INTRODUCTION

It is now four years since I began building my new, larger version of the Newcastle to Fassifern Railway. Some 90% of baseboards and track work and a few structures are completed, but alas no scenery as yet. However, I have been holding operating sessions for three years, and I now host up to 17 people every six weeks or so.

Previous articles in LDSIG and OPSIG journals covered the planning of the current layout, as well as details of the steelworks (see references; further details are on the website (www.newcastle-modelrail.com). Now that I have some operating experience on the layout, I thought it might be of interest to OPSIG readers to see how the layout has emerged from a paper empire and come to life. This article covers:

- Inspiration from A Rail-fan’s Heaven
- Staging Construction for Early Operating Fun
- Designing for Operations
- Lessons Learned So Far

INSPIRATION FROM A RAIL-FAN’S HEAVEN
Newcastle, NSW, like its counterpart in England, is synonymous with coal. Captain Cook noted exposed coal seams as he sailed past in 1770. Newcastle was therefore established in 1801, just 13 years after Australia’s first European settlement, and the first coal was sent 100 miles south to Sydney by sea that year. Soon dozens of mines were operating, and the first railway in the area was built in the 1860’s to make it easier to link the mines to the growing port of Newcastle.

Coal and railways remain vital to Newcastle, which is now the world’s largest coal export port. In 2016, some 180 million metric tons of coal were exported from the terminals at Port Waratah and Kooragang Island, with well over 50 coal trains of up to 13,000 gross tons arriving at the port every day (see references for videos of current coal train operations).

However, I was fascinated with the area from the mid 1960’s, when I first saw streamlined C38 class Pacifcs hauling air-conditioned passenger trains, and AD60 class Beyer-Garrett locomotives on coal and freight trains and at Broadmeadow (Figure 2).

Figure 2 (Left): 3801 departing Newcastle with the “Flyer” in the 1960’s. (Right): Painting of Newcastle Loco Depot showing the double roundhouses and Beyer-Garretts.

The Newcastle area in those days was a rail-fan’s heaven. This area was the last in Australia to succumb to the diesel, and as late as 1970 there were still 100 or more government-owned steam locomotives based at the twin roundhouses at Broadmeadow and the picturesque full-circle roundhouse at nearby Port Waratah. In addition, there were privately owned steam locomotives on some of the coal line branches.

As Australia’s sixth largest city, Newcastle was the terminus for around 30 daily suburban and local rail services operated by 4-6-4 tank locomotives, C35 and C36 class 4-6-0’s and diesel railcars, as well as the thrice daily “Newcastle Flyer” expresses from Sydney. Most of the early NSW diesel electric locomotives could also be found in the Newcastle area, handling a mix of longer distance freight and passenger trains as well as some local coal trains. However, the bulk of coal and other traffic was still handled by steam.

The combination of passenger, freight and coal traffic meant that there were over 250 trains per day, plus light engine movements, concentrated in the junctions between Newcastle and Port Waratah (Figure 3). In those days, the density of traffic required a four-track main line between Broadmeadow and Hanbury Junction, and north from there to Maitland. Train movements were directed by multiple signal boxes (“towers” in US parlance) under the general direction of “train control”. CTC came later and today all operations are controlled from a single location. A mixture of upper and lower quadrant semaphore signals as well as color light signals were in operation, and all trains as well as light engine movements were included in the working timetable, although many trains such as wheat trains or fruit expresses were “conditional” and only ran as required by seasonal traffic.
Newcastle was also the home of BHP’s steelworks, the largest in Australia in the 1960’s, along with Sulphide smelters and other heavy industry. BHP had its own private rail network operated by a fleet of GE centre-cab and end-cab BO-BO diesel shunters, as well as fascinating operations including such aspects as slag trains (Figure 4).

Altogether there were some 20 distinct classes of steam and diesel locomotives in the area. In combination with the variety and density of traffic, this offered great opportunities for train crew. (see references for videos of the area in the 1960’s). However, as discussed later, I wanted to
operate my layout in a similar fashion to the prototype in the 1960’s. This meant opportunities for signalmen, yard shunters and locomotive foremen, working from “fixed locations”, as well as for engineers following their trains with walk-around throttles.

**STAGING CONSTRUCTION FOR EARLY OPERATING FUN**

From the outset, I envisaged up to twelve operators would be required to run my railway when completed. However, I didn’t want to wait for years until the layout was finished before I could start operations. I therefore designed it to be built in stages, with operations to be progressively enhanced after each stage was completed.

Figure 5 (left) shows the first stage, which included the key facilities of Broadmeadow marshalling yard and loco depot, and incorporated the first roundhouse, which I salvaged from an earlier layout. Stage 1 was built on a total of 7 permanent modules and connected into a simple loop using temporary modules.

![Figure 5](image)

Figure 5 – (Left): Stage 1 included the first seven modules plus temporary connections to allow early operations. (Right): Stage 2 added three modules and Port Waratah.

First operations began after just twelve months. This had the major benefit of widening my circle of friends, and soon half a dozen people were offering help with various aspects of the layout as they bought into the “vision”. Stage 2 which included Port Waratah quickly followed (Figure 5).

![Figure 6](image)

Figure 6 – (Left): Modules under construction, showing Lachlan McGuire, an early and enthusiastic recruit. Note light weight foam sandwich construction. (Right): A 44 class Diesel emerges from Tickhole tunnel (on Module 6), a year after construction started.

