A Functional Branch Line — Geoff Perkins

🗁✍ Introduction.

My previous presentation at the 2013 MROQ outlined the process by which my representation of the Boonah (Fassifern) Branch of the Qld Railways in a scale of 1:120 (TTn3.5) came into being.

The closing scene was that of a layout needing a bit more work to reach a point where scenery could commence. An update is therefore in order.

Once the track and wiring was finally complete and tested, it was time to operate a few trains to see whether some of the decisions I had made in relation to track layout and locations of stations and line-side industries were justified.

I was very pleased to discover that generally things have worked out quite well, with sufficient variety in train movement, passing loop length, and line-side industries to keep it interesting.

After running trains for a little while it was time to start developing the scenic elements, beginning with basic landscape form using expanded polystyrene foam, followed by construction of railway infrastructure such as station buildings, goods sheds, bridges, and other buildings. It was also time to start thinking about train consists to make sure I had enough rolling stock of the types necessary to service the various industries I was creating.

As part of this process I needed to understand how often these industries should be served, either for incoming deliveries of goods and materials or outgoing deliveries.

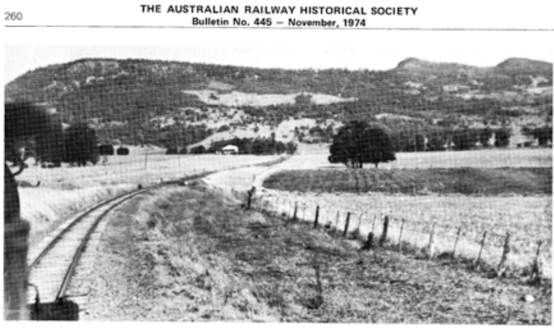
This would also determine the number of trains needed to run each session to achieve a realistic operating timetable, which was one of my main goals for the layout.

So, this led to some consideration of the type and frequency of traffic that a branch line like this would be expected to generate, from which a timetable could be formulated. These considerations form the subject of this presentation.

🗎✍ Where to start?

The first step was to look at some old timetables for various branch lines. These were found either in articles on those branch lines in ARHS publications, or in old Qld Railways working timetables (copies held in the library at the Ipswich Workshops Museum).

Some examples are provided below, with the AHRS publications on the left and the Qld Railways working timetables on the right:



The view from the engine cab, as C16 655 on 306 Up Mount Edwards mixed lurches down the grade into Warumkarie. Note the well-tended and weed-free track.
(Photo: R. Ruthven)

Part of the regular routine of the train crews was the job of opening and closing the level crossing gates at Fassifern Valley, and also Mount Edwards after 1954. To avoid unnecessary "incidents" after dark, a fettler was arranged to light the gate lamps at night. In July, 1959, the gates at Fassifern Valley were removed.

1960 Timetable

		326 Goods Fri.	306 Mixed Mon.Wed.	330 Pass. Fri.
		a.m.	a.m.	p.m.
Ipswich	dep	1 20	10 35	4 49
Harrisville	arr	2 46	11 51	5 56
				cross 323
	dep	3 10	12 10 pm	6 4
Munbilla	arr	3 32	12 32	6 21
	dep	3 42	12 37	6 24
Kalbar	arr	4 5	(m) 1 0	6 42
	dep	4 35	1 30	6 45
Mount Edwards	arr	6 0	2 55	7 17

m : Meal stop

		327 Pass. Fri.	315 Mixed Mon.Wed.	331 Goods Fri.
		a.m.	p.m.	p.m.
Mount Edwards	dep	6 50	3 50	8 15
Kalbar	arr	7 22	5 25	9 20
	dep	7 25	6 0	9 40
Munbilla	arr	7 44	6 25	10 3
			cross 332	
	dep	7 47	6 35	10 13
Harrisville	arr	8 4	6 55	10 33
		cross 310		
	dep	8 12	7 25	11 3
Ipswich	arr	9 26	8 56	12 40 am
			cross 340	Sat.

Trains crossed:-
323 Goods daily exc. Sun & Mon. Dugandan to Ipswich.
310 Goods daily exc. Sun & Mon. Ipswich to Dugandan.
332 Goods as required Tuesday & Thursday.

The Mount Edwards line was a "20 m.p.h. road"; trains were permitted a maximum speed of 20 m.p.h., to be reduced to 15 m.p.h. while passing around 10 to 12 chain curves. Rail motors leapt and shuddered along to higher speeds. A limit of 35 m.p.h. for 102 h.p. and 153 h.p. cars and 30 m.p.h. for 50 h.p. cars was allowable, provided the motor remained in one piece!

Traffic

The rich, dark volcanic soils of the Warrill Creek valley have always suited the growing of vegetables, and each year the railway catered for the transport of the tons of potatoes, onions and beans to the markets in Brisbane. During the various seasons, the paddocks around Kalbar and Aratula hummed to the sounds of tractors and trucks bringing in the produce. One or two box wagons were generally provided at Kalbar for the traffic in vegetables for the markets, while at Fassifern Valley and Aratula, vegetables were loaded as roadside. A large quantity of chaff and hay in bales was loaded in open wagons for despatch to graziers in the west, mostly as wagon load consignments. Tonnages conveyed were under:-

	1930	1940	1950	1953	1956	1960
Kalbar	2,531	2,177	4,249	5,529	3,165	1,479
Total for line	6,159	7,710	8,791	10,440	5,565	1,826

Tonnages increased to a peak in the early 1950's, then slumped under road competition. Roads were improving, and trucking concerns offered a better service in that the farmer could load his produce directly to the truck at his farm, without losing valuable harvest-

PITTSWORTH AND MILLMERRAN BRANCH.

UP TRAINS.

Miles from Toowoomba.	Miles from Brisbane Central.	Stations.	66 Goods. Tues. Wed. Thurs. Fri.	66 Goods. Sat. only.	204 Motor Pass. Mon. only.	296 Goods. Mon. only.	200 Motor Pass. Except Sat.	—
m. ch.	m. ch.		a.m.	a.m.	a.m.	a.m.	p.m.	
..	100 68	T'wmba (W)–ES d	*5 10	5 10	5 35	*10 15	*3 10	..
2 74	103 62	Harristown arr	..	..	..	..	..	..
		Ditto–ES dep	5 28	5 28	5 47	10 33	3 22	..
4 25	105 13	Drayton	..	..	D	..	D	..
6 62	107 50	Finnie	..	..	D	..	D	..
8 74	109 62	Shepperd	..	..	D	..	D	..
10 43	111 31	Wyreema–ES arr	5 47	5 47	..	10 52	..	..
		Ditto–OS dep	*6 2	6 2	6 3	10 57	3 38	..
16 29	117 17	Umbiram	..	..	D	..	D	..
19 78	120 66	Wheat Board Sdg.	..	..		..		..
20 60	121 48	Southbrook arr	7 0	7 0	6 24	11 42	A 3 59	..
..	..	Ditto–OS§§ dep	7 5	7 5	6 26	11 45	4 1	..
24 1	124 69	Broxburn	..	..	..	..	D	..
26 76	127 64	Pittsworth (W) arr	m7 40	7 40	6 39	12 18	..	..
		Ditto–OS dep	*9 10	——	6 41	12 45	*4 16	..
27 19	128 7	Ballast Siding ..	..	..	..	..	..	..
30 61	131 49	Murlaggan ..	..	..	D	..	D	..
33 75	134 63	Yarranlea ..	..	..	D	..	D	..
39 47	140 35	Brookstead arr	10 10	..	7 8	m1 45	..	..
		Ditto–OS§ dep	*10 35	..	7 10	*2 45	A 4 45	..
42 51	143 39	Pampas	..	..	A	..	A	..
47 5	147 73	Yandilla (W) arr	L 11 10	..	..	L 3 20	..	..
		Ditto .. dep	11 25	..	D	3 35	D	..
52 50	153 38	Wheat Board Sdg.	..	..		..		..
53 63	154 51	Millmerran arr	*11 50	..	7 45	4 0	5 20	..

The section from Wyreema to Millmerran is laid with 42 lb. or lighter rails. See Clause 263 of the General Appendix.

Train crew on **66** Tuesday and Friday change **285** Brookstead.

Train crew on **296** and **277** Mondays change at Brookstead.

Nos. 277, 285, and **66** will have passenger accommodation attached, but are liable to cancellation or alteration without notice when not required for goods and cream traffic.

Trainmen of **277 Down** and **66 Up** Wednesday work through.

The maximum speed of trains is 20 miles per hour Wyreema to Millmerran, and of rail motors 35 miles per hour between Wyreema and Yarranlea, and 30 miles per hour between Yarranlea and Millmerran.

The Fireman will assist the Guard to shunt if required.

For Rail Motor stops see page 90.

In order to reduce the work on Rail Motors, Parcels, Mails, &c., should be sent forward from Toowoomba by special trains when running, provided they are timed to reach destination in advance of Rail Motors.

Train staff cabinets have been placed at Pittsworth and Millmerran, and Trains when notified will work through Pittsworth and arrive and depart Millmerran under Rule 442.

During the period that the Station-master, Brookstead, is off duty, Trains will work through and cross at Brookstead in accordance with Rules 229 and 442. The controlling stations are Pittsworth (Wyreema when Pittsworth off duty) and Millmerran.

Southbrook is an unattended Staff Station and Trains will work through and cross at this station in accordance with Rules 229 and 442. The controlling stations are Wyreema and Pittsworth.

Traffic

Pigs for the Darling Downs Co-operative Bacon factory at Willowburn, near Toowoomba, were trucked from Nara, Goombungee and Haden on Tuesdays. Most Tuesdays, the goods attached two or three wagons of pigs at Goombungee, with one from Haden and Nara, and delayed at Willowburn to detach the wagons into the factory's stock unloading ramps. Every so often, a wagon load was railed through to the sales and meatworks in Brisbane. Prior to the early 1960's, calves were also loaded at Goombungee, but they were later moved by road transport.

Little was carried other than pigs. Chaff and hay for produce stores in Toowoomba and Brisbane was sometimes despatched in open wagons, though little wheat and grain was loaded. Eggs in wooden cases were despatched from Yalangur, Goombungee and Haden to the Marketing Board. Occasionally, the Goombungee butter factory loaded an 'ABG' wagon with butter.

