Review of Queensland Rail's

DAU 2015

B&H Strategic Services Pty Ltd

September 2015

Executive Summary

This review is an assessment under the terms of the Terms of Reference of the contract between B&H Strategic Services and the Queensland Competition Authority.

Its main objective is to assess the reasonableness of the Maintenance, Operation and Capital Plans that Queensland Rail have submitted as part of the 2015 DAU.

We find that Queensland Rail's plans are not reasonable on a number of levels. We have considered the forecast tonnages and the capacity of the network, its current condition and the work program of Capital and Maintenance planned expenditure in the Asset Management Plan provided by Queensland Rail. We have not assessed the planned expenditure for below rail Operations such as Train Control and Capacity Allocation (planning) but we have assessed those costs to identify the fixed and variable components.

Firstly, at a time when the coal industry's only strong attribute is reliability of supply, Queensland Rail has embarked upon an enormous Maintenance and Capital Plan for 2015/16 which will greatly affect that reliability.

Secondly, Queensland Rail have emphasised the boundary condition relating to coal traffic in Section 3.4 Investment Drivers and Triggers of the AMP that "*The Queensland Government has stipulated that coal trains will not continue through the SEQ network beyond 2032*". There appears to be no further recognition of this "Driver and Trigger" in either the Maintenance or Capital Submissions. Our primary analysis is on the basis of coal transport continuing past 2032 and we have provided further comment on the impact on Capital and Maintenance budgets if the transport was terminated in 2032.

Thirdly, Queensland Rail indicates it will mostly deliver these plans with internal resources and such is the increase in activity that even if they were able to assemble such resources there is considerable doubt about the sustainability of that workforce. Redundancies would be required after the first year of the plan.

Fourthly, there is no coordination of plans and this is evidenced by all maintenance activities continuing at the levels that one sees in following years when capital activities reduce. It is not plausible that as much maintenance is required when a significant portion of the asset is being renewed or refurbished. It appears that individual maintenance plans have been created independently and that those have been created independent from the capital plans.

Therefore we have recast the Asset Management Plan to reflect the practicalities of performing large scale renewals alongside maintenance and, assuming some capital projects are justified, also taken those projects into account in the formulation of the proposed asset management plan. These are shown in Figure 1 for Maintenance and Figure 2 for Capital up to the end of the Regulatory Period.

Plans for the secondary scenario, that is, where coal transport is ceased after 2032 have been created in the relevant sections of this report. We are suggesting that there will be no change in maintenance at this time whether cessation occurs in 2032 or not. But for Capex, we are suggesting a modified program.

Individual maintenance and capital activities are separately commented.

There are a number of issues with the presentation of the cost data in the submission. The Maintenance Submission is shown in nominal costs while the Asset Management Plan is shown in constant costs (we have inferred July 2014 although this is not explicitly stated). This means the actual scope variations during the period are not transparent.

It is also unknown why Queensland Rail reports activities for which there are no costs. This only serves to confuse the product. We have eliminated them from our Asset Management Plan. We have also eliminated from our calculations items in the capital plan that have not been included in Queensland Rail's tariff model[1]; and we note there is no documentation to substantiate that the expenditure will benefit coal carrying services such as the plans for tunnel upgrading and plant maintenance depot upgrading.

We note that the AMP shows steadily rising costs from FY2021 and since these costs are in "real $", it is unclear as to why this may be the case unless some long term projections indicate significantly rising tonnages. A ten-year AMP is however a good strategic initiative. We have now shown those data in our tables as they fall beyond the Regulatory Period.

During the course of the assessment Queensland Rail was asked to clarify and expand on certain items and data requests were made. We refer to the data request and the responses in the body of the report.

Figure 1 Recast Maintenance Asset Management Plan

Shown on Page iii

Figure 2 Recast Capital Asset Management Plan (Without 2032 Embargo)

Shown on Page iv

[1] Includes West Moreton System Model AU1 - QCA Sub 23.04.15 (R2J), West Moreton System Model AU1 - QCA Sub 23.04.15 (J2C), West Moreton System Model AU1 - QCA Sub 23.04.15 (BM)

Figure 1 Recast Maintenance Asset Management Plan (July 2014$)

West Moreton Maintenance Plan 2015/2016 Budget	FY16 ($'000)		FY17 ($'000)		FY18 ($'000)		FY19 ($'000)		FY20 ($'000)		FY21 ($'000) Budget	FY22 ($'000) Budget	FY23 ($'000) Budget	FY24 ($'000) Budget	FY25 ($'000) Budget
Discipline															
Product Description ($'000)	QR	B&H	QR	B&H	QR	B&H	QR	B&H	QR	B&H					
TRACK AND CIVIL INFRASTRUCTURE															
Repairs Concrete Bridges	150	150	0	0	0	0	0	0	0	0	0	0	0	0	0
Repairs Steel Bridges	237	237	250	250	250	250	250	250	250	250	283	290	297	305	312
Repairs Timber Bridges	1,581	1,581	1,126	1,126	1,073	1073	1,021	1021	1,466	1,466	1,780	1,825	1,870	1,917	1,965
Steel Bridge Paint (Contract)	0	0	0	1,900	5,700	1,900	0	1,900	500		0	0	0	0	0
Structures Inspection	620	620	243	243	399	399	243	243	702	702	772	791	811	831	852
Structures Pest Control	15	15	15	15	15	15	15	15	15	15	17	17	18	18	19
Drainage construction	200	200	0	0	0	0	0	0	0	0	164	168	172	177	181
Drainage maintenance	364	364	275	275	375	375	275	275	375	375	283	290	297	305	312
Retaining Wall maintenance	0	0	20	20	20	20	20	20	20	20	23	23	24	24	25
Structures and Civil Total	3,167	3,167	1,929	3,829	7,832	4,032	1,824	3,724	3,328	2,828	3,322	3,405	3,490	3,577	3,666
Ballast Undercutting Other	1,170	0	1,400	0	1,400	0	1,400	0	1,400	0	1,584	1,624	1,664	1,706	1,748
Ballast Undercutting Total	1,170	0	1,400	0	1,400	0	1,400	0	1,400	0	1,584	1,624	1,664	1,706	1,748
Earthworks - Non Formation	15	15	150	150	150	150	100	100	100	100	113	116	119	122	125
Earthworks Total	15	15	150	150	150	150	100	100	100	100	113	116	119	122	125
Minor Yard Maintenance	230	0	230	0	230	0	230	0	230	0	215	220	226	231	237
Rail Joint Management	1,641	1,641	1,520	1,520	1,260	1,260	1,050	1,050	1,050	1,050	1,471	1,508	1,545	1,584	1,624
Rail Renewal	931	0	931	0	931	0	931	0	931	0	1,053	1,079	1,106	1,134	1,162
Turnout Maintenance	150	150	150	150	150	150	150	150	150	150	175	180	184	189	194
Mechanised Resleepering		13,249		0		0		0		0					
Monument/Signage Mtce	357	357	360	360	60	60	60	60	60	60	68	70	71	73	75
Maintenance Ballast	1,035	1,035	690	600	660	550	630	500	620	500	1,561	1,600	1,640	1,681	1,723
Sleeper Management	375	375	225	225	360	360	540	540	1,080	1080	1,222	1,252	1,284	1,316	1,349
Fire & Vegetation Mgmt	1,391	1,391	1,400	1400	1,400	1400	1,400	1400	1,400	1400	1,584	1,624	1,664	1,706	1,748
Rail Stress Adjustment	794	500	790	500	790	500	790	500	790	500	894	916	939	963	987
Track Inspection	781	781	785	785	785	785	785	785	785	785	888	910	933	956	980
Rail Lubrication	256	256	260	260	260	260	260	260	260	260	294	302	309	317	325
Top & Line Spot Resurfacing	1,372	1,372	1,370	1,370	1,370	1,370	1,370	1,370	1,370	1,370	1,550	1,589	1,628	1,669	1,711
Rail Repair	1,548	1,548	1,250	1,250	1,150	1,150	1,080	1,080	1,080	1,080	1,641	1,682	1,724	1,767	1,811
Track Maintenance Total	27,195	22,655	9,961	8,420	9,406	7,845	9,276	7,695	9,806	8,235	12,616	30,326	13,255	13,586	13,926
Mechanised Resurfacing	3,000	1,800	2,950	2,500	2,900	2,250	2,850	2,000	2,800	2,000	3,394	3,479	3,566	3,655	3,747
Mech Resurfacing Turnouts	0	0	90	90	90	90	90	90	90	90	102	104	107	110	112
Resurfacing Total	3,000	1,800	3,040	2,590	2,990	2,340	2,940	2,090	2,890	2,090	3,496	3,583	3,673	3,765	3,859
Rail Grinding - Mainline	683	683	391	391	654	654	391	391	654	654	464	475	487	500	512
Rail Grinding - Turnouts	98	98	91	91	175	175	105	105	84	84	107	110	113	116	119
Rail Grinding Total	781	781	482	482	829	829	496	496	738	738	571	586	600	615	631
Track Geometry Recording	151	151	151	151	151	151	151	151	151	151	170	175	179	183	188
Ultrasonic Test Ontrack Mach	200	200	200	200	200	200	200	200	200	200	226	232	238	244	250
Ultra Sonic Testing (Manual)	64	64	65	65	65	65	65	65	65	65	74	75	77	79	81
Track Monitoring Total	415	415	416	416	416	416	416	416	416	416	470	482	494	506	519
TRACK AND CIVIL Total	35,741	28,833	17,377	15,887	23,022	15,612	16,451	14,521	18,676	14,407	22,172	40,121	23,295	23,877	24,474
FACILITIES MAINTENANCE															
Fencing	50	50	50	50	50	50	50	50	50	50	226	232	238	244	250
Level crossing maintenance	0	100	100	100	100	100	100	100	100	100	113	116	119	122	125
Level crossing constr/recond.	569	0	0	0	0	0	0	0	0	0	0	0	0	0	0
FACILITIES Total	619	150	150	150	150	150	150	150	150	150	339	348	357	366	375
SIGNALLING															
Preventative Telecoms Backbone maintenance	103	103	108	108	108	108	108	108	108	108	96	99	101	104	106
Phone/Data maintenance	5	5	6	6	6	6	6	6	6	6	5	5	5	5	6
Telecommunications Total	108	108	113	114	113	114	113	114	113	114	101	104	106	109	112
Prevent Signalling Field Mtce	821	821	823	823	823	823	823	823	823	823	735	754	773	792	812
Correct Signalling Field Mtce	237	237	241	241	228	228	215	215	203	203	215	220	226	231	237
Signalling Level Xing Protect	513	513	519	519	519	519	519	519	519	519	464	475	487	500	512
Cable Route Maintenance	196	196	196	196	196	196	196	196	196	196	175	180	184	189	194
Signalling Train Protect Syste	51	51	51	51	51	51	51	51	51	51	45	46	48	49	50
Wayside Monitoring System	55	55	61	61	61	61	61	61	61	61	54	56	57	58	60
Signal maintenace TOTAL	1,873	1,873	1,891	1,891	1,878	1,878	1,866	1,865	1,853	1,853	1,689	1,731	1,775	1,819	1,865
SIGNALLING Total	1,981	1,981	2,004	2,005	1,992	1,992	1,979	1,979	1,966	1,967	1,790	1,835	1,881	1,928	1,976
Sub-Total Maintenance	38,341	30,964	19,531	18,042	25,164	17,754	18,580	16,650	20,793	16,524	24,302	42,305	25,532	26,171	26,825
GENERAL															
Inventory & Minor Asset Mgmnt	116	116	116	116	116	116	116	116	116	116	131	135	138	142	145
Consulting/Technical Advice	380	380	380	380	380	380	380	380	380	380	0	0	0	0	0
Asset Management	625	625	620	620	620	620	620	620	620	620	701	719	737	755	774
Project Mgmt & Services	59	59	59	59	59	59	59	59	59	59	0	0	0	0	0
GENERAL Total	1,180	1,180	1,175	1,175	1,175	1,175	1,175	1,175	1,175	1,175	833	854	875	897	919
GRAND TOTAL	39,521	32,144	20,706	19,217	26,339	18,929	19,755	17,825	21,968	17,699	25,135	43,158	26,407	27,068	27,744

