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Raglan: Gateway Enterprise Park – Rail Connection

This letter confirms the rail layout and rail operations within the Gateway Enterprise Park site (formerly the Central West Regional Road/Rail Freight Terminal) and the connection to the main western rail line, is essentially the same as those described in Annexure 3 of the Central West Regional Road/Rail Freight Terminal Part 3a ENVIRONMENTAL ASSESSMENT, obtaining corresponding Concept plan approval 05_0047, 12th August 2006.

The following items have been revisited:

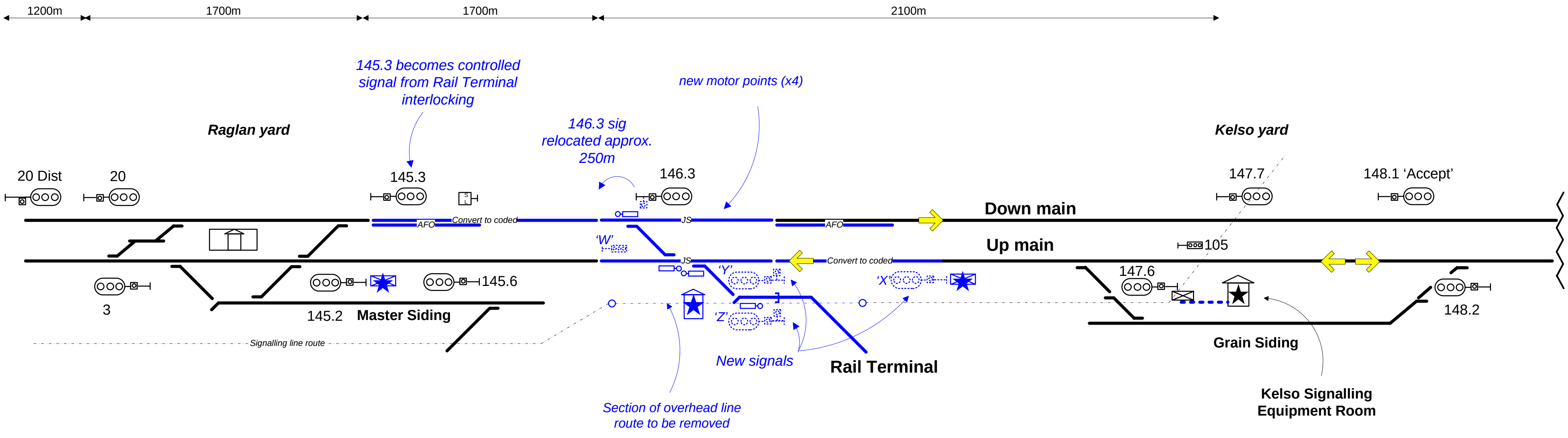
a) The siding curvature at the south-west corner of the site has been reduced to a radius of 200metres. This creates a more exploitable hard-stand area on the loading side of the train. There is no adverse impact on the train operations as a result of this modification.

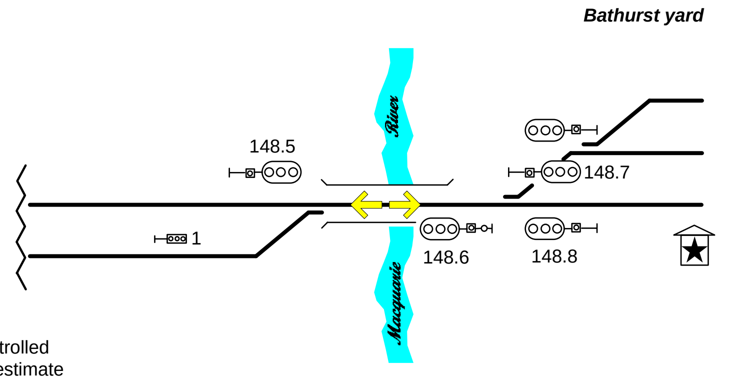
b) Levels across the rail portion of the site have been established. The proposed loading, motive power and maximum gradient of 1:100 has been modelled to ensure the trains will be satisfactorily managed into and out of the site as the connection to the main line is on a 1:46 grade.

