slipped' from the rope by the accompanying guard on the approach to the appropriate station.

Where operation differs is the start-up to speed: in San Francisco the 'grip' is applied gradually to the constantly moving continuous cable to effect a smooth acceleration from rest; no such option was envisaged on the London and Blackwall Railway – no attachment was made until the rope had been paid out fully from one end of the line and was lying motionless: only then were all the carriages attached at their various stations along the line ready for the rope to be hauled on to the drum at the other end of the line.

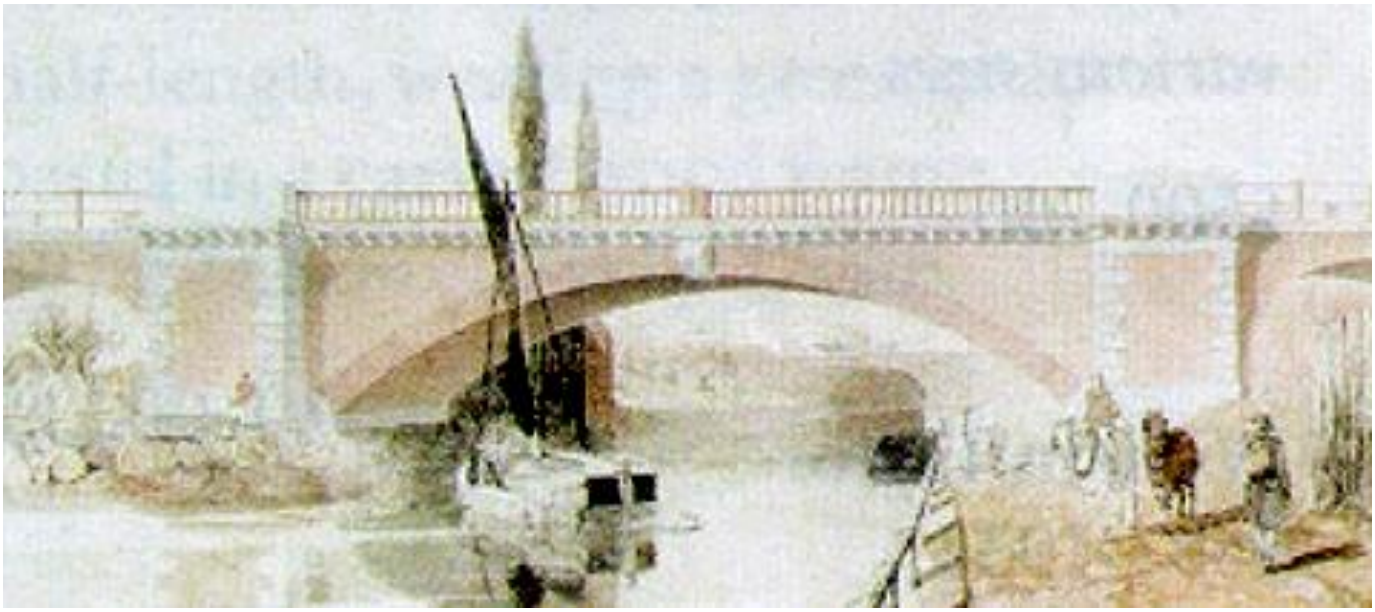
Here is a contemporary account of the railway's operation, taken from Andrew John Robertson, 'Blackwall Railway Machinery', read at the Institution of Civil Engineers, The Civil Engineer and Architect's Journal, 11-March-1848, 83-6:

The London and Blackwall Railway is about 3¾ miles in length, and is worked by stationary engines of the estimated force of 448 H.P. and 280 H.P. [...]

There are seven intermediate stations on this line; the Poplar, West India Docks [page 7], Limehouse, Stepney, and Shadwell stations, communicate with the Fenchurch-street terminus; whilst those of the Minories, Cannon-street, Shadwell, and Stepney, communicate with the Blackwall terminus. This arrangement is effected by appropriating a separate carriage from the termini for each intermediate station, communicating with the same; these are detached whilst the trains are moving, and by means of breaks [sic.] they are stopped at their respective destinations; as soon, however, as the terminal train arrives at either end of the line, and the rope ceases its motion, these intermediate carriages are attached to the rope, whilst it is in a state of rest; so that when the engines



Minories Station, showing the winding gear



George Haydock Dodgson: *Regents Dock Viaduct on the London and Blackwall Railway*

are again started, the carriages are also simultaneously set in motion, and arrive successively at the termini, in the order and at intervals corresponding with the position of the places from which they started; as they arrive they are released from the rope, though in motion, by the sudden withdrawal of the grip iron, and then their momentum carries them forward to their proper places in the station. It will be perceived, that the intermediate traffic is by this means provided for, without causing any detention to the through trade. The peculiar mode of working the line, and the circumstance of so many carriages being attached to the rope at different places, rendered it absolutely necessary to provide some quick and certain system of signals between the termini and the intermediate stations. These objects being deemed attainable by means of the electric telegraph, that system was adopted, although it was of greater extent than any which had been previously tried, and it was executed by Mr. Cooke, one of the patentees. The telegraphic wires are inclosed [sic.], for security, within welded iron pipes, with screwed joints like gas pipes; there is a duplicate set of such wires and pipes, in case of one set being accidentally fractured. One pipe runs along each side of the railway throughout its length. The machinery at the London end, for working the railway, is situated at the Minories station. The carriages in coming towards London are disconnected from the rope, a little before they arrive at the Minories, and they perform the rest of the journey to the terminus in Fenchurch-street by their momentum. The upward inclination of the rails at this place is 1 in 150. When the down-train leaves the terminus in Fenchurch-street, it descends the incline to the Minories by its gravity, where it is stopped by the breaks, to allow of the passengers being received at that station, and to permit the attachment of the rope; there the train remains for a short time, until signals have been received by the electric telegraph, from each of the intermediate stations, that the carriages are ready for starting, and are properly attached to the rope, in the manner already described. It being thus known at the Minories that all is ready, the signal for starting is sent from thence to Blackwall; the engines there are then put in motion and begin to draw the rope with all the carriages towards Blackwall. At the same time that the down-train leaves the Minories, the train leaves Blackwall, the arrangements being similar to those above described. The train runs by gravity from the Blackwall station to beyond the engine-house, where it is stopped by the breaks [brakes], in order to attach it to the rope, and as soon as signals have been received at Blackwall, from each of the intermediate stations, that all is ready, the signal for starting is sent from Blackwall to the Minories, and the engines there are put in motion, and begin to draw the rope and all the carriages towards London. The machinery at the Blackwall end is situated a little way along the line from the terminal station; the distance from thence to the place where the carriages going to Blackwall are disconnected from the rope, being somewhat farther from the station than the engine house, and the carriages run that distance by momentum, in the same manner as at the London end; the rise towards the Blackwall station being there also 1 in 150.

During the winter, the railway is worked from half-past eight o'clock in the morning until nine at night; and in the summer, from eight o'clock in the morning until ten at night. A train leaves each end every quarter of an hour (giving in winter, 51 trains, and during the summer 57 trains per day). The whole time occupied in passing between the termini is thirteen minutes; but the engines are at work only from eight to nine minutes.

