

The Pichi Richi Railway Extension Project



Stirling North to Port Augusta

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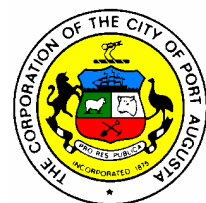
2002 Track Work Achievement Award Submission

Permanent Way Institution SA Section

Submitted by:-

Corporation of the City of Port Augusta on behalf of the:-

- ♦ City of Port Augusta
- ♦ Tourism SA
- ♦ Pichi Richi Railway Preservation Society Inc



INTRODUCTION

Pichi Richi Railway trains for many years operated to Woolshed Flat from Quorn a distance of 16 Kilometres. In 1998 Stage 1 of the Pichi Richi Extension Project received support from the Federal Government Rail Reform Transition Program with a grant of \$1.35m. This enabled the remaining 16 kilometres of track to Stirling North (7km from Port Augusta) to be fully rehabilitated.

Also four the original Port Augusta built Ghan carriages, three sitting cars classed NABPA, and the Special Services car NSS34 were rebuilt to their original glory.

Historic steam trains commenced regular operations between Quorn and Stirling North every Saturday and most Wednesdays during the tourist season of 2000.

STIRLING NORTH TO PORT AUGUSTA EXTENSION

The final leg into Port Augusta Railway Station, a destination never thought possible in 1973 when the Pichi Richi Railway Preservation Society was formed became a reality in 2001 with the completion of 7 km of new track, running along side the main ARTC standard gauge line.

This stage was a joint venture between

- Corporation of the City of Port Augusta
- South Australian Tourism Commission
- Pichi Richi Railway Preservation Society Inc
- Pichi Richi Afghan Express Committee

The City of Port Augusta was the Project Manager for the construction work. It has certainly been a long time since Local Government has been responsible for the construction of a railway in Australia.

The Aramac Shire in the central west of Queensland constructed and operated a line from Barcaldine to Aramac until the 1960's. Another ran between Kerang and Koondrook in the Riverland, northern Victoria but they are few and far between.

The project has also been assisted by: -

- NRG Flinders by approving the construction of an underpass for the Pichi Richi Rail line to pass beneath their Leigh Creek coal line at Stirling North.

- Australian Rail Track Corporation (ARTC) for approving a licensed corridor and interface agreements for the construction, operation and maintenance of the new track within their rail corridor
- Transport SA for providing leases for terminal facilities in the Port Augusta Station precinct, assisting with easements, and provision of second hand rail.

The construction of 7km of new track required the following: -

- earthworks requiring the excavation and placement of approximately 25,000m³ of material
- dismantling, transport and relaying of 1300 lengths of 12.2m long rail totalling 500 tonnes.
- Construction of six turnouts at Port Augusta to provide a run around loop and access to the storage shed and turntable.
- Laying of approx 11500 sleepers comprising approximately 10,000 Redgum timber and 1500 steel sleepers
- Use of 30,000 secondhand dogspikes, 10,000 screwspikes and 5200 fishbolts
- Transport distribution and tamping of 8,000 tonnes of ballast
- Design manufacture, transport and installation of 13 large precast concrete culvert crown and 14 base sections. The installation was undertaken in only 60 hours to ensure no disruption to coal supplies from Leigh Creek.
- Installation of around 1600 pieces of pin-crib walling to the underpass at Stirling North.

PORT AUGUSTA FACILITIES

To operate steam trains from Port Augusta to Quorn and return a basic preparation, running maintenance and secure storage shed and compound was constructed. The Port Augusta facilities consist of: -

1. Steel framed 90 metre long shed containing two tracks providing enough room to secure the Afghan Express steam locomotive and carriages
2. An amenities area for the crews containing office, smoko room, W.C.'s and showers
3. A restored 18.2 metre turntable to enable steam locomotives to be turned around at the end of each journey ready for the next
4. Resurfaced platform at Port Augusta station including new furniture such as park bench seating, bins and signage, resurfaced roadway and parking.

