# Supplementary Report

# Review of the Queensland Rail (QR) West Moreton System

## Depreciated Optimised Replacement Cost (DORC)

## Using the Timeline of Expenditure

## for the Queensland Competition Authority

**September 2014**

**B&H Strategic Services Pty Ltd**

## Executive Summary

The Queensland Competition Authority has released a discussion paper outlining the factors that have been considered in a review of Queensland Rail's 2013 DAU and asking stakeholders for their views about certain parameters. The method of estimating the DORC for the West Moreton system was one such parameter. The methods of calculating the impact of the suburban system on Western System capacity as well as the estimates for maintenance were also the subject of the discussion paper. This review addresses those items where further information is to hand.

The West Moreton system is unlike any other coal line in Queensland in that it was built at a time when construction methods were rudimentary by today's standards and the line has a relatively short history in the task of hauling large volumes of bulk products such as coal.

Agricultural products have been transported over the line for more than a century but at relatively modest axle loads and tonnages by today's practice of coal haulage on the line. QR has sought to progressively improve the reliability of the line for coal haulage as tonnages increased over nearly two decades and has selectively upgraded components of the infrastructure.

In May 2014 B&H Strategic Services considered the methodology involving the estimation of ORC and its depreciation[1]. The QCA has subsequently asked B&H to consider an approach that reviewed the historical expenditure and the depreciation of assets.

This report has approached the calculation of DORC using a bottom up method and used principles that the QCA has provided to B&H in order to guide calculations used in this report. The principles are::

- Assets have an expected life and are depreciated on a straight line basis
- Assets that exceed their expected depreciated life have done so through maintenance
- Recovery of efficient costs for the purposes of calculating a tariff should follow what has actually been incurred comprising depreciation, WACC and efficient maintenance/operation

Each asset type on the system has had its history traced and its depreciation trajectory and value calculated. The initial value of the asset (IAV) in $2013 has been calculated and the remaining life has been calculated to produce a value of the remaining life as of June 2013 and we have shown this as the Remaining Life of IAV.

A pictorial has been developed to trace the life of each asset shown in Figure 1 and the notes underpinning the pictorial shown in Table 2.

Some assets comprise "asset bundles" where Capex was expended on a particular project and this is shown on the pictorial accordingly. Each bundle was further assessed for its components of the various asset types and their values are shown in Table 2.

**Figure 1 – Timeline Analysis of QR Assets on the West Moreton System**

[1] Review of the Queensland Rail (QR) West Moreton System, Maintenance Costs, Capital Costs (Capex), Operations Costs, Depreciated Optimised Replacement Cost (DORC) for the Queensland Competition Authority