Pigs Loaded on Haden Branch 1920-63

	1920	1940	1950	1955	1963
Goombungee	2,346	3,310	4,845	6,140	5,855
Haden	1,292	7,194	3,742	3,251	1,452
TOTAL for line	3,823	12,682	10,494	10,579	8,289

Train Services

All goods trains on the Haden line were worked by crews and engines based at Toowoomba, though in the first years, the run involved an overnight camp at Haden. A daily mixed train was scheduled when the line opened, and it trundled from Toowoomba to Wahoon (Haden) in the afternoon, returning the following morning. B15-class engines were generally rostered, and a water gin was required for the trip on the branch. Empty hopper wagons for the Sugarloaf and Kingsthorpe collieries were detached on the outward journey, any loaded wagons being lifted the next morning. Firewood was railed from Boodua, Kudo, Goombungee and Haden, and pigs were yarded weekly at Goombungee and the terminus. The Mixed occasionally attached a wagon of sheep at Nara.

However, during the early 1920's, the service was cut to thrice weekly, running to Haden on Mondays, Thursdays and Fridays. The mines at Kingsthorpe had been abandoned, and the lull in loading was destined to last until the line closed. Special trains were never common.

November 1926

		76 Mixed Mon, Thur, Fri.			75 Mixed Tue, Fri, Sat.
		p.m.			a.m.
TOOWOOMBA	dep	3.15	HADEN	dep	7.00
Willowburn		3.23	Goombungee	arr	7.30
Kingsthorpe	arr	4.03		dep	7.45
	dep	4.10	Kingsthorpe	arr	–
Goombungee	arr	5.25		dep	9.05
	dep	5.40	Willowburn		E(9.50)
HADEN	arr	6.20	TOOWOOMBA	arr	10.05

September 1945

		76 Goods Tue. Fri.	258 Rail motor Sat.	256 Rail motor Ex. Sat.
		a.m.	p.m.	p.m.
TOOWOOMBA	dep	6.35	12.55	3.35
Willowburn		6.45	A	A *
Kingsthorpe	arr	7.30	1.33	–
	dep	7.35	1.37	4.11
Goombungee	arr	8.45	–	–
	cross	255		
	dep	9.05	A2.23	A4.54
HADEN	arr	9.40(m)	2.54	5.23

Adorned with signs extolling the worth of Aunt Mary's Baking Powder, Haden station in 1963 was decorated with plants and shrubs. Firewood for the cottage was heaped by the line.
(Photo: J. Armstrong)

PITTSWORTH AND MILLMERRAN BRANCH—*continued.*

DOWN TRAINS.

Height above Mean Sea Level.	Miles from Millmerran.	Capacity of Crossing Loop (Including Loco) in units	Stations.	203 Motor Pass. Ex. Sat.	283 Goods. Sat. only.	285 Goods. Tues. Thur. Fri.	277 Goods. Mon. and Wed.	201 Motor Pass. Fri. only.	—
Feet.	m. ch.			a.m.	a.m.	a.m.	p.m.	p.m.	
1336	..	44	Millmerran–OS dep	8 0	..	8 50	*12 45	5 35	..
..	1 13	..	Wheat Board Sdg.	..	..	..	..	..	..
1245	6 58	..	Yandilla (W) arr	..	..	9 11	L 1 6	..	..
			Ditto .. dep	D	..	L 9 25	1 20	D	..
1254	11 12	..	Pampas	A	..	..	..	D	..
1274	14 16	63	Brookstead arr	..	..	10m5	m2 0	6 8	..
			Ditto–OS§ dep	A 8 35	..	*10 40	2 30	6 10	..
1391	19 68	..	Yarranlea.. ..	A	..	..	..	D	..
1597	23 2	..	Murlaggan ..	D	..	..	..	D	..
..	26 44	..	Ballast Siding ..	..	..	..	..	..	..
1702	26 67	31	Pittsworth (W) arr	..	..	11 45	3 35	6 37	..
			Ditto–OS dep	*9 4	m9 20	12 25	*4 30	6 39	..
1816	29 62	..	Broxburn ..	D	..	..		D	..
1782	33 3	46	Southbrook arr	A 9 17	9 55	1 0	5 5	6 52	..
..	..	..	Ditto–OS§§ dep	9 19	10 0	*1 5	5 10	6 54	..
1805	33 65	..	Wheat Board Sdg.	..	..	..	..	..	..
1537	37 34	..	Umbiram ..	D	..	..	..	D	..
1753	43 20	66	Wyreema–OS arr	..	10 50	1 55	6 5	..	..
			Ditto–ES dep	A 9 42	11 20	2 20	6 20	7 17	..
1821	44 69	..	Shepperd ..	D	..	..	..	D	..
1956	47 1	..	Finnie	D	..	..	..	D	..
2075	49 38	..	Drayton	D	..	..	..	D	..
2134	50 69	62	Harristown arr	..	..	..	6 50	..	..
			Ditto–ES dep	A 9 58	11 50	2 50	6 55	7 33	..
1924	53 63	..	T'w'mba (W) arr	*10 10	*12 5 p.m.	*3 5 p.m.	7 5	7 45	..

No. 277 Down meets **200** and follows **267** Pittsworth.

No. 203 Down on Mondays, Tuesdays, Wednesdays, and Fridays, will lift cream en route for Toowoomba.

Nos. 285 and **277 Down,** when necessary, will do roadside work or shunting between Millmerran and Wyreema in accordance with Rules 443 and 444.

Enginemen working **285** have meal at Brookstead on Thursdays and at Wyreema, Tuesdays and Fridays.

Telephone communication is available between Toowoomba Station and "Control," General Manager's Office, Harristown, Drayton, Wyreema, Southbrook, Pittsworth, Yarranlea, Brookstead, Pampas, Yandilla, and Millmerran.

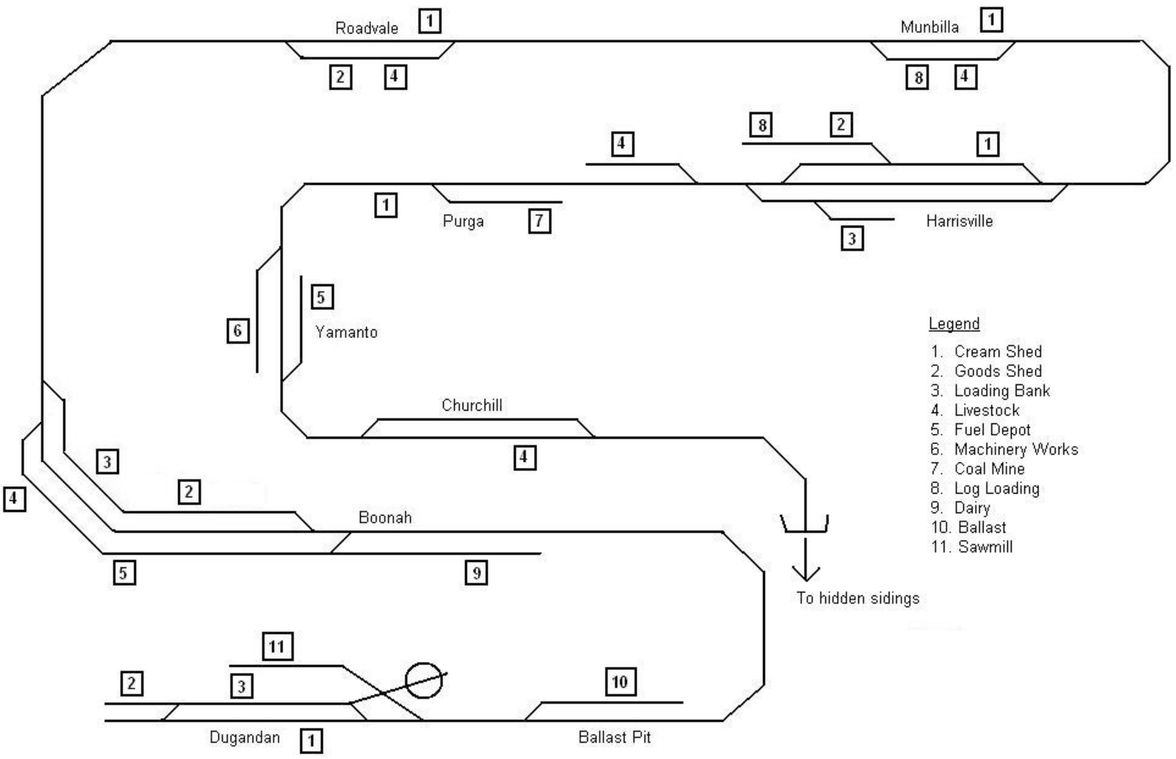
For Rail Motor stops see page 90.

These gave a good snapshot of branch railway traffic in the heyday of the railways, with the information usually providing at least the numbers and types of trains, which days they ran, and any unusual aspects of their operation. Some branch line histories in various publications also contain information on the goods traffic and passenger traffic carried annually, eg number of passengers, number of livestock, tonnages of timber, wheat, coal, or other produce, etc.

This information, coupled with the number and type of industries included in my layout, enabled me to generate a summary of the various wagon types and associated loads that would be needed to service the industries on my layout, along with the potential frequency of those loads.

What traffic will I have?

Reference to the single-line diagram for my layout (refer image below) indicates the industries served which include livestock loading ramps at Churchill, Harrisville, Munbilla, Roadvale and Boonah, fuel depots at Yamanto and Boonah, an engineering works at Yamanto, a coal mine at Purga, log loading facilities at Harrisville and Munbilla, a dairy at Boonah, the ballast pit, and a sawmill at Dugundan.



In addition there would be a cream shed at various stations, a goods shed and station building at each main station, and small shelter sheds at intermediate stops including Yamanto and Purga. From this information I was able to generate a list of industries, the type of loads in and out, the type of wagons required to service them, and the frequency that these wagons would need to be run for my 'imagined' prosperous branch line. All this data was entered into a spreadsheet to enable me to manipulate the information more easily.

The end result was a much greater range of loads than I had originally anticipated, and consequently a much greater train frequency and size than I had allowed for in my planning.

Some rationalization was therefore in order, otherwise my planned 2-hour operating sessions could have ended up as all-night affairs, not that I would have minded, but my guests (and their partners) may have objected. I therefore started pruning the service by reducing some deliveries to every second day, twice-weekly or even once a week, and reducing the size of some deliveries from multiple wagons to only one or two.