*Avoiding Disaster!*
Building in stages with easily separated modules also meant I avoided what could have been a catastrophe. Less than two years into layout construction, my wife and I decided to move house! This meant abandoning my fabulous 10m*7m fully lined and insulated train “shed”. However, by removing internal walls and two bedrooms in the new house, I managed to get an even better layout room - about 80 sq. m. (1,000 sq. ft.) of fully carpeted and heated internal space. Did I mention my wife is a saint?

Figure 7: Moving house 18 months into construction proved no obstacle: (Left): Peter McGuire, John Zubrikas and Laurie Moses help the author (left) load the first of 10 modules into a van. (Right): Removing internal walls, eliminating two bedrooms and inserting steel beams created the perfect space!

The move also allowed the track plan to be further improved. Figure 8 shows how the layout was extended in stages 3, 4 and 5, with operations restored at the end of each stage utilizing temporary connections.

Figure 8: Stages 3, 4 and 5 have been built in the new Layout Room.

Figure 9 shows the layout as at June 2017, and now includes some 23 modules. Not shown are the hidden Sydney staging area under Broadmeadow station, and the hidden North Staging area under Newcastle City.

The layout as now built is designed for up to 18 operators - 10 train crew (shown in blue in Figure 9) and 8 fixed operators (shown in red in Figure 9). Fixed operators are located as far as possible so as not to block the aisle-ways, and include:
1) Dispatcher
2) Woodbury Junction Signalbox Operator
3) Port Waratah Yardmaster/Shunter
4) Steelworks Shunter(s)
5) Broadmeadow Yardmaster/Adamstown Signalbox Operator
6) Broadmeadow Shunter
7) Broadmeadow Loco Foreman
8) Freight Traffic Manager
Several more additions are planned, including the second roundhouse at Broadmeadow; an extension of the Burwood Branch with an additional coal mine in the alcove at the top right-hand corner of the room; the Toronto Branch from Fassifern; and an additional staging yard under Port Waratah. When complete there will be over 20 hidden staging tracks and another 30 tracks in yards and stations as well as two roundhouses, providing sufficient capacity for over 35 trains and 50 locomotives.

Several more additions are planned, including the second roundhouse at Broadmeadow; an extension of the Burwood Branch with an additional coal mine in the alcove at the top right-hand corner of the room; the Toronto Branch from Fassifern; and an additional staging yard under Port Waratah. When complete there will be over 20 hidden staging tracks and another 30 tracks in yards and stations as well as two roundhouses, providing sufficient capacity for over 35 trains and 50 locomotives.

**DESIGNING FOR OPERATIONS**

OPSIG’s wonderful Compendium of Model Railroad Operations (see reference list) only came out in the last few months. In my view, it is an invaluable guide to building a layout designed for operations. Fortunately, I was familiar with many of the principal ideas involved through books and articles by the likes of John Armstrong, Tony Koester and Byron Henderson as well as through articles in the OPSIG, LDSIG and Model Railroad Planning journals.

My own experience probably mirrors that of many others but might nevertheless be of interest. Some of the key parameters I adopted in my layout design, and how they have worked out in practice, are listed below:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>My Design</th>
<th>Experience to Date</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Space for Operators</strong></td>
<td>Minimum aisle width 24 inches (pinch point) and 30 - 36 inches elsewhere</td>
<td>Pinch point turned out to be too narrow. Layout redesigned to allow 27 inches. Aisles in front of yards generally 36 inches or more</td>
</tr>
<tr>
<td><strong>Minimum Radius Curves</strong></td>
<td>30 inches (75cm) plus transition curves wherever possible</td>
<td>Satisfactory for NSW trains in the 1960’s. Ideally would be larger if running modern day rolling stock.</td>
</tr>
</tbody>
</table>
### Parameter

<table>
<thead>
<tr>
<th>Parameter</th>
<th>My Design</th>
<th>Experience to Date</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Train and Siding Lengths</strong></td>
<td>Maximum train length 12 feet (3.6 metres)</td>
<td>Based on prototype NSW trains in the 1960’s which were quite short. Yards and Staging areas have worked out well.</td>
</tr>
<tr>
<td><strong>Maximum gradient</strong></td>
<td>2.5% (1 in 40) on the Fassifern “Bank”, as in prototype</td>
<td>Maximum gradient has been eased slightly to allow for additional resistance on curves.</td>
</tr>
<tr>
<td><strong>Locomotive Control</strong></td>
<td>NCE with radio throttles</td>
<td>Worked out well; many operators were already familiar with NCE. However, radio communication to the throttles is sometimes an issue with 17 operators blocking the signal; there are plans to upgrade and duplicate the radio base station and a 5-amp booster has been added.</td>
</tr>
<tr>
<td><strong>Accessory Control</strong></td>
<td>Roco Z21 system with separate auxiliary bus and radio link to IPAD touch screen control panel(s)</td>
<td>Having a totally separate bus has worked well to date. Touch screen control of points and semaphore signals (via PECO boards and servos) works well, with additional optional control from local control panels with toggle switches.</td>
</tr>
<tr>
<td><strong>Fast Clock</strong></td>
<td>Assumed a fast clock of 2:1</td>
<td>To date full timetable operations have not been successful. Experience suggests that this will require operators to be fully familiar with the prototype, the layout and operating practices. Will revert to sequence timetable and potentially introduce a 1.5: 1 fast clock in the future, to ensure yards do not become clogged.</td>
</tr>
</tbody>
</table>

## EXPERIENCE TO DATE

“Build it and they will come”

![Figure 10: Operating Session in 2017. Fourteen operators are visible](image)

Interest in the layout has grown rapidly over the last couple of years, and I have had over 250 attendees (70 different individuals) at operating sessions in the last two years. These sessions are now held approximately every six weeks. This gives me time for construction between events (scenery has only just begun!) and to prepare for each session, which usually takes a full week.