## Figure 1 – Timeline Analysis of QR Assets on the West Moreton System

**Timeline Analysis of QR Assets on West Moreton System**

| Asset | 1867/1875…1967/1975 | 1995 | 2013 | IAV/RAV (with IDC) | Rosewood to Macalister | Macalister to Columboola |
|---|---|---|---|---|---|---|
| Legend | THE REGULATORY PERIOD OVER WHICH THE ASSET IS FUNCTIONAL | | THE PERIOD OF MAINTENANCE | | | |
| Tunnels | First 1867 Last 1875<br>LIFE OF ASSET | | ALL MAINTENANCE | Remaining IAV $0.00m 2013 | | |
| Timber Bridges | | | Last 1970<br>LIFE OF ASSET | IAV $2013: $13.36m<br>Remaining IAV $8.41m 2013 | 27.90% R-M<br>63.0% wght'd rem'g life 2013 R-M | 72.10% M-C Life to 2070<br>63.0% rmnng lf 2013 M-C |
| Concrete Bridges | | First 1970 | Last 2007 | IAV $2013: $35.34m<br>LIFE OF ASSET<br>Remaining IAV $28.53m 2013 | 98.07% R-M<br>80.9% wght'd rem'g life 2013 R-M | 1.93% M-C Life to 2107<br>74.00% rmnng lf 2013 M-C |
| Concrete/steel Culverts | | First 1957 | Last 2004 | IAV $2013: $27.72m<br>LIFE OF ASSET<br>Remaining IAV $12.20m 2013 | 87.57% R-M<br>44.0% wght'd rem'g life 2013 R-M | 12.43% M-C Life to 2104<br>44.0% M-C |
| Timber sleepers | | | ALL MAINTENANCE | Remaining IAV $0.00m 2013 | | |
| Steel sleepers | | First 1984 | Last 2005<br>MAINTENANCE | IAV $2013: $0.00m<br>Remaining IAV $0.00m 2013 | | |
| Concrete sleepers | | | First 1999 Last 2006 | IAV $2013: $44.23m<br>LIFE OF ASSET<br>Remaining IAV $35.99m 2013 | 100.00% R-M<br>81.4% wght'd rem'g life 2013 R-M | 0.00% M-C Life to 2056 |
| Ballast at 250mm depth | | | Last 1995<br>LIFE OF ASSET | IAV $2013: $19.95m<br>Life to 2015<br>Remaining IAV $1.99m 2013 | 100.00% R-M<br>10.0% wght'd rem'g life 2013 R-M | 0.00% M-C<br>0.00% M-C |
| Fences | | First? Last pre-1995<br>LIFE OF ASSET | MAINTENANCE | | | |
| Earthworks | LIFE OF ASSET | MAINTENANCE | Last 2007<br>MAINTENANCE | IAV $2013: $0.135m<br>Remaining IAV $0.127m 2013 | 100.00% R-M<br>94.0% wght'd rem'g life 2013 R-M | 0.00% M-C Life to 2107<br>0.00% M-C |
| Signals & telcomms Incl LXings | | First 1976 | Last 2006<br>LIFE OF ASSET | IAV $2013: $33.71m<br>Remaining IAV $4.32m 2013 | 78.90% R-M<br>16.0% wght'd rem'g life 2013 R-M | 21.10% M-C Life to 2026<br>0.8% M-C |
| 41kg/m rail at 50 yrs max life | | | First 1983 Last 2013 | IAV $2013: $106.98m<br>Remaining IAV $59.86m 2013 | 68.77% R-M<br>35.9% wght'd rem'g life 2013 R-M | 31.2% M-C Life to 2063<br>100.0% M-C |
| 50kg/m rail straights at 50 yrs max life | | Adjustments made for max 50 year life of rail | First 2006 | IAV $2013: $13.89m<br>Remaining IAV $11.94m 2013 | 100.00% R-M<br>86.0% wght'd rem'g life 2013 R-M | 0.0% M-C Life to 2056 |
| 50kg/m rail curves at 32 yrs max life | | Adjustments made for max 50 year life of rail | First 2004 | IAV $2013: $14.64m<br>Remaining IAV $10.52m 2013 | 100.00% R-M<br>71.9% wght'd rem'g life 2013 R-M | 0.0% M-C Life to 2036<br>0.0% M-C |
| 50kg/m HH curves at 50 yrs max life | | Adjustments made for max 50 year life of rail | First 2013 | IAV $2013: $6.38m<br>Remaining IAV $6.38m 2013 | 100.00% R-M<br>100.0% wght'd rem'g life 2013 R-M | 0.0% M-C Life to 2063<br>0.0% M-C |
| Top 600 | | Has never existed | | Remaining IAV $0.00m 2013 | | |
| Turnouts | | MAINTENANCE | | Remaining IAV $0.00m 2013 | | |
| Roads | LIFE OF ASSET | | MAINTENANCE | Remaining IAV $0.00m 2013 | | |
| Power Systems | | First 1975 | Last 1996 | IAV $2013: $3.18m<br>Remaining IAV $0.94m 2013 | 91.13% R-M<br>29.5% wght'd rem'g life 2013 R-M | 8.9% M-C Life to 2026<br>30.0% M-C |
| Pre 2007 Capex not Included in IAV (2007) | Western System Historical Capex 1995-2007<br>These items included in previous assets | | | Remaining IAV $0.00m 2013 | | |
| Jondaryan Track Upgrade Post 2007 | Includes Track, Bridges, Culverts | | First 2008 Last 2011 | IAV $2013: $15.18m<br>LIFE OF ASSET<br>Remaining IAV $13.82m 2013 | 100.00% R-M<br>91.0% wght'd rem'g life 2013 R-M | 0.0% M-C Wtd Lf - 2059<br>0.0% M-C |
| Columboola to Fisherman Islands Project Post 2007 | Includes Track, Signals, Culverts, Earthworks and Telecomms | | First 2011 Last 2013 | IAV $2013: $27.14m<br>LIFE OF ASSET<br>Remaining IAV $25.32m 2013 | 82.93% R-M<br>93.4% wght'd rem'g life 2013 R-M | 17.07% M-C Wtd Lf - 2053<br>92.6% M-C |
| Western System Asset Replacement Post 2007 | Track including turnouts only | | First 2007 Last 2013 | IAV $2013: $28.05m<br>LIFE OF ASSET<br>Remaining IAV $26.20m 2013 | 100.00% R-M<br>93.4% wght'd rem'g life 2013 R-M | 0.0% M-C Wtd Lf - 2048<br>0.0% M-C |
| | | | | Total IAV $2013: $389.89m | IAV $2013: $330.70m R-M | IAV $2013: $59.19m M-C |
| | | | | Of Total IAV | R-M 84.8% | M-C 15.2% |
| | | | | Remaining Asset Value $246.56m 2013 | RAV $2013 R-M $200.64m | RAV $2013 M-C $45.93m |
| | | | | Of Remaining IAV | R-M 81.4% | M-C 18.6% |