Beneath each line of railway there is a large drum for the rope [...] with a pair of engines at each of its extremities. Only one pair of engines is worked at a time, the other pair being disconnected at the cranks. Under ordinary circumstances, one pair is worked for about six weeks, and then the other pair for a similar period; the

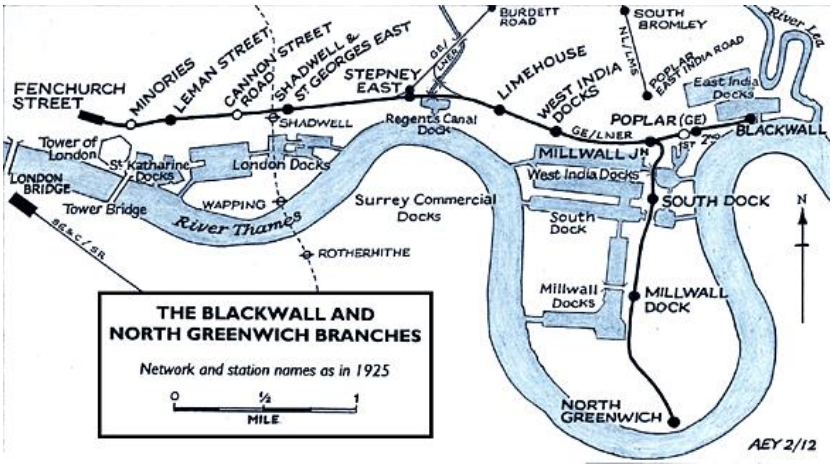
Blackwall Railway 5-needle Block Instruments (1840)

object being to secure the traffic from interruption, by having a duplicate pair of engines always ready to be connected at all emergencies and in case of any accident happening to the other pair, as well as to give time for the ordinary cleaning and repairing of that pair of engines which is not at the time in use. [...]

The rope on one line must be wound up round its drum, whilst that on the other line is allowed to unwind from off its drum, so that the two drums will revolve in contrary directions. The trains travel alternately backwards and forwards on the same line of rails, instead of one line of rails being always travelled over in one direction and the other line in the contrary direction, as is the case on other railways. For instance, if the first train in the morning goes down from London to Blackwall along the north line, the second train down in the same direction will go along the south line, and the third train down along the north line, and so on. One end of each rope is wound around one of the drums at the Minories, and the other end of the same rope around a corresponding drum at Blackwall; and whenever one of those drums is turned round by its engines for winding up that end of the rope, the drum at the other end of the same rope must be disconnected, and left free to turn round as the rope is pulled off it. This requires some ready means of disengaging either of the drums from the engines, [...] worked by a handle on the platform in the recess in front of the drums; so that a man by turning that handle, either connects or disconnects the gearing, as may be required.[...] Hence there are two sets of machinery exactly similar, and capable of being connected and disconnected in such manner, as to admit of either of the two drums being worked by either of the two pairs of engines, whilst the other drum is wholly disconnected; each line can thus be worked by either pair of engines, independently of the other line or pair of engines. The engines always revolve in the same direction, causing the drums to wind up the ropes around them; but when the drums turn round in a contrary direction for unwinding the ropes, they are disconnected from the engines. A wheel is attached to each drum for the purpose of being acted upon by a break, not only for stopping the motion of the drum, after the arrival and stoppage of the down-train at the Blackwall end of the line, but also for maintaining a suitable degree of tension on the part of the rope behind the train, whilst it is in motion. The object of keeping the tension on the rope is to prevent it from being unwound from off the drum faster than the train proceeds, and to secure the rope against the risk of breakage, to which it would be liable, if it were allowed to become slack and then to be suddenly tightened, by the acceleration which takes place in the motion of the train, after it has commenced the descent of a steeper gradient than that on which it was previously travelling.

To avoid snatching the rope, by which it might be broken, great care is taken to start the engines as gradually as possible, in order that all the slack of the rope may be gathered up around the drum, and then the train be started slowly, and gradually accelerated to the full speed. The valve is therefore only partially opened at first, and is afterwards opened fully by degrees; as the engines acquire speed, the valve is closed again gradually, to restrain the speed, as the carriages arrive one after another, and the resistance diminishes.

The boiler-house is beneath the railway, the five boilers being placed under the arches on which the continuation of the railway is carried beyond the engines. Two of them are square marine-boilers, with the ordinary internal furnaces and rectangular flues; the other three boilers are constructed on the Cornish system, being circular, with two internal tubes through their entire length, and the furnaces in the front ends. The two marine-boilers, which are equal in power to the three Cornish boilers, are capable of supplying steam



for one pair of engines. The two marine-boilers, or the three Cornish boilers, are worked together as a set, the two sets being used, alternately in the same manner as the engines, but for about three months at a time. [...]

The engines and machinery at Blackwall are similarly arranged, but on a smaller scale. The railway there passes by the side of the engine-house on the ground, and therefore the ropes are tethered on at the lowest part of the circumference of the drums, instead of at the highest part, as at the Minories, where the railway passes over the engine-house.

Remarks made at the Meeting after the reading of the above Paper.

Mr. A.WIGHTMAN stated that [...] although the present cost of working the line by the rope system was high, yet by no other system had they been able satisfactorily to effect the accommodation of stopping at the various stations, without interfering with the "through traffic."

Over the life of this remarkable railway, times of operation varied, as shown in successive Bradshaws. The extended summer operations are apparent, and I have included all of the timetables for the line that I could find. Bradshaw initially reflected individual company practice for showing times, and the standardized matrix was in use only on the longer lines:

1840: 'From London – At 8 30 a.m. and continuing until 7 30 p.m. On Sundays from 8 30 to 10 30 a.m. and from 1 30 to 7 30 p.m. From Blackwall – At 8 a.m. and continuing until 8 30 p.m. – On Sundays from 8 to 10 a.m. and from 2 to 8 30 p.m.'

1841: 'From London – At 8 30 a.m. and continuing until 7 30 p.m. On Sundays from 8 30 to 10 30 a.m. and from 1 30 to 7 30 p.m. From Blackwall – At 8 a.m. and continuing until 8 30 p.m. – On Sundays from 8 to 10 a.m. and from 2 to 8 30 p.m.'

also **1841**: 'Trains every day to and from London and Blackwall and from the Intermediate Stations of Shadwell, Stepney, Limehouse, West India Docks, and Poplar, every quarter of an hour from 8 30 in the morning, till 8 45 at night. On Sundays, the Trains cease running from 10 30, till 1, being the hours of church service.'

1842: 'Trains every day to and from London and Blackwall and from the Intermediate Stations of Shadwell, Stepney, Limehouse, West India Docks, and Poplar, every quarter of an hour from 8 30 in the morning, till 8 45 at night. London terminus in Fenchurch-st. & Minories, and the Blackwall terminus at the Brunswick Wharf. On Sundays, trains start from the Minories Station instead of Fenchurch-street, and cease running from 10 30 till 1, being the hours of church service.'

also **1842**: 'Trains every day to and from London and Blackwall and the intermediate stations of Cannon-street Road, Shadwell, Stepney, Limehouse, West India Docks, and Poplar, from 8 in the morning, till 9¾ at Night. London terminus in Fenchurch-street and Minories, and Blackwall terminus at the Brunswick Wharf. On Sundays the trains cease running from 10½ till 1, being the hours of church service.'