TIMELINES AND PROGRAM

The project gathered momentum during October and November 2000. All the necessary development approvals from the various government agencies, NRG Flinders and ARTC were eventually worked through and obtained by mid February 2001.

The original program had considered a construction program of 10 months with a completion target date being the all important Centenary of Federation Event – “Tracks to Federation” which would see the Pichi Richi train steaming into Port Augusta alongside the Federation Train en route to Perth on Monday 22nd October 2001.

The program was designed to accommodate a range of the other activities and limitation that would provide minimum cost outcomes to the project. These included but were not limited to: -

1. recovery and transport of rail from Cambrai being organised by Pichi Richi volunteers and subcontractors.
2. provision of the necessary quantity of timber sleeper from smaller/individual cutters at a rate they could supply.
3. availability of existing Pichi Richi Railway plant and equipment to support a relatively small workforce so as to minimise hire and or purchase of equipment.
4. ability of local contractors to contribute to the project given existing work loads.

As it turned out, the last approvals delayed physical site work until early March. This also provided for an initial stockpile of sleepers to be prebored and some personnel training to be undertaken prior to production activities. The delay was somewhat of a blessing as the region experienced some of the most severe summer temperatures for many years. Port Augusta regularly reached over 40^oC with a maximum of 47^oC.

The program of construction ultimately was reduced to about 7.5 months and little float in the schedule remained. Fortunately only 2 days were lost to inclement weather and with the transfer of the workforce onto construction of the concrete encased track at four level crossings, and the construction of six turnouts the supply of sleepers just kept up.

The construction gang consisted of former A.N.R/C.R. trackman Barry Retallack and six local track workers/plant operators employed specifically for the track and associated constructions. All other Project Management functions, including scheduling, purchasing/tendering processes, specifications were undertaken by the author.

Barry had been employed previously by Pichi Richi Railway to assist with the restoration of the track between Woolshed Flat and Stirling North. He developed an intimate knowledge of Pichi Richi plant, equipment and materials and was an enthusiastic leader on the job.

PLANT AND EQUIPMENT

Most of the plant and equipment was provided at no cost to the project by Pichi Richi Railway. The project contributed to the direct operating costs of the equipment provided. Equipment provided by Pichi Richi Railway consisted of:

1. Dual Cab Dodge Truck 5 tonne tipper
2. Ford A62 F.E.L.
3. Gemco combination resleeping machine/scarifier (used mainly as an on track tractor to access the cutting/underpass construction site.)
4. Electro matic Mark II Torsion Beam Production Tamper.
5. Portable Gensets – 1 x Honda
1 x B & S
6. 5 Kango 900/1000 electric tampers.
7. Electric drills for on site sleeper boring
8. Pneumatic Ingersoll–Rand spike drivers x 3
9. Pneumatic Impact wrenches x 2
10. Full range of track tools including track bars, "Annie's foot" bars, snatches, 'Jim Crow', hammers, gauge bars, air hoses, sockets etc, etc.
11. Flat top trolley trailers x2
12. Petrol powered reciprocating rail saw x2
13. Petrol powered 2 stroke rail borers x 2
14. 4 wheel ballast plough and 12x4 wheel ballast hoppers
 - 6 VTE ex Queensland Railways owned by Pichi Richi Railway
 - 2 HFN ex SAR owned by Pichi Richi Railway
 - 4 HFN ex SAR leased from Steam Town Peterborough
15. Trailer mounted 'Porta-loo'

In addition to the equipment available from Pichi Richi the following items were used:-

1. A Multispindle sleeper borer loaned for the job from the Puffing Billy Railway was regauged from 762mm to 1067mm to prebore sleepers
2. A 8 tonne Isuzu tray top with Hiab hoist was hired locally
3. A second hand 100 c.f.m. trailer mounted air compressor was purchased
4. Port Augusta Council provided the following plant on an as required basis
 - 8 tonne tipper
 - Grader
 - F.E.L.'s
5. A Comeng Aresco ballast regulator was hired from Zig Zag Railway in NSW.