I can accommodate up to a maximum of 18 people in the train room at one time. Typically, five or six people volunteer (or are volunteered if necessary!) for the “fixed” positions, with the remaining
operators being train crew. Single man crews are used, which means the train engineer has to also handle shunting at way stations and industry sidings (including any paperwork), although they are assisted by yard shunters in the main yards.

This means up to 10 trains can be operating at one time, some with double-headed power, with additional locomotives moving in the yards or loco depot. To date this has been possible with a 5-amp NCE system plus 5-amp booster.

Operators vary in experience from those fully familiar with both the layout and actual prototype operations (we have some current and past train engineers, signalmen etc.), through to novices who are not yet familiar with the layout or even the NCE throttles. Some are regulars and come to nearly every session; others might come once a year. About half come from within about 50 miles, the rest from Sydney (about 1 1/2 hours north), Canberra (2 hours south), Wollongong (1 hour east) or the Newcastle area itself (3 hours north).

Many of the operators were also train buffs during the 1960’s and some spent considerable hours photographing the last great days of steam in and around Newcastle. So, they are very familiar with the area on which the layout is based, and have helped me significantly in trying to recreate the prototype operations and era.

**Technology or People?**

![Diagram of train operations](image)

**Figure 11: The layout is based on an “intermediate” approach to technology**

There are many different approaches to operations – ranging from fully manual systems with all points and signals hand thrown, and slow-paced operations with detailed paperwork, through to fully automated “hands-off” systems with computerized control, automatic signaling and trains chasing each other around the layout.

My own preference is for something in-between, closer to how my prototype operated in the mid 1960’s. The density of traffic on the main lines means that some powered points (“switches”) are both necessary and prototypical. These are operated from control panels which represent Signal Boxes (“Towers”). But yard points are all hand operated. Engineers have to deal with switch lists, but hopefully not individual car cards. The dispatcher has a timetable, but needs to react to delays, the operation of “conditional” trains, locomotive failures and the like.

The system architecture is based on the above approach (Figure 11). Eventually I would like to have hand-thrown levers in the signal boxes to give the “tactile” feel of the real thing, coupled with prototypical communications systems. But touch screen “duplicates” of the physical panels will also be used. This will allow flexibility from “one man” operations through to full sessions with enough personnel to man all operator positions.
Fortunately, many of my operators are electronic gurus. Unfortunately, I am totally incompetent in all things electrical or electronic. Accordingly, despite the best efforts of my colleagues, the use of technology is still a work in progress.

**Preparing for an Operating Session**

Usually, I **invite interest** by email about two weeks before a session. I try to ensure that those operators who have helped out on the layout get advance notice of a session so that they can respond quickly if able to come. Occasionally the level of interest has meant that it has been fully “booked” before the session.

There is usually a flurry of activity in the **week leading up to a session**. This includes fixing electrical or other problems, cleaning track, developing the operating plan, updating the operating documents and staging trains and locomotives (in addition to organizing food!).

In order to **minimise paperwork**, I use the following tools:

- Computerized timetables and schedules
- Laminated, re-usable train cards for train crew
- Magnetic train board to facilitate staging of trains.

Prior to a session, I devise a **session timetable**, based on the actual working timetable in operation in the mid 1960’s. This typically includes about 25 trains plus additional light engine movements, to be run in a two-hour operating session. It includes local and long-distance passenger trains; fast goods, unit freight, general freight and local “trip” or “pickup” freights; and a range of loaded and empty coal trains. Most train crew would get to operate 3 or more trains in a two-hour session. See Table 2 for the train list for a typical session.

In devising a timetable, I take into account availability of locomotives and rolling stock (including “foreign owned”), as well as factors such as avoiding too many freight trains entering Broadmeadow Yard at one time, which causes chaos.

The last column in the Train List is used to record which crew member is assigned to the train. This helps the despatcher ensure operators get a variety of trains (unless they have particular preferences – for example one of my operators prefers running passenger trains, while others prefer local freights).
Table 2: List of Trains Selected for an Operating Session