A copy of the revised spreadsheet page is provided below:

Location	Product	In/Out	Wagon	Day	Origin	Destination
Churchill	livestock	in	KA/N	as required	Boo,Mun,Har	Churchill
	empties	out	KA/N	as required	Churchill	Har,Mun,Boo
Yamanto	fuel	in	tank	Tu,Th,Sa AM	Ipswich	Yamanto
	empties	out	tank	Tu,Th,Sa PM	Yamanto	Ipswich
	supplies	in	open, flat	M,W,F AM	Ipswich	Yamanto
	machinery	out	open, flat	Tu,Th,Sa AM	Yamanto	Har,Boo,Dug
Purga	empties	in	VJM	daily AM	Ipswich	Purga
	coal	out	VJM	daily PM	Purga	Ipswich
Harrisville	empties	in	open	M, Th	Ipswich	Harrisville
	hay bales	out	open	M, Th	Harrisville	Ipswich
	empties	in	S	Tu, F	Dugandan	Harrisville
	logs	out	S	Tu, F	Harrisville	Dugandan
	empties	in	KA/N	as required	Churchill	Harrisville
	livestock	out	KA/N	as required	Harrisville	Churchill
	machinery	in	open, flat	as required	Ips, Yam	Harrisville
	empties	out	open, flat	as required	Harrisville	Ipswich
	perishables	in	CMIS	M,W,F PM	Ipswich	Harrisville
	empties	out	CMIS	Tu,Th,Sa AM	Harrisville	Ipswich
	empties	in	open, closed	Tu,Th,Sa AM	Ipswich	Harrisville
	produce	out	open, closed	Tu,Th,Sa PM	Harrisville	Ipswich
Munbilla	empties	in	open	Tu, F	Ipswich	Munbilla
	hay bales	out	open	W, Sat	Munbilla	Ipswich
	empties	in	KA/N	M, Th	Churchill	Munbilla
	livestock	out	KA/N	M, Th	Munbilla	Churchill
	empties	in	open, closed	W, Sat	Ipswich	Munbilla
	produce	out	open, closed	W, Sat	Munbilla	Ipswich
Roadvale	empties	in	open	Tu, F	Ipswich	Roadvale
	hay bales	out	open	W, Sat	Munbilla	Ipswich
	empties	in	KA/N	M, Th	Churchill	Roadvale
	livestock	out	KA/N	M, Th	Roadvale	Churchill
	empties	in	open, closed	W, Sat	Ipswich	Roadvale
	produce	out	open, closed	W, Sat	Roadvale	Ipswich
Boonah	empties	in	CMIS	daily AM	Ipswich	Boonah
	dairy	out	CMIS	daily AM	Boonah	Ipswich
	empties	in	open	Tu, F	Ipswich	Boonah
	hay bales	out	open	W, Sat	Boonah	Ipswich
	empties	in	KA/N	Tu, F	Churchill	Boonah
	livestock	out	KA/N	Tu, F	Boonah	Churchill
	fuel	in	tank	M, W, F am	Ipswich	Boonah
	empties	out	tank	M, W, F pm	Boonah	Ipswich
	produce	in	open, closed	daily	Ipswich	Boonah
	produce	out	open, closed	daily	Boonah	Ipswich
	machinery	in	open, flat	as required	Ips, Yam	Boonah
	empties	out	open, flat	as required	Boonah	Ipswich
	perishables	in	CMIS	M,W,F PM	Ipswich	Boonah
	empties	out	CMIS	Tu,Th,Sa AM	Boonah	Ipswich
Ballast	empties	in	VTS	M,W,F AM	Ipswich	Ballast
	ballast	out	VTS	M,W,F PM	Ballast	Ipswich
Dugandan	logs	in	S	Tu, F	Harrisville	Dugandan
	empties	out	S	Tu, F	Dugandan	Harrisville
	empties	in	open	M, W	Ipswich	Dugandan
	sawn timber	out	open	M, W	Dugandan	Ipswich
	empties	in	open, closed	daily	Ipswich	Dugandan
	produce	out	open, closed	daily	Ipswich	Dugandan
	machinery	in	open, flat	as required	Yamanto	Dugandan
	empties	out	open, flat	as required	Dugandan	Yamanto

A copy of the spreadsheet is provided on the USB stick containing this presentation. The variety in wagon codes available for some wagon types means that these could not be precisely nominated in the table above. Further details are included in the spreadsheet file provided.

Now that I had a bit of an idea what range and volume of traffic my branch line might sustain, it was time to start relating that to train sizes and consists.

Developing train lengths

The ruling consideration in train size for any real or model single-line railway is usually the clear length of crossing loops.

My layout has potentially 6 crossing loops, but it was only ever intended to have two trains in progress along the branch at any one time, with a third train shunting at the terminus and other trains being made up in the fiddle yard.

The crossing loop lengths available are as follows:

Churchill – 650mm

Harrisville – 1050mm on the main and passing loop, 720mm on the loop siding

Munbilla – 720mm

Roadvale – 450mm

Boonah – 900mm on the main and passing loop and also on the loop siding

Dugandan – 310mm

In Queensland, crossing loop lengths were traditionally measured as equivalent to a standard ‘unit’ of rolling stock, which was the length over buffers of a 4-wheel open ‘F’ wagon. A crossing loop would therefore be described as having a length of ‘30F’ or similar between the clearance points. All wagons, guards vans and locomotives were coded with their equivalent length in ‘F’ units, so a train controller could calculate the length of a train of mixed stock and determine which crossing loops it could safely refuge in for crossing trains coming in the opposite direction.

As an example, a TTn3.5 model of a standard ‘F’ wagon has a length of just on 50mm between couplings, so my crossing loops would be described as follows (rounded down to the nearest whole number):

Churchill – 13F

Harrisville – 21F on the main and loop, 14F in the loop siding

Munbilla – 14F

Roadvale – 9F

Boonah – 18F

Dugandan – 6F

These limitations would therefore govern which trains could pass at which locations, an important consideration when working out a timetable. The same train could also vary in length throughout its journey, as it drops off or collects wagons along the way. These lengths would also of necessity include the loco and guards van.

For timetabling purposes I decided that Munbilla and Roadvale would not be used as crossing loops, and that only the railmotor would cross a train at Dungandan. The main goods trains could only cross each other at Harrisville and Boonah, and my local shunt train could cross other trains at either Churchill or

Harrisville, which is where it terminated. To accomplish this I had to ensure that one of the trains crossing at these loops had to fit within the loop length, while the second train could exceed it if necessary.

The practical limit for train lengths for my layout was eventually determined to be the loop length at Harrisville, as trial running with the available locos indicated this was the maximum that could be hauled up the gradients by the largest loco.

It was also necessary to severely limit the length of trains that could be sent from Boonah to Dugandan, if some complicated shunting manoeuvres were to be avoided at that terminus.

In order to make the assembling of trains simpler, a rationalized system of assigning vehicle lengths was adopted. All 4-wheel wagons were assumed to be 1F in length and all bogie wagons were assumed to be 1.6F in length, based on the lengths of the majority of wagons available. This has worked out quite well as some wagons were slightly longer, but many more were shorter, so it all balanced out. Locos and guards vans were classed 2F as they were all about twice the length of an F wagon, while the railmotor and trailer was measured at 230mm making it equivalent to 4.6F.

<u>The next train consists of…..</u>

Now that I knew what the length limits were for my trains, and what lengths my wagons were, it was possible to assemble the groups of wagons necessary to provide the chosen level of service, and see if they would fit.

As an example, let's take the Monday train from Ipswich to Dugandan. For convenience all trains running from Ipswich towards the branch would be classed as 'Down' trains and all trains running from the branch back towards Ipswich would be classed as 'Up' trains.

From the spreadsheet we can see that it would need to convey the following from Ipswich:

- Bogie wagon with supplies to machinery works at Yamanto
- Empty bogie open wagon for loading hay bales at Harrisville
- Bogie refrigerated van for perishables to Harrisville and Boonah
- Empty bogie livestock wagons to Munbilla and Roadvale
- Empty bogie refrigerated van to dairy at Boonah
- Full bogie fuel tanker to depot at Boonah
- Empty bogie louvre van for loading produce at Boonah
- 3 empty 4-whl ballast wagons for loading at Ballast Pit
- Empty bogie open wagon for loading sawn timber at Dugandan
- Empty 4-whl louvre wagon for loading produce at Dugandan

That makes a train of 8xbogie and 4x4-whl wagons for a length of (8x1.6 + 4=) 16.8 F-units. Note that the coal wagons listed on the spreadsheet as being a daily frequency to Purga will be conveyed by the shunt train as it is a facing siding to Down trains.

Adding a loco and van makes a total train length of 20.8 F-units which means it will fit into the loop at Harrisville but not at Boonah. However, some of the wagons will be detached en-route, reducing the train length by 4 bogie wagons equal to 6.4 F-units, making the train length 14.4 F-units by the time it reaches Boonah, which will fit into the loop at Boonah.

Now let's look at the Tuesday train from Ipswich to Dugandan. Note that the daily coal wagons for Purga and the Tuesday fuel wagons for Yamanto both involve shunting a facing siding for Down trains and will therefore be conveyed by the shunt train.

The goods train will therefore need to convey the following from Ipswich:

- Potential empty bogie cattle wagon for Harrisville
- Potential loaded open or flat wagon for machinery from Yamanto to Harrisville or Boonah
- Bogie refrigerated van for perishables to Harrisville and Boonah
- Empty bogie open wagons for loading hay bales at Munbilla, Roadvale and Boonah
- Empty bogie cattle wagon for Boonah
- Empty bogie refrigerated van for the dairy at Boonah

That makes a train of possibly 8 bogie wagons for a length of 12.8 F-units. Adding a loco and van makes a total of 16.8 F-units so it will fit at both Harrisville and Boonah. However, it needs to collect a loaded log wagon at Harrisville on the way through, increasing the train length to 18.4 F-units which makes it too long for Boonah. The option is to reduce its load, or make sure it is able to shunt a train of that length at Boonah without fouling the main line.

It was also considered that, for variation, on some days one or more of the open or louvred bogie wagon wagons would each be replaced by two 4-wheel wagons, which increases the effective length of the train.

Armed with this information it was now possible to develop a timetable for the branch line, assemble typical train consists for the planned running sessions, and prepare train manifests (what I think others might call 'switch lists') for each train to inform the train drivers about the need to drop off or collect wagons along the way.

⌛✍ **The Timetable**

For me this was the most interesting part of the process, and I hope you find it interesting too.

The development of the timetable was broken down into several steps, these being:

- Work out the number of trains in each direction each day and their approximate running times
- Work out the length of the layout and the time it would take to travel the route, including allowances for shunting
- Make sure trains can cross at suitable locations.

Development of these steps occurred as follows.

♋◑ Number of trains

From the information in my spreadsheet I was able to decide which goods trains would run on which days between which stations. In addition I decided that my railmotor service would have at least three (3) return trips each weekday, one early in the morning, one around midday, and one in the late afternoon.

Your layout would have it's own requirements for the number and directions of trains.