Warren G Mills
Director
WANDS SOLUTIONS PTY LTD

Attachment:
- Proposed Rail Connection 15-12-2005

Raglan to Kelso Rail Signalling





LEGEND

Existing mainline signal	New underground (main) cable route
Proposed mainline signal	Electric points machine
Equipment cabinet	Computer based interlocking (Microlok / Microtrak)
Direction of train travel – as permitted by signalling system	Sign
Equipment room	*'Blue indicates new work'*
All distances are approximate	Not all details shown

Note: this sketch is one possible option for provision of remote controlled signalling but is not a proven or accepted design – the associated estimate is based upon the principles within this sketch

Note: without overlap track detection in siding all movements into siding will stop, timeout and proceed into terminal on authority of shunt signal

UTS Rail PTY LTD

NAME	SIGN		
DRN BY: Jeff Meurer	Jeff Meurer	DWG No: Raglan-Kelso sig V2.0.vsd	SHEET : 1 OF 1
CKD : Scott Ardley		ISSUE No : 1	ISSUE DATE: 19/7/06
APPD :		FILE :	

TITLE: RAGLAN RAIL TERMINAL

BATHURST INTERMODAL TERMINAL

RAIL SIGN OFF

This report deals with the issue of grading in the proposed Bathurst Intermodal Rail Terminal and its impact on departing train operations, as well as related issues to do with train running.

TRACK PROFILE:

The track profile was as laid out in long section plan A3-MW235SDG. In brief this proposes the siding come off the main line at a turnout at 235.48 km on a falling 1 in 48 grade (matching the main line at this point), steepening slightly to 1 in 46 once clear of the main line and continuing for 130 metres before reducing to 1 in 88 for a further 130 metres. From this point on the siding is planned to be 1 in 100 falling to the end of track at 236.44 km. Track speeds for simulation were set at 25 km/h for the turnouts (NSW standard) and 20 km/h within the loading part of the siding (ARTC Basic Siding Design Standards).

It should be noted that the siding is approached by a main line falling grade of 1 in 50 of approximately two km which has implications both for arriving (downhill) trains and departing (uphill) trains.

TRAIN CONSIST:

The train has been specified as comprising two 3000hp locomotives and 26 three TEU wagons with an overall length of 567 metres. Siding lengths are designed for this train so that longer (and heavier) trains are unlikely at any stage in the future. Trains were all simulated to start from 235.76 km at the upper end of the loading area.

The specified wagons are normally rated to run at up to 78 tonnes gross, but alternative similar length wagons can run at 92 tonnes gross at the same 80 km/h maximum speed or at 100 tonnes gross at 65 km/h. As a sensitivity test all three situations were simulated – 2028 tonne, 2392 tonne and 2600 tonne trains respectively. Experience suggests that the accumulated gross tonnage on trains of 78 TEU would rarely exceed 2000 tonnes.

SENSITIVITY TESTING:

As a means to validate the results of simulation the train was tested with three different gross tonnages, as noted in the preceding paragraph. As well a modified siding track profile was tested, entailing the 1 in 88 grade being steepened to 1 in 46 but the loading area being eased to 1 in 150. This test was to validate the ability of the train to negotiate a section of 1 in 46 grade with the specified loads.

An important issue for train load rating is the ‘effective grade’ – the average grade under the length of the train. As a cross check on the simulation results the effective grade under the train was added to the simulation output. The effective grade includes curve resistance so in cases where there are long continuous grades and curves the effective grade will be steeper than the nominal grade. In other cases where there are short sections of steep grade mixed with lesser grades, with only intermittent curves the effective grade can be flatter than the nominal steepest grade.

A secondary check on results was derived from train running data for the whole route to Sydney. The steepest grade encountered is 1 in 40 between Lithgow and Zig Zag. On this section the load rating for two 3000hp locos is 2260 tonnes (2400 tonnes for coal trains).

SIMULATION RESULTS:

As noted earlier three train loads and two track profiles were simulated. In all cases trains were able to start from the siding, and once the whole train was clear of the 20 km/h siding speed restrictions were able to increase speed. The place where this speed gain started happened to be where the effective grade was momentarily at its worst – 1 in 46 - which provided some confidence in the outcomes. The second issue of importance was that the trains performed very nearly identically departing from either of the two siding track profiles, which was to be expected since the centre of the train was lifted through the same gain in elevation in both cases.

