INLAND RAIL

Inland Rail Business Case Briefing Paper No. 3

Technical and operational parameters

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ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

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Introduction

This paper contains information drawn from Inland Rail's 2015 *Programme Business Case* (the Business Case). The Business Case, prepared for ARTC by PricewaterhouseCoopers, was published in 2015. Infrastructure Australia subsequently included Inland Rail as a Priority Project on the *Infrastructure Priority List*. Additional information is drawn from Inland Rail's service offering, and from answers provided to Questions on Notice arising from the Senate Committee Inquiry into Inland Rail. Some of these answers provide updated information based on work undertaken during Inland Rail's continuing development.

The paper includes information under six headings:

1. Key technical specifications
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1 Key technical specifications

Information on Inland Rail's technical and operational specifications is given in Appendices A and B to the 2015 Inland Rail *Programme Business Case* (the Business Case). These specifications underpin the four key characteristics of the Inland Rail Service Offering: reliability, price, transit time and availability.

Train Length: 1,800m with future proofing for ultimate 3,600m train length

Axle Load / Maximum Speed: 21 tonnes @ 115km/h, 25 tonnes @ 80km/h, with future proofing for 30 tonnes @ 80km/h

Double Stacking: 7.1m clearances for double stack operation

Interoperability: Full interoperability with the interstate mainline standard gauge network. Dual-gauging in Queensland to provide for connectivity to the Queensland narrow gauge regional network. Connections to the NSW Country Regional Network to provide for standard gauge connections to the ports of Melbourne, Port Kembla, Sydney, Newcastle, Brisbane, Adelaide and Perth.

2 Minimum design standards

General alignment standards:

Design speed	115km/h
Maximum grade	1:100 target, 1:80 maximum (compensated)
	1:200 maximum at arrival or departure points at loops
Curve radius	1,200m target, 800m minimum
Cant / cant deficiency[1]	Set for intermodal reference train

[1] **Cant / Cant deficiency:** Trains operating in curves experience a lateral force (centrifugal force) to the outside of the curve that is a function of speed. Cant refers to the degree of superelevation of the track (i.e. raising the outside rail in curves, similar to banking a road) to partially compensate for the centrifugal (sidewise) force when travelling through the curve, allowing trains to travel safely at higher speeds

Medium speed alignment standards (mountainous terrain):

Design speed	80km/h minimum
Maximum grade	1:100 target, 1:50 maximum (compensated) 1:200 maximum at arrival or departure points at loops
Curve radius	800m target, 400m minimum
Cant	Set for coal reference train
Corridor width	40m minimum
Rail	Minimum 53kg/m on existing track; 60kg/m on new or upgraded track
Concrete sleepers	Rated @ 30 tonne axle load
Sleeper spacing	667mm spacing (1,500/km) - existing track 600mm (1,666/km) - new corridors / track or re-sleepering existing track
Turnouts	Tangential, rated at track speed on the straight and 80km/h entry / exit on the diverging track
Crossing loops (initial)	1,800m (clearance point to clearance point) plus signalling overlap No level crossing across loops or within road vehicle sighting distance from loops

3 Future proofing

Train length	To provide for future extension of maximum train length to 3,600m
New structures	Capable of 30 tonne axle load @ 80km/h minimum
Formation	Formation on new track suitable for 30 tonne axle load @ 80km/h
Crossing loops	Loops designed and located to allow future extension for 3,600m trains

4 Reference train

Intermodal	21 tonne axle load, 115km/h maximum speed, 1,800m length (initial), 2.7hp/tonne power:weight ratio
Coal / bulk	25 tonne axle load (initial), 80km/h maximum speed, length determined by customer requirements within maximum train length

5 Operational specification

Freight train transit time (terminal to terminal)	Target driven by a range of customer preferences and less than 24 hours Melbourne terminal - Brisbane terminal for the intermodal reference train. Flexibility to provide for faster (higher power:weight ratio) and slower (lower power:weight ratio) services to meet market requirements
Gauge	Standard (1,435mm) with dual standard / narrow (1,067mm) gauge in appropriate Queensland sections
Maximum freight operating speed	115km/h @ 21 tonne axle load
Maximum axle loads (initial)	21 tonnes @ 115km/h 23 tonnes @ 90km/h 25 tonnes @ 80km/h
Clearance (terminal to terminal)	As per ARTC Plate F for double stacking (7.1 m above rail)
Maximum train length (initial)	1,800m
Braking curve	G40 for intermodal reference train
Reliability and availability	Competitive with road

6 Additional technical and operational information

Number of crossing loops between Melbourne and Brisbane: There will be 54 crossing loops (also known as passing loops) which are sections of track that allow a slower or non-priority train to wait off the main line while a faster or priority train continues unimpeded - or allow trains running in opposite directions to pass. The sections from Seymour to Albury/Wodonga and from Junee to Illabo have no crossing loops as the sections have double track and these sections total 221km or some 13% of the 1700km route.

The number and spacing of crossing loops are determined in order to accommodate more reliably the capacity, Service Offering and anticipated train plan (timetabling) requirements for Inland Rail. Crossing loops are not evenly spaced given that the capacity requirement varies over the network.

Crossing loops determine capacity but are also intrinsically linked to the Service Offering, both in terms of transit time (fewer loops = longer transit time as trains spend longer waiting in loops for passing or opposing trains to arrive) and reliability (fewer loops = lower reliability due to the longer average transit time).

How long does a train spend in a crossing loop: Typically, a train would spend in the order of 10-20 minutes in a crossing loop if required to utilise one although about 50% of trains will run through with no requirement to stop in a loop.

The average speed for a 24-hour transit from Melbourne to Brisbane is just over 70 km/h. This accounts for a range of factors including time spent in crossing loops (minimised by efficient train control), and track curvatures and gradients which slow trains below the design speed achieved on straight and level sections.

Number of level crossings and waiting times: Current planning for Inland Rail includes 391 public road-rail interfaces between Tottenham in Melbourne and Acacia Ridge in Brisbane. This includes 62 road-over-rail or rail-over-road grade separations, 173 public level crossings with fully active protection (signal lights, gates and bells) and 156 with passive protection (signs).

There are also 209 private level crossings providing access from a private property to a road or between parcels of a severed property, three of which will have active protection and 206 with passive protection.

The above figures are at the reference design stage. The final number of level crossings will be determined through approval processes following the preparation of Environmental Impact Statements.

It is estimated that the waiting time for road traffic for a 1,800m freight train travelling through a level crossing will be up to approximately 2 ½ minutes, inclusive of the length of time between boom gate warning lights signalling “stop” and signalling “all clear” once the train has passed.

Trains stopping at regional centres: It is expected that terminals in regional centres will likely be served by origin-destination specific trains and, in general, Melbourne-Brisbane trains will not stop to service these terminals. However, these decisions will be made by train operating companies depending on market requirements which will evolve over the course of the 100-year operating life of Inland Rail.

Number of trains per day: The attached map from the Business Case shows the expected number of trains per day on various sections of Inland Rail. Bromelton (13km south of Kagaru) has been added as a terminal in Brisbane since this map was prepared in 2015 due to the development of the SCT terminal there in 2017. Other adjustments to the route have also been made; for example, it no longer passes through Oakey or Kingsthorpe. Note that train numbers increase through to 2039/40 then drop following the assumed increase in some trains’ length to 3600 metres, anticipated to occur in about 2039. The additional capacity of each longer train from that time will initially mean a reduction in train numbers, after which the number will again gradually increase.

Appendix 1 Expected train movements per day – 2015, 2025 and 2040