AURIZON

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Annex S

(Confidential) Worley Parsons – Queensland Railways Maintenance Variability: Coal Network Cost Variability with Traffic Density, 18 August 2008

QR NETWORK

UT3 Parallel Active Comparison Exercise

Supporting document

Queensland Railways Maintenance Variability

Coal Network Cost Variability With Traffic Density

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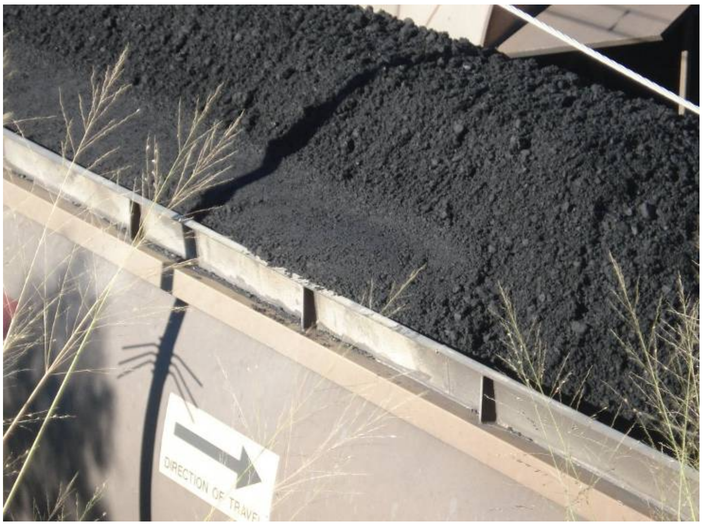

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SYNOPSIS

As supporting documentation to UT3 parallel active comparison exercise Queensland Rail Network commissioned WorleyParsons to carry out desktop review of the calculation for short run and long run marginal costs in relation to variations in GTK. This paper discusses the issues inherent in addressing maintenance variability in conjunction with variations in traffic density and forms part of the support documentation for the UT3 review.

Disclaimer

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1. FIT FOR PURPOSE & INFRASTRURE MAINTENANCE VARIABILITY

1.1 The QCA UT1 assumed a direct variability between infrastructure maintenance and the volume of traffic, measured by Gross Tonne Kilometres (GTK). It further imposed cost penalties and discounts for system users if tonnage exceeds or falls short of agreed annual volumes.

This logic stands on two pillars. First, that Maintenance is indeed variable with GTK over the short term. This is disputed, and is the focus of a WorleyParsons/Queensland Railways desktop engineering study. Secondly, it assumes a maintenance regime that could efficiently adapt to traffic variability in the short term. This is clearly unsustainable.

This paper addresses these issues.

Maintenance Regimes – State Monopoly and Open Access

State Monopoly

1.2 The traditional organisation of railways in Queensland, including the coal lines, was as a single large network, maintained by a large Infrastructure Division. Resources could, to a degree, be shifted around the whole network in response to traffic variation, weather events and accidents, with resources being balanced to achieve overall efficiency. Therefore, a traffic downturn on the coal lines would enable resources to be moved to productive work in other areas, thereby reducing the costs of maintenance on those coal lines without compromising overall QR network maintenance efficiency.

With the move to Open Access and outsourcing, this approach is no longer possible.

Open Access

1.3 The hybrid public ownership/ private access regime now adopted assumes infrastructure maintenance is contracted to a specialist provider. Both ARTC, Asciano and Connex Melbourne do this. That QR chooses to contact in-house to its own Network Infrastructure Division is just a variation on this model – the maintenance effort is still a “contract” and should be treated as such by the QCA.

2. REVIEW OF DIFFERENT JURISDICTIONS

Variability with volume

2.1 That track deteriorates significantly with high volumes of traffic may be taken as a given. Equated mileage parameters developed by AREMA are based on studies of major North American railways, although warnings are given that cost differentials can be significant between railways in different areas, and that at tonnages over 35 Mgta (Million gross tonnes per annun), the effect of additional volume is non-linear and unquantifiable by the AREMA study.1

Similarly, the Office of Rail Regulation in Britain has made several studies, recently summarised by Dick Bullock. The ORR findings in 2000, 2005 and 2007 for the variability of track renewal with tonnage have fluctuated from 36% to 44% and to 22%, and Dick notes that variability would be much higher for the QRNA heavy haul lines.[2]

2.2 The actual factors for track maintenance variability with gross tonne kilometres (GTK) while likely to be high, cannot be ascertained from desktop studies of railways elsewhere. The influence of track gauge, terrain, climate, wagon type, axle loading and train speeds are sufficient to warrant Queensland based studies. While insufficient time appears to be available to accomplish this in UT3, measures should be put in place to provide this for UT4.

2.3 When it comes to defining short term variability, the literature is meagre indeed. No study of this issue has been found. "Short-term" is invariably left undefined in the railway context. Nevertheless, the inability to change maintenance regimes in the short term is recognised. This leaves us with a conundrum. For heavy haul railways, there is a direct relationship between aggregate train mass (measured in GTK) and track deterioration; nevertheless maintenance costs are more or less fixed in the "short-term".

Therefore, significant changes in volume in Year 1 are unlikely to be reflected in higher or lower maintenance costs until several years afterwards. (Bearing in mind that any downturn will be used by maintenance providers to "catch-up" any deficit, and any upturn will initially restrict access and thereby initiate a deficit to be overcome later).