Figure 2 Recast Capital Asset Management Plan (Without 2032 Embargo) (July 2014$)

		No 2032 Embargo Scenario											
Project ID	QCA Capital Item	Project Name		2015/16		2016/17		2017/18		2018/19		2019/20	
				QR	B&H	QR	B&H	QR	B&H	QR	B&H	QR	B&H
B.04044	2	Formation Strengthening - West Morton System	CIVIL PROGRAM	3,006	4,176	0	0	0	0	0	0	0	0
APR 12458	3	Timber Bridge Upgrades	CIVIL PROGRAM	3,001	3,001	5,271	5,271	6,507	6,507	6,828	6,828	6,492	6,492
NEWCIVIL5	9	Steel Bridge Strengthening	CIVIL PROGRAM	2,000	0	0	2000	0	0	0	0	0	0
B.04043	3	Timber Bridge Strengthening	CIVIL PROGRAM	1,999	1,999	0	0	0	0	0	0	0	0
APR 12548	1	Toowoomba Range Slope Stabilisation	CIVIL PROGRAM	1,500	1,000	1,500	1,000	1,500	1,000	1,500	1,000	1,500	1,000
APR 12454	4	Timber & Steel Bridge repl. With RCBC	CIVIL PROGRAM	1,000	1,000	1,200	1,200	0	0	0	0	0	0
NEWCIVIL4	2	Formation Strengthening - West Morton System	CIVIL PROGRAM	0	0	3,112	4,512	3,006	4,406	3,006	4,406	3,006	4,406
NEWCIVIL2	5	Drain Renewal	CIVIL PROGRAM	0	0	1,000	1,000	2,000	2,000	2,000	2,000	2,000	2,000
REGCIV003	3	ISAAC ST Timber Bridge Upgrade	CIVIL PROGRAM	0	0	1,000	0	0	1,000	0	0	0	0
REGCIV017		PROGRAM TRACK PROGRAM - WEST MORETON TRACK	CIVIL PROGRAM	0	0	0	0	0	0	0	0	0	0
	CIVIL PROGRAM TOTAL			12,506	11,176	13,083	14,983	13,013	14,913	13,334	14,234	12,998	13,898
B.04163 (WM Portion)	15	Corridor & Asset Protection (WM Portion)	COND'N MONIT'G	1,298	1,298	460	460	0	0	0	0	0	0
NEW	15	Corridor & Asset Protection (WM Portion)	COND'N MONIT'G	0	0	625	625	400	400	0	0	0	0
	CONDITIONING MONITORING PROGRAM TOTAL			1,298	1,298	1,085	1,085	400	400	0	0	0	0
APR 12657		Toowoomba Range Capacity and Clearance Upgrade	GROWTH	55,735		260		0		0		0	
	GROWTH TOTAL			55,735		260		0		0		0	
SEQFAC015		Toowoomba Plant Maintenance Depot	IMPRVT/EFFICY PROG	500		3,500		1,000		0	0	0	0
	IMPROVEMENT/EFFICIENCY PROGRAM TOTAL			500	0	3500	0	1000	0	0	0	0	0
NEWSIGNALWM02	20	Upgrade of 4.5V Solar Track Feed to 12V Helidon to Lockyer (3), Forest Hill to Laidley (3), Yarongmalu	SIGNAL'G PROGRAM	0	0	0	0	100	100	285	285	0	0
NEWSIGNALWM03	21	Upgrade of Model 10 Boom Mech SIGNALLING PROGRAM	SIGNAL'G PROGRAM	0	0	0	0	100	100	100	100	100	100
NEWSIGNALWM04	22	Upgrade Alternators Grandchester, Yarongmalu, Rangeview	SIGNAL'G PROGRAM	0	0	0	0	150	150	150	150	150	150
NEW	16	Digital Telemetry (WM)	SIGNAL'G PROGRAM	0	0	0	0	50	50	455	455	455	455
B.04075 (WM Portion)	11	Level Crossing Compliance - Regional (WM Portion)	SIGNAL'G PROGRAM	1,728	1,728	702	702	1,500	1,500	0	0	0	0
B.04196	13	Siemens AZ S600 Axle Counter Replace West Moreton	SIGNAL'G PROGRAM	1,071	1,071	0	0	0	0	0	0	0	0
B.04073 (WM Portion)	12	Pedestrian Crossing Installations & Upgr (WM Portion)	SIGNAL'G PROGRAM	700	700	450	450	0	0	0	0	0	0
NEWSIGNALWM01	19	Signalling Pole Route Upgrade Grandchester to Laidley	SIGNAL'G PROGRAM	400	400	450	450	0	0	0	0	0	0
B.04115	17	DTC Automatic Code Exchange	SIGNAL'G PROGRAM	280	280	180	180	0	0	0	0	0	0
APR 12445	18	Level Crossing Install Remote Monitoring (WM Portion)	SIGNAL'G PROGRAM	25	25	250	250	250	250	0	0	0	0
B.04064 (WM Portion)	14	ATP Encoder Replacement (WM Portion)	SIGNAL'G PROGRAM	10	10	10	10	240	240	240	240	0	0
B.04086 (WM Portion)	13	Siemens AZ S 600 Axle Counter Replacements West Moreton	SIGNAL'G PROGRAM	0	0	511	511	0	0	0	0	0	0
NEWSIGNALWM05	23	Upgrade Asbestoses Loc Boxes	SIGNAL'G PROGRAM	0	0	0	0	0	0	100	100	350	350
NEW	12	Pedestrian Crossing Installations & Upgr (WM Portion)	SIGNAL'G PROGRAM	0	0	0	0	1,400	1,400	800	800	550	550
REGSIG004		PROGRAM SIGNALLING PROGRAM	SIGNAL'G PROGRAM	0	0	0	0	0	0	0	0	0	0
	SIGNALLING PROGRAM TOTAL			4,214	4,214	2,553	2,553	3,790	3,790	2,130	2,130	1,605	1,605
B.04055 (WM Portion)	24	Train Radio Network Replacement (WM Portion)	TELECOMS PROGRAM	2,125	2,125	0	0	0	0	0	0	0	0
APR 12795 (WM Portion	25	LEDR Radio System Replacement West Moreton System	TELECOMS PROGRAM	69	69	0	0	0	0	0	0	0	0
	TELECOMMS PROGRAM TOTAL			2,194	2,194	0	0	0	0	0	0	0	0
B.04047	6	CHECK RAIL CURVES - TOOMWOOMBA RANGE AND LITTLE LIVERPOOL RANGE	TRACK PROGRAM	3,642	3,278	2,329	2,096	0	0	0		0	
APR 12545	8	RELAYING (Rerailing) PROGRAM ROSEWOOD - HELIDON	TRACK PROGRAM	0	700	2,022	2,722	2,059	2,759	2,059	2,759	2,059	2,759
NEWTRACK6	7	Relay Oakey to Jondaryan	TRACK PROGRAM	1,187	1,187	3,580	3,580	2,580	2,580	2,580	2,580	3,115	3,115
APR 12540	6	CHECK RAIL CURVES - TOOMWOOMBA RANGE AND LITTLE LIVERPOOL RANGE	TRACK PROGRAM	0	0	2,476	1,114	4,911	3,200	1,899	3,200	0	843
NEWTRACKWM01	10	Level Crossing Reconditioning West Moreton	TRACK PROGRAM	0	200	400	200	400	200	400	200	400	200
REGTRACK012		PROGRAM TRACK PROGRAM - WEST MORETON TRACK	TRACK PROGRAM	0	0	0	0	0	0	0	0	0	0
	TRACK PROGRAM TOTAL			4,829	5,365	10,807	9,712	9,950	8,739	6,938	8,739	5,574	6,917
			GRAND TOTAL	25,541	24,247	31,028	28,333	28,153	27,842	22,402	25,103	20,177	22,420

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1 BACKGROUND TO 2015 DAU

1.1 Business Background

Queensland Rail makes it perfectly clear that the environment for setting tariffs and constructing the inputs has changed since the 2013 DAU in stating that "*The environment for coal and non-coal services has changed markedly since the 2013 DAU was submitted, with both coal and non-coal volumes declining*"[2].