March **1843**: 'Trains every day to and from London and Blackwell, and the intermediate stations of Cannon-street road, Shadwell, Stepney, Limehouse, West India Docks, and Poplar, every quarter of an hour from ½ past 8 in the morning, till ¼ to 9 at Night. London terminus in Fenchurch-street and Minories, and Blackwall terminus at the Brunswick Wharf. On Sundays the trains cease running from 10¾ till 1, being the hours of church service.'

also **1843**: 'Trains every day to and from London and Blackwall, and the intermediate stations of Cannon-street road, Shadwell, Stepney, Limehouse, West India Docks, and Poplar, every quarter of an hour from 8½ in the morning, till 8¾ at Night. London terminus in Fenchurch-street and Minories, and Blackwall terminus at the Brunswick Wharf. On Sundays the trains cease running from 10¾ till 1, being the hours of church service.'

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West India Docks

the Brunswick Wharf. On Sundays the trains cease running from 10¾ till 1, being the hours of church service.'

February 1844: 'Trains every day to and from London and Blackwall, and the intermediate stations of Cannon-street road, Shadwell, Stepney, Limehouse, West India Docks, and Poplar, every quarter of an hour from 8½ in the morning, until 8¾ at Night. On Sundays the trains cease running from 10¾ till 1, being the hours of church service.'

June 1844: 'Trains every day to and from London and Blackwell, and the intermediate stations of Cannon-street road, Shadwell, Stepney, Limehouse, West India Docks, and Poplar, every quarter of an hour from 8 a.m. until 9¼ p.m. On Sundays the trains cease running from 10¾ till 1, being the hours of church service.'

also **1844:** 'Trains every day to and from London and Blackwell, and the intermediate stations of Cannon-street road, Shadwell, Stepney, Limehouse, West India Docks, and Poplar, every quarter of an hour from 8 a.m. until 9¼ p.m. On Sundays the trains cease running from 10¾ till 1, being the hours of church service.'

April 1845: 'Trains every day to and from London and Blackwell, and the intermediate stations of Cannon-street road, Shadwell, Stepney, Limehouse, West India Docks, and Poplar, every

Frederick Bacon Barwell *Parting Words,* Fenchurch Street Station 1859

quarter of an hour from 8½ a.m. until 8¾ p.m. On Sundays the trains cease running from 10¾ till 1, being the hours of church service.'

also **1845:** 'Trains every day to and from London and Blackwell, and the intermediate stations of Cannon-street road, Shadwell, Stepney, Limehouse, West India Docks, and Poplar, every quarter of an hour from 8½ a.m. until 8¾ p.m. On Sundays the trains cease running from 10¾ till 1, being the hours of church service.'

September 1845: 'Trains every day to and from London and Blackwell, and the intermediate stations of Cannon-street road, Shadwell, Stepney, Limehouse, West India Docks, and Poplar, every quarter of an hour from 8 a.m. until 9¾ p.m. On Sundays the trains cease running from 10¾ till 1, being the hours of church service.'

March 1846: 'Trains every day to and from London and Blackwell, and the intermediate stations of Cannon-street road, Shadwell, Stepney, Limehouse, West India Docks, and Poplar, every quarter of an hour from 8½ a.m. until 8¾ p.m. On Sundays the trains cease running from 10¾ till 1, being the hours of church service.'

June 1846: 'Trains every day to and from London and Blackwell, and the intermediate stations of Cannon-street road, Shadwell, Stepney, Limehouse, West India Docks, and Poplar, every quarter of an hour from 8 a.m. until 9¾ p.m. On Sundays the trains cease running from 10¾ till 1, being the hours of church service.'

July 1846: 'Trains every day to and from London and Blackwell, and the intermediate stations of Cannon-street road, Shadwell, Stepney, Limehouse, West India Docks, and Poplar, every quarter of an hour from 8 a.m. until 9¾ p.m. On Sundays the trains cease running from 10¾ till 1, being the hours of church service.'

September 1846: 'Trains every day to and from London and Blackwell, and the intermediate stations of Cannon-street road, Shadwell, Stepney, Limehouse, West India Docks, and Poplar, every quarter of an hour from 8 a.m. until 9¾ p.m. On Sundays the trains cease running from 10¾ till 1, being the hours of church service.'

March 1850: 'LONDON, BLACKWALL and WOOLWICH. – Eastern Counties. – Shoreditch Station.

From London to Woolwich.—On Week Days, at 8¾, 9½, 10¼, 11, and †11¾ morn.; 12½, 2, 2¾, 3½, 4¼, 5, 5¾, 6½, 7¼, 8, 8¾, and 9½ aft. From Stratford Bridge at 7 25 and 8¼ morn.

From Woolwich (Rolf's Pier) to London.—On Week Days, at †7 55, 8¾, 9½, 10¼, 11, and 11¾ morn.; 12½, 2, 2¾, 3½, 4¼, 5, 5¾, 6½, 7¼, 8, 8¾, and 9½ aft. To Stratford Bridge only, at 10¼. aft. On Sundays, same as on Week Days, with the exception of trains from London and Woolwich, at 11¾ a.m. and 12½ p.m.

On Sundays, same as Week Days, with the exception of trains from London and Woolwich, at 11¾ a.m. and 12½ p.m. [sic.]

† Gov. trains. 1st and 2nd class by all the trains.'

This final timetable shows the 'improvements' made to the cable-hauled service after conversion to locomotive power.

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Some thoughts on tourist railway timetabling … Puffing Billy Tourist Railway

Steven Haby

On Sunday 30 December 2018 my partner and I with my 12 y.o. son spent the day travelling on one of Victoria's if not Australia's premier tourist railways – Puffing Billy. We decided to travel the entire length of the line but with breaks at Lakeside and Gembrook to enable us to experience a number of different trains.

As it turned out we were able to experience two different trains but in three different combinations as will be made clear later. It was also interesting to observe the operation of an intensive timetable during a very busy time of year.

Timetables

Puffing Billy operates 364 days of the year and in all weather.. Different timetables operate throughout the year to reflect demand and summer holidays sees the busiest period requiring maximum utilisation of rolling stock - a case of 'everything with wheels'. The busiest timetable sees six return services each day with two services running to and from Gembrook requiring four locomotives and carriage sets.

Belgrave to Lakeside

The first train of the day with the timetable (shown in the figure below) is the 0950 to Gembrook which is what we travelled on. We arrived early at Belgrave to secure tickets and hopefully a seat in anything other than the stock standard 'NBH'. As luck would have it we secured some comfortable seats in 26 NAC – a second class car with guard's accommodation.

The 0950 being the first train of the day also conveys numerous tourist groups catering to the inbound Asian market. These groups mostly go as far as Menzies Creek where they are collected by coach. A few groups continue to Lakeside. This creates in my view challenges for Puffing Billy in terms of effective rolling stock utilisation over a relatively short distance.

On arrival at Lakeside at 1045 the train engine (7A) cuts off and runs around to platform 2 (Lakeside is an island platform station) to take water then proceeds to the up end of the station and then moves onto the track at platform 1.

The 1128 arrival at Lakeside is formed by the 1030 down from Belgrave. This train's locomotive (8A) then uncoupled after taking water and moves to the down end of the station and reverses to couple on to the 1045 arrival which then departs at 1145 for Gembrook.