The pictorial indicates that the Remaining Asset Value in 2013 was $246.56m which is 63.2% of the Initial Asset Value. For the Rosewood to Macalister section this represented 81.4% of the remaining IAV of the total route with a value of $200.64m, while for the Macalister to Columboola section with a remaining IAV of $45.93m this represented 18.6% of the remaining IAV of the total route.

Table 1 shows the summary of the considerations for the DORC and Remaining Asset Value (RAV) by the two methods of estimate that have been used during these considerations. The ORC and DORC May 2014 are those derived using the hypothetical approach where Modern Equivalent Assets are considered. The IAV and Remaining IAV are those taking into account the actual expenditure profile of historic assets and are the subject of this report.

**Table 1 Summary of ORC, DORC, IAV and Remaining Life for Various Asset Categories as at 30 June 2013 by Different Methodologies**

| Asset Class | ORC 2007 (From EI report) | ORC 2013 (adjusted by CPI) ˜ | B&H (May 2014) | | B&H (Sep 2014) | | |
|---|---|---|---|---|---|---|---|
| | | | Remaining life (%) | DORC 2013 | IAV of Assets That Have Not Fully Depreciated | Remaining life (%) of IAV Assets | DORC 2013 |
| Sleepers | $148,847,554 | $175,433,587 | 51.30% | $89,997,430 | $44,232,628 | 81.37% | $35,993,723 |
| Rail | $119,365,687 | $140,685,890 | 52.10% | $72,672,349 | $141,893,717 | 62.52% | $88,706,565 |
| Turnouts | $6,640,000 | $7,825,987 | 47.70% | $3,732,996 | Part of "Track" | | Part of "Track" |
| Ballast | $26,642,779 | $31,401,512 | 50.00% | $15,700,756 | $19,949,847 | 10.00% | $1,994,985 |
| Top 600 | $50,272,529 | $59,251,831 | 34.00% | $20,145,623 | Never existed | | Never existed |
| Roads | $36,463,719 | $42,976,595 | 34.00% | $14,612,042 | Fully depreciated | | Fully depreciated |
| Fences | $9,409,992 | $11,090,734 | 50.00% | $5,545,367 | Fully depreciated | | Fully depreciated |
| Other Track (in post-2007 projects) | | | | | $63,297,680 | 92.97% | $58,847,910 |
| **Track total** | **$397,673,662*** | **$468,703,147*** | | **$222,406,562** | **$269,373,873** | | **$185,543,183** |
| Signals and Telecoms | $69,060,000 | $81,394,979 | 50.00% | $35,422,489 | $35,588,101 | 20.12% | $6,062,869 |
| Bridges | $113,774,300 | $134,095,812 | 26.34% | $25,320,837 | $51,058,260 | 76.57% | $39,096,142 |
| Culverts | $21,320,000 | $25,128,018 | 50.00% | $12,564,009 | $28,458,866 | 45.22% | $12,868,894 |
| Earthworks | $60,110,000 | $70,846,397 | 34.00% | $22,587,775 | $2,229,951 | 93.48% | $2,084,601 |
| Tunnels | $180,390,000 | $212,609,908 | 50.00% | $106,304,954 | Fully depreciated | | Fully depreciated |
| Land Acquisition | $15,506 | $18,276 | ‡ | $7,006 | Fully depreciated | | Fully depreciated |
| Land | $470,000 | $553,948 | ‡ | $556,414 | Fully depreciated | | Fully depreciated |
| Power Systems | $3,160,000 | $3,724,415 | 50.00% | $1,862,208 | $3,182,951 | 29.57% | $941,073 |
| **Total** | **$845,973,468** | **$997,074,900** | | **$427,032,254#** | **$389,892,001** | | **$246,596,761** |

*‡ Adjusted to value in Queensland Rail's 2013 DAU submission.*
** Adjusted to incorporate a balancing adjustment from the EI report.*
*˜ CPI adjusted figure provided by QCA*
*@ DORC weighted*
*# this reflects a reduction in the aggregate DORC value by the amount of transport service contract payments from the Queensland government.*

## TABLE OF CONTENTS

# 1 Background

The assessment of a depreciated replacement cost from an historical perspective has a main tenet at its roots that an infrastructure railway operator should not recover twice, by way of capital charges on fully depreciated assets as well the efficient maintenance costs that were used to extend the life of the asset, plus any margin[2].