<table>
<thead>
<tr>
<th>NO</th>
<th>TRAIN</th>
<th>DRN</th>
<th>CLASS</th>
<th>SET</th>
<th>FROM</th>
<th>TO</th>
<th>LOC(S)</th>
<th>BM</th>
<th>PW</th>
<th>BML</th>
<th>CREW</th>
</tr>
</thead>
<tbody>
<tr>
<td>38X</td>
<td>UP Gosford Pass</td>
<td>UP</td>
<td>PASS</td>
<td>31</td>
<td>Newcastle</td>
<td>Gosford (5 Stag)</td>
<td>C55/C56/C17</td>
<td>Out</td>
<td>NSW</td>
<td></td>
<td>Laurie</td>
</tr>
<tr>
<td>403</td>
<td>Down Inland Express</td>
<td>DOWN</td>
<td>FAST GOODS</td>
<td>42</td>
<td>Hermington (5 Stag)</td>
<td>Brisbane (N Staging)</td>
<td>2*DE</td>
<td>Shunt</td>
<td>Allister</td>
<td></td>
<td></td>
</tr>
<tr>
<td>540</td>
<td>UP Gosford Pass</td>
<td>UP</td>
<td>PASS</td>
<td>33</td>
<td>Newcastle</td>
<td>Gosford (5 Stag)</td>
<td>260+270+270</td>
<td>Out</td>
<td>NSW</td>
<td></td>
<td>Roger</td>
</tr>
<tr>
<td>730</td>
<td>UP Singleton Pass</td>
<td>UP</td>
<td>PASS</td>
<td>25</td>
<td>Singleton (N Staging)</td>
<td>Newcastle</td>
<td>C55/C56/C5/C2</td>
<td>In</td>
<td>NSW</td>
<td></td>
<td>Dennis</td>
</tr>
<tr>
<td>964</td>
<td>UP Newcastle Trip</td>
<td>UP</td>
<td>TRIP</td>
<td>52</td>
<td>Newcastle</td>
<td>Broomfield</td>
<td>D59/C60 Link Tank</td>
<td>Term</td>
<td>In</td>
<td>Allan B</td>
<td></td>
</tr>
<tr>
<td>967</td>
<td>DOWN P Waratah Trip</td>
<td>DOWN</td>
<td>TRIP</td>
<td>53</td>
<td>Broadmeadow</td>
<td>P Waratah</td>
<td>D59/53</td>
<td>Orig</td>
<td>Term</td>
<td>Out</td>
<td>Ben</td>
</tr>
<tr>
<td>8</td>
<td>UP Armidale Mail</td>
<td>UP</td>
<td>FAST PASS</td>
<td>24</td>
<td>Armidale (N Staging)</td>
<td>Sydney (5 Staging)</td>
<td>C36, C38</td>
<td>Change</td>
<td>John Z</td>
<td></td>
<td></td>
</tr>
<tr>
<td>951</td>
<td>DOWN COAL (Loaded)</td>
<td>DOWN</td>
<td>COAL</td>
<td>61</td>
<td>Newnham</td>
<td>P Waratah</td>
<td>2*AB60/ AB60</td>
<td>Thru</td>
<td>Term</td>
<td>In</td>
<td>Leanne</td>
</tr>
<tr>
<td>698</td>
<td>DOWN Godford Pass</td>
<td>DOWN</td>
<td>PASS</td>
<td>31</td>
<td>Godford (5 Staging)</td>
<td>Newcastle</td>
<td>C55/C66/C12</td>
<td>In</td>
<td>NSW</td>
<td></td>
<td>Alan G</td>
</tr>
<tr>
<td>645</td>
<td>Down Wheat (Empty)</td>
<td>DOWN</td>
<td>GOODS</td>
<td>44</td>
<td>P Waratah</td>
<td>Werris Cl (N Staging)</td>
<td>A249/DE</td>
<td>Orig</td>
<td>Out</td>
<td>Roger</td>
<td></td>
</tr>
<tr>
<td>81</td>
<td>DOWN Newcastle River</td>
<td>DOWN</td>
<td>FAST PASS</td>
<td>22</td>
<td>Sydney (5 Staging)</td>
<td>Newcastle</td>
<td>G38</td>
<td>In</td>
<td>NSW</td>
<td></td>
<td>Allister</td>
</tr>
<tr>
<td>410</td>
<td>Up Main Nth Goods</td>
<td>DOWN</td>
<td>GOODS</td>
<td>56</td>
<td>Werris Cl (N Staging)</td>
<td>Enfield (E Staging)</td>
<td>36</td>
<td>Shunt</td>
<td>Rafael</td>
<td>John Z</td>
<td></td>
</tr>
<tr>
<td>687</td>
<td>Down Steel (Empty)</td>
<td>DOWN</td>
<td>GOODS</td>
<td>46</td>
<td>5 Staging</td>
<td>P Waratah</td>
<td>A260</td>
<td>Shunt</td>
<td>Term</td>
<td>In</td>
<td>Dennis</td>
</tr>
<tr>
<td>598</td>
<td>Up Express Goods</td>
<td>DOWN</td>
<td>GOODS</td>
<td>41</td>
<td>Brisbane (N Staging)</td>
<td>Chifley (5 Staging)</td>
<td>2*15/ A000</td>
<td>Shunt</td>
<td>Change</td>
<td></td>
<td></td>
</tr>
<tr>
<td>255</td>
<td>DOWN Coal (Loaded)</td>
<td>DOWN</td>
<td>COAL</td>
<td>64</td>
<td>Banwood</td>
<td>Port Waratah</td>
<td>D54/54</td>
<td>Out</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>455</td>
<td>DOWN Lismore (Empty)</td>
<td>DOWN</td>
<td>GOODS</td>
<td>43</td>
<td>Homebush (E Staging)</td>
<td>Werris Cl (N Staging)</td>
<td>Diesel</td>
<td>Shunt</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>920</td>
<td>UP COAL (Empty)</td>
<td>DOWN</td>
<td>COAL</td>
<td>62</td>
<td>P Waratah</td>
<td>Newnham</td>
<td>A260</td>
<td>Orig</td>
<td>Out</td>
<td></td>
<td></td>
</tr>
<tr>
<td>180</td>
<td>DOWN Passifhorn Pass</td>
<td>DOWN</td>
<td>PASS</td>
<td>33</td>
<td>Passifhorn</td>
<td>Newcastle</td>
<td>620+270+270</td>
<td>Out</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>715</td>
<td>DOWN Singleton Pass</td>
<td>DOWN</td>
<td>PASS</td>
<td>25</td>
<td>Newcastle</td>
<td>Singleton (N Staging)</td>
<td>C55/C65/C2</td>
<td>Out</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>41</td>
<td>UP Coal (Loco)</td>
<td>DOWN</td>
<td>COAL</td>
<td>63</td>
<td>Newcastle</td>
<td>Wamull (5 Staging)</td>
<td>A440+45</td>
<td>Out</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>231</td>
<td>UP Combed Trip</td>
<td>DOWN</td>
<td>TRIP</td>
<td>55</td>
<td>P Waratah</td>
<td>Cowrural</td>
<td>363 Diesel</td>
<td>Out</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>269</td>
<td>DOWN Piggrow Goods</td>
<td>DOWN</td>
<td>TRIP</td>
<td>51</td>
<td>Erfield (5 Staging)</td>
<td>Newcastle</td>
<td>D59</td>
<td>Shunt</td>
<td>In</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>UP Brisbane Express</td>
<td>DOWN</td>
<td>FAST PASS</td>
<td>26</td>
<td>Brisbane (N Staging)</td>
<td>Sydney (E Staging)</td>
<td>2* DE</td>
<td>Out</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>303</td>
<td>DOWN Bolmont Pass</td>
<td>DOWN</td>
<td>PASS</td>
<td>34</td>
<td>Newcastle</td>
<td>Burwood</td>
<td>620+270+270</td>
<td>CPH</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The columns to the left of that record which trains do business in Broadmeadow or Port Waratah (and whether they originate, terminate, run-through without shunting or shunt), and which trains require or release locomotives at Broadmeadow Locomotive Depot. This assists the fixed operators at those locations in planning their activities.