These changes have been reflected in Queensland Rail's projections for traffic and the implications for tariff.

1.2 Context of This Review

Queensland Rail goes on to say "*Queensland Rail has prepared a forecast of efficient costs over the 2015-2020 period for the purpose of assessing the MAR*". This review comments on those efficient cost forecasts, their logic, consistency and comparison with other known benchmarks.

This review will rely on the review conducted by the QCA for the 2013 DAU Submission, and where duplication can be avoided the 2013 DAU review will be referenced.

1.3 Strategic Context

Queensland Rail makes it very clear with assertive statements; firstly in section 3.4 Investment Drivers and Triggers of the submission, paragraph "SEQ 2032 Limitation" that "*The Queensland Government has stipulated that coal trains will not continue through the SEQ network beyond 2032*". Secondly, in section 3.5 Traffic Potential it is said "*The Queensland Government currently has imposed a date limit for coal traffic traversing through the SEQ network of 2032 which if not increased will potentially restrict future growth if coal companies do not have a viable way of accessing a coal export port.*"

Further, in section 4.2 Strategic Assumptions the long term assumption is "*SEQ 2032 access limitation*".

This makes it pretty clear in this reviewer's mind that this boundary condition is one that should be taken seriously and we have considered the Queensland Rail submission for maintenance and capex in two scenarios. Firstly, despite Queensland Rail's Asset Management Plan asserting that an embargo will occur in 2032, we have assumed continuation of the transport because nowhere else in the submission is this assertion discussed or taken into account, which we believe is of such great significance that it should have been. As a secondary analysis, we have assumed the embargo scenario will occur and we have discussed the implications for the maintenance and capital budgets.

[2] 2015 DAU Submission Volume 2: 4

1.4 Infrastructure Operation

Queensland Rail has previously and repeats[3] the characteristics of the infrastructure as follows:

> 3.6 Capacity Constraints
>
> The West Moreton System is constrained by five aspects.
>
> - All timber and steel structures are limited to 15.75tal;
> - Most of the formation material was not engineered and is considered under-strength for 15.75tal;
> - The Toowoomba Range restricts train path capacity to 112 return paths;
> - Passing loops on the Toowoomba Range are 670m long, which dictates the maximum length of trains on the system; and
> - Available paths in the SEQ network for trains to reach the Port of Brisbane.

In comparison with the 2013 DAU where 77 return paths for coal were forecasted only 62.8 return paths for coal are forecast in the 2015 DAU[4]. Also the corridor is now (2015 DAU) not capacity constrained as was forecast earlier (2013 DAU).

Also given now in the 2015 DAU only 3 non-coal return services are forecast compared to 29 return non-coal services per week in the 2013DAU, a dramatic shift has occurred in non-coal paths. This reviewer draws the conclusion that more track time will be available to perform maintenance, at least in the planning stage, since 26 contracted return services of non-coal traffic and 14 services for coal traffic will now not be on the network.

[3] Asset Management Plan, 2015 DAU

[4] Section 1.2.2.2 Forecast coal services 2015 DAU Submission, Volume 2

2 REVIEW OF MAINTENANCE COST ELEMENTS

In this section an item by item review will be conducted to make up a complete picture of Queensland Rail's proposal and any estimates thought more appropriate by this review.

2.1 Configuration Parameters

The configuration and traffic task parameters used in order to carry out this review are shown in Figure 3 and Figure 4. Figure 3 is the table shown in the 2015 DAU Explanatory Submission at section 1.2.4.

Figure 3 Volume Forecasts 2015-2020

Table 4 2015-20 volume forecast (2015-2020)

Loading point	Forecast weekly return paths	Annual					
		One way paths	Net tonnes (million)	Fisherman Islands to Rosewood '000gtks[a]	Rosewood to Jondaryan '000gtks	Jondaryan to Colum-boola '000 gtks	Total Haul '000gtks
Jondaryan	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Macalister	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Columboola	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total Coal	62.8	**6,280**	**6.154**	**866,138**	**1,666,223**	**444,155**	**2,976,517**
Non Coal	3	**300**	**N/A**	**N/A**	**30,916**	**14,873**	**N/A**

a Excludes Ebenezer

The track lengths pertinent to coal traffic and under consideration are shown in Figure 4.

Figure 4 Track Lengths for Coal Train Movements

Line Section	Km from	Km To	Single or Double Track	Track Length Main Line	Track Length Loop/Empty Train	Total Track Length
Rosewood to Granchester	56.297	69.395	D	13.098	13.098	26.196
Granchester to Yarongmulu	69.395	76.185	S	6.790	0	6.790
Yarongmulu to Helidon	76.185	115.097	D	38.912	38.912	77.824
Helidon to Toowoomba	115.097	160.610	S	45.513	0	45.513
Lockyer Loop	121.578	122.480	S	0.902	0	0.902
Murphy's Creek Loop	131.161	132.006	S	0.845	0	0.845
Holmes Loop	139.095	139.982	S	0.887	0	0.887
Spring Bluff Loop	145.824	146.697	S	0.873	0	0.873
Rangeview Loop	155.349	156.267	S	0.918	0	0.918
Toowoomba to Willowburn	0.000	0.716	S	0.716	0	0.716
Willowburn to Jondaryan	0.716	42.730	S	42.014	0	42.014
Willowburn Loop	0.716	3.361	S	2.645	0	2.645
Gowrie Loop	11.637	12.464	S	0.827	0	0.827
Kingsthorpe Loop	19.157	19.968	S	0.811	0	0.811
Oakey Loop	29.838	30.626	S	0.788	0	0.788
Jondaryan to Columboola	42.730	194.345	S	151.615	0	151.615
Malu Loop	48.202	49.043	S	0.841	0	0.841
Bowenville Loop	56.849	57.698	S	0.849	0	0.849
Koomi Loop	66.778	67.645	S	0.867	0	0.867
Blaxland Loop	77.264	78.134	S	0.870	0	0.870
Dalby Loop	82.478	83.598	S	1.120	0	1.120
Baining Loop	95.448	96.345	S	0.897	0	0.897
Macalister East Loop	106.823	107.672	S	0.849	0	0.849
Warra Loop	127.153	128.015	S	0.862	0	0.862
Chinchilla Loop	163.392	164.272	S	0.880	0	0.880
Rywung Loop	180.077	180.980	S	0.903	0	0.903
Cameby Downs Balloon			S	8.000	0	8.000
TOTALS				325.092	52.010	377.102

Source: Drawing NAG046, 2012 Issue

A comment about Track Length must be made at this point. In Queensland Rail's Asset Management Plan 2015/16 at Appendix 6 of the Explanatory Submission of the 2015 DAU, it states at section 2.1 that the track length is 435 km narrow gauge.

The details of this Track Length are not shown but could include all of the Queensland Rail sidings, dead ends, and other sundry track that will now be used by two passenger return paths per week and one other return path. In effect, Queensland Rail now has many redundant assets but in the absence of closure, these assets continue to be inspected and maintained, presumably at minimal but safe levels.

The amount of effort going into those assets is disproportionately high compared to the ratio of coal and non-coal traffic task because as Queensland Rail notes in its section 6.2 Tonnage Forecast Impacts of the 2015 DAU Maintenance Submission many activities are not tonnage dependent, only time dependent. In fact a deep review of this network at the forecast traffic levels could conclude that it contained many redundant assets and that an entirely different RAB is constructed and a new maintenance plan conceived.

The Asset Management Plan is inconsistent with the main body of the submission where it says in section 3.1 *"Other non-coal traffic (agricultural products) is a small portion of the total traffic task. Agricultural products and other freight trains are allocated 14 paths through Rosewood to Macalister per week*".

This is clearly not the case as in section 1.2.3.2 of the Explanatory Submission is stated "*For the 2015 DAU, Queensland Rail has based its forecast of non-coal volumes on average current usage, consistent with the approach now being adopted for coal services. Based on this information, only three non-coal return paths per week are expected to be used.*"

2.2 Benchmarking

The annual average maintenance cost over the 377.102 kms of track is $59,376[5] per track kilometre excluding mechanised resleepering. This is higher than the 2013 DAU and Queensland Rail have suggested why this is the case as evidenced in Figure 10. This is despite lower tonnage of coal and much lower tonnages and paths for non-coal services.