The engine off the 1045 Lakeside arrival then couples up to the 1030 down from Belgrave and heads back up the line. All going well there is a 12 minute turnaround for the cars off the 1030 down. On this day we were travelling, the weather was particularly poor with rain making for slippery conditions. As a result the 1030 down arrived about 15 minutes late resulting in the 1145 down Gembrook departing at 1154.

Nevertheless there is some very slick moves performed by Puffing Billy staff that would put V/Line to shame in terms of turning around trains at a terminus.

Lakeside to Gembrook

8A then proceeded to Gembrook. This part of the line is pretty much a 1 in 30 climb for most of the journey from Cockatoo and 8A was battling hard in wet conditions with eight cars on her drawbar and (happily) a good load of passengers.

Fifteen minutes are allowed between Lakeside and Cockatoo and 25 minutes between Cockatoo to Gembrook.

Our train arrived at Gembrook at 1247 – twenty minutes late – after a very slow run due to the rain.

This enabled us to have a 30 minute lunch at an excellent local café before boarding the return service which was scheduled to depart at 1340.

Gembrook to Lakeside

The return trip was much faster with five minutes off the timetable to take into account the downhill gradient to Lakeside.

9.50	**10.30**	**11.30**	**12.30**	**1.55**	....	**3.40**	**Belgrave dep**
10.13	10.53	12.03	1.08	2.20	....	4.12	Menzies Crk arr
10.15	11.00	12.10	1.10	2.28	....	4.24	Menzies Crk dep
10.29	11.15	12.25	1.26	2.55	....	4.40	Emerald dep
10.45	11.28[c]	12.40	1.41	3.10[c]	....	4.52	Lakeside arr
11.45	....	....	....	....	**3.20**	....	**Lakeside dep**
12.00	....	....	....	....	3.35	....	Cockatoo dep
12.25	....	....	....	....	**4.00**	....	**Gembrook arr**
							FROM GEMBROOK
....	....	**1.40**	....	....	....	**5.10**	**Gembrook dep**
....	....	2.00	....	....	....	5.30	Cockatoo dep
....	....	2.15[b]	....	....	....	5.45	Lakeside arr
11.40	**1.55**	....	**2.35**	**3.50**	**5.20**	**5.50**	**Lakeside dep**
11.55	2.10	....	....	4.05	5.35	6.05	Emerald dep
12.09	2.22	....	3.14	4.17	5.47	6.17	Menzies Crk arr
12.13	2.30	....	3.28	4.25	5.50	6.20	Menzies Crk dep
12.38	**2.55**	....	**3.48**	**4.50**	**6.16**	**6.45**	**Belgrave arr**

Timetable which operated on 30 December 2018

7A ready to couple up to the 0950 down Gembrook.

On arrival at Lakeside, 8A cut off and coupled onto the cars from the 1230 down Lakeside from Belgrave which was hauled by 6A. The latter would then haul the cars from the 1340 up Lakeside arrival back to Gembrook as the 1520 down service.

We then changed trains.

Lakeside to Emerald

According to the timetable the 1435 up Lakeside was scheduled not to stop at Emerald although staff did check each carriage to enquire if anyone required this stop. The reason was made obvious as on arrival at Emerald we were directed into no.2 road to cross the 1355 down Lakeside with 7A as train engine and the carriages from the earlier 1030 down from Belgrave.

Normally crosses are made at Lakeside or Menzies Creek as both stations are island platforms.

Emerald to Belgrave

Our train then continued onwards to Belgrave with a 14 minute stop at Menzies Creek. Meanwhile the last down service from Belgrave was scheduled to depart at 1540 with our arrival timed at 1548. With no crossing loops between Belgrave and Menzies Creek I pondered somewhat about how both trains would cross – particularly considering Belgrave only has one platform.

The answer was apparent as we approached Belgrave as the 1540 with 12A as train engine was 'put away' in the loop on the down side of Belgrave station past the Old Monbulk Road level crossing.

We arrived at Belgrave at 1551 about six minutes down on the 'table.

Summary

On our way home after a most enjoyable day we reflected on the following:

The timetable operated on the Sunday was the most extensive working of trains with four locomotives and four carriage sets required for the day's program.

Crosses were made at the usual stations at Menzies Creek and Lakeside both of which are island platforms but Belgrave and Emerald were pressed into service.

If any further trains were to operate on the line consideration would need to be given to rebuilding Belgrave station to incorporate an additional platform although the track layout does enable a second train to arrive or depart from Belgrave (although this restricts trains to about eight cars and would require the use of a yard pilot to move cars). Emerald could also include a second platform if required.

To better spread the use of available cars and locomotives one train could commence from Gembrook in the morning perhaps crossing at Emerald with the first down service. However appropriate facilities, i.e. a shed for the locomotive and cars may need to be built for overnight storage and security.

With the above in mind the 0950 down service in the morning basically provided the Gembrook service throughout the day operating to/from Lakeside before returning to Belgrave as the 1710 up ex Gembrook.

From a safeworking perspective the staff sections on normal operational days are Gembrook – Lakeside; Lakeside – Menzies Creek; and Menzies Creek – Belgrave. On the day we travelled Puffing Billy was running 'short staff sections' which enabled the crosses at Emerald and Belgrave.

This time table supersedes any previous versions. ■ *Closed Christmas d*

FROM BELGRAVE													
Belgrave dep	**10.30**	**11.10**	**12.30***	**2.30**	**10.30**	**11.10**	**12.30***	**2.30**	**10.30**	**11.10**	**12.30***	**1.15**	**2.30**
Menzies Crk arr	10.53	11.33	12.59	2.53	10.53	11.33	12.59	2.53	10.53	11.33	12.59	1.47	2.53
Menzies Crk dep	11.05	11.38	1.05	3.00	11.05	11.38	1.05	3.00	11.05	11.38	1.05	1.55	3.00
Emerald dep	11.20	11.53	1.20	3.15	11.20	11.51	1.20	3.15	11.20	11.53	1.15	2.10	3.15
Lakeside arr	11.30[C]	12.08	1.40	3.30	11.30	12.00	1.40	3.30	11.30[C]	12.08	1.30	2.20	3.30
Lakeside dep	....	**12.20**	....	....	....	....	....	....	...	**12.20**	...	...	...
Cockatoo dep	....	12.35	....	....	....	....	....	....	...	12.35	...	...	...
Gembrook arr	....	**1.00**	....	....	....	....	....	....	...	**1.00**	...	...	...
FROM GEMBROOK													
Gembrook dep	....	....	**2.45**	....	....	....	....	....	...	...	**2.45**	...	...
Cockatoo dep	....	....	3.05	....	....	....	....	....	...	...	3.05	...	...
Lakeside arr	....	....	3.20	....	....	....	....	....	...	...	3.20	...	...
Lakeside dep	**12.30**	**2.25***	**3.40**	**4.15**	**12.30**	**2.25***	**3.40**	**4.15**	**12.30**	**2.30***	**3.45**	**4.20**	**5.00**
Emerald dep	12.45	2.40	3.55	4.25	12.45	2.40	3.55	4.25	12.45	2.45	4.00	4.30	5.10
Menzies Crk arr	12.57	2.57	4.07	4.37	12.57	2.57	4.07	4.37	12.57	3.02	4.12	4.42	5.22
Menzies Crk dep	1.00	3.00	4.08	4.38	1.00	3.00	4.08	4.38	1.00	3.05	4.15	4.45	5.25
Belgrave arr	**1.30**	**3.30**	**4.32**	**5.08**	1.30	3.30	4.32	5.08	**1.25**	**3.30**	**4.40**	**5.10**	**5.50**

The day enabled us to experience a very slick and professional operation utilising volunteers from all ages. The driver of our Gembrook train was a young Metro 'spark' driver and two conductors on our train home were in their late teens. This bodes well for the operation.