RAIL

Most of the Pichi Richi's reusable 60 Lb rail stocks, built up over 15 years were consumed in the upgrading of the extension from Woolshed Flat to Stirling North during 1998/99. Only a handful of lengths remained. Negotiations with Transport SA enabled 60A rail from the redundant and isolated broad gauge section of the former Sedan Railway, between Apamurra and Cambrai to be relocated to Stirling North and Port Augusta. It was known that the rail had deteriorated in recent times where drifting sand had established couch and other grass growth around the foot of the rail. Foot and lower web corrosion was far more extensive than expected and approximately 30% was ultimately considered not suitable for reuse. A further 70 lengths were also defected after delivery to the Port Augusta site. Pichi Richi were required to enter an agreement with TSA to dismantle the line and clean the site fully of all rail, sleepers and other fixtures at their expense.

The rerailling diagrams for the Sedan Line showed 60A rail in 40 foot lengths north from Appamurra to a point about half way to Cambrai, then continuing in 30 foot length until about 1 kilometre south of the town. The remainder was in 61 1b rail. The 60A was brand new into the track during construction where as the 61 Lb was second hand.

The corrosion of the rail was greatest in the area laid with the 40 foot rail and barely enough was recovered to complete the 7 kilometres between Stirling North and Port Augusta. The rail was broken up and dragged to suitable loading locations along the route. Loads of approximately 60 lengths were trucked north and unloaded directly on the new formation as close as possible to their final location.

EARTHWORKS

The major part of the earthworks was the excavation of a cutting to provide an underpass beneath the NRG Flinders Leigh Creek Coal Line. The future route options to the west of Stirling North had been considered in some detail a few years earlier during the rehabilitation of the track from Woolshed Flat to Stirling North. Pichi Richi's lease of the rail reserve terminated at North Terrace Stirling North at the east side of the main ARTC corridor. Clearly an at grade continuation through Stirling North close to the original alignment would not be acceptable to the main line owners, nor would it be cheap to construct special crossovers and provide for signalling to control the interface.

The only real option was to keep the two incompatible systems entirely separate. A grade separation with the narrow gauge going under the coal line was clearly the front runner due to the lower height clearance required by the old SAR/CR minimum structures diagram and the ability to have approaches on relatively steep grades with sharp curves. These only needed to be compatible with the existing limitations through Pichi Richi Pass were a very tight 6.5 chain (130m) radius and a ruling grade of 1 in 60 uncompensated were common.

Ultimately an underpass location was approved by NRG Flinders. This enabled an 'S' curve approach for the west end. Commencing at the Harris Street level crossing the track reaches the underpass on 12 chain curves with a grade of about 1 in 60. The east approach involves a 10 chain curve on a grade of 1 in 55 directly from the apex of the triangle constructed previously to provide a turning facility for trains terminating at Stirling North from Quorn. The triangle involved each curved leg crossing the sealed access road to the City of Port Augusta refuse reserve. The alignment of the triangle was asymmetrical with one leg curving at 6.25 chains and the other at 9.5 chains; the latter becoming the mainline once the Port Augusta extension was established.

The excavated material amounted to around 25000m³. The three main uses were to

- a) provide a 5 metre wide increase to the width of the causeway across 'Lake Knockout' approximately 1.2 metres high and 950 metres long.
- b) provide a 250mm capping to the loose sandy formation to enable access for construction and vehicles and plant
- c) to fill borrow pits in the dump site which was originally a Commonwealth Railways ballast reserve and for years after had been used as an uncontrolled dump site for all sorts of nasties created by the railway activities in the years gone by.

FORMATION ALIGNMENT

After reaching Harris Street level crossing at Stirling North the construction essentially paralleled the ARTC mainline along the corridor to Port Augusta. The corridor varies in width but is generally around 60 metres wide. The final alignment of the Pichi Richi track did however require positioning to meet certain requirements.