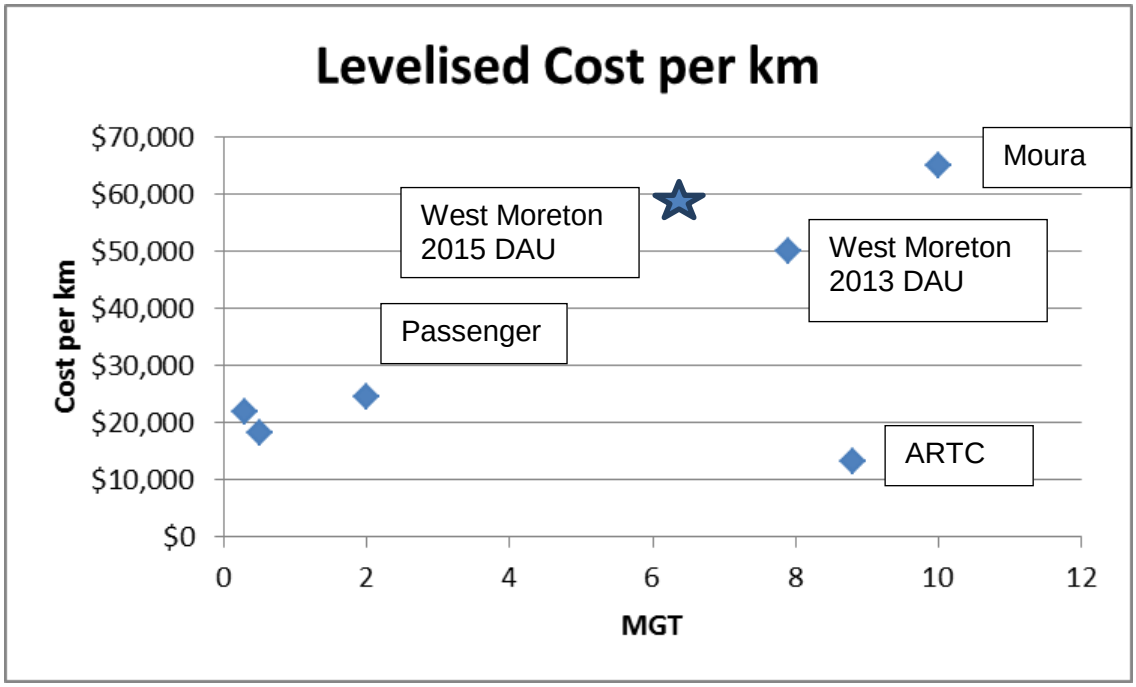
However, Queensland Rail suggests that the additional costs compared to the 2013 DAU outweigh the lowered costs due to the reduced tonnages. Figure 3 indicates the volume forecasts for 2015 to 2020 and will be used in assessing the parameters of maintenance in the following sections.

In Figure 5 the levelised track cost derived in the review[6] of the 2013 DAU is now augmented by the 2015 DAU result (star). This shows a worsening position and prima facie a new maintenance and operating strategy is required to stem the costs.

[5] Real, derived from Asset Management Plan. Average MGT (gtkm/km) for the network.

[6] 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, B&H Strategic Services, Figure 1

Figure 5 Levelised Track Cost



If maintenance costs are to be driven to high unit costs due to a continuation of the same operating parameters such as transit time and maximum speed with lower tonnages, is this in the best interests of the stakeholders or could a balanced approach lead to better overall outcomes?

This review suggests alternative approaches and also comments on the specific quantum suggested by Queensland Rail.

2.3 Maintenance Element Review

2.3.1 Program Assessment

This assessment has reviewed each of the elements in the Maintenance Asset Management Plan in the context of the current condition, age, configuration and maintenance history of the asset.

In Figure 6 a number of the maintenance cost elements are shown. The element cost quanta have been sourced from Queensland Rail's response to the data request for the data 2010/11 to 2014/15, and from Queensland Rail's DAU 2015 Submission for 2015/15 to 2019/20. The costs for 2014/15 to 2019/20 are real $ values (2015) whereas 2010/11 to 2014/15 are nominal $ costs. Some distortion therefore exists in the values.

It is clear however, that there is an overwhelming increase in many elements from 2015/16 onwards. Queensland Rail have submitted that some cost elements were not completely captured previously and these relate primarily to management functions but the large increases appear in maintenance activities.

This assessment has attempted to answer the following questions, and where they could not adequately be answered or rationalised from the documents, alterations have been proposed in the Recast Asset Management Plan.

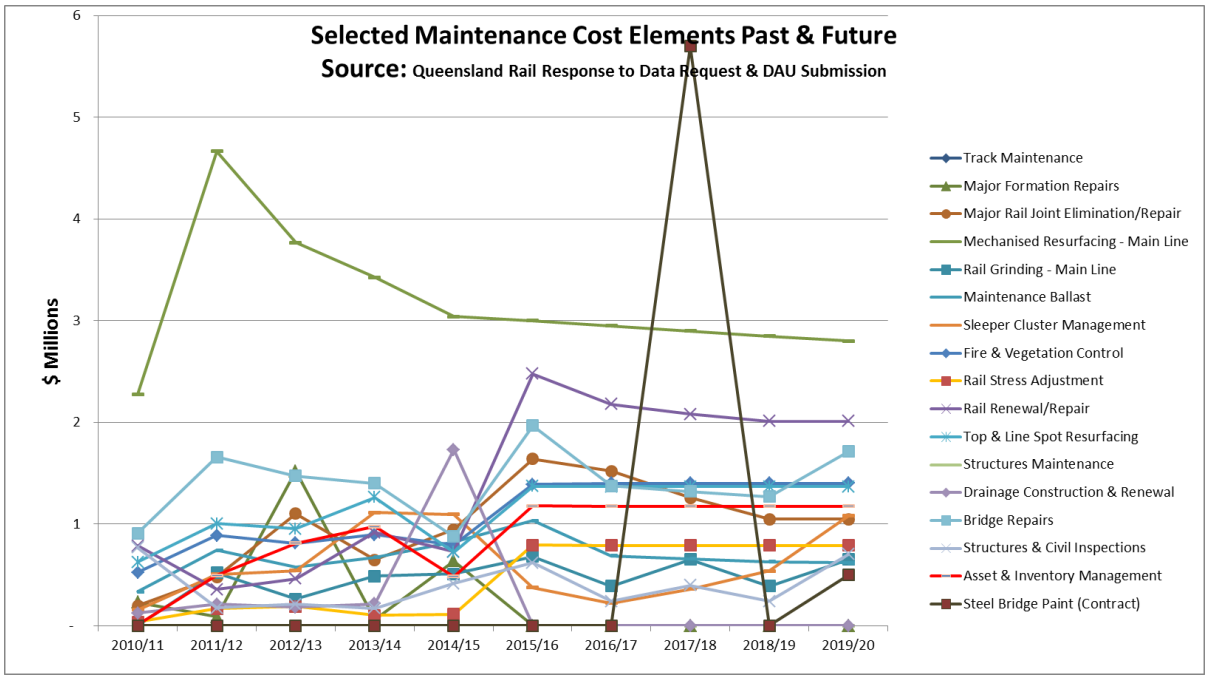
Why would it be necessary now, to increase rail renewal & repair, rail stress and rail joint elimination, all at the same time when tonnage is decreasing from previous Regulatory Periods?

Why would sleeper cluster management costs increase in a year of Mechanised Resleepering?

How can all of the resurfacing works be completed in the year of mechanised resleepering which requires its own resurfacing resource?

Can all of the work programmed for 2015/16 in maintenance also be completed with the mechanised resleepering program earmarked when Queensland Rail have indicated they will be using mainly in-house resources?

Figure 6 Selected Maintenance Cost Elements Past & Future



Each of the elements is reviewed in subsequent sections.

2.3.2 Asset Management

The items shown in Figure 7 (Table 8.2) are reasonable based on the proportion of the amount of work, both maintenance and capital proposed and is reasonable for variations proposed in this review since greater use of these resources is required for the proposed reductions in this review in maintenance and capital costs to better manage the asset.

Figure 7 Maintenance Costs Asset Management

Table 8.2: Maintenance Costs Asset Management (nominal $'000)

Asset Management	2015/16	2016/17	2017/18	2018/19	2019/20
Inventory Mgt & Fixed Asset Stocktakes	121	126	131	136	141
Consulting/Technical Advice	395	411	427	444	462
Asset Management	650	671	697	725	754
Project Mgmt & Services	62	64	67	69	72
TOTAL	**1,227**	**1,271**	**1,322**	**1,375**	**1,430**

Source: Queensland Rail 2015 DAU, Vol 2, Appendix 4: 38.

2.3.3 Structures

The consideration of assessing the maintenance program for structures includes an assessment of the capital works proposed for the bridges.

Queensland Rail is suggesting replacement at the rate of approximately $5m per year (2015). The capital cost of that expenditure is approximately[7] 10% or $500,000 per year. The question is whether that amount would need to be spent extra to the current maintenance program for those particular bridges to be maintained or whether it is more cost efficient to replace the bridges. The Queensland Rail 2015 DAU Submission does not include the detail where the maintenance and Capex trade-off is considered.

There are between 3 and 8 bridges to be replaced per year of the program. Approximately therefore for those bridges an extra $60,000 to $150,000 per bridge per year for the life of the bridge would need to be spent in order for the capital cost to be justified.