Notes

For the record these are some of the trains that operated on Sunday 30 December.

0950 down Gembrook: 7A – 2NDB – 52NBH – 8NBH – 3NBH – 24NBH – 17NBH – 16NBH – 26NAC

1030 down Lakeside: 8A – 21NBHC – 18NBH – 20NBH – 1NBH – 10NBH – 7NBH – 14NBH – 5NBH – 13NBH – 11NBHC

Belgrave yard pilot: DH59

1435 up Lakeside: 8A – 5NC – 186NQR – 21NQR – 15NBH – 6NBH – 2NBH – 12NBH – 23NBH – 9NBH – 44NBH – 19NBH – 22NBHC

1540 down Lakeside: 12A

By way of reference are the other timetables that operate throughout the year shown above.

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My partner and I settled comfortably in 26NAC

My son Domenic, my partner Katie and I on 21 NQR one of several wagons fitted with seats for summer operation at Menzies Creek.

North of Narrabeen

HILAIRE FRASER

FOLLOWING THE ARTICLE on Palm Beach bus services in Sydney, this article will cover some other bus services operating north of Narrabeen, nAMely to Warriewood Valley, Church Point and Narrabeen Peninsula.

The 1970s

The first map (below) is scanned from the Department of Government Transport Guide Maps for Bus Drivers which I obtained in 1974. The sAMe maps were also contained in public timetables. This map is in two parts. The first part shows route 155 Manly to North Narrabeen via the Narrabeen Peninsula (Ocean St). The Narrabeen Peninsula separates the Pacific Ocean from Narrabeen Lagoon. Route 155 had a daytime frequency of thirty minutes with some trips extended to Mona Vale Hospital and Palm Beach. Also shown are peak period services operated from Manly to Palm Beach as 142 via Brookvale and 146 via Harbord Rd. The second part shows route 157 from Manly to Church Point via Warriewood Valley. Route 157 had a daytime frequency of ninety minutes. Also shown are peak hour services.

185 Wynyard-Church Point via Warriewood Valley and 186 Wynyard-Church Point via Pittwater Rd.

The 1980s

In April 1983 a major recast of bus services from Manly was implemented. The full time network with Monday to Friday daytime frequencies is listed below:-

131 Manly-Seaforth (The Bluff) via Balgowlah Heights (60 minutes)

132 Manly-Bantry Bay via Balgowlah Heights (60 minutes)

136 Manly-Chatswood via North Curl Curl, Dee Why & Narraweena (30 minutes)

139 Manly-Warringah Mall via South Curl Curl (30 minutes, alternate services extend to Dee Why via Wingala)

141 Manly-Bantry Bay via North Balgowlah (60 minutes)

142 Manly-Skyline Shops via North Balgowlah & AllAMbie Heights (60 Minutes)

144 Manly-St Leonards (15 minutes)

146 Manly-Wheeler Heights (War Veterans Home) via Fairlight & Cromer Heights (60 minutes)

148 Manly-Collaroy Plateau (60 minutes)

155 Manly-Church Point & McCarrs Creek via Narrabeen Peninsula (60 minutes)

157 Manly-Mona Vale via Warriewood Valley (60 minutes)

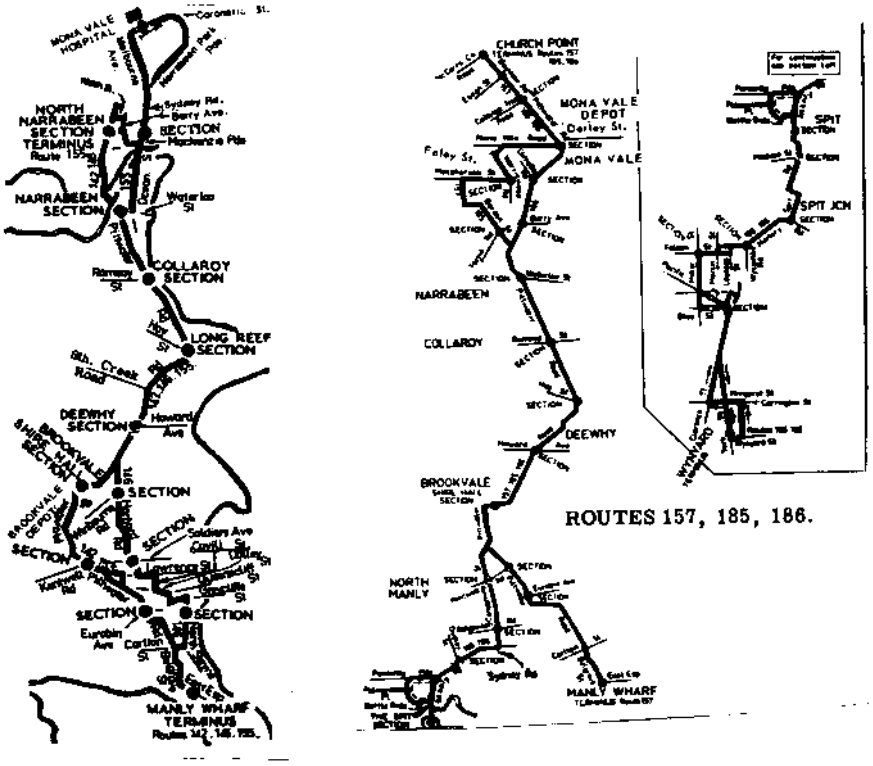
169 Manly-Skyline Shops via Narraweena (30 minutes, alternate services extend to Wynyard via Wakehurst Parkway)

Church Point with an extension to McCarrs Creek was added to the 155, while Warriewood Valley services now terminated at Mona Vale

The 1990s to 2016/17 (Pre B-Line)

The page from the 155 and 156 timetable dated 23 October 2016 shows the hourly services on 155 to Bayview and 156 to McCarrs Creek. The additional hourly 155 service leaving Manly at 37 minutes past the hour allows Pittwater Road between Manly and Warringah Mall to have an average 10 minute service provided by routes 155, 156, 159 and 169. The map from this timetable shows 158 Manly to Cromer which provides a single AM trip from Manly, one PM trip from Cromer and route E86 Wynyard to McCarrs Creek peak hour express as well as evening 155 services extending to McCarrs Creek. Prior to the B-Line, Warriewood Valley was served by L85 Wynyard-Mona Vale service operating limited stops to Warringah Mall with a Monday to Friday daytime frequency of thirty minutes as shown on the timetable dated 23 October 2016. The map with this sAMe timetable also

(Continued on page 15)