Essentially this means that an operator should not recover more than the cost of Capex incurred, including WACC and depreciation plus the maintenance (and below rail operation).

If the asset value is zero because the asset has fully depreciated or been provided free of charge[3] then the below rail supplier should not be able to charge a Capex component. In practice this meant that in B&H's calculations, an Initial Asset Value was not ascribed to an asset that had already exceeded its depreciated life. This principle occurs more recognisably where there is a direct contribution from a customer or a direct contribution by government as a Community Service Obligation.

Hand in hand with this principle is that the below rail provider will recover any capex expenses for the future from the future.

[2] The QCA has explained this principle to B&H by way of the Terms of Reference for the consultancy and draft chapters of the Draft Decision for the purposes of guiding B&H's calculations of relevant quantities

[3] Asset values that are part of the asset base and have been provided with a direct contribution are recovered by QR but are then rebated through an arrangement with the provider

# 2 Historical Asset Considerations

## 2.1 Definitions

Owing to the configuration of the West Moreton System being very different to a Modern Engineering Equivalent and not Optimised in the way the Central Queensland System has been optimised, we have not referred to ORC standards and we have therefore not calculated ORC. Instead we have calculated an Initial Asset Value (IAV), which in some instances may coincidentally be the same as ORC for that asset, and instead we have looked to use the value of the asset actually in place.

Where we have labelled the pictorial with "First 1970", this is the first evidence that an asset with a life that extends beyond 2013 was sighted. Where we have labelled "Last 1995" this is the last time an asset in that category was constructed. Therefore "Life to 2070" corresponds to the end of the expected and depreciated life of the last example of the asset that was constructed. Hence for concrete bridges, the first construction is recorded as in 1970 and the last in 2007 with an expected life to 2107. This is 100 years since the last build.

Bridge construction was however included in some more recent project bundles, such as Jondaryan Track Upgrade. In that case the bundled project life expectancy has been calculated on a life and cost weighted basis and averaged to 2059. This is because some of the assets were track and signals that have shorter lives than bridges.

The remaining life at 2013 is similarly a weighted remaining life taking into account the individual components and their costs and expected lives.

For the purposes of accurately apportioning asset values to the Rosewood to Macalister section and Macalister to Columboola sections we have further interrogated the data and made the necessary allocations.

## 2.2 Sources of Data

The sources of data for an historical treatment have been numerous and generally relate to the evidence for particular asset types and specific project details.

Evidence has been made available by QR that relates to specific projects undertaken in the recent past, from 2007 to 2013, and further historical projects 1995 to 2007.

Two spreadsheets were in particular useful:

- West Moreton System Model AU1 - QCA 28.06.13 (R2M).xls
- West Moreton System Model AU1 - QCA 24.07.13 (M2C Split)

In these spreadsheets are tabs associated with the major projects of recent years, Columboola to Fisherman Islands Project, Jondaryan Track Upgrade and Western System Asset Replacement. These three projects are also detailed in QR's "AU1 West Moreton Reference Tariff Reset Capital Submission".

Also in these spreadsheets was evidence of projects that were undertaken between 1996/97 and 2006/07 in the “Historical Capex” tab and between 2007/08 and 2012/13 in the “Capex” tab.

The two spreadsheets detail the location of each project and its elements, since up until quite recently, Macalister was somewhat of a boundary on investment since there was no coal transported from west of the location. QR has in fact argued that the tariff should, amongst other things, reflect the fact that most capital in recent years has been injected into Rosewood to Macalister (R2M) section and this is borne out in the analysis.

The pictorial of Initial Asset Value indicates the proportion of IAV and remaining AV for the separate sections.

Another key source of data for assets prior to 2007/08 was the exercise undertaken by the QCA for its Draft 2009 Decision[4] where Connell Hatch[5] deduced its estimate using an ORC methodology and which was later reviewed by Everything Infrastructure[6] and with a Draft Decision by QCA. In this data are various notes indicating bridges and other assets were replaced or upgraded and the value of that work.