♌◑ Track and Route Configuration

Next, our layout needs to drawn out as a single-line diagram. For a point-to-point layout like mine, or a point-to-loop or loop to loop layout, this is relatively simple. For a continuous layout you would need to choose your major station as the starting point and draw the layout as a straight line until you reach your main station again. For more complex layout arrangements, choose your 'main line' and draw it first, then add the connecting lines as they occur along the route. The main station need only be shown once, but you could divide it and put half at each end.

Below are a couple of examples to give you the idea. These layout track plans were all free downloads from various internet sites, some with minor modifications to suit this presentation. For double-track layouts you would show both tracks running side-by-side where appropriate.

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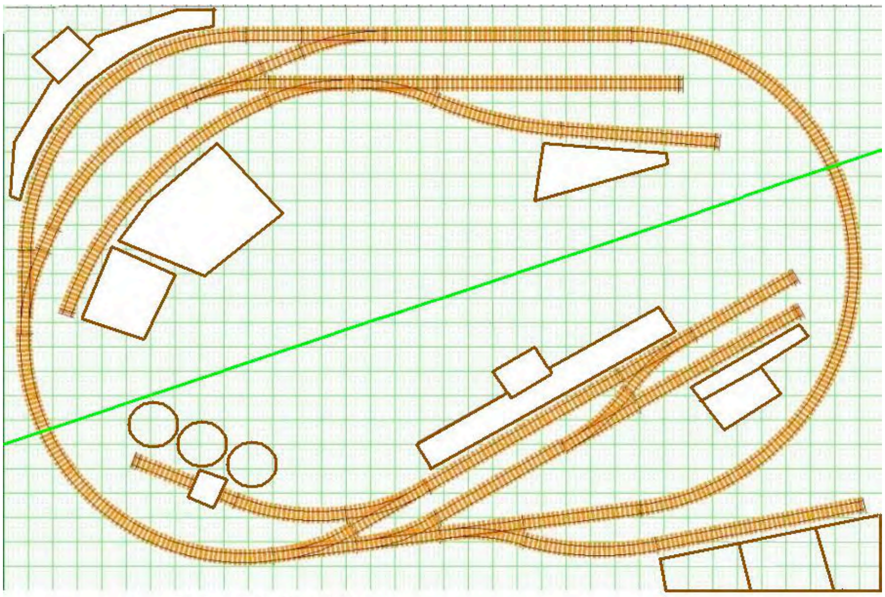
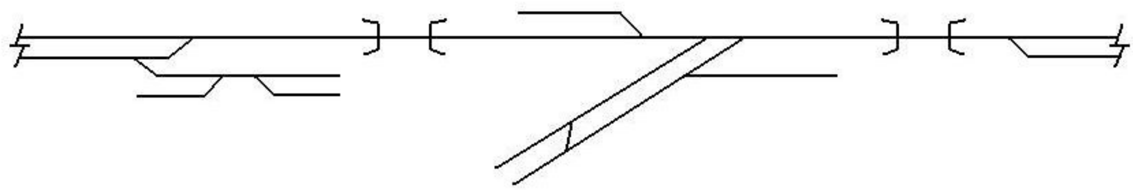
Layout plan

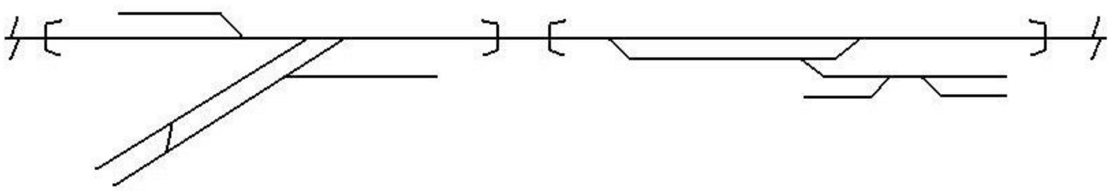


Each square = 25mm in N gauge

Track diagram

This layout could be represented in two ways depending on which is considered the main station:





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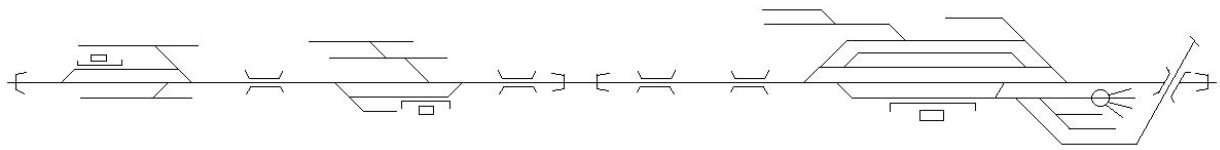
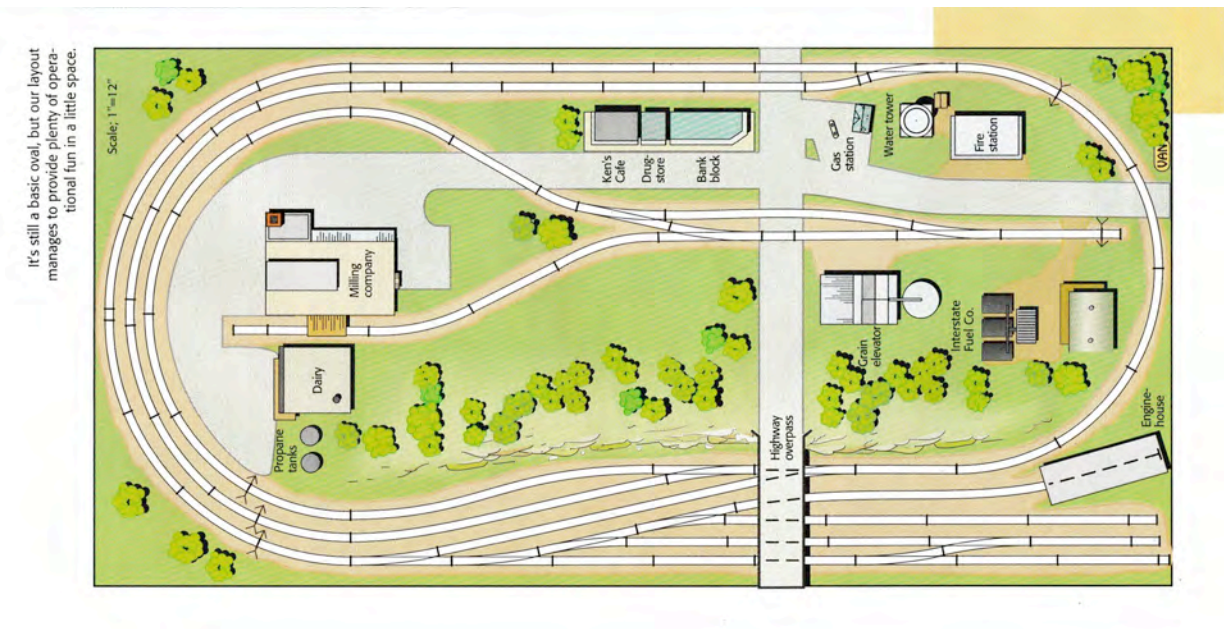
Layout Plan

Track diagram

If the branch to the right went to a staging yard then that should also be included.



Layout plan



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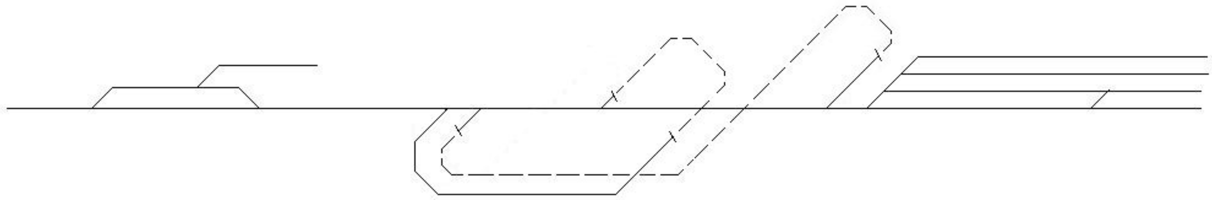
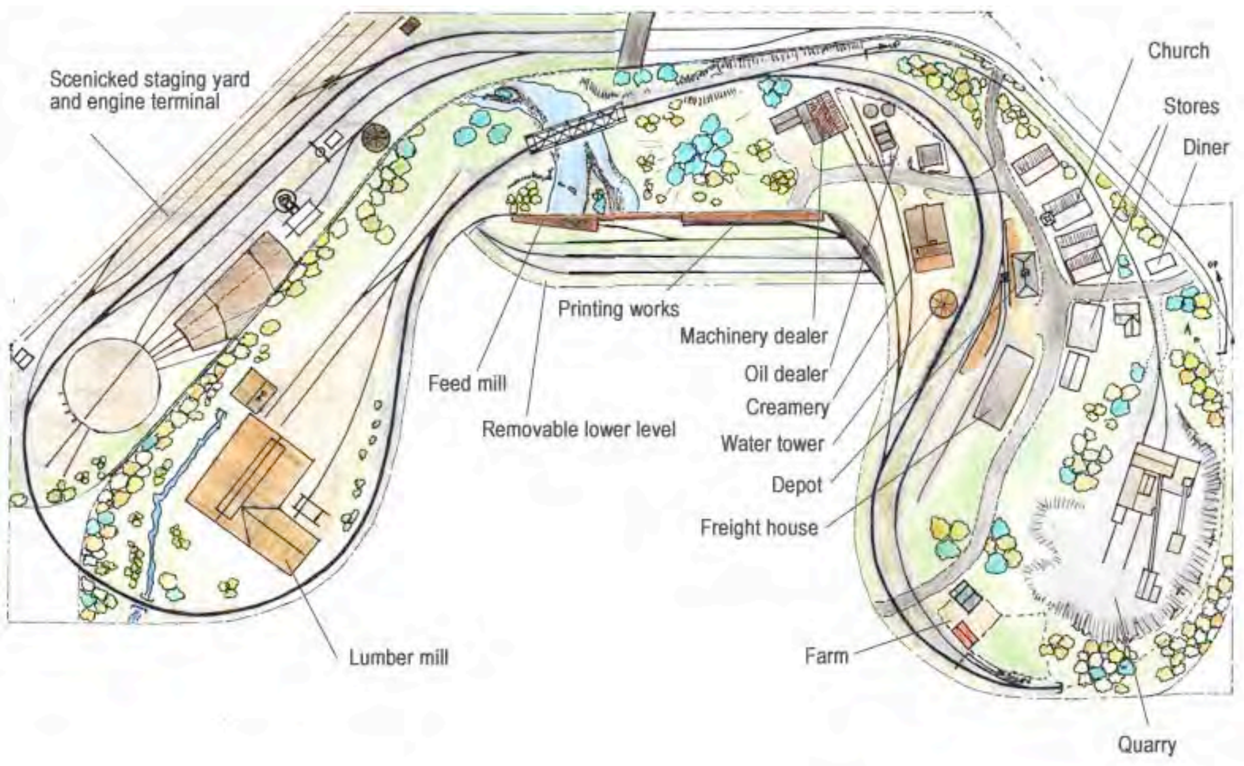
Track diagram

The dashed lines represent the connecting routes forming the oval for continuous running.