22 Monday to Friday — City & Manly to Mona Vale & McCarrs Creek

Monday to Friday (continued...)											
Route Number	155	155	155	156	155	156	155	155	156	155	155
O City - Wynyard Carrington Street	...	...	...	...	...	...	...	...	...	...	...
N Neutral Bay Junction Military Rd & Wycombe Rd	...	...	...	...	...	...	...	...	...	...	...
M Manly West Esplanade	08:52	09:02	09:17	09:22	09:45	10:15	10:37	10:45	11:15	11:37	11:45
L Warringah Mall Pittwater Road	09:04	09:14	09:29	09:34	09:57	10:27	10:49	10:57	11:27	11:49	11:57
K Dee Why Pittwater Road & Howard Avenue	09:13	09:23	...	09:43	10:07	10:37	10:59	11:07	11:37	11:59	12:07
J Collaroy Pittwater Road & Collaroy Street	09:20	09:30	...	09:50	10:15	10:45	...	11:15	11:45	...	12:15
I Narrabeen Pittwater Road & Waterloo Street	09:24	09:34	...	09:54	10:20	10:50	...	11:20	11:50	...	12:20
H Narrabeen Peninsula Narrabeen Park Parade	09:28	09:38	...	...	10:25	...	...	11:25	...	...	12:25
G Mona Vale Hospital Coronation Street	09:32	09:42	...	...	10:29	...	...	11:29	...	...	12:29
F Mona Vale Junction Barrenjoey Road	...	09:46	...	10:02	...	10:58	...	...	11:58	...	...
E Mona Vale Waratah Street & Bungan Street	09:37	...	...	...	10:34	...	...	11:34	...	...	12:34
D Mona Vale Bus Depot Darley Road	...	...	...	...	...	...	...	...	...	...	...
C Bayview Garden Village Annam Road	09:45	...	...	...	10:42	...	...	11:42	...	...	12:42
B Church Point McCarrs Creek Road	...	...	...	10:13	...	11:09	...	...	12:09	...	...
A McCarrs Creek McCarrs Creek Road	...	...	...	10:18	...	11:14	...	...	12:14	...	...

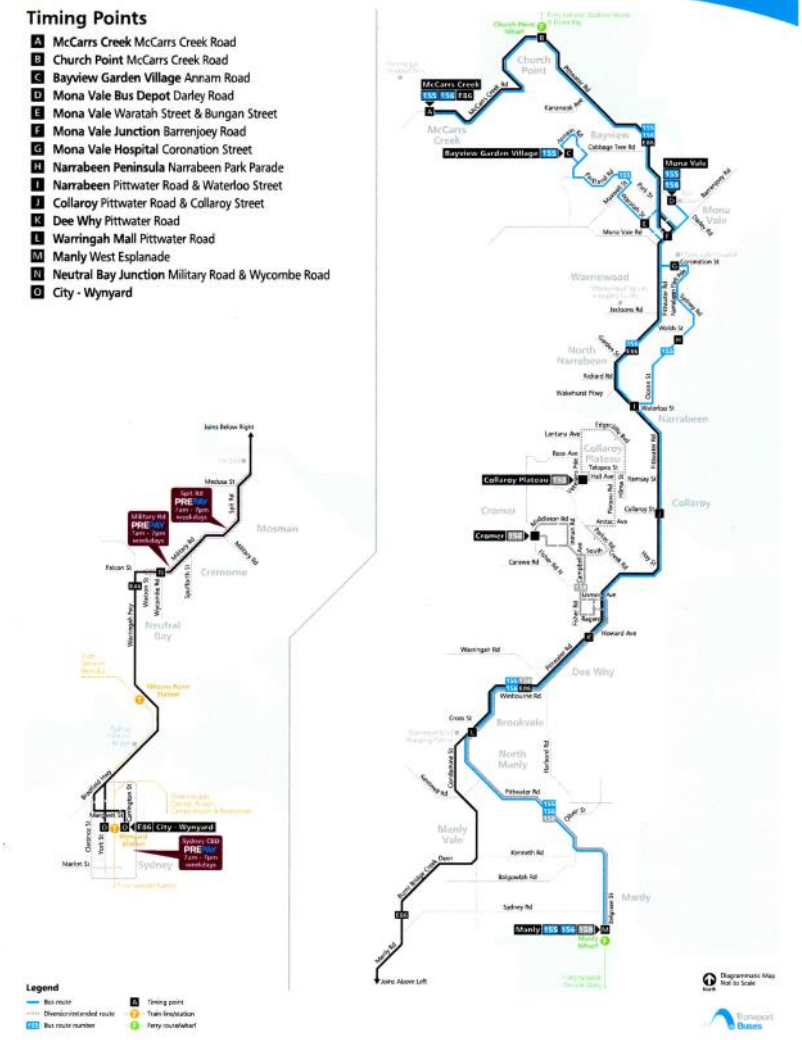
Monday to Friday (continued...)											
Route Number	156	155	155	156	155	155	156	156	155	155	156
O City - Wynyard Carrington Street	...	...	...	...	...	...	...	...	...	...	...
N Neutral Bay Junction Military Rd & Wycombe Rd	...	...	...	...	...	...	...	...	...	...	...
M Manly West Esplanade	12:15	12:37	12:45	13:15	13:37	13:45	14:15	14:37	14:42	15:07	15:12
L Warringah Mall Pittwater Road	12:27	12:49	12:57	13:27	13:49	13:57	14:27	14:49	14:54	15:20	15:25
K Dee Why Pittwater Road & Howard Avenue	12:37	12:59	13:07	13:37	13:59	14:07	14:37	14:59	15:04	15:30	15:35
J Collaroy Pittwater Road & Collaroy Street	12:45	...	13:15	13:45	...	14:15	14:45	15:06	15:11	15:37	15:42
I Narrabeen Pittwater Road & Waterloo Street	12:50	...	13:20	13:50	...	14:20	14:50	15:11	15:16	15:42	15:47
H Narrabeen Peninsula Narrabeen Park Parade	...	...	13:25	...	...	14:25	...	...	15:21	...	15:52
G Mona Vale Hospital Coronation Street	...	...	13:29	...	...	14:29	...	...	15:25	...	15:56
F Mona Vale Junction Barrenjoey Road	12:58	...	...	13:58	...	...	14:58	15:20	...	15:51	16:00
E Mona Vale Waratah Street & Bungan Street	...	...	13:34	...	...	14:34	...	...	15:30	...	...
D Mona Vale Bus Depot Darley Road	...	...	...	...	...	...	...	...	...	...	...
C Bayview Garden Village Annam Road	...	...	13:42	...	...	14:42	...	...	15:37	...	...
B Church Point McCarrs Creek Road	13:09	...	...	14:09	...	...	15:09	15:31	...	16:02	...
A McCarrs Creek McCarrs Creek Road	13:14	...	...	14:14	...	...	15:14	15:36	...	16:07	...