Where no data exists as to the value of an asset that has been replaced or may still have remaining life, the ORC value has been adopted. This does not apply to many assets because many assets have already reached their expected (depreciated) life.

Thus, in the main, the data for the scope, asset category and Initial Asset Value have been derived from the Connell Hatch data for assets prior to 1996/97, from QR’s spreadsheets for the period 1996/97 to 2006/07 and then from the projects undertaken since that time. For capex undertaken prior to 1996/97, some assets have already fully depreciated so their remaining values are zero.

In the following sections the individual assets, their IAV and the remaining lives are discussed.

[4] Draft Decision QR Network 2009 Draft Access Undertaking December 2009
[5] Final Estimate Report, Western System Depreciated Optimised Replacement Cost (DORC) Assessment Queensland Rail, 6 August 2008
[6] QR Network's 2009 Access Undertaking Assessment of Western System Asset Valuation November 2009

# 3 Asset Value Estimates

In this section each of the assets indicated in the pictorial (Figure 1) and in Table 1 are discussed. The assets are grouped here as they are in Figure 1 where a particular asset label may not represent all assets of that type in the analysis. For example, the "Concrete Bridge" label relates to bridges constructed as stand-alone works but further concrete bridge works were included in the Jondaryan Upgrade and the Columboola Project and these are accounted for further in the list in that specific project.

A background to the condition and the configuration of the assets was discussed and presented in the B&H May 2014 report.

## 3.1 Tunnels

Tunnels were constructed well over 100 years ago[7] but have an ascribed life for depreciation of 100 years. Since no QR information or any other source has identified capital expense, their remaining life for depreciation is zero. We conclude that the tunnels have had their life extended by way of maintenance and therefore the IAV has been ascribed as zero.

## 3.2 Timber Bridges

The original timber bridges were constructed over 100 years ago but some timber bridges have received extensive works as indicated in the Connell Hatch estimates. The value of those upgrades was captured for the purposes of the IAV and remaining life. By far the majority of the timber bridge assets did not receive a capital upgrade, so have fully depreciated.

## 3.3 Concrete Bridges

The first records of concrete bridge construction to replace timber bridges is shown in the Connell Hatch estimates; the first in 1970 and the last in 2007 where they are recorded as separate works outside of other packages. We have included these works for estimating the IAV.

## 3.4 Concrete/steel Culverts

Culverts have not been specifically mentioned as separate works in any document provided by Queensland Rail and the value adopted in this estimate is the value adopted in the Connell Hatch estimate suitably inflated and adjusted for remaining life.

## 3.5 Timber sleepers

All timber sleepers have been treated as being depreciated fully. This is because the original timber sleepers when replaced with timber sleepers were done under a maintenance regime.

[7] The tunnels were constructed by 1867 and as of 2013 were 146 years old

### 3.6 Steel sleepers

The steel sleeper programs were maintenance activities replacing timber sleepers, sometimes contiguously but mainly as an interspersed pattern. Queensland Rail has not provided information that steel sleepers were part of a historic Capex program. Therefore, all steel sleepers have been treated as maintenance and so fully depreciated.

### 3.7 Concrete sleepers

All concrete sleepers have been treated as Capex. The concrete sleepers under this label are those that were installed separately to an integrated major project[8]. Records indicate that concrete sleepers were first installed in 1999 and that by 2006 they had been incorporated into the other programs dealt with below.

In regards to the unit cost of concrete sleepers we have used the 2009 Draft Decision valuation which was a unit cost derived by Connell Hatch but later reviewed by Everything Infrastructure and which was $211.87 in 2008.

### 3.8 Ballast

The ballast in this label represents ballast that would not have been included in a project[9] but was identified as a specific Capex item in any other historical capital cost, either QR data or in Connell Hatch data. The last record of ballast placement in this way was in 1995. Since ballast life is estimated to be 20 years, the last ballast to be depreciated for this item will expire in 2015.

### 3.9 Fences

Queensland Rail has not provided information of Capex specifically for fencing. Given expected life of 15 years, the presence of fencing in QR's asset base means that its original life has been extended with maintenance and its remaining value is therefore zero.

### 3.10 Earthworks

This item relates to stand-alone earthworks activities. In 2007 a small amount of earthworks activities was recorded as Capex in QR's spreadsheet ('historical capex' tab). Other than that the earthworks on the system was constructed more than 100 years ago and has retained its physical life either through maintenance or through an integrated project.