Having selected which trains to run, I ensure appropriate train cards are completed. These are printed on both sides of a page (usually four on an A4 page), then cut out and laminated. The front of the train card includes details of the train as well as its timetable and specific instructions. The back of the card includes the switch list for any cars to be added or set out at specific yards, sidings or stations (see Figure 12 and Table 3).

Fig 12 (Left): Re-usable Train Cards stored in order of “sign-on” on the left, and after completion of the assignment on the right. (Right): Author dispatching the layout. The timetable is on the computer in an Excel program. Note the throttles and the magnetic board showing initial location of trains. The methylated spirits are not meant for drinking, but for cleaning the car cards of any special instructions after use!

The completed cards are approximately 5 inches by 3.5 inches, fit into a shirt pocket, and have all the information required by a train crew. If there are any additional specific instructions required...
for a train for a particular operating session, these can be written onto the train cars using a felt pen, and later easily erased as the card is laminated.

Currently I have developed train cards and detailed timetables for over 30 trains, covering about 5 hours of the prototype timetable. I will continue to add more and envisage I will eventually have the potential to run some 120 different trains across a 24-hour period. Developing the timetable and train cards is extremely labor-intensive, but once done, the train cards can be re-used.

Depending on the number of operators likely to be available for a session, it is relatively easy to select a busier or quieter time of day, or to delete some of the conditional trains (such as wheat trains, coal trains or fruit expresses) which only operated in certain seasons, or when ships were in port to load export cargoes.

Table 3: (Left): Train Order Card for a Wheat Train. (Right): Switch List for the same train.

At this stage, I have avoided using individual car cards and waybills. Instead train crew are instructed to pick up or set down a given number of cars of particular types at particular locations. These represent the maximum number to be exchanged - if fewer are available to be set out or picked up then only those available are exchanged. See example above in Table 4. Eventually I may attempt to go further and generate switch lists for individual cars. However, I suspect with over 400 freight cars on the roster, this may prove too much paperwork, unless the process can be generated by JMRI or another computer-based program (which one of my operators has offered to do).

Operating Challenges for Challenged Operators

The layout offers a wide variety of jobs for operators with a variety of tastes, experience and skills:

- Many of the passenger runs are relatively straightforward, although some involve locomotive changes or swapping of cars at Newcastle or Broadmeadow.
- Through Freights usually only stop at Broadmeadow, where they re-marshal their train and frequently change locomotive power from steam to diesel or vice versa (the North Coast...
Main Line from Newcastle to Brisbane was exclusively operated by diesels by the mid 1960’s, but most other lines out of Newcastle were mainly steam-powered.

- “Trip” trains or “Pick up” trains involve complex shunting to serve industry sidings.
- Coal trains in the future will be able to load real coal at the four coal mines planned for the layout. Coal traffic is complex, and includes coking coal as well as coke trains to the steelworks, plus steaming and coking coal for export.