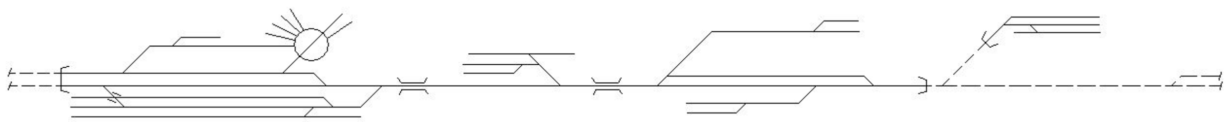


Layout plan



Track diagram

The main station would be the scenicked staging yard, and this could be divided and half put at each end.



Once your single-line diagram is complete, then with a measuring tape, or suitable length of string, measure the length of each section of the layout between major elements such as sidings, passing loops, stations, and line-side industries. Accuracy need only be to within a centimetre. For sidings measure to the toe of the turnout, for passing loops measure to the mid-point of the loop, for stations measure to the location of the station building, and for line-side industries measure to the loading point for wagons. Record these measurements on your schematic layout diagram.

♍☽ Train Speeds and Times

Now run a train non-stop over the full length of your layout (as shown on your diagram) at a realistic speed and measure the time it takes. Run the train at the speed you would be using during operation of the layout. Decide what clock speed you will use for your timetable and convert this time to scale time.

For example if you are using a 12:1 clock speed and your train took 173 seconds to traverse the layout, then the scale time would be 173 x 12 = 2076 seconds or about 34 ½ minutes.

If you want you could convert this to scale km/hr by multiplying the distances measured above by the scale and clock speed. For example, if your N-scale layout was 10m end to end, and your clock speed 12:1, then your time-adjusted scale distance would be 10 x 160 x 12 = 19200m or 19.2km. Your train travel time of 34 ½ minutes therefore represents a scale speed of 19.2 x (60 / 34.5) = 33.4km/hr which is reasonable. You might want to adjust this to suit the types of trains you run, with passenger trains having higher speeds than freight trains. You could also change the ration of scale to real distance if preferred – that is what I did for convenience, using 1m = 1km.

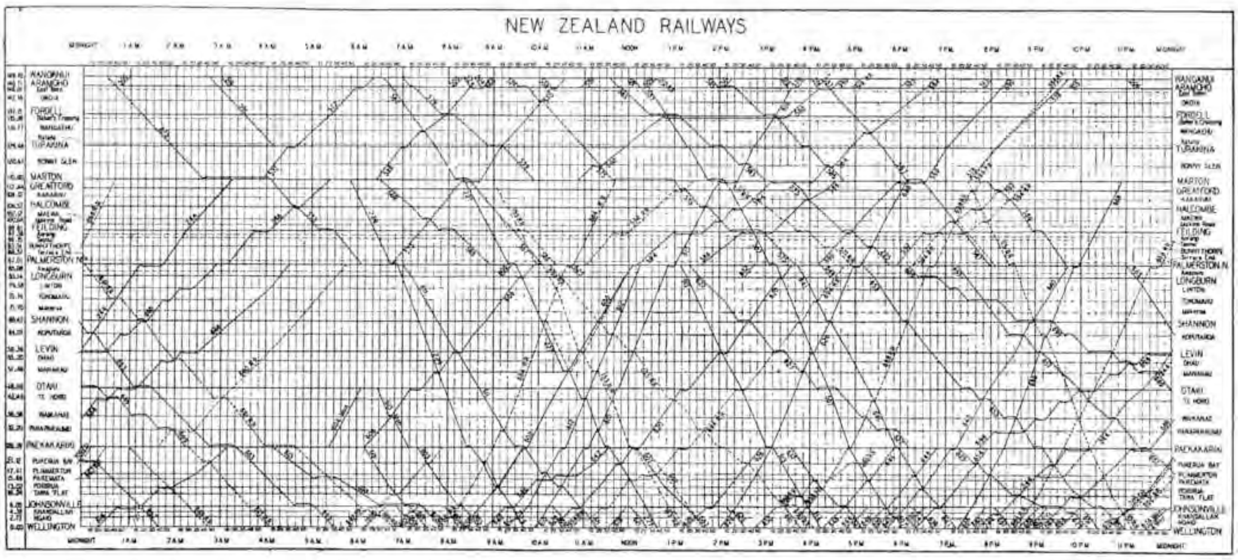
♎◑ <u>The Train Working Diagram</u>

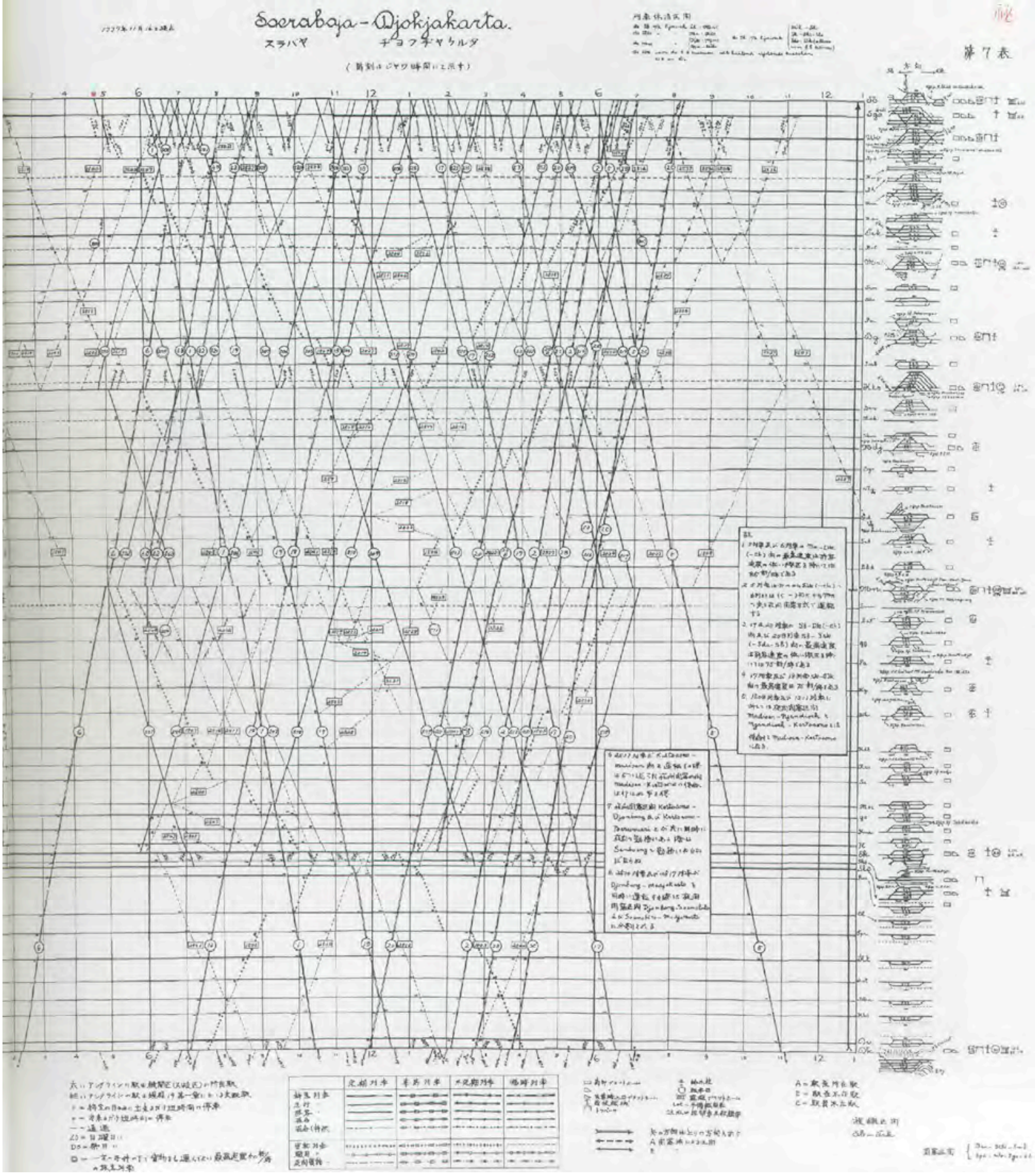
The train working diagram is a graph which plots the location, speed and direction of each train over a nominated section of line for a set time period. This enables the path of each train to be plotted so that crossings can be arranged to occur at stations having suitable length crossing loops, adequate time is allowed for shunting, and the arrival and departure times at each station can be identified for each train.

This is not my invention, it's been around for ages and was introduced into Queensland by a Mr Albert Prewett who was Secretary and Traffic Manager for the Qld Railways in the 1890's. An article on his train working diagrams appeared in the ARHS Bulletin for January 1978.

On the following pages are some examples of similar train working diagrams developed by other railways, but hopefully yours will not be quite so complicated.

WELLINGTON-WANGANUI. TRAIN-CONTROL DIAGRAM.