2.4 How then may access charges reflect the forward impact on costs, and still give access seekers some certainty that they will not be expected to "pay twice"? Some estimate of forward maintenance needs seems unavoidable, but past estimates have been has been proven to be unreliable when compared with actual performance. Maybe the forward estimate should be based on a maintenance contract for the line in question.

[1] Manual for Railway Engineering, American Railway Engineering and Maintenance-of-Way Association, 1999. p16-112
[2] Bullock, D. (2007) "Variability of infrastructure costs – recent developments in UK"

Usage and condition

2.5 Maintenance costs/km should be bracketed according to a lines usage and condition. Usage is straightforward, but condition is not. Condition is the basic track standard and residual life, modified by an assessment of maintenance deficit.

But how can it be ascertained what the deficit is at the beginning of a period, and how much has been eliminated (or added) during a period? If a maintenance on a section was going to be contracted for a period (say three years), the tender would indicate the items needing correction to start with, and specify to standard required at the end of the contact, with guaranteed track occupation regimes during the contact period. The prospective contractors would then bid accordingly. Access charges could then be based on the accepted bid.

Maintenance or renewal?

2.6 The issue of what constitutes "maintenance" needs clarification too. Some criticism has been levelled at QR for undertaking "renewals" in lieu of "maintenance". This issue has been recently studied, and the findings support the need for "renewals" as a means of ensuring overall maintenance costs are minimised.[3]

2.7 The authors of this study noticed that major U.S. railways maintain infrastructure through a mix of ordinary maintenance and periodic renewal of infrastructure components. The proportions of ordinary maintenance to periodic renewal varied, with little consensus as to the best combination. Furthermore, the cost-effectiveness of emphasizing one method over the other had not been analysed using empirical data. The study investigated the cost-effectiveness of renewal-based maintenance strategies using high-level financial data from industry sources, and found that maintenance strategies placing more weight on renewal generally result in lower unit maintenance costs. The results imply that if railroads constrain renewal maintenance to reduce overall capital expenditures, increasing maintenance expenses will more than offset temporary reductions in capital spending.

The results are consistent with the hypothesis that an emphasis on renewal programs for track maintenance was cost-effective from an engineering viewpoint and provides an explanation for why railroads have consistently increased their use of renewal maintenance in relation to ordinary maintenance. Additionally, apparent differences in unit maintenance costs can be largely explained by the degree to which individual firms apply renewal strategies.

[3] Cost-Effectiveness of Railway Infrastructure Renewal Maintenance, G.A. Grimes & C.P. L. Barkan
http://cee.uiuc.edu/railroad/CEE/pdf/

Given that renewal capital expenditures comprise the largest share of overall capital spending on railways, if they unduly constrain renewal maintenance in an effort to conserve capital resources, they will find that ordinary maintenance expenses will rise disproportionately in relation to the reductions in capital expenditures. Making such tradeoffs may improve free cash flow temporarily, but the effect will only be short lived as overall maintenance cost eventually increases.

2.8 The issue is a live one for the QR coal network, as rail replacement is recognised as the key item of variability with traffic volume, and one would expect that given the degree of ballast fouling on the coal network, undercutting and ballast renewal would run this a close second. It seems unreasonable to treat these items as "capital improvements" in an ongoing (or steady state) heavy haul context.

3. SHORT TERM VARIABILITY

Contract Maintenance

3.1 The resources of maintenance contractors must be geared to the contacted tasks; otherwise their businesses will be inefficient and unprofitable. Spare capacity is minimised, so that short term increases in task can only be met by buying in resources from other providers at short term hire rates. Conversely, a traffic downturn or other event that reduces the maintenance task will not reduce the contracted cost of the contract in the short term.

3.2 If contracted maintenance is assumed, it follows that it must be for an agreed traffic task, with the railway being maintained "fit for purpose" to set axle loads, speeds and maximum number of train paths. The number and length of track possessions would be agreed, as would the cumulative delays from speed restrictions.

Under a contracted maintenance regime, at the end of the period (say, two years), the railway must be as "fit for purpose" as at the beginning. The major inhibitions on a contractor which might hinder this objective would be:-

- traffic congestion reducing track possessions,
- weather damage, and
- accident damage

3.3 Major flood damage, or a major derailment are generally beyond the resources of a maintenance contractor to repair, forcing skilled labour and equipment to be brought in from other railway districts, or short term hired from other contractors at very high rates. It is not uncommon for resources to be sourced from many hundreds of kilometres, and for infrastructure work elsewhere to come to a virtual standstill while the emergency persists. This is the reason QR prefers to retain some otherwise redundant track machinery, but accessing skilled labour remains a problem.

3.4 The peculiar nature of railway infrastructure demands a training process, both in safety and maintenance methods and processes that militates against the quick take up of skilled labour. The problem is exacerbated by the remote location of most railway infrastructure worksites, and the short supply of labour in an economy with very low unemployment.

The railway industry has a number of small infrastructure maintenance providers, often ex-employees of the big State railway systems, who have set up as independent companies and purchased some smaller items of equipment. These resources are available at high daily hire rates, and are used to “fill the gaps” in the large maintenance contracting companies when an unforeseen workload occurs. There are few such small firms located in the Central Queensland coal network.