However, the really challenging jobs are the dispatcher, yardmasters and shunters, and signalmen. Usually I act as dispatcher (figure 12) – the job involves allocating throttles and train cards to train crew, monitoring the timetable, and in future, maintaining communications with yardmasters, signalmen and the Broadmeadow locomotive foreman.

Woodbury Junction (which combines Woodville and Hanbury Junctions on the prototype) is particularly complex, and the signalman routes all traffic to and from the Main North, Port Waratah, the Steelworks, Newcastle and Broadmeadow, as well as directing traffic into Sydney Staging and North Staging (see Figure 13). There are at least 25 different routes through the junction in common use, many of which conflict with other routes. In addition, trip trains can tie up the main lines when shunting local sidings.

The yardmaster and shunter at Broadmeadow also face real challenges, as they have to manage five arrival/departure tracks and six classification tracks; local industries; movements through Adamstown Junction; and frequent moves into and out of the Locomotive Depot (Figure 14).

For those operators who can’t get enough shunting (switching), there is always the steelworks!
The Steelworks / Port Waratah complex has approximately 70 yard tracks and sidings, and can keep two or even three operators busy. The area is broken into five “zones”, including:

1) The main Steelworks Zone, including Blast Furnace, Coke Ovens, Basic Oxygen Furnace, Scrapyard and Engine/Blower house
2) Port Waratah Yard, including Morandoo exchange sidings
3) The Wharf area, including sidings for coal, iron ore/limestone; grain; cement; and the fishing fleet.
4) The Rolling Mill Zone
5) the “Comsteel Zone” on the other side of a busy main line and Woodbury Junction. This includes the Comsteel Plant, the Slag/Ash dump and the Lime Kilns (Figure 16).

![Figure 15](Left): BHP diesels at the Blast Furnace. (Right): Shunting Ingot Cars. Photos: Leon Oberg

![Figure 16](Main Zones and Track Plan for Steelworks Complex)

The Port Waratah Yardmaster/shunter works mainly in Zones B and C and is responsible for making up and breaking down coal, wheat and Broadmeadow “trip” trains, and moving cars to appropriate wharf sidings. The Steelworks shunter(s) focus on Zones A, D and E as well as the Morandoo exchange sidings (Tracks 37–40) in Zone B.
Figure 17: Overview of Steelworks. Gas Holder, Blast Furnace, and Ore Bridge in foreground; BOS, refinery, Blower House, coke ovens and rolling mills in background. Port Waratah yard on the left. John Briggs built the Gas Holder from scratch as well as several of the other steelworks facilities from kits.

Figure 18 shows the key assignments for the Steelworks shunters, in this case allocating the tasks between two operators (SW1 and SW2).

### STEELWORKS ASSIGNMENTS

<table>
<thead>
<tr>
<th>No</th>
<th>Assignment</th>
<th>Instructions: NOTE: NOTIFY CONTROL WHEN ASSEMBLED TRAIN READY FOR DEPARTURE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Hot Metal Move</td>
<td>Move any loaded hot metal torpedo or ladle cars from Blast Furnace (Track 6A, 6B) to BOS (Track 2) or, if destined for Comsteel plant, to Morandoo storage sidings (Tracks 39, 40). Replace with any empty torpedo or ladle cars to Blast Furnace from BOS or De-kicking station (Track 8). If any hot metal cars are scheduled for Comsteel, add to next available SLAG or Comsteel Trip train.</td>
</tr>
<tr>
<td>2</td>
<td>Ingot Move</td>
<td>Move any loaded ingot Cars from BOS (Tracks 4A, 4B) to Rolling Mill (Track 73) or if scheduled for Comsteel plant, to Morandoo (tracks 39, 40) for adding to net available SLAG or Comsteel trip train. Replace with any empty ingot cars from Rolling Mill or from Morandoo sidings.</td>
</tr>
<tr>
<td>3</td>
<td>Coal / Coke Move</td>
<td>Move any empty coke hoppers from BF high line (Track 9) to Port Waratah Yard. Move &amp; loaded coking coal hoppers (if available) from Port Waratah yard to Coke Oven unloading track 19 using runaround track if necessary; push through to coke loading area. Transfer loaded coke hoppers to BF high line (Track 9). If no coking coal is available at Port Waratah, but coke cars are, take up to 6 of these direct from Port Waratah to BF Track 9 for unloading.</td>
</tr>
<tr>
<td>4</td>
<td>Scrap Move</td>
<td>If necessary, move any empty scrap buggies from BOS (track 1), using the high line and runaround track, to the scrapyard (Track 11); and replace with any loaded scrap buggies from the scrapyard (Track 11).</td>
</tr>
<tr>
<td>5</td>
<td>Assemble Steel Train</td>
<td>Pull loaded steel cars from Rolling Mill in turn from tracks 71, 72, 74-76 in turn and move to Morandoo sidings using runaround track. Deliver any loaded cars destined for steel mill. Make up outbound steel train on track 40, starting with brakevan, then cars for northern destinations, then cars for Newcastle, then remainder (except cars for Comsteel).</td>
</tr>
<tr>
<td>6</td>
<td>Assemble SLAG Train</td>
<td>Pull loaded slag and ash cars from Blast Furnace (Track 7) and BOS (Track 3). Transfer to Morandoo Sorting sidings (Tracks 38, 39). Assemble SLAG train on Track 40 starting with Brake Van.</td>
</tr>
<tr>
<td>7</td>
<td>Assemble Comsteel Trip Train</td>
<td>Make up Comsteel Trip Train in Track 40, starting with brakevan, then adding empty lime hoppers from Track 5, loaded limestone hoppers from Track 51, and any loaded or empty steel cars for Comsteel from Morandoo sorting tracks (46, 39).</td>
</tr>
<tr>
<td>8</td>
<td>Break up Incoming Steel / SLAG / Trip Train</td>
<td>As soon as possible after incoming train arrives, break up and deliver cars to appropriate sidings (e.g. refinery, scrap yard, BOS, Blast Furnace, Rolling Mill etc. Store Brakevan.</td>
</tr>
</tbody>
</table>