23 Monday to Friday — City & Manly to Mona Vale & McCarrs Creek

Bus route map — 155, 156, 158, E86

Timing Points

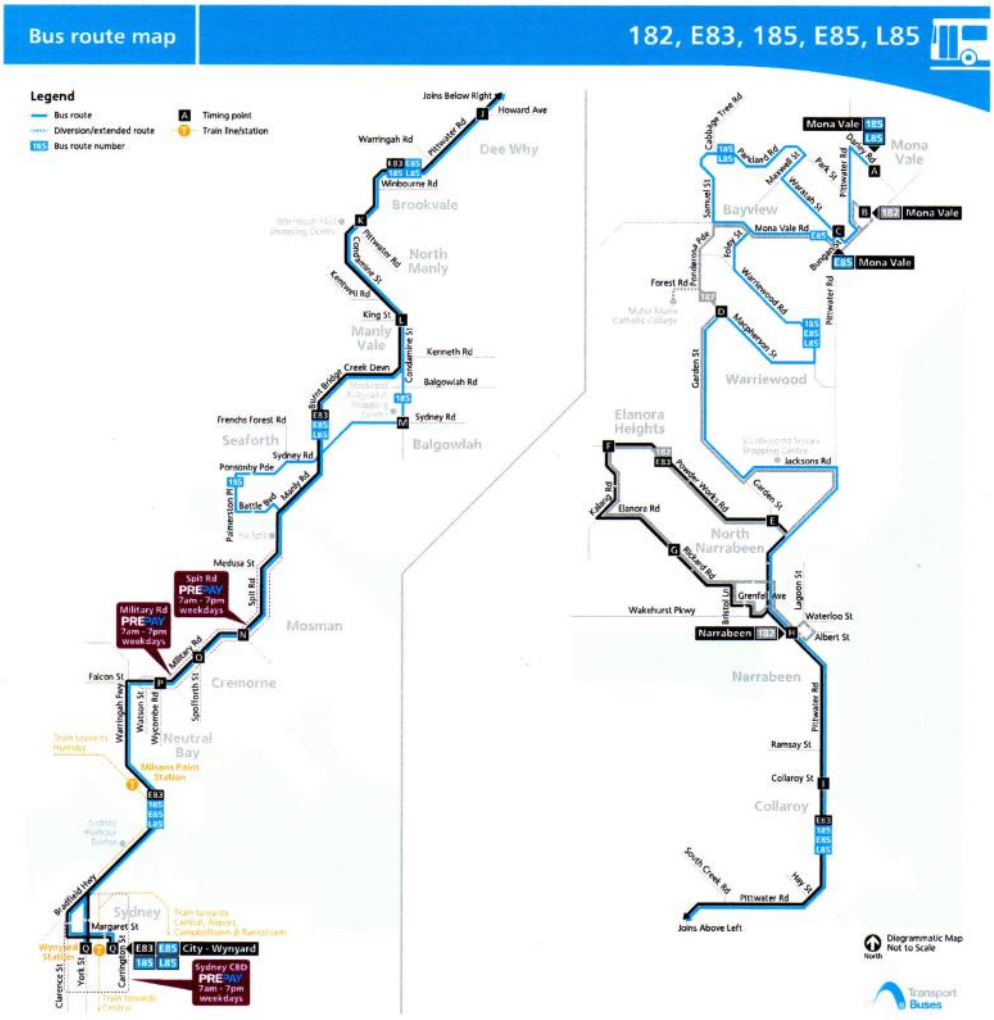
- A **McCarrs Creek** McCarrs Creek Road
- B **Church Point** McCarrs Creek Road
- C **Bayview Garden Village** Annam Road
- D **Mona Vale Bus Depot** Darley Road
- E **Mona Vale** Waratah Street & Bungan Street
- F **Mona Vale Junction** Barrenjoey Road
- G **Mona Vale Hospital** Coronation Street
- H **Narrabeen Peninsula** Narrabeen Park Parade
- I **Narrabeen** Pittwater Road & Waterloo Street
- J **Collaroy** Pittwater Road & Collaroy Street
- K **Dee Why** Pittwater Road
- L **Warringah Mall** Pittwater Road
- M **Manly** West Esplanade
- N **Neutral Bay Junction** Military Road & Wycombe Road
- O **City - Wynyard**



Monday to Friday										
Route Number	185	185	185	L85	L85	185	L85	L85	L85	L85
Q City - Wynyard Carrington Street	...	05:37	06:19	06:59	p07:37	p08:15	...	p08:45	p09:15	p09:45	p10:15
P Neutral Bay Junction Military & Wycombe Rds	...	05:48	06:30	p07:11	v07:51	v08:29	...	v08:59	v09:29	v09:54	v10:24
O Cremorne Junction Military Rd & Spofforth St	...	05:50	06:32	p07:13	▼	▼	...	▼	▼	▼	▼
N Spit Junction Spit Road & Military Road	...	05:54	06:36	p07:17	v07:55	v08:33	...	v09:03	v09:34	v09:59	v10:29
M Balgowlah Condamine Street & Sydney Road	...	06:08	06:50	07:34	...	...	...	...	...	...	...
L Manly Vale Condamine Street & King Street	...	06:11	06:54	07:39	08:08	08:46	...	09:16	09:45	10:10	10:40
K Warringah Mall Pittwater Road	...	06:14	06:58	07:44	08:11	08:49	...	09:19	09:48	10:13	10:43
J Dee Why Pittwater Road & Howard Avenue	i05:55	06:20	07:05	07:53	08:20	08:58	...	09:28	09:58	10:23	10:53
I Collaroy Pittwater Road & Collaroy Street	06:01	06:26	07:12	08:00	08:27	09:05	...	09:35	10:05	10:30	11:00
H Narrabeen Pittwater Road & Waterloo Street	06:05	06:30	07:17	08:05	08:32	09:10	...	09:39	10:09	10:34	11:04
D Warriewood Valley Macpherson & Garden Sts	06:11	06:37	07:25	08:13	08:40	09:18	...	09:47	10:17	10:42	11:12
C Mona Vale Waratah Street & Bungan Street	06:21	06:49	07:40	08:28	08:55	09:33	...	10:02	10:32	10:57	11:27
A Mona Vale Bus Depot - Darley Street	...	...	...	...	08:57	09:37	h09:50	10:06	10:36	11:01	11:31

Monday to Friday (continued...)											
Route Number	L85	L85	L85	L85	L85	L85	L85	L85	L85	D85	E85
Q City - Wynyard Carrington Street	p10:45	p11:15	p11:45	p12:15	p12:45	p13:15	p13:45	p14:15	p14:45	p15:15	p15:30
P Neutral Bay Junction Military & Wycombe Rds	v10:54	v11:24	v11:54	v12:24	v12:54	v13:24	v13:54	v14:24	v14:54	v15:24	v15:39
O Cremorne Junction Military Rd & Spofforth St	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼
N Spit Junction Spit Road & Military Road	v10:59	v11:29	v11:59	v12:29	v12:59	v13:29	v13:59	v14:29	v14:59	v15:29	v15:44
M Balgowlah Condamine Street & Sydney Road	...	...	...	...	...	...	...	...	...	...	...
L Manly Vale Condamine Street & King Street	11:10	11:40	12:10	12:40	13:10	13:40	14:10	14:40	15:10	15:40	▼
K Warringah Mall Pittwater Road	11:13	11:43	12:13	12:43	13:13	13:43	14:13	14:43	15:13	15:43	p15:59
J Dee Why Pittwater Road & Howard Avenue	11:23	11:53	12:23	12:53	13:23	13:53	14:23	14:53	15:23	15:53	p16:07
I Collaroy Pittwater Road & Collaroy Street	11:30	12:00	12:30	13:00	13:30	14:00	14:30	15:00	15:30	16:00	p16:14
H Narrabeen Pittwater Road & Waterloo Street	11:34	12:04	12:34	13:04	13:34	14:04	14:34	15:04	15:34	16:04	p16:18
D Warriewood Valley Macpherson & Garden Sts	11:42	12:12	12:42	13:12	13:42	14:12	14:42	15:12	15:42	16:12	d16:26
C Mona Vale Waratah Street & Bungan Street	11:57	12:27	12:57	13:27	13:57	e14:27	14:57	15:27	15:57	16:27	...
A Mona Vale Bus Depot - Darley Street	12:01	12:31	13:01	13:31	14:01	...	...	15:31	16:01	16:31	...