### 3.11 Signals & Telecommunications Incl LXings

The first record of Signals & Telecommunications Capex specifically being undertaken was in 1976 and the last was in 2006 before any expenditure in this area was incorporated into larger (post-2007) projects. The values used in this estimate have been derived from the Connell Hatch records. Given an expected life of 20 years, where signalling assets have a life longer than 20 years, their IAVs is zero.

[8] The post 2007 projects
[9] Post 2007 project

## 3.12 Rail

There are various rail types in use on the system and we have investigated the life expectancy and the remaining life for each type. We have capped any life expectancy from new or remaining life at 50 years which is a reasonable estimate of its useful life from the point of view of obsolescence regardless of the tonnage traversing.

We have calculated the expected life of each rail type using the methodology in "*Review of the Queensland Rail (QR) West Moreton System, Maintenance Costs, Capital Costs (Capex), Operations Costs, Depreciated Optimised Replacement Cost (DORC) for the Queensland Competition Authority*", May 2014 by B&H Strategic Services Pty Ltd.

In relation to unit rate for rail, which included laying, we have modified the unit rate determined by QCA in their 2009 Draft Decision on the advice of Everything Infrastructure because the "savings" identified on rail material costs was applied to all costs of rail, including laying, and we have therefore increased the rate to reflect only the "savings" provided by the rail material cost.

### 3.12.1 41kg/m rail[10]

There remains 196kms of track between Rosewood and Macalister of 41kg/m rail. It has been steadily replaced with 50kg/m rail over a 10 year period and the remaining rail occurs in straights or on the Down main which is subject to empty trains. In that section it has between 13 and 26 years life remaining. In the Macalister to Columboola section, all rail is 41kg/m and it has a life up to 50 years remaining as it receives relatively small tonnages.

### 3.12.2 50kg/m rail straights[11]

There is 37kms of track using 50kg/m[12] rail on straights with a remaining life averaging 43 years all in the Rosewood to Macalister section.

### 3.12.3 50kg/m rail curves[13]

There is 39kms track using 50kg/m[14] rail in curves with a remaining life averaging 23 years all in the Rosewood to Macalister section.

### 3.12.4 50kg/m HH curves[15]

There is 17kms track using 50kg/m head hardened rail with a remaining life capped at 50 years all in the Rosewood to Macalister section.

## 3.13 Top 600

The Top 600 is the capping layer usually used in modern asset construction. If there was a capping in the original railway it was constructed at the same time as the "earthworks". There is ample evidence to suggest that the West Moreton system was built with no Top

[10] at 50 yrs max life
[11] at 50 yrs max life
[12] Standard carbon 50kg/m rail, not Head Hardened
[13] at 32 yrs max life
[14] Standard carbon 50kg/m rail, not Head Hardened
[15] at 50 yrs max life

600. Moreover, since that time there is no mention of any specific Top 600 works, therefore its IAV is zero and it is included in this assessment purely for comparison purposes with other assessments.

### 3.14 Turnouts

No turnouts have been identified as separable from the post-2007 capex projects and in those post-2007 projects this category is identified with Track.

### 3.15 Roads

No roads have been identified as separable in any data and are included in this analysis only for comparative purposes. If roads have been constructed they would most likely be included in an earthworks category.

### 3.16 Power Systems

Power systems relates to the power that is provided to installations along the track and mainly relates to power supplied to level crossings. Power System assets have been ascribed a full life of 30 years which means that some assets (those constructed before 1984) have already fully depreciated. The data used is from the Connell Hatch and Everything Infrastructure considerations.

### 3.17 Pre 2007 Capex not Included in IAV (2007)

This item simply indicates that all pre-2007 Capex has been included beforehand.

### 3.18 Jondaryan Track Upgrade

This is a project that was begun in 2008 and concluded in 2011. It was composed of various asset category parts which are identified in Table 2. Data is from QR's spreadsheet 'capex' tab.

### 3.19 Columboola to Fisherman Islands Project

This is a project that was begun in 2011 and concluded in 2013. It was composed of various asset category parts which are identified in Table 2. The balloon loop and spur at Columboola is not included in the estimate since that was coal-only capex.

### 3.20 Western System Asset Replacement

This is a 10-year project that has various stages and was begun in 2007. It is composed of various asset category parts which are identified in Table 2.

### 3.21 Land & Land Acquisition

The corridor on which the common assets are contained is crown land vested for these purposes when the railway was built. There are no other records of land acquired since for the purposes of the common assets and therefore no value has been ascribed.