- 1) At level crossings the track centres were reduced to between 8 and 9 metres to minimise vehicular problems associated with the operation of the crossings with flashing lights and boom gates. Stirling Road created some problems due to the proximity of a large valve pit in the Morgan-Whyalla pipeline. Here the new track was slewed away from the ARTC mainline and back again to clear the pit.
- 2) Between the crossings in the open country east of the lagoon the offset from the main line is around 18 metres to clear existing ARTC and Telstra cables. Across the lagoon it reduces to around 11 metres, again to clear cables and provide vehicular maintenance access and then for a short distance of approximately 450metres the centreline is reduced to 5 metres on the approach to the Highway 1 underpass. Finally in the built up area of Port Augusta it remains at approximately 8 metre centres. Curves to connect all these alignments are generally around 30 chains (600m) radius.

TRACK JEWELLERY

The collection and use of secondhand track components was an exercise in 'scrounging' and recycling where possible. Purchase of new items was necessary to cover the shortfalls.

1) Dogspikes

Approximately 30,000 second hand dogspikes of various lengths were used in the majority of the red gum sleepers. These were provided by Pichi Richi Railway at no cost to the project and represented about 80% of the stock built up over 10 years.

2) Ajax Preservation Screws

The track through Pichi Richi Pass for its entire operating life never had a rail anchor applied to rails by any of the administration (SAR, CR) despite numerous fixed points and long gradients. Only a small number of anchors had been collected by Pichi Richi over the years and these were to be all consumed on the approaches to the underpass at Stirling North.

To make some effort to control rail creep in a similar manner to the 1 in 3 steel sleepers sections, galvanised 19mm Ajax Screws were installed on all the timber sections at 1 in 3. These all timber sections were limited to the approach to all level crossings, most being around 0.5 km long. The use of these screws was considered a useful test case for the future as availability of dogspikes both new and secondhand is becoming more difficult.

3) **Base Plates**

Like the stocks of 60 Lb rail, all the 60 Lb base plates were consumed in the upgrade of Woolshed Flat to Stirling North where unplated curves were plated and 60 Lb rail was used to replace worn 50 Lb rail.

Less than 2000 reusable plates were expected from the Cambrai recovery work so it was decided to fully timber sleeper the curved approaches to the Stirling North underpass. These curves were the only sharp curves on the extension to Port Augusta with the exception of the 9 chain curve into the station at Carlton Parade which was also plated. Single lip, symmetric pattern plates were used on these curves, where as all the other track is unplated. The use of baseplates on all curves less the 12 chain radius is consistent with the existing trackwork through Pichi Richi Pass.

4) **Fishbolts**

Most second-hand fishbolts/nuts were too poor to reuse due to shank corrosion. Approximately 80% of fishbolts were provided new by Ajax Fasteners. Sweetmans Fasteners supplied flat washers and Industrial Spring and Engineers the new spring washers. The new fishbolts effectively used the last stocks of fishbolts on the shelf in Australia. In fact to complete the order a significant quantity was shipped from store in north Queensland and a special production run was required, to complete the order.

SLEEPERS

Most of the track was constructed using river red gum sleepers from the Echuca region. Sleepers measured 2.0m x 225mm x 115mm and were trucked direct from the suppliers to a temporary compound provided by Aztec Services near the Highway 1 overpass. This was a central site and enabled easy unloading and preboring before distribution to site using smaller vehicles. Only those sleepers that could be consumed in track construction on the day were delivered to the work site. On at least one occasion sleepers set up with spikes, with rail in position for the next days spiking were stolen from the work face.

For those areas not affected by track circuits for level crossing protection equipment, one in three steel sleepers were provided at very competitive rates by One-Steel Trackloc. These were nominally 7.5mm thick pressed steel sleepers set up to accommodate the 60A rail in a flat configuration. This meant that the steel sleepers could not be used where baseplates were to be used with the timber sleepers, however this was anticipated as the available materials were sourced and allocated throughout the project.

BALLAST

Some of the big cost savings was having a ballast crushing plant immediately adjacent to the railway reserve, resulting in negligible road transport of ballast.

40mm ballast was crushed by Boral Resources at Stirling North and stockpiled in the railway reserve, enabling rapid loading by their two Cat 966 F.E.L.'S.

With loading times as low as 12 minutes up to 4 return trips were accomplished in a day using volunteer Pichi Richi Railway train crews and ballast runners.