Bus route map — 182, E83, 185, E85, L85



(Continued from page 12)
shows 182 Narrabeen to Mona Vale via Elanora Heights with a Monday to Friday daytime frequency of 60 minutes, E83 Wynyard to Elanora Heights peak hour express, 185 Wynyard to Mona Vale via Warriewood Valley evening service and E85 Wynyard to Mona Vale via Warriewood Valley peak hour express.

Post B-Line

On 26 November 2017, the B1 B-Line Mona Vale to Wynyard service began, using double decker buses. This involved a major overhaul of bus services to the Northern Beaches. Prior to this change, the full time bus network to or from Manly (with Monday to Friday daytime frequencies) was as follows:-

132 Manly-Warringah Mall via Balgowlah Heights, Seaforth, Bantry Bay & North Balgowlah (60 minutes)

135 Warringah Mall-Quarantine Station via Fairlight & Manly (30 minutes, alternate services extend to North Head)

136 Manly-Chatswood via North Curl Curl, Dee Why & Narraweena (30 minutes)

139 Manly-Warringah Mall via South Curl Curl (30 minutes)

142 Manly-Skyline Shops via North Balgowlah & AllAMbie Heights (60 Minutes)

143 Manly-Chatswood via Pacific Highway Direct (30 minutes)

144 Manly-Chatswood via Royal North Hospital (30 minutes)

155 Manly-Bayview Garden Village via Narrabeen Peninsula (60 minutes)

156 Manly-Church Point & McCarrs Creek via Pittwater Rd (60 minutes)

159 Manly-Dee Why via Wingala (60 minutes)

169 Manly-Skyline Shops via Narraweena (30 minutes, alternate services extend to Wynyard via Wakehurst Parkway)

The final three maps show the following current services (Frequencies are Monday to Friday daytime frequencies):

155 Narrabeen-Bayview Garden Village via Narrabeen Peninsula (60 minutes)—this page.

156 Mona Vale-Church Point & McCarrs Creek (30 minutes)—page 16 upper left.

185 Warringah Mall-Mona Vale via Warriewood Valley (30 minutes)—page 16, lower right

To reach Manly, travellers are required to change to 199 Manly-Avalon operating every fifteen minutes (with alternate services extending to Palm Beach) City passenger change to B1 Wynyard-Mona Vale operating every ten minutes.

References:

Spence, P. Sydney by Public Transport (2nd edition), Gregory's, St Peters, NSW. 1982.

Spence, P. Sydney by Public Transport (3rd edition), Transit Australia Publishing, Sydney, NSW. 1989.

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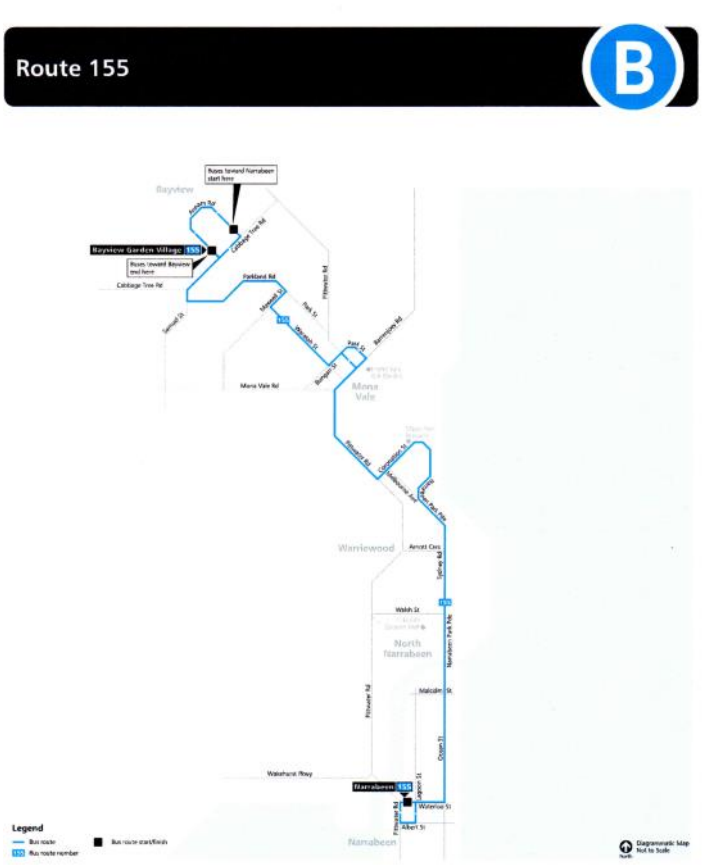

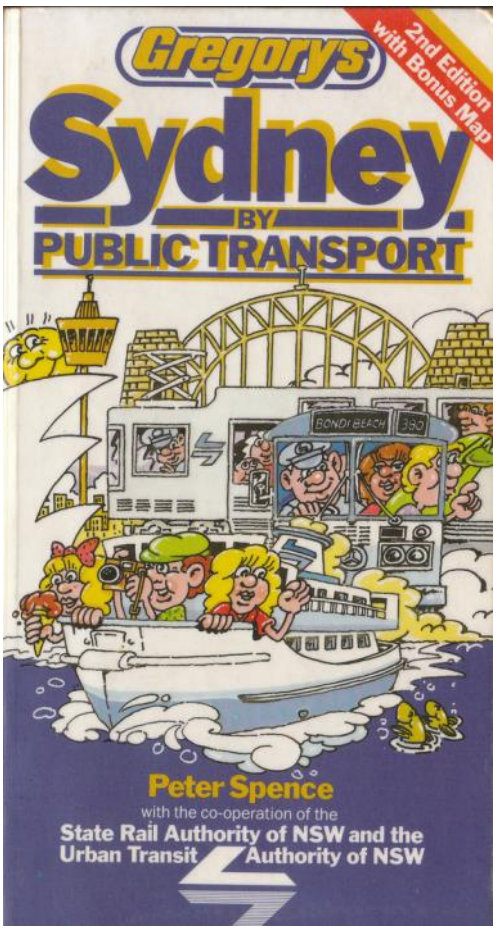

Route 156

Routes 182, E83, 185, E85

Routes E83 and E85 to City

Picks up and sets down passengers at all stops to Dee Why, then Warringah Mall, Neutral Bay Junction and Wynyard.

Routes E83 and E85 from City

Picks up passengers only at Wynyard, then Neutral Bay Junction, then picks up and sets down passengers at Warringah Mall, Dee Why and then all stops.