### 3.22 Notes to Estimates

Table 2 indicates the assumptions, sources of data and any adjustments to previously published works used in this estimate.

### Table 2 Notes Accompanying Figure 1

<table>
<tr><td colspan="9">1. CPI has been applied to IAVs that were assessed in 2007 and modified for EI recommendations at the rate used by QCA</td></tr>
<tr><td rowspan="2"></td><td>2005/06</td><td>2006/07</td><td>2007/08</td><td>2008/09</td><td>2009/10</td><td>2010/11</td><td>2011/12</td><td>2012/13</td></tr>
<tr><td>4.19%</td><td>2.60%</td><td>5.07%</td><td>1.98%</td><td>3.23%</td><td>3.86%</td><td>0.90%</td><td>1.99%</td></tr>
<tr><td>2</td><td colspan="8">IAVs (Initial Asset Values) assessed in 2007 were performed by Connell Hatch and the data used a base for asset numbers and proportionate asset values</td></tr>
<tr><td>3</td><td colspan="8">Bridges and culverts have been assigned a life of 100 years because the Australian Standard AS5100 adopts a 100 year design life</td></tr>
<tr><td>4</td><td colspan="8">Remaining lives for mixed asset types or mixed new life date have been calculated by weighting the asset type and its maximum life with its value</td></tr>
<tr><td>5</td><td colspan="8">The "First" label shows when the asset began its life, which could be at the start of a program</td></tr>
<tr><td>6</td><td colspan="8">The "Last" label shows when the last of the asset was constructed</td></tr>
<tr><td>7</td><td colspan="8">For the projects since 2007 derivation has been from QR's " West Moreton System Model AU1 - QCA 24.07.13 (R2M).xls and West Moreton System Model AU1 - QCA 28.06.13 (M2C split) .xls</td></tr>
<tr><td>8</td><td colspan="8">For track components, the B&H Report "Review of the QR West Moreton Maintenance, Capex, Opex, DORC May 2014 Final.docx" has been used and this refers to QR's asset data in "Curves ML WM System.xls" and similar as response to QCA's Data request</td></tr>
<tr><td>9</td><td colspan="8">Unit rates for IAV were extracted from Hatch's Valuation of 2008 " DORC Valuation 080715 Appendix B - Excel.xls" and adjusted to reflect EI's recommendations and agreed by QCA. For concrete sleepers this was "$7.9m over the Rosewood to Macalister section" for which there are 298.483kms track at a spacing of 685mm or 485,742 sleepers or a saving on $230 per sleeper of $18.13 to result in a unit cost in $2007 of $211.87. For rail, EI suggests a reduction by the equivalent of 5.6% of the total ORC of the whole network. The total ORC before the adjustment was assessed by Hatch as $884.2m and 5.6% would be $49.5m over 394.49 track kms or $125,517 per km reduction for rail from the $350,000 per km for rail making a total of $224,483 per km. However EI's reduction was said to apply to the rail steel price and they have erred in applying a 35% reduction across the installed cost for which the rail steel cost is approximately one half. Thus our adjustment will be $62,250 reduction per km, making an installed unit rail rate of $288,750 per track km in $2007. For bridges the data discrepancies highlighted by EI are not material to the very few bridges included in this evaluation.</td></tr>
<tr><td>10</td><td colspan="8">A weighted life is one that weights each asset type by value and maximum life. Thus some of the assets may individually have longer lives</td></tr>
<tr><td>11</td><td colspan="8">Rail lives have been adjusted to a maximum 50 year life, thus some rails will adopt a 2013 insertion date because they still have 50 years life</td></tr>
<tr><td>12</td><td colspan="8">Siding and Balloon Loop (S&B) not included in M2C assets of Columboola Project because they are coal-only projects</td></tr>
<tr><td>13</td><td colspan="2">For the Jondaryan Track Upgrade the asset type components of IAV were</td><td>Track</td><td>$12.080m</td><td>Bridges</td><td>$2.360m</td><td>Culverts</td><td>$0.738m</td></tr>
<tr><td rowspan="2">14</td><td colspan="2" rowspan="2">For the R-M of the Columboola Project the asset type components of IAV were:</td><td>Track</td><td>$19.190m</td><td>Bridges</td><td>$0.000m</td><td>Culverts</td><td>$0.000m</td></tr>
<tr><td>Signals</td><td>$0.902m</td><td>EarthWks</td><td>$2.095m</td><td>Telecom</td><td>$0.317m</td></tr>
<tr><td>15</td><td colspan="2">For the M-C of the Columboola Project the asset type components of IAV were:</td><td>Track</td><td>$3.977m</td><td>Signals</td><td>$0.653m</td><td></td><td></td></tr>
</table>