A summary table of load, time from start to passing Raglan station (located at the top of the hill), speed through Raglan and the minimum continuous speed (balancing speed) on the ascent of the hill to Raglan is provided below.

TABLE 1: SIMULATION RESULTS FOR DEPARTING TRAINS

TRAILING LOAD (tonnes)	SDG PROFILE	TIME TO RAGLAN	SPEED THRO RAGLAN	MIN CONT SPEED
2028	PLANNED	7m 05s	29.5 km/h	27.1km/h
2028	REVISED	7m 05s	29.5 km/h	27.1km/h
2392	PLANNED	7m 48s	26.0 km/h	23.5 km/h
2392	REVISED	7m 47s	26.0 km/h	23.5 km/h
2600	PLANNED	8m 12s	24.4 km/h	21.8 km/h
2600	REVISED	8m 10s	24.4 km/h	21.8 km/h

The minimum continuous speed for the type of loco planned for this train is 20 km/h, suggesting that even with the heaviest load of 2600 tonnes there is a margin remaining before reaching critical (boundary) conditions. At the anticipated maximum load of 2000 tonnes there is a substantial capacity margin.

A secondary conclusion is that the siding approach of 1 in 46 could be lengthened to include the proposed 1 in 88 to allow the siding to be graded at 1 in 150 as recommended in the ARTC standards. This would entail the end of track (at 236.44) being 0.9 metres higher than now. Changes to the mix of grades in any alternative arrangement may change the outcomes as listed in Table 1 but will make no significant change to the ability of the train to start from the siding, provided that the steepest grade is kept around the 1 in 46 mark.

SIDING LEVELS:

The siding is approached by a two km main line section of falling 1 in 50 grade, while the facility itself has a short 1 in 46 grade which flattens to 1 in 100 falling for the working part of the siding. The actual working area of the siding is tightly constrained with only a small margin of tolerance for safe placement of a full length train.

There are two issues that arise from this arrangement –

- The ability of an arriving train to arrive under complete control into the siding and stop at the appropriate point without overshooting
- The grade under a standing train is steep enough that wagons (or the whole train) could run away if not properly secured.

Neither of these issues is a 'show stopper' but carefully constructed arrival, terminal and departure processes will need to be developed, based on risk assessment principles, to avoid overshoots or runaways.

As indicated in the sensitivity testing section earlier in this report it would be possible to regrade the siding to 1 in 150 with a simple change in the approach grades. This arrangement however makes little change to the effective grade under an arriving train and therefore would only make a small difference for an arriving train. It would however make securing the train during loading considerably safer and easier to manage.

It is recognised that the siding levels and the surrounding hardstand need to be aligned, in which case the issue of regrading will be rather more complicated than a simple track alteration. If it is not possible to effectively regrade the loading area an alternative might be to lift the track from the lower end of the loading area through to the end of track on a rising grade to provide some security against a runaway or minor misjudgement on an arriving train. Coupled with some form of energy absorbing end of track arrangement this could provide an alternative arrangement with a similar risk profile to a 1 in 150 grade for the length of the loading area.

A flatter grade than the 1 in 100 proposed for the siding would be preferred, but if that proves to be difficult to achieve a carefully designed rising grade / energy absorption end of track approach should provide a similar level of risk amelioration.

CONCLUSIONS:

It is concluded that:-

1. A train of 2000 tonnes gross, hauled by two contemporary 3000hp locomotives will have no difficulty in starting from the siding and maintaining a safe speed to the top of the grade at Ragan, some two km east. It is noted that through train loads between Bathurst and Sydney will be constrained by the grade out of Lithgow rather than the grades at Bathurst.
2. It is desirable that the siding either be flattened to a 1 in 150 grade, or that an end of track arrangement be provided that will provide a similar risk profile for arriving and standing trains.
3. Operating procedures will be required that deal with the arrival of trains, securing of standing trains or wagons, and shunting (uncoupling, coupling and any train rearrangement) in the siding, with particular emphasis on safety of the train and people working on site with the train.