The further question remains as to whether the bridges earmarked for replacement are maintainable. That is, are the bridges so deteriorated that the next step in their maintenance is a full rebuild. This could be the case for the substructure which may be sinking or where maintenance patches simply make the waterway too small for effective water passage. Each of these considerations needs to be made on a case by case basis.

It has been observed that the maintenance program for structures appears, like the capital program for structures, to be not well structured in expenditure timing with large lumps of expenditure and a "loss of continuity" in the elements.

The following sections assess the various components of structures maintenance proposed by Queensland Rail, but suffice to say that the total allocations proposed have been retained except that the timing of some programs have been altered to reflect the

[7] Depreciation 2%, WACC 7%

programs in other maintenance activities and the likely disruptions that would occur to traffic. Figure 8 is the Queensland Rail summary of the total structures maintenance proposal.

Figure 8 Queensland Rail's Structures Maintenance Proposed[8]

Table 8.3: Maintenance Costs Structures (nominal $'000)

Structures	2015/16	2016/17	2017/18	2018/19	2019/20
Repairs Concrete Bridges	156	0	0	0	0
Repairs Steel Bridges	247	270	281	292	304
Repairs Timber Bridges	1,644	1,217	1,207	1,194	1,783
Steel Bridge Paint (Contract)	0	0	6,412	0	608
Structures Inspections	645	263	449	285	854
Structures Pest Control	16	16	17	18	18
Drainage construction	208	0	0	0	0
Drainage maintenance	379	297	422	322	456
Retaining wall maintenance	0	22	23	23	24
TOTAL	3,293	2,086	8,810	2,134	4,049

Steel Bridge Paint (Contract)

The program currently shows a large single year 2017/18 with $5.700m (real $) and a smaller $0.5m in 2019/20. Rather than this lumpy profile we suggest a more moderate approach for a number of reasons. A program of painting is more likely to attract large premiums for peak contract workforce attendance. A contractor that has no programs either side of a peak is likely to charge more because they must train and demobilise the workforce. We suggest a program extending over three years 2016/17 to 2017/18 which would then run into the 2019/20. That would be $1.9m (real $) in each of the three years.

This is the way a stand-alone evaluation would conclude this type of transaction but it is possible Queensland Rail have had this program driven, not from need but because the contractor is involved in other Queensland Rail work and this is the only time or most convenient time for the broader Queensland Rail program. In any event, the more moderate program is a better outcome for this network.

Repair Concrete Bridges

There are 19 prestressed concrete bridges on the network. It is surprising that maintenance is required on them in the first year of the Regulatory Period only. We have not altered the projection.

[8] Queensland Rail, volume 2, Appendix 4: 39.

2.3.4 Track

Queensland Rail Maintenance Submission 2015 DAU for Track is shown in Figure 9.

We note the contributors to the increases in maintenance costs from the 2013 DAU indicated in Figure 10 but we remain unconvinced that there is a need to increase maintenance cost due a number of factors including concurrency of programs and productivity gains due to lower traffic levels.

We note for example the costs for Asset Management with costs such as inventory management, technical advice and project management. Queensland Rail has said “These costs were not included in the 2013 DAU, and total around $1.2m per annum”. Does this mean the costs were incurred but forgotten in the submission or new activities have occurred? Certainly, unlike 2013 DAU, an Asset Management Plan now exists so then the program should be better managed. Should this then attract a productivity benefit at least as equal to the expenditure of $1.2m?

We have commented separately on each maintenance element in this section.

Figure 9 2015 DAU Maintenance Submission for Track

8.1.3 Track (excluding Mechanised Resleepering)

The allocations are outlined in the following table:

Table 8.4: Maintenance Costs Track (nominal $'000)

Track	2015/16	2016/17	2017/18	2018/19	2019/20
Ballast Undercutting (Other)	1,216	1,514	1,575	1,638	1,703
Earthworks - Non Formation	15	162	169	117	122
Fencing	52	54	56	58	61
Rail Joint Management	1,707	1,644	1,417	1,228	1,277
Rail Renewal	968	1,007	1,047	1,089	1,132
Turnout Maintenance	156	162	169	175	183
Mechanised Resurfacing	3,120	3,191	3,262	3,334	3,407
Mech Resurfacing - Turnouts	0	97	101	105	110
Rail Grinding - Mainline	710	423	735	457	795
Rail Grinding - Turnouts	102	99	197	123	102
Minor Yard Maintenance	239	249	259	269	280
Track Geometry Recording	157	163	169	176	183
Ultrasonic Test Ontrack Machine	208	216	225	234	243
Monument /Signage Maintenance	371	389	67	70	73

Maintenance Ballast	1,076	746	742	737	754
Sleeper Management	390	243	405	632	1,314
Fire & Vegetation Management	1,447	1,514	1,575	1,638	1,703
Rail Stress Adjustment	826	854	889	924	961
Ultra Sonic Testing (Manual)	66	70	73	76	79
Track Inspections	812	849	883	918	955
Rail Lubrication	266	281	292	304	316
Top & Line Spot Resurfacing	1,427	1,482	1,541	1,603	1,667
Rail Repair	1,610	1,352	1,294	1,263	1,314
Level crossing maintenance	0	108	112	117	122
Level crossing constr/recond.	592	0	0	0	0
TOTAL	**17,534**	**16,871**	**17,255**	**17,287**	**18,856**

Figure 10 Evidence of Increased Maintenance Costs[9]

The main contributors to the increase in other costs in 2015-16 and 2016-17 are:

- provision for asset management costs such as inventory management, technical advice and project management. These costs were not included in the 2013 DAU, and total around $1.2m per annum;
- additional provisions for rail renewal (around $0.9m in 2015-16 and $1.0m in 2016-17); and
- additional allowances for rail management (stress, joints, welds) product, attributable to increasing scope for rail stress measurement, replacement of rail defects found through ultrasonic testing, and welding (around $1.3m in 2015-16).

Queensland Rail has also analysed its maintenance program amidst the forecast decline in demand, and Appendix 4 includes a discussion on the way in which each maintenance product will vary with changed volumes. However, the downward variation associated with the current reduced volume outlook has been outweighed by the factors contributing to an increase in maintenance costs, discussed above.

Also increased substantially are rail joint management and rail repair justified on the basis of decreasing maintenance costs. While there is a reduction in rail joint management over the period the rate at the end of the period is still greater than the 2013 DAU proposal.

2.3.4.1 Ballast Undercutting

Ballast Undercutting in the 2015 DAU appears to have replaced Track Reconditioning as an activity seen in 2013 DAU and apart from the capital works associated with formation rebuilding appears to be the main tool to fight against the poor formation conditions causing spot mud holes and defects. The Undercutting process is a new activity.

It is reasonable that a program is undertaken with this less expensive machine and on a more focussed basis.

While undercutting is an activity generally associated with replacement of ballast and the capping, if it existed, it can also be a substitute for formation repair where the damage is not deep. The inspection and criteria for carrying out the work is very similar, that is, excessive track geometry subsidence and differential settlement and loss of ballast stability through contamination by the formation. Ballast undercutting also typically replaces all of the ballast which contrasts with ballast cleaning which reconditions existing ballast while adding some top up.

We conclude that the purpose of ballast undercutting and formation repair has the same effect, to prolong the life of the formation and that the two programs are essentially the same activity even though one activity requires more intervention than the other.

Therefore we conclude that both programs should be combined into one activity under the capital program and that no maintenance allowance be included.

[9] Queensland Rail 2015 DAU Submission Volume 2, section 3.2.6: 43.

2.3.4.2 Earthworks Non-formation

This relates to minor repair of the formation which is usual for any railway.

2.3.4.3 Fencing

This relates to minor repair of fences which is usual when damage is caused throughout the year from falling trees or errant stock.

2.3.4.4 Rail Joint Management

This is a large program, greater than in 2013 DAU which was estimated from the WorleyParsons report[10] as being $2.404m over four years and is in 2015 DAU indicated as $7.273m (nominal $) or $6.521 (real $)[11] over 5 years.

Rail joint elimination and management is a proven strategy to bring down maintenance costs but it appears to be having little effect on resurfacing (mechanised and spot) and ballast usage and improvement strategies such as undercutting or formation repair. The elimination of rail joints should reduce the need for resurfacing and consequent ballast usage.

Either Queensland Rail progresses with an aggressive rail joint program or it retains the high maintenance costs associated with deteriorated ballast. The former strategy is the one preferred by this author.

Therefore we propose to reduce the ballast maintenance allowance and resurfacing allowances progressively over the period and retain the joint elimination program.

2.3.4.5 Rail Renewal

In the 2013 DAU no rail renewal was itemised so either it was “buried” in other activities or this is a new program.

The emergence of rail renewal in the maintenance program is a little confusing because project APR 12545 RELAYING (Rerailing) PROGRAM ROSEWOOD – HELIDON also appears in the Capital Program.

Rail renewal is a normal activity where curves have worn out or where defect rates have become so large that the risk of a defect related derailment is intolerable or the cost of repairing the defects is too high, so some renewal is expected.

Figure 11 is an extract from Queensland Rail’s configuration data[12] where a computed “rail life from new” and remaining life for curves in priority order with the lowest remaining life first and then up to 10 years life for the section Rosewood to Helidon . The operative

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[10] Queensland Rail - Attachment 4_Worley Report_Confidential(629497_1) which was attached to the previous Queensland Rail Submission 2013 DAU

[11] The Asset Management submission appears to be in real $ but this is not explicitly stated, while the maintenance submission is stated as nominal $. We have assumed the AMP is real July 2014 $.