## 3.23 Other Components of the Estimates

In the Executive Summary is shown Figure 1 and Table 1, and these data have been derived from the sources identified in section 2.2 as well as other advice as follows:

### 3.23.1 Figure 1

Included in the estimates are:

- Inflation at the appropriate rate since the time of construction and shown in Table 2.
- Interest incurred during the construction (IDC) at a WACC rate provided by QCA (9.9625%) over a 2 year period for the individual components of the IAV. The WACC rate is that most applicable for the asset rollover in 2009. This was applied to pre-2007 assets. Post-2007 capex projects already included IDC.

### 3.23.2 Table 1

- Amounts provided directly by Transport & Main Roads (TMR) or their predecessors for the purposes of other traffic or as Community Service Obligations have been extracted from each asset category shown in Table 1 and which applies only to “DORC (2013)” under “B&H May 2013”. This permits a like for like comparison with the B&H September 2014 estimates within this report because the Capex used in the current methodology only considers common corridor assets in which the TMR Capex is not recorded as it is contribution.

# 4 Maintenance on the Western System

In May 2014, B&H Strategic Services concluded that maintenance costs on the system were high, but that this level of maintenance reflected the deteriorated state of the asset. Attempts were being made by QR to improve the reliability of the asset with targeted investment with concrete sleepers, new 50 kg/m rail and ballast and formation rebuilding. However, fundamentally, over such a large length, the infrastructure was under stress.

It was concluded however that the direction of improvement would eventually lead to a level of maintenance expenditure that was more akin to that seen on the Central Queensland Coal Network that had a longer history of upgrade.

The topography and its challenges in earthworks will always create a long term legacy and maintenance costs are never expected to be as low as the CQCN.

By way of comparison, a new railway built to Modern Equivalent Asset standard and carrying approximately 10 million tonnes could be expected to have a maintenance cost in the vicinity of $12,000 per km per year for the first 5 years of its life.[16] A “mature” MEA railway, where components are wearing and where replacement is on-going and carrying this tonnage could be expected to have a maintenance cost of approximately $20,000 per km per year.[17] The West Moreton System maintenance cost is approximately $50,000 per km per year.[18]

The maintenance costs for the West Moreton System, taking into account its legacies, could be expected to level off after the upgrading work being carried out at approximately $30,000 per km per year of which approximately $10,000 could be attributed to the severe topography.

[16] This benchmark is based on the maintenance costs observed in the Central Queensland’s GAPE system which carries similar tonnages as the West Moreton system.

[17] This benchmark is based on the maintenance costs observed for Brookfield Rail’s standard gauge system in Western Australia which carried similar tonnages as the West Moreton system.

[18] The maintenance cost proposed by QR is about $62,000 per km per year. However, on a steady state basis the proposed cost is about $50,000 per km per year.

## 5 Suburban System Impact

In the B&H report of May 2014 it was observed that the suburban system has two impacts on the capacity of the Western System for coal and other bulk transport.

Firstly, the peak hour periods of the suburban service limit accessibility to the network. Secondly, maintenance activities carried out in the suburban area for suburban area reasons, and which are not aligned in time with maintenance on the Western System, creates another capacity constraint.

The current method of train planning which involves finding pathways in which coal trains can operate is manual. It consists of a tried and tested graphing technique in which various pathways are hypothesised and the practicality of the pathway assessed. Pathways need to be provided with tolerance because trains do not operate perfectly on time, neither suburban or freight trains.

B&H provided its estimate of pathway capacity using a graphing technique and this was found to be little different to the calculations provided by QR, except that QR injected a “practicality” factor which B&H has not factored because the circumstances are within QR’s control to rectify and do not impact the theoretical capacity for the purposes of allocation of capacity cost.

A more robust method of determining capacity is through a dynamic simulation, extended over a long period and to which a probability of pathway availability is the outcome. B&H suggests QR undertake such exercises.

In terms of suburban maintenance requirements, since the May 2014 report, QR has indicated it may provide evidence (such as train control charts or log records) to quantify the degree of alignment in maintenance possessions of the Western System and Suburban System. This data has not yet been made available. An alignment of maintenance possessions would negate the need to reduce the effective capacity of the Western System by an add-on maintenance factor.