**SCHEDULE**

<table>
<thead>
<tr>
<th>Task no</th>
<th>Assign To</th>
<th>Comp</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>SW1</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>SW1</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>SW1</td>
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<tr>
<td>4</td>
<td>SW1</td>
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<tr>
<td>5</td>
<td>SW2</td>
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</tr>
<tr>
<td>6</td>
<td>SW2</td>
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</tr>
<tr>
<td>7</td>
<td>SW1</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>SW1</td>
<td></td>
</tr>
</tbody>
</table>

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**Fig 18: Steelworks Assignments**
Altogether well over 30 shunting manoeuvres are required to handle movements of coal, coke, limestone, lime, hot metal, slag, ash, ingots, steel product (blooms, billets, plate steel etc.) and refinery products, as they are switched between facilities. These include the wharf, high line, blast furnace, basic oxygen furnace, rolling mill, engine/blower house, coke ovens, refinery and slag dump. Movements of slag and trip trains between the main steelworks area and the Comsteel Zone are particularly complex as they involve crossing the busy Main Northern Line at Woodbury Junction.

Operating Manual

A 28-page Operating Manual has been developed to help operators familiarize themselves with the layout and operating plan, and is available on the website (www.newcastle-modelrail.com). To my surprise, quite a few people have actually read it!

The manual is periodically updated, and includes information on:

- The Prototype Railway
- The Track Plan and how it was selectively compressed from the Prototype
- Control Systems and System Architecture
- Rules for Train Crew
- Specific Rules for Fixed Location Operators

One aspect yet to be developed is communications between the dispatcher, signal boxes, yardmasters and locomotive foreman, or more specifically, communications infrastructure (a certain amount of yelling and hand gestures suffice at present). This will be particularly useful since experience shows trains seem to show up unexpectedly all over the place despite the best intentions of the timetable staff! Seth Neumann’s article on communications in the OPSIG Compendium should prove invaluable in that respect.

The Rule Book

There is also a set of Rules, partly tongue in cheek, designed to smooth operations (see below):

<table>
<thead>
<tr>
<th>Rule</th>
<th>Statement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rule 1</td>
<td>“UP” trains are headed South, to Sydney. “DOWN” trains are headed North, away from Sydney. South in this part of the world is always to your left as you face the layout. North is always to your right. Those people having difficult distinguishing their left from their right or of other political persuasions should report to the Despatcher for training.</td>
</tr>
<tr>
<td>Rule 2</td>
<td>Engine Crew will obtain their instructions from the Dispatcher in the form of a Train Instructions Card. These list details of train location, locomotive(s) including any changes, origin and destination stations, and details of any cars to be picked up or set down. They will also receive a throttle at this time. Throttles and Train Cards should be returned to the despatcher on completion of that duty. The despatcher will allocate trains to crew on the basis of traffic requirements and seniority. No correspondence will be entered into with the despatcher but appropriate bribes will be accepted.</td>
</tr>
<tr>
<td>Rule 3</td>
<td>Train crew and others are instructed that new Occupational Health and Safety procedures at the layout entrance are in effect, involving a duck under. Use of this facility whilst a train is passing overhead is dangerous and potentially expensive, especially if a brass locomotive is involved, and should be avoided.</td>
</tr>
<tr>
<td>Rule 4</td>
<td>Train Crew should, if necessary, pick up their loco from the ready tracks at Broadmeadow Loco under the instructions of the Roundhouse Foreman. No swearing will be tolerated in the event of a defective locomotive being allocated. They should return their loco, if appropriate, to the</td>
</tr>
</tbody>
</table>
servicing track at BML (Broadmeadow Loco) and report any defects in locomotive performance to the Roundhouse Foreman. Limited use of expletives is permitted at this time.

Rule 5  Train Crew must obey the instructions from the Fat Controller (Woodbury Junction Signalman) at all times, in particular when entering or leaving Port Waratah, Newcastle, Broadmeadow or staging. See Rule 3 with regard to the use of expletives.

Rule 6  All trains passing through Adamstown (whether from the main line, the Belmont Branch or the Yard) should hold at the appropriate signal for clearance by the Broadmeadow Yardmaster/Signalman prior to proceeding. Any derailments due to failure to follow this rule will result in demerit points and downgrading from Grange Hermitage to Chateau Nui San Wagga Wagga (see note below), or for repeat offenders, to Coca Cola.

Rule 7  Points outside of Woodbury Junction and Adamstown areas are still manually operated, and should be returned to “main line” positions after departure. See Rule 6 regarding derailments.