[12] Curves WL WM System.xls

date is 2012 so the table is already out of date but is a good indication of the quantum expected over the next 5 to 10 years. The tonnage ascribed to the track (16 MGT/yr) is high compared to the expected tonnage for 2015 DAU, but again the priority is consistent.

This table shows that 12.342 kms of track require some form of rerailing over the next 10 years from 2012 for the purpose of replacement for wear. We indicate “some form” of rerailing because if curve wear is the only criteria then it is possible only the high rail, or wearing rail, needs to be replaced. Over the next 8 years to 2020 (from 2012) the quantum is 8.009 kilometres.

The Maintenance Plan shows:

- Rail Renewal in 2015/16 to 2019/20 at $931,000 per year (real $).
- The Capital Plan shows 2015/16 $0, 2016/17 $2,022,000, and 2017/18 to 2019/2020 $2,059,000 (real $)

Making a total of 2015/16 - $931,000 (real $)

2016/17 - $2,953,000 (real $)

2017/18 to 2019/20 - $2,990,000 (real $)

The proposed capital works are on the basis of replacing 41kg/m rail with 50 kg/m rail while the maintenance program is based on the replacement of like for like which will be 50 kg/m.

However, since the functionality of the existing 41 kg/m rail is the same as the proposed 50 kg/m rail in that no increased speed or axle load will result, the replacement of either rail has the same purpose, to ensure safety and to maintain reliability. The quantum of the program is also significant ($1m per year) and warrants capitalisation. Therefore it is proposed to combine programs into the Capital Plan.

The assumed cost rate in the Capital Plan for rail renewal is $468/m. This is a rate based on the replacement of both rails where the 41 kg/m rail is replaced with the 50 kg/m rail. Where only one rail is replaced such as in curves the rate would not be one half because the manpower resource is not as efficient but it would be a significant reduction because the cost of the rail material is a significant component. This is estimated at $250/m for the single rail.

The maintenance rate for rerailing is shown in Table C09-1 - Rail Renewal (2015/16) as $967,824.00 for 2km but the quantity “2km” is not detailed as being for a single rail, the worn rail, or for both. This rate is $484/m which is higher than the Capital Plan rate of $468/m and it is not clear why this would be so except that being focussed on tight curves in the steepest part of the network may add some costs. But it is clear that the maintenance rate appears to be a rate inclusive of two rails. This is excessive and at least some of the curve wear replacement would involve a single rail only.

Therefore we propose that the maintenance estimates be reduced to a rate of $350/m which will on average permit a mixture of curve worn single rail replacement and some double rail replacement.

The calculated maintenance quantum which would have applied is therefore $700,000 (real $) for each year and the fully capitalised program which includes the previous maintenance allocation is:

2015/16	$700,000 (real $)
2016/17	$2,722,000 (real $)
2017/18 to 2019/20	$2,759,000 (real $)

Figure 11 Extract of Queensland Rail Data and Expected Rail Lives

District	Line Section	Short Text	Track	Start KM	End KM	Rail Type	Sleeper Type	Radius	Comment	Loop	Cant	Length	Rail Life from New MGT	Tonnage per yr	New Life in years	Date of relay	Tonnes since	Remaining life
WEST REGION	889	ML CURVE 71.339	1	71.339	71.671	50KG	Timber	103	PLATED		50	0.332	205.15	16.00	12.82	2002	176	1.82
WEST REGION	889	ML CURVE 74.102	1	74.102	74.46	50KG	Timber	108	PLATED		50	0.358	213.38	16.00	13.34	2002	176	2.34
WEST REGION	889	ML CURVE 72.946	1	72.946	73.311	50KG	Timber	115	PLATED		50	0.365	224.29	16.00	14.02	2002	176	3.02
WEST REGION	889	ML CURVE 71.866	1	71.866	72.012	50KG	Concrete	125			45	0.146	238.77	16.00	14.92	2002	176	3.92
WEST REGION	889	ML CURVE 72.784	1	72.784	72.899	50KG	Concrete	125	PLATED		45	0.115	238.77	16.00	14.92	2002	176	3.92
WEST REGION	889	ML CURVE 73.683	1	73.683	73.908	50KG	Concrete	125	PLATED		45	0.225	238.77	16.00	14.92	2002	176	3.92
WEST REGION	889	ML CURVE 73.932	1	73.932	74.073	50KG	Concrete	125	PLATED		45	0.141	238.77	16.00	14.92	2002	176	3.92
WEST REGION	889	ML CURVE 74.483	1	74.483	74.597	50KG	Concrete	125	PLATED		45	0.114	238.77	16.00	14.92	2002	176	3.92
WEST REGION	889	ML CURVE 74.670	1	74.67	74.969	50KG	Concrete	125	PLATED		45	0.299	238.77	16.00	14.92	2002	176	3.92
WEST REGION	889	ML CURVE 71.671	1	71.671	71.763	50KG	Timber	128	PLATED/TUNNELL		45	0.092	242.89	16.00	15.18	2002	176	4.18
WEST REGION	546	ML CURVE 146.021	1	146.02	146.12	50KG	Timber	92				0.094	185.53	16.00	11.60	2006	112	4.60
WEST REGION	546	ML CURVE 148.771	1	148.77	148.85	50KG	Concrete	92.5			55	0.078	186.47	16.00	11.65	2006	112	4.65
WEST REGION	889	ML CURVE 71.763	1	71.763	71.866	50KG	Timber	134			45	0.103	250.85	16.00	15.68	2002	176	4.68
WEST REGION	546	ML CURVE 139.796	1	139.8	139.86	50KG	Timber	96.93			55	0.067	194.59	16.00	12.16	2006	112	5.16
WEST REGION	546	ML CURVE 155.024	1	155.02	155.18	50KG	Timber	100			55	0.154	200.01	16.00	12.50	2006	112	5.50
WEST REGION	546	ML CURVE 139.695	1	139.7	139.8	50KG	Timber	100.1			55	0.101	200.19	16.00	12.51	2006	112	5.51
WEST REGION	546	ML CURVE 143.381	1	143.38	143.58	50KG	Timber	100.2	53kg Check Rail		55	0.199	200.27	16.00	12.52	2006	112	5.52
WEST REGION	546	ML CURVE 151.007	1	151.01	151.1	50KG	Timber	100.3			55	0.088	200.60	16.00	12.54	2006	112	5.54
WEST REGION	546	ML CURVE 151.095	1	151.1	151.37	50KG	Timber	100.6			55	0.277	201.05	16.00	12.57	2006	112	5.57
WEST REGION	546	ML CURVE 154.257	1	154.26	154.53	50KG	Timber	100.7			55	0.274	201.27	16.00	12.58	2006	112	5.58
WEST REGION	546	ML CURVE 135.935	1	135.94	136.33	50KG	Concrete	110.6			45	0.399	217.45	16.00	13.59	2005	128	5.59
WEST REGION	546	ML CURVE 147.802	1	147.8	147.99	50KG	Timber	100.9			55	0.187	201.57	16.00	12.60	2006	112	5.60
WEST REGION	546	ML CURVE 140.405	1	140.41	140.55	50KG	Timber	101.1			55	0.145	201.91	16.00	12.62	2006	112	5.62
WEST REGION	546	ML CURVE 154.165	1	154.17	154.26	50KG	Timber	101.7			55	0.092	202.94	16.00	12.68	2006	112	5.68
WEST REGION	546	ML CURVE 139.863	1	139.86	139.93	50KG	Timber	102.2			55	0.069	203.77	16.00	12.74	2006	112	5.74
WEST REGION	546	ML CURVE 142.160	1	142.16	142.25	50KG	Timber	102.2	53KG CHECK RAIL		55	0.094	203.82	16.00	12.74	2006	112	5.74
WEST REGION	546	ML CURVE 156.267	1	156.27	156.37	50KG	Timber	102.5			50	0.098	204.30	16.00	12.77	2006	112	5.77
WEST REGION	546	ML CURVE 152.831	1	152.83	152.89	50KG	Timber	103.3			55	0.054	205.60	16.00	12.85	2006	112	5.85
WEST REGION	546	ML CURVE 143.038	1	143.04	143.14	50KG	Concrete	106.1			45	0.098	210.31	16.00	13.14	2006	112	6.14
WEST REGION	546	ML CURVE 136.457	1	136.46	136.57	50KG	Concrete	120	4.97		45	0.112	231.68	16.00	14.48	2005	128	6.48
WEST REGION	546	ML CURVE 134.515	1	134.52	134.76	50KG	Concrete	120.3			45	0.241	232.04	16.00	14.50	2005	128	6.50
WEST REGION	546	ML CURVE 119.765	1	119.77	120.11	50KG	Concrete	161.1			60	0.344	282.87	16.00	17.68	2002	176	6.68
WEST REGION	546	ML CURVE 136.569	1	136.57	136.69	50KG	Concrete	122.5			45	0.123	235.27	16.00	14.70	2005	128	6.70
WEST REGION	546	ML CURVE 134.772	1	134.77	134.89	50KG	Concrete	124			45	0.116	237.38	16.00	14.84	2005	128	6.84
WEST REGION	546	ML CURVE 141.195	1	141.2	141.31	50KG	Concrete	114			35	0.114	222.77	16.00	13.92	2006	112	6.92
WEST REGION	546	ML CURVE 143.283	1	143.28	143.38	50KG	Timber	114.1	53kg Check Rail		45	0.098	222.95	16.00	13.93	2006	112	6.93
WEST REGION	546	ML CURVE 137.093	1	137.09	137.17	50KG	Concrete	126			45	0.072	240.16	16.00	15.01	2005	128	7.01
WEST REGION	546	ML CURVE 156.079	1	156.08	156.22	50KG	Concrete	118			45	0.145	228.76	16.00	14.30	2006	112	7.30
WEST REGION	546	ML CURVE 143.155	1	143.16	143.28	50KG	Concrete	119			45	0.121	230.23	16.00	14.39	2006	112	7.39
WEST REGION	546	ML CURVE 144.877	1	144.88	145.01	50KG	Concrete	120			45	0.135	231.68	16.00	14.48	2006	112	7.48
WEST REGION	546	ML CURVE 145.874	1	145.874	145.931	50KG	Concrete	120			25	0.057	231.68	16.00	14.48	2006	112	7.48