A total of about 8500 tonnes were used. Train loads of 168 tonnes using the rake of 12 four wheeled hoppers with bomb bay doors and a single direction 'v' type ballast plough enabled fairly good distribution. A deflector plate was bolted to the nose of the 'v' plough to offset the ballast distribution to the high leg on curves as and where necessary. Ultimately two passes were used to distribute ballast to provide a minimum of 100mm below sleepers once tamped. This is much better than most of the existing Pichi Richi track which is still 'muck' ballast.

Ballast distribution was delayed until July as a result of wet weather problems that prevented completion of the track through the underpass and insurance issues with NRG Flinders. By this time the rail head was well over the lagoon and nearing the Highway 1 underpass.

Some ballast was however delivered by road to construct the turnouts and ramps at each level crossing.

PORT AUGUSTA TERMINAL

The track terminates on the dock platform directly opposite the through main standard gauge line. Terminal track work was kept to a minimum and includes a platform track and run around loop, with a dead end to the old motor vehicle loading ramp.

A siding leads to a two track running/storage shed adjacent to the run around loop. On the opposite side (south) side of Carlton Parade a further siding leads to a manually operated 60ft diameter turntable.

One of the traditional railways characteristics was never to waste depreciating assets! And this construction was not really any different.

The turntable came from Kapunda and was donated by Australian Southern Railway. It was lifted from its original resting place using a 100 tonne crane provided by James Contracting Supplies and transported by road to Port Augusta by local heavy carriers V.O. Whiting & Son. At a contractors yard it was stripped of rail, sleepers and decking before being grit blasted, weld repaired and repainted. Once positioned at its new site opposite the old C.R. Stores Building on Railway Parade, new jarrah timbers were installed and rails regauged to 3'6".

The track work at Port Augusta, by design required 2 x 1 in 10 and 4 x 1 in 8 turnouts. By pure coincidence the track work recovered from the Cambrai yard contained exactly that. The turnouts, like all the plain track were 60A rail and were 'cut and shut' to regauge from 5'3" to 3'6". They are all the old SAR type featuring narrow heel opening and cast iron chairs with pins and cotters fixing them to the stock rails.

Because part of Cambrai yard was rubble over for road truck access to the silo and some point work had been oxy-cut apart and laid aside a reasonable amount of reworking was necessary to produce serviceable components.

Point rodding was modified to accept switch stands rather than the old 'cheeseknob' lever. Also all chairs were screw spiked to the timbers instead of the traditional method of a round headed peg. Like almost all turnouts on PRR these were constructed without sleeper plates. The curved closure rail was however double spiked on the field side. The use of screw spikes and double spiking has prevented gauge widening for nearly 20 years on turnouts in the Quorn yard which are subject to just about every train movement Pichi Richi operates.

PROJECT BUDGET

The available funds made the project very tight from the beginning. Difficulties encountered with quoted prices for level crossing active protection equipment being higher than budget prices due to a falling Australian Dollar and other factors compounded these constraints.

The exceptional efforts of a very hard working and dedicated construction crew, ably supported by Pichi Richi Railway volunteers and understanding local contractors however contributed to an acceptable outcome, pretty much on budget and just in time.

Whilst the fully functional active protection of level crossings was not completed until recently (Sept 2002) the infrastructure was sufficiently complete to enable Pichi Richi trains to commence regular operations during Easter 2002.

A review of the main cost categories below indicates how economically the railway has been constructed.