Rule 8  COMPLAINTS. All complaints regarding electrical malfunctions should be referred to Lachlan McGuire, chief electrical engineer. All complaints regarding signals (or lack thereof) should be referred to Roger Tuck, chief signaling engineer. All other complaints will be ignored.

Note: Grange Hermitage is Australia’s premium wine. Chateau Nui San Wagga Wagga is a cheap wine. See Monty Python’s skit of Australian Wine Connoisseurs for more details.

Table 4: The Rulebook

As is evident from the rulebook, my attitude to operating sessions is somewhat on the relaxed side - it’s lucky I’m not in charge of a real railway! Part of the fun for me is watching the chaos emerge and seeing how the operators cope with it.

Fig 19: (Left): Mishaps occur in the best run operating sessions, while “out of era” paint schemes are tolerated in informal operating sessions (Right). When all else fails there is always a glass of wine!

Fortunately, most of the operators also take a reasonably relaxed approach, although some do seriously try to get things to run as smoothly and prototypically as possible. But with up to 30 trains in a two-hour session, and up to five freight trains in Broadmeadow yard all wanting to exchange cars, seamless operation has yet to be achieved!

Formal and Informal Sessions

Because many operators come from several hours away, and because operators vary in skills, experience and tastes, I generally run an “operating day” as follows:

10:00am - 10:30am: Coffee, orientation and set-up
10:30am - 12:30pm: “FORMAL” Operating Session
12:30 pm - 1:30 pm: Lunch
1:30 pm - 3:30 pm: “INFORMAL” Operating Session
3:30 pm - 4:00 pm: Coffee and chat

The **FORMAL** Sessions attempt to run a timetable based on the mid 1960’s prototype, with only those locomotives and trains which are appropriate being used. Fortunately, many operators bring not only appropriate locos and rolling stock but also their own NCE throttles. The timetable is a cut down version of the actual working timetable, adjusted to take account of the compression of distances. To date this has been run both as a simple “sequence” timetable, and as a true timetable with a 2:1 fast clock.

However, the latter has so far proved unworkable, with over 30 train and light engine movements through Woodbury Junction in 2 hours, or one every 4 actual minutes, so a 1.5:1 fast clock will be trialed in future to reduce the intensity of operations.

The **INFORMAL** sessions are for people to run their own trains and to just have fun without the stress of a timetable or schedule. Many operators don’t have their own layouts, but value the opportunity to run their own rolling stock on a medium sized layout.

And since many of them have made major contributions to the layout, from building structures to installing decoders to wiring, building and installing signals, I enjoy being able to provide a venue for others to just run trains. Indeed, some strange “foreign” rollingstock appears on the layout from time to time, including recently a Burlington Zephyr set, some 8,000 miles out of its usual territory!

![Fig 20: (Left): Geoff Small and Peter Baron in conversation. Peter has installed DCC chips in many of my locomotives. (Right): Chief Signaling Engineer Roger Tuck, who has installed working semaphore signals on the layout as well as the Roco auxiliary DCC system used for points and signal control.](image)

The other advantage for me of “informal” sessions is that, I get to run trains myself! (instead of being the “fat controller / despatcher”).

Past sessions have sometimes run through till 6pm, so I assume people must be enjoying themselves. Much of the enjoyment I think comes from people just getting together, chatting about their latest triumphs or disasters, and sharing experiences, from decoder installations to scenery techniques.
CONCLUSIONS

Although there are few structures and little by way of scenery as yet on the Newcastle - Fassifern Railway, this doesn’t seem to bother people, and many seem to enjoy running trains on “medium density fibre-board central”.

From my experience, I would encourage people to get into operations as soon as they can, and not to worry about having a finished layout. Operations can rapidly expand your network of friends and with it the range of skills and experience you can draw on. It can also help you debug your track work and wiring before scenery gets in the way.

My own perspective on operations is that I feel there is real value in trying to operate a layout as closely to prototype practice as possible, whilst at the same time not getting too bogged down in paperwork. I think there is a lot of satisfaction from replicating the actual transportation system which railways provide. For me, much of the fun comes from trying to reproduce the wonderful variety provided by the real Newcastle railway in the mid 1960’s and re-creating “rail fan” heaven.

ACKNOWLEDGEMENTS

I would like to acknowledge the fabulous help I have received over the last four years from many fellow modelers, including Lachlan McGuire, Roger Tuck, Peter Baron, John Briggs, Marcus Ammann, Peter McGuire, Alan Birse, Alan Garbutt, Laurie Moses, John Zubrikas, Denis Gilmore, Alistair Gilmore, Dick Day, Chris Day, Brian McWilliam and many others.

I would also like to acknowledge the help and inspiration I have gained from visiting many of the great layouts in the US including those of David Parks, Howard Zane, George Sellios, Bernie Kempinski, Seth Neumann, Chuck Catania, Rick Fortin, Bill Kachel, Tony Koester, Ted Pamperin, Ken McCorry, Mike Rabbitt, the late John Pryke and others. You guys might run on the wrong side of the tracks, but you do it with style!

REFERENCES


For a video of recent Coal Train action in the Hunter Valley, NSW, see for example https://www.youtube.com/watch?v=r5UjAT0oQ80. For videos of rail action in the Hunter in the 1960’s, see for example https://www.youtube.com/watch?v=ePpG4tVHSMQ&t=273s

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