District	Line Section	Short Text	Track	Start KM	End KM	Rail Type	Sleeper Type	Radius	Comment	Loop	Cant	Length	Rail Life from New MGT	Tonnage per yr	New Life in years	Date of relay	Tonnes since	Remaining life
WEST REGION	546	ML CURVE 151.501	1	151.501	151.725	50KG	Concrete	120			45	0.224	231.68	16.00	14.48	2006	112	7.48
WEST REGION	546	ML CURVE 151.725	1	151.725	151.788	50KG	Concrete	120	Length of curves		45	0.063	231.68	16.00	14.48	2006	112	7.48
WEST REGION	546	ML CURVE 134.341	1	134.341	134.433	50KG	Concrete	132.49			65	0.092	248.88	16.00	15.56	2005	128	7.56
WEST REGION	546	ML CURVE 138.075	1	138.075	138.148	50KG	Concrete	121			45	0.073	233.12	16.00	14.57	2006	112	7.57
WEST REGION	546	ML CURVE 138.158	1	138.158	138.21	50KG	Concrete	121			45	0.052	233.12	16.00	14.57	2006	112	7.57
WEST REGION	546	ML CURVE 141.320	1	141.32	141.424	50KG	Concrete	121			45	0.104	233.12	16.00	14.57	2006	112	7.57
WEST REGION	546	ML CURVE 141.428	1	141.428	141.652	50KG	Concrete	121			45	0.224	233.12	16.00	14.57	2006	112	7.57
WEST REGION	546	ML CURVE 141.813	1	141.813	142.01	50KG	Concrete	121			45	0.197	233.12	16.00	14.57	2006	112	7.57
WEST REGION	546	ML CURVE 152.273	1	152.273	152.406	50KG	Concrete	121			45	0.133	233.12	16.00	14.57	2006	112	7.57
WEST REGION	889	ML CURVE 72.496	1	72.496	72.731	50KG	Concrete	180			30	0.235	302.12	16.00	18.88	2002	176	7.88
WEST REGION	546	ML CURVE 156.689	1	156.689	156.765	50KG	Concrete	125			45	0.076	238.77	16.00	14.92	2006	112	7.92
WEST REGION	546	ML CURVE 134.175	1	134.175	134.341	50KG	Concrete	139.95			65	0.166	258.40	16.00	16.15	2005	128	8.15
WEST REGION	546	ML CURVE 156.533	1	156.533	156.636	50KG	Concrete	128.3			45	0.103	243.30	16.00	15.21	2006	112	8.21
WEST REGION	546	ML CURVE 137.769	1	137.769	137.971	50KG	Concrete	140.8			40	0.202	259.45	16.00	16.22	2005	128	8.22
WEST REGION	546	ML CURVE 138.220	1	138.22	138.298	50KG	Concrete	130			40	0.078	245.59	16.00	15.35	2006	112	8.35
WEST REGION	546	ML CURVE 152.084	1	152.084	152.176	50KG	Concrete	130			45	0.092	245.59	16.00	15.35	2006	112	8.35
WEST REGION	546	ML CURVE 156.773	1	156.773	156.829	50KG	Concrete	130			45	0.056	245.59	16.00	15.35	2006	112	8.35
WEST REGION	546	ML CURVE 144.750	1	144.75	144.824	50KG	Concrete	131			45	0.074	246.92	16.00	15.43	2006	112	8.43
WEST REGION	546	ML CURVE 137.971	1	137.971	138.075	50KG	Concrete	131.47			40	0.104	247.54	16.00	15.47	2006	112	8.47
WEST REGION	546	ML CURVE 137.493	1	137.493	137.629	50KG	Concrete	145			35	0.136	264.56	16.00	16.53	2005	128	8.53
WEST REGION	546	ML CURVE 137.635	1	137.635	137.768	50KG	Concrete	145	Length of curves		35	0.133	264.56	16.00	16.53	2005	128	8.53
WEST REGION	546	ML CURVE 122.616	1	122.616	122.898	50KG	Concrete	197.75			45	0.282	318.46	16.00	19.90	2002	176	8.90
WEST REGION	546	ML CURVE 139.409	1	139.409	139.545	50KG	Concrete	137			25	0.136	254.70	16.00	15.92	2006	112	8.92
WEST REGION	546	ML CURVE 152.801	1	152.801	152.831	50KG	Timber	137.77			45	0.03	255.67	16.00	15.98	2006	112	8.98
WEST REGION	546	ML CURVE 138.410	1	138.41	138.66	50KG	Concrete	138			65	0.25	255.96	16.00	16.00	2006	112	9.00
WEST REGION	889	ML CURVE 72.153	1	72.153	72.334	50KG	Concrete	200	PLATED		30	0.181	320.42	16.00	20.03	2002	176	9.03
WEST REGION	546	ML CURVE 138.298	1	138.298	138.408	50KG	Concrete	139.5			65	0.11	257.84	16.00	16.12	2006	112	9.12
WEST REGION	546	ML CURVE 118.021	1	118.021	118.507	50KG	Concrete	201.7			45	0.486	321.89	16.00	20.12	2002	176	9.12
WEST REGION	546	ML CURVE 155.811	1	155.811	155.921	50KG	Concrete	140			40	0.11	258.46	16.00	16.15	2006	112	9.15
WEST REGION	546	ML CURVE 141.657	1	141.657	141.813	50KG	Concrete	140.97			45	0.156	259.66	16.00	16.23	2006	112	9.23
WEST REGION	546	ML CURVE 157.139	1	157.139	157.241	50KG	Concrete	141.5			45	0.102	260.31	16.00	16.27	2006	112	9.27
WEST REGION	546	ML CURVE 145.492	1	145.492	145.587	50KG	Concrete	142			35	0.095	260.93	16.00	16.31	2006	112	9.31
WEST REGION	546	ML CURVE 142.254	1	142.254	142.385	50KG	Concrete	143.03			45	0.131	262.18	16.00	16.39	2006	112	9.39
WEST REGION	546	ML CURVE 136.340	1	136.34	136.405	50KG	Concrete	157.07			45	0.065	278.44	16.00	17.40	2005	128	9.40
WEST REGION	546	ML CURVE 142.428	1	142.428	142.627	50KG	Concrete	144			45	0.199	263.36	16.00	16.46	2006	112	9.46
WEST REGION	546	ML CURVE 150.272	1	150.272	150.358	50KG	Concrete	145			45	0.086	264.56	16.00	16.53	2006	112	9.53
WEST REGION	889	ML CURVE 75.904	1	75.904	75.992	53KG	Concrete	210	PLATED		45	0.088	328.90	16.00	20.56	2002	176	9.56
WEST REGION	546	ML CURVE 133.524	1	133.524	133.791	50KG	Concrete	159.55			60	0.267	281.17	16.00	17.57	2005	128	9.57
WEST REGION	546	ML CURVE 152.414	1	152.414	152.577	50KG	Concrete	148	7.645		35	0.163	268.12	16.00	16.76	2006	112	9.76
WEST REGION	546	ML CURVE 122.491	1	122.491	122.596	50KG	Concrete	215			30	0.105	332.99	16.00	20.81	2002	176	9.81
WEST REGION	546	ML CURVE 134.433	1	134.433	134.491	50KG	Concrete	163.83			60	0.058	285.76	16.00	17.86	2005	128	9.86
WEST REGION	546	ML CURVE 139.968	1	139.968	140.057	50KG	Concrete	151.31			20	0.089	271.96	16.00	17.00	2006	112	10.00

2.3.4.6 Turnout Maintenance

Turnout maintenance is a usual part of routine maintenance operations and the estimates are realistic.

2.3.4.7 Mechanised Resurfacing

This program needs to be read in conjunction with Maintenance Ballast because much of the activity relies on the supply of ballast for the tamping operations.

The Mechanised Resurfacing expenditure of $3.1m represents a scope of approximately 200kms to 250kms at a rate of $12k to $15k per kilometre indicated in the 2013 DAU.

Queensland Rail's response to the data request indicates between [redacted]km and [redacted]kms on resurfacing per year over the last five years at an average cost per km of between $[redacted] and $[redacted] per km. At an average of $[redacted] per km, the 2015 plans indicate approximately [redacted]kms will be resurfaced each year, about the same as previous years. This is equivalent to resurfacing the whole of the network, some of which only receive 2 to 3 million gross tonnes.

Between Jondaryan and Rosewood (208.549 track kms) the net tonnage is 6.154m tonnes and 000gtk's 1,697,139 (1,666,223+30,916) and between Columboola and Jondaryan (168.553 track kms) is 1.568m tonnes and 000gtk's 459,028 (444,155+14,873).

Between Jondaryan and Rosewood the average gross tonnes is 8.14mgt[13] (when spread over the double tracks) and between Columboola and Jondaryan is 2.72mgt with a weighted average[14] for the whole network of 6.99mgt.