Earthworks

- ♦ includes survey and all earthworks, plus the underpass constructions, drainage, etc. \$528k

Level Crossing Works

- ♦ includes concrete encased tracks, all active protection equipment and services relocations. \$698k

Track Work

- ♦ includes all rail, sleepers and ballast purchases, all labour, plant hire, fastenings and turntable installation \$644k

Running/Storage Shed

- ♦ includes all concrete flooring, pits, steelwork, fencing, amenities, security, power, water and compressed air \$254k

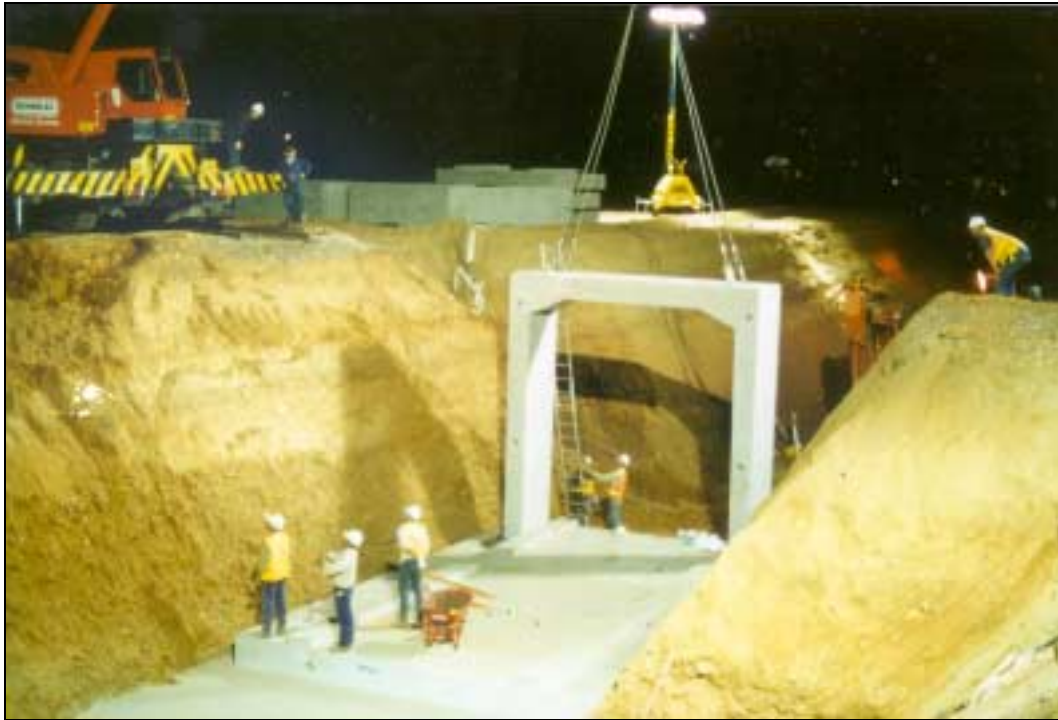
Utility Alterations

- ♦ includes relocation, upgrades of the ETSA, SA Water, Telstra & RIC equipment en route \$105k

Miscellaneous

- ♦ includes leases/licences, etc \$16k

TOTAL \$2.245m



Lifting the first crown unit into position around 8.00 pm on Anzac Day 2001. The crane was rated at 90 tonne maximum. Trains were running again in under 24 hours.



One of the first empty coal trains approaches the underpass. Note the crib walling in the foreground is only partially complete.



Early track construction between Harris Street and Footner Road. Note the 1 in 3 steel sleepers.



Trimming the top of the widened embankment across Lake Knockout. A local contractors vintage Cat D5 dozer was more than adequate.



New track on the eastern approach to the underpass ready for spiking. Note staggered joints and single lip base plates throughout. Gradient 1 in 55: Radius 10 chain.



The concrete encased rail being completed on the west bound carriageway on Stirling Road, Port Augusta. Note the strongbacks used to hold the rails in correct position.



First drop ballasting along the platform road at Port Augusta Station using ex S.A.R. Port Lincoln Division plough BP3533 and 12 four wheel hoppers.



PRR's Mark II Torsion Beam Tamper 'fanging' across Lake Knockout with ex CR Trackman, Kenny White on the 'wander lead'.



Volunteers from the Puffing Billy Railway, Victoria dressing timbers on the newly positioned turntable, opposite the old CR Stores Building on Railway Parade, Port Augusta



On Monday 22nd October, 2001, PPR's doubleheaded 18 car train and GSR's 30 plus train 'tip toe' through the estimated 5000 people trackside between Stirling North and Port Augusta