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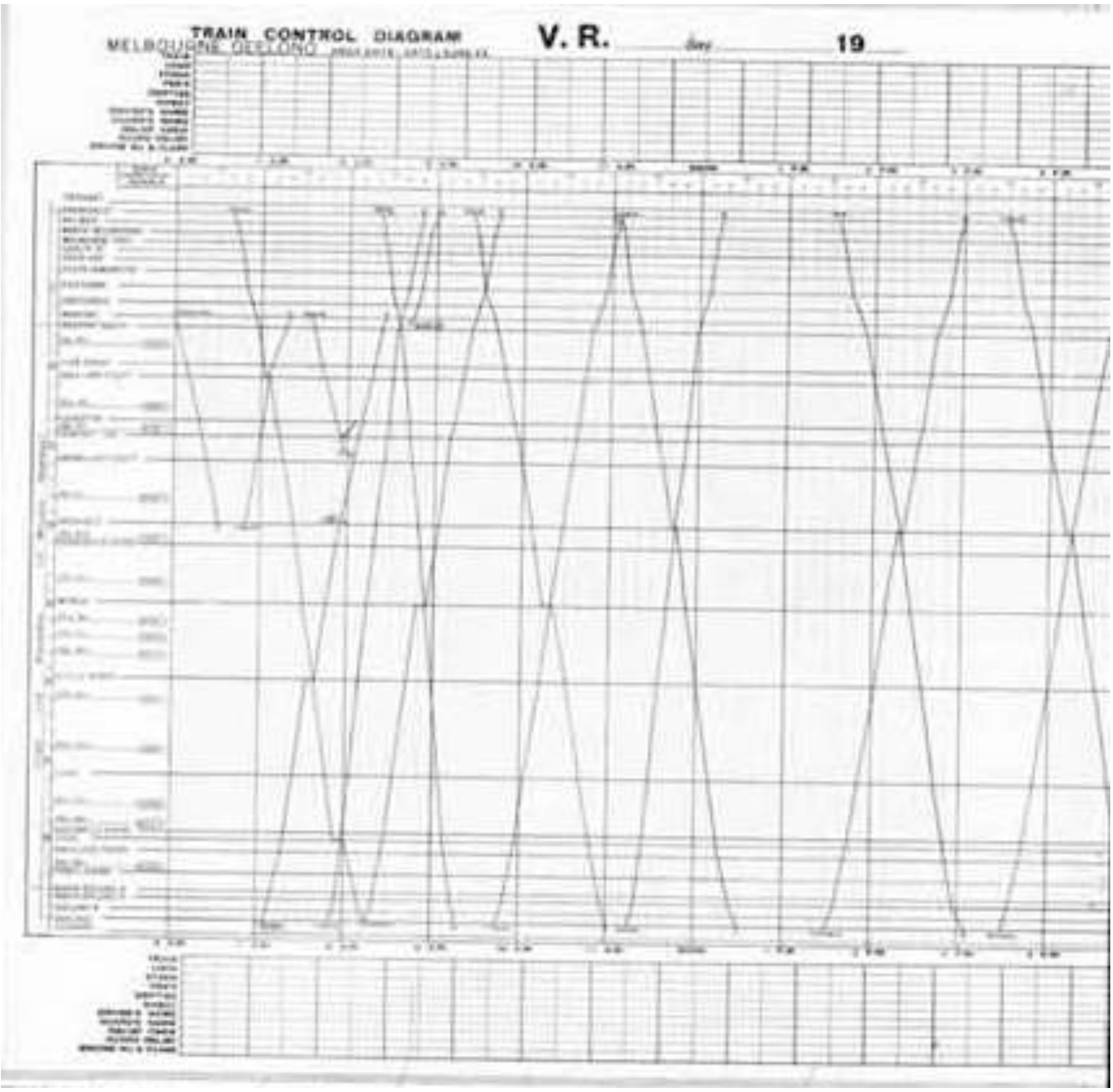

♏✆ Preparing the graph framework

Take a sheet of graph paper with suitable squares. I used a sheet of A3 graph paper with 5mm squares obtained from the newsagent. Divide the bottom axis into the required number of one-hour segments that you want your timetable to cover. My train service starts at 6:00AM and finishes at 6:00PM so I will have 12 one-hour segments. Subdivide them into portions of an hour (segments of either 1, 3, 4, 6, 10 or 15 minutes would be most convenient as simple factors of 60).

Next, draw your single line diagram up the side axis with the correct proportional distances between each major element as measured above. The easiest way to do this is to take the total length of your single-line diagram and divide that evenly over the graph divisions and then round down to the nearest convenient measurement. If, for example, your total main line run was 10m and your graph paper had 54 divisions then each division would be equal to about 185mm of track so you would round that up to (say) 200mm and you would then have 50 divisions of 200mm and two spare divisions at the top and bottom of the sheet. Then plot the position of each major element proportional to the distances on the sheet.

The arrangement of my framework is shown on the following page (I have generated this in an Excel spreadsheet for ease of reproduction as my hand-drawn original is now a bit messy ☺. A copy of a sample spreadsheet, along with instructions on how to use it, is included on the USB stick for you to play with).

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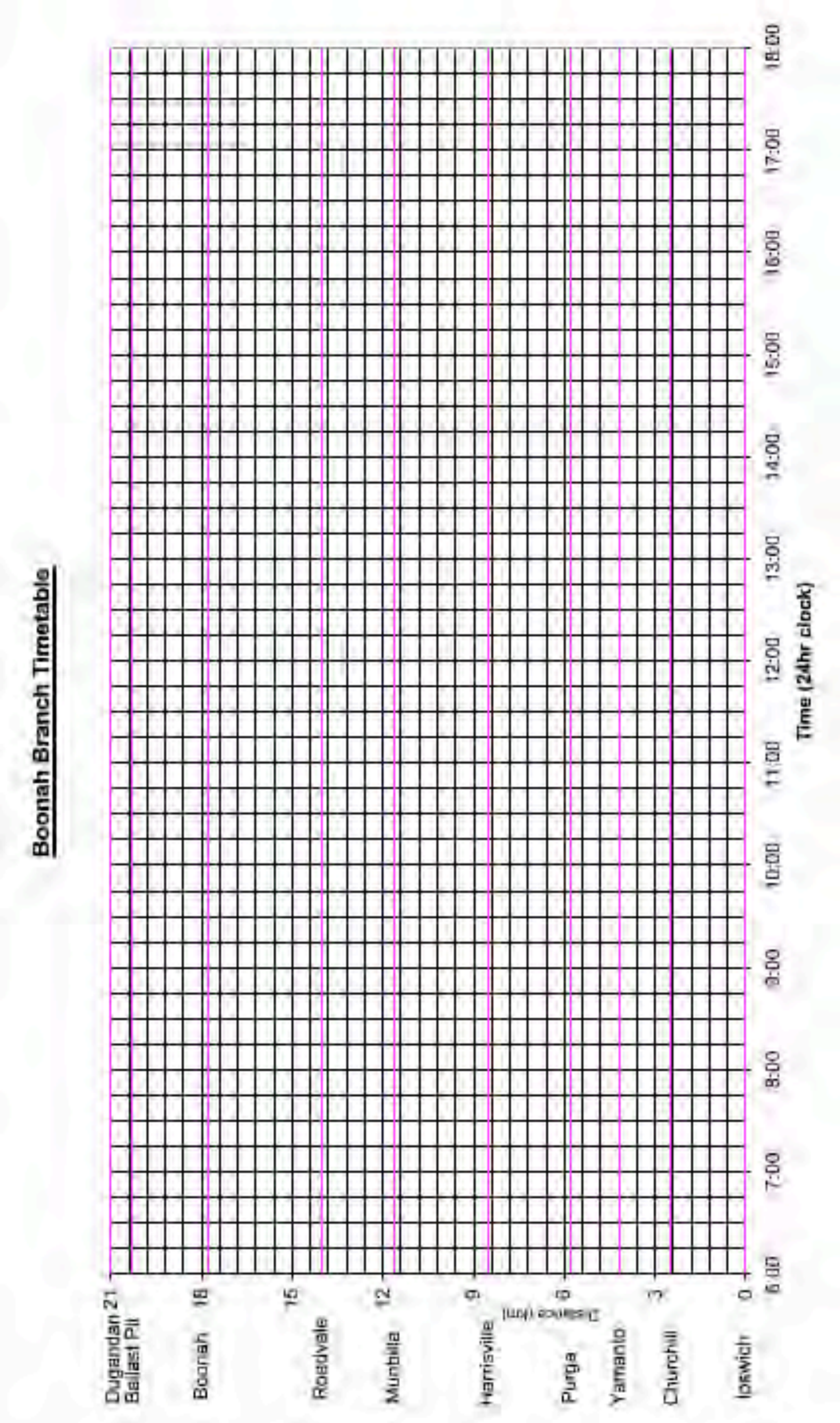

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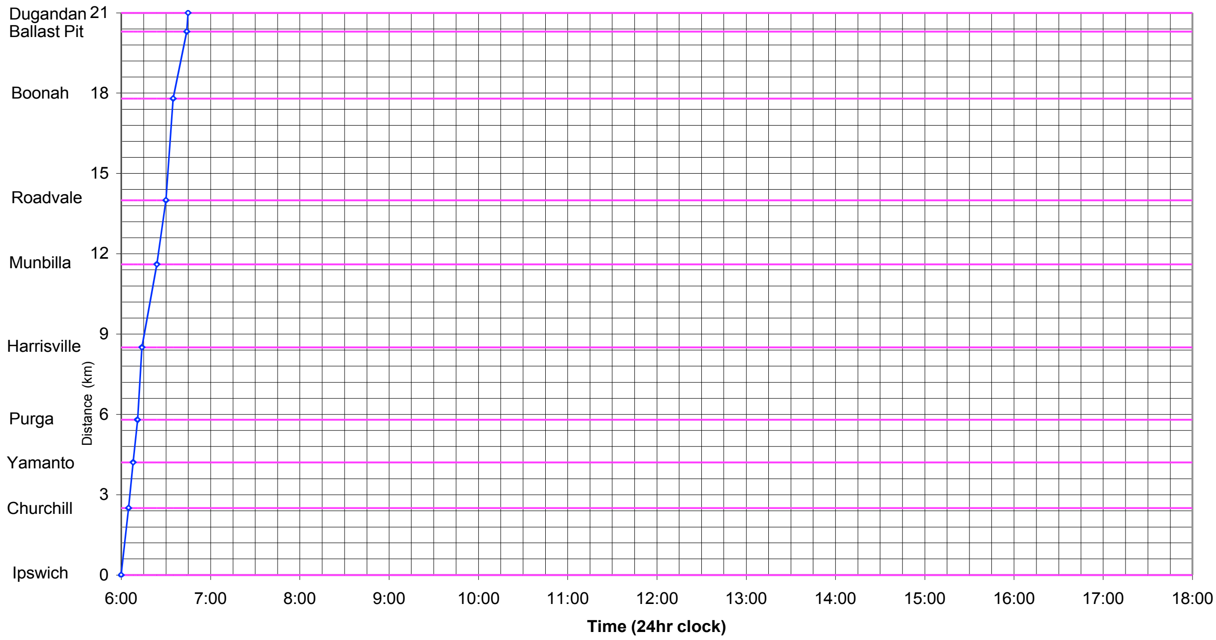
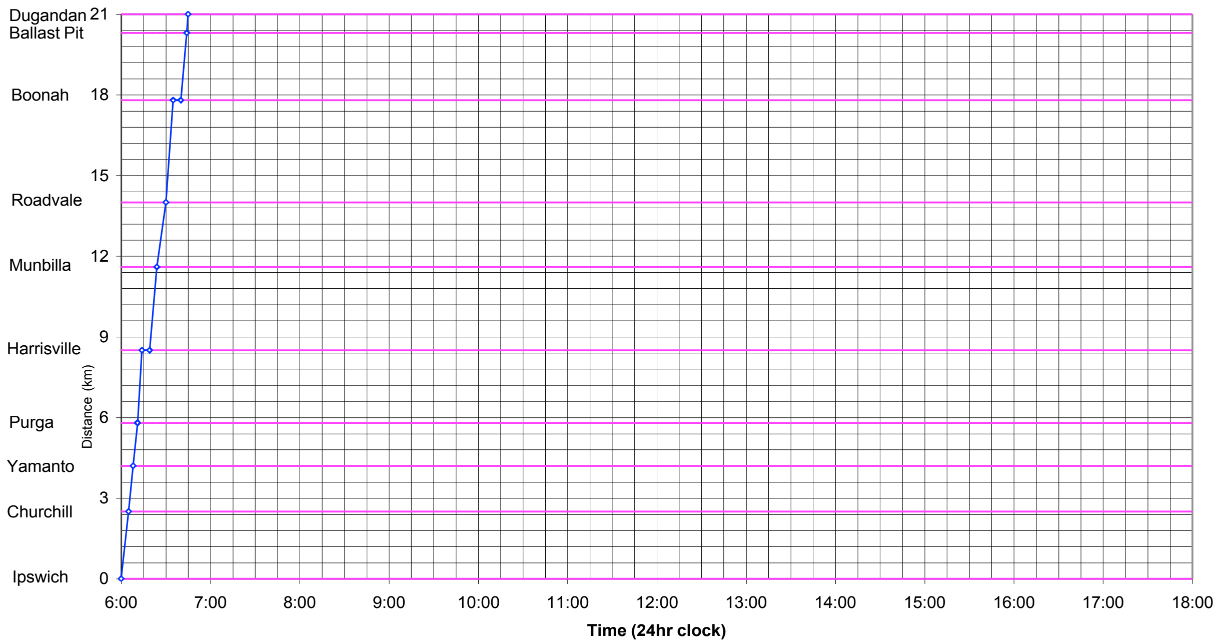
f) Plotting the trains

Now comes the cool bit! Select the starting time for your first 'Down' train of the day, let's say it is 6:00AM. Then, starting at that time, draw a faint line in soft pencil based on the scale time for your train to reach the other end of the layout (34 ½ minutes scale time as in the earlier example). My Excel spreadsheet line is a bit wiggly due to rounding of times to the nearest minute.



Then, starting at the first stopping place for that train draw a short horizontal line equal to the duration of time it is stopped, and then draw a line starting there and running parallel to the first line to the next stopping place. This represents the actual train path. The stopping time required for shunting trains is the actual time required to carry out the necessary shunting multiplied by your fast clock ratio. For example, if it takes an actual 160 seconds to carry out the required shunting then the time allowance on your diagram for a 12:1 fast clock would need to be 160 x 12 = 1920 seconds or 32 minutes.

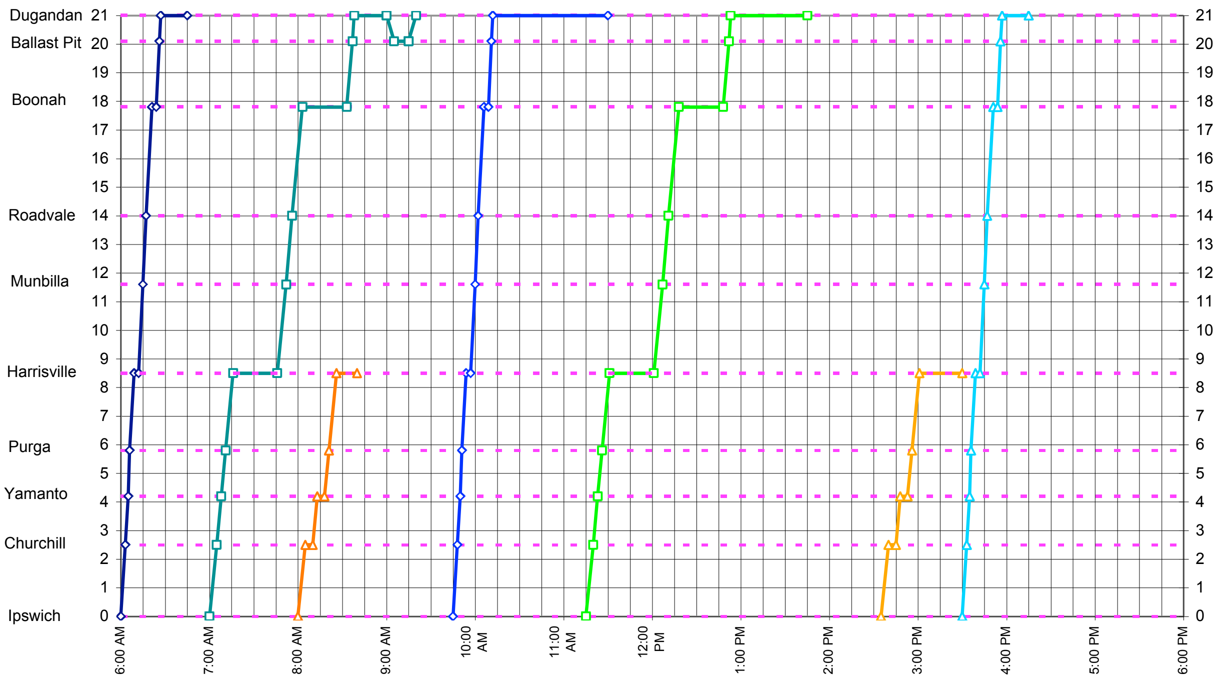
Repeat this for the other stopping places, then erase the redundant sections of line above the actual train path. As my first train is a railmotor and is only stopping at Harrisville and Boonah then I will have it wait for 5 minutes at each of those stations. The diagram should now look something like this:



Repeat this for the other trains you want to run in that direction, each one starting at a suitable time. Note that passenger trains might run faster than goods trains, and goods trains will stop longer if they need to shunt. Allow enough time for your (real-time) shunting to be completed within the time allocated on your (scale time) clock.

Your diagram might now look something like this (I've changed the formatting a bit from the previous one):

Boonah Branch Train Working Diagram



You will notice that the slower trains have a different angle on the lines representing them, the faster trains having a steeper angle. This makes it easier to identify them later, although you could also draw them in different colours (but not just yet if you are doing it manually).

If your faster passenger train catches up with a slower goods train, then either start the passenger train earlier or the goods train later, or else arrange for the passenger train to overtake the goods train at one of the stations where the goods train is shunting.

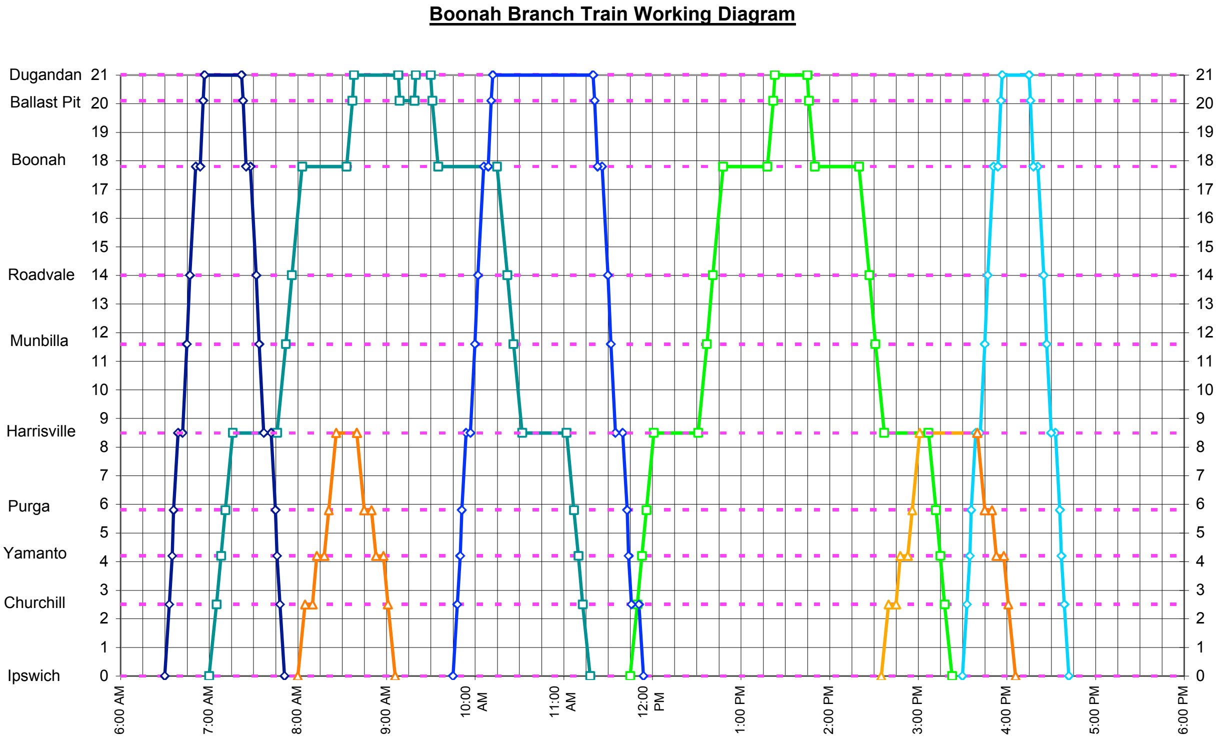
♐☽ Conflicting movements.

Ok, that covers all our train movements in the 'Down' direction but what about the other direction.

Our first 'Up' train can now be plotted using the same method. Let's say it is the return journey of our 6:00AM 'Down' train. First draw a line from the top of the diagram at the time of departure of our train from the end of the line, running to the bottom of the diagram at the required travel speed. Where this line crosses the first of the previous lines, this represents a Down train which your Up train needs to cross. If this is in the middle of a section of single track you have a problem!! The solution is to take one of those trains back to the previous crossing loop or station and hold it there until the other one passes. It doesn't matter which one for now, but for now lets say we hold the 'Up' train at the previous station.

Once the opposing train has passed, then your 'Up' train can continue its journey until it meets the next 'Down' train and the above process is repeated. Keep on going until your 'Up' train finally reaches its destination. You may choose to hold a 'Down' train in some locations, which will mean adjusting some of your previous work, but that's ok and that's why we do it all in pencil to start with. You might also consider changing the starting time of either the 'Up' or 'Down' trains to better fit the passing opportunities on your diagram.

Once you have finished plotting all your trains, the diagram may look like this:



You can then look at the arrival and departure times for your trains at the main stations and decide whether you need to adjust them and/or the train crossing priorities to ensure your passengers or freight reach their destinations within a suitable time frame and that pick-up and drop-off times are appropriate for both passengers and freight.

One point that should not be overlooked is the number of controllers you have. If using DCC this might not be a problem, but if using traditional DC control with block sections which can be switched to different controllers then the number of trains in simultaneous operation will be limited by the number of controllers. This may require you to adjust times again to make sure you don't have more trains scheduled to operate than you have controllers available for them.

Once you have done that and adjusted the diagram to suit, it's time to run a few test trains and try it out. You might need to adjust stopping times at stations or time allowances for shunting, but eventually you will arrive at a compromise which you are happy with.

My original hand-drawn diagram looks like this:

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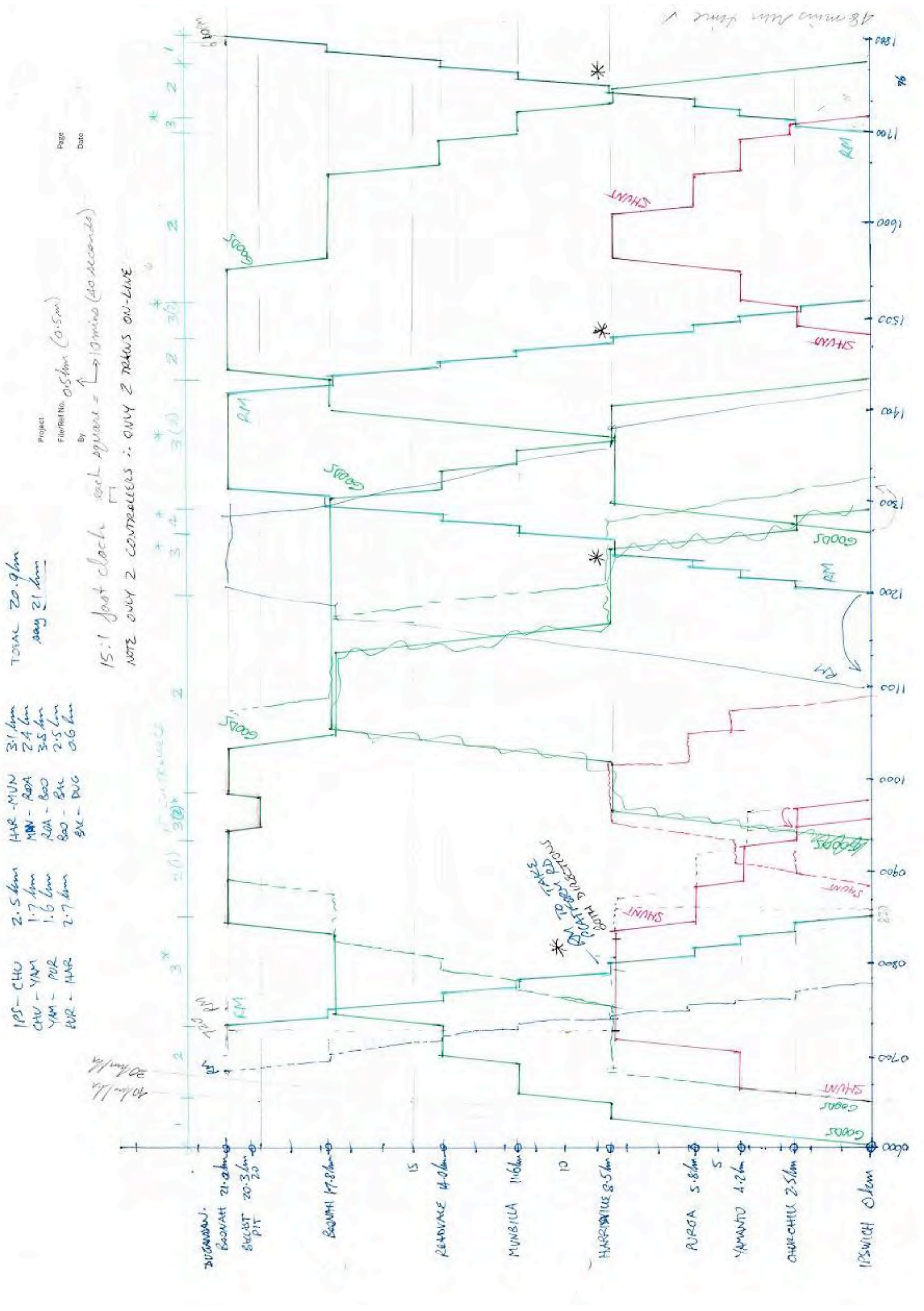
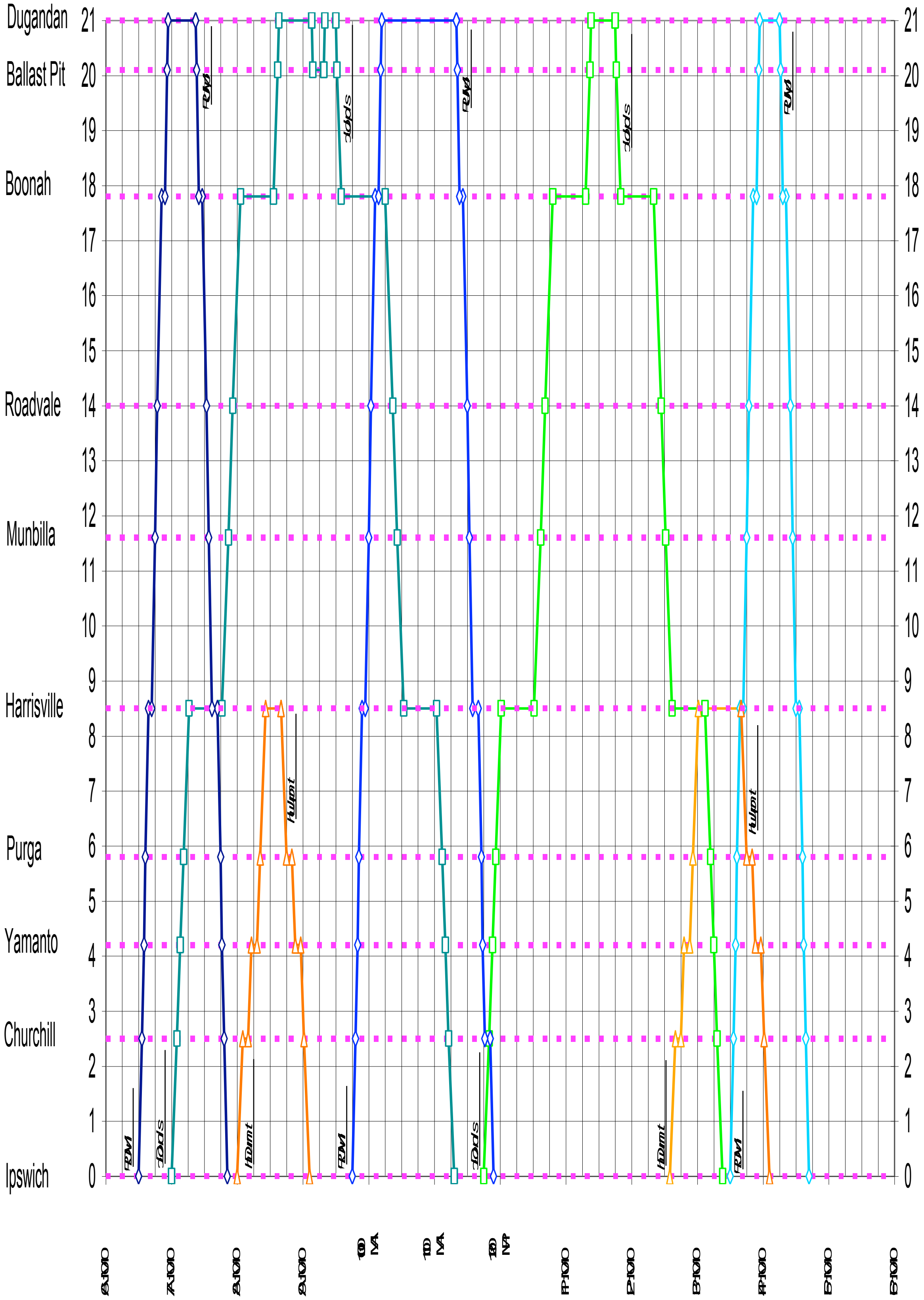


As a result of some trial runs I subsequently modified the train times and other details to provide better shunting time and to suit the number of available controllers, which I developed in a spreadsheet format for easier modification. My current spreadsheet version now looks like this:

Boonah Branch Train Working Diagram



h) <u>Putting it all together</u>

So, we now have our timetable, our train consists, and our switch-lists or manifests, so we can start running trains, right?

Well, not quite, we might want some way of tracking our wagons so that we know where they are. Some people use the actual wagon numbers (ok for larger scales but not so practical in N or TT), some people use coloured pins or coloured tabs stuck on top of the wagons, or magnetic tabs which stick to a small piece of steel embedded in the wagon construction, and there are other methods as well. Most will require a waybill and a car-card for each wagon, which are clipped together to form the manifest and placed in boxes at the locations where those wagons are dropped off or collected. That way there is always a check available for the location and status of each wagon. There have been many articles in the various model railway magazines describing these systems over the years so I'm not going to repeat them here.

Personally, I don't want to go to that level of detail, and I'm satisfied with simply ensuring I have kept track of all wagons on the timetable and train manifests so that none should go missing during an operating session.

I have not been able to prove this in practice yet, owing to a recent need to dismantle one part of the layout to allow access for termite treatment in part of the garage wall, followed by a nocturnal visit from the cat which jumped onto the layout to chase a gecko (which was probably after the termites) and in the process succeeded in destroying a large but apparently fragile curved trestle bridge I had spent some weeks scratch-building. Running of trains can't recommence until those things have been attended to, but when this happens I'll probably find my train diagram may still need a bit of fine tuning before I'm satisfied with it.

<u>Conclusion</u>

I hope this presentation has been interesting and has given you a glimpse of what can be done to improve realism in operation of your model railway, and will perhaps spur you on to develop your own train timetable to use in running sessions.

Like most things in this hobby, my way is just that, and the basic principles described in this presentation can be modified and used in whatever way you choose so you can develop something that suits your style and the needs of your model railway.