If the network is being resurfaced each year it means that the return gross tonnage is approximately 8 mgt, which is very high and one where the ballast deterioration due to tamping must be very high. It is not good practice. The program would require a dedicated resurfacing group to be operating most days of the year and completing one kilometre of work each day, which is a very high amount given the train frequency.

In addition[15], almost 57,000 sleepers are planned to be inserted/replaced in 2015/16 accounting for approximately 100 kilometres of track assuming a replacement of 1 in 3 sleepers. Given that these sleepers will mainly be replaced west of Jondaryan where 1 in 2 steel sleepers are currently, there could well be more than 100 kms affected.

Thus 400kms to 450 kms of track will be resurfaced in 2015/16. This is not regarded as realistic by us since a large part of that length will be resleepered which has its own resources for resurfacing.

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[13] This is computed by dividing the gross tonne kilometre by track kilometre

[14] By track kilometre

[15] Section 7.4 Mechanised Resleepering of the 2015 DAU Maintenance Submission: 33.

We observe that the same amount of resurfacing occurs in every other year of the program which is not realistic since resleepering and formation work will result in longer return periods for resurfacing.

Further, Capital Works are proposed for 2015/16 involving Formation Strengthening ($3.006m real $ AMP) as well as Relay Oakey to Jondaryan ($1.187m real $ AMP).

Clearly this is not a coordinated program and the amount of resurfacing for 2015/16 needs to be moderated.

We recommend a reduction in the estimate for 2015/16 by 100 kms of resurfacing which adjusts the cost estimate to $1.872m[16] (nominal) or $1.8m (real $). A reduction is also recommended for the remainder of the Regulatory Period in order to better reflect the trend of spending previously achieved and in the context of the reduction in traffic levels.

2.3.4.8 Mechanised Resurfacing – Turnouts

Mechanised Resurfacing for turnouts is a usual part of the maintenance process.

The program indicates no work in 2015/16 and then approximately $100,000 per year which we estimate represents approximately 10 turnouts per year. From a population of 43 turnouts this is a reasonable frequency of attention.

2.3.4.9 Rail Grinding – Mainline

Rail grinding is an essential activity especially on tight radius curves and for reducing rail wear and the level proposed is commensurate with good practice. Queensland Rail's response to the data request indicates an average expenditure of $447,000 per year over the last 4 years which is similar to that proposed.

2.3.4.10 Rail Grinding – Turnouts

Rail grinding of turnouts is good practice but since specialist machinery is required, the cost of mobilisation and demobilisation can be a high proportion of total cost.

While we have no variation to suggest to the expenditure we suggest that the activity occur every two years rather than every year, in order to minimise the proportion of mobilisation costs. At the relatively low tonnages, deterioration to turnouts will not be severe over that period and any particular problems can be addressed with other manual grinding equipment.

2.3.4.11 Minor Yard Maintenance

It is unclear as to what "minor yards" would now be used with the rapid reduction in non-coal activity and the reduction in coal train frequency. In fact an emphasis should be placed on putting yards and other sidings out of service as quickly as possible. We cannot identify any reason to have a budget in this area and have reduced it accordingly.

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[16] On the basis of 250kms resurfacing planned less 100kms for mechanised resleepering or 60% of $3.12m (nominal) or $1.8m (real in AMP)

2.3.4.12 Track Geometry Recording

This is an essential part of the maintenance activities and we have no variations to suggest.

2.3.4.13 Ultrasonic Test On Track machine

This is an essential part of the maintenance activities and we have no variations to suggest.

2.3.4.14 Monument Signage Maintenance

This is an essential part of the maintenance activities but usually at activity levels below that suggested. We note that there is a catch up phase in the first two years of the program and a more moderate phase thereafter which is reasonable after damage caused in recent years due to inclement weather.

2.3.4.15 Maintenance Ballast

Maintenance Ballast is, like the 2013 DAU, a large expenditure at an average of $811,000 per year represents an increase over 2013 DAU. This cost is the cost of material for routine maintenance associated with resurfacing, and not that associated with ballast undercutting which consumes much more ballast on a pro-rata basis and is separately accounted.

Maintenance Ballast costs represents a complete reconstruction of the track every 20 years and may have been calculated on that basis. This has to be interpreted in conjunction with the scope of mechanised resurfacing both of which go hand in hand.

Mechanised Resurfacing has been noted as being extraordinarily high in scope, almost the entire track equivalent tamped each year.

In addition, the Mechanised Resleepering affecting approximately 100kms of track, will also consume ballast and this means, similarly to Mechanised Resleepering, that more than all of the track will be ballasted during 2015/16. Again, the programs and estimates do not appear to have been coordinated but we have suggested that the ballast monies be retained for 2015/16 at the beginning of the program but that in subsequent years reductions take effect. This level is more consistent with the expenditure on this item in the last 5 years, shown in Queensland Rail's data request response, which shows an average of $632,000.

Like Maintenance Resurfacing, capital works involving Formation Strengthening ($3.006m real $ AMP) as well as Relay Oakey to Jondaryan ($1.187m real $ AMP) make the Maintenance Ballast unworkable and it is anomalous that so much work can be accomplished in one year with "internal Queensland Rail resources[17]".

The impact on the Capital Works Plan is commented separately in this assessment.

[17] Repeated references for all capital works and maintenance projects

2.3.4.16 Sleeper Management

Sleeper Management is a normal activity and some budget is needed for the activity. We note that in the last two years of the program the expenditure increases rapidly due presumably to a lead up to the next major resleepering operation planned for 2022. Why the level remains high after 2022 in the Asset Management Plan is unknown and appears excessive but does not affect this DAU.

2.3.4.17 Fire and Vegetation Management

This is an essential part of the maintenance activities.

2.3.4.18 Rail Stress Adjustment

This activity is new in the sense that it had not previously been itemised. The documentation says that "*The costs included in this product include restressing of sections where track works and modifications have occurred*" and there are other reasons for the work including "*traversing the Toowoomba Range poses its own problems because significant forces are exerted on the track by trains through tight radius curves resulting in more frequent rail stress adjustments"*.

The reason for the activities implies that when "track work and modifications" have been carried out the cost of restressing has not been included. This would relate to rail defect elimination, rerailing, level crossing rehabilitation and rail joint management. This might mean that a specific workforce carries this work out but it hides the real cost of performing those works to completion.

Rail stress adjustment should occur as a normal part of a completed works and the only specific rail stress adjustment as a separate activity such as where rail creep or curve movement occurs.

The current allowance of $790,000 (real $) therefore appears to be excessive and an estimate of $500,000 (real $) is suggested.

2.3.4.19 Ultrasonic Testing (Manual)

This is an essential part of the maintenance activities.

2.3.4.20 Track Inspections

This is an essential part of the maintenance activities.

2.3.4.21 Rail Lubrication

This is an essential part of the maintenance activities.

2.3.4.22 Top & Line Spot Resurfacing

This is most likely to be local gang work using hand held tools. This is common track maintenance work.

2.3.4.23 Rail Repair

A reduction in the expenditure on this item is noted over the period and being mostly due to the checkrail replacement program, where “rail repair” is in fact the replacement of checkrail bolts.

While the Checkrail Replacement program has laudable objectives, there must be serious concern about the level of capital expenditure given the embargo for coal after 2032 (17 years away) as well as plans to re-route the line as part of the Inland Rail considerations. While the Asset Management Plan of Queensland Rail’s Submission indicates that regarding Inland Rail “*it will not be considered further in this asset management plan*” the combination of the embargo and the Inland Rail, together with a large capital outlay must bring the program into tight focus, perhaps by only addressing the most severe problem areas.

The Capital Plan indicates “*The relay will provide new 50kg head hardened rail and 33C1 check rail on an inclined boltless check rail baseplate on concrete sleepers and fresh ballast. The track is to be installed on a designed and monumented alignment at a stress free neutral temperature of 38 degrees Celsius*”. This no doubt is a great engineering solution but its affordability and an evaluation of alternative strategies must be considered.

For the Maintenance Plan we have not suggested different estimates to Rail Repair but we have assessed the Capital Plan elsewhere in this report.

2.3.4.24 Level Crossing Maintenance

At the rate of $100,000 per annum (real $) is a normal program of maintenance and we have included 2015/16 due to the changes we propose for Level Crossing Construction/Reconditioning.

2.3.4.25 Level Crossing Construction/Reconditioning

We note Queensland Rail’s reason for this item in section 7.3.3 of the 2015 DAU Maintenance Submission as “*A change in accounting principles has resulted in the remaining 4 financial years renewals being capitalised and captured in the capital document*”, but wonder why this treatment cannot come into effect in 2015/16.

In the Capital Plan we have:

- Level Crossing Compliance – Regional (WM Portion) (Signalling)
- Level Crossing Maintenance - $100,000 (real $) per annum
- Level Crossing Reconditioning West Moreton at $400,000 (real $) per year from 2016/17 and which would seem to compliment the maintenance allocation of $569,000 (nominal) in 2015/16.
- Level crossing install remote monitoring (WM Portion)

These programs appear to be continuing as though nothing has occurred when in fact coal paths are lower and non-coal services are almost non-existent.

We suggest that level crossing reconditioning is a large burden in the face of dropping tonnages and with far less trains to disrupt transit time there may be adequate opportunity to lower train speed to avoid damage on particular crossings and avoid early reconditioning.

Therefore we suggest a more modest $200,000 (real $) capital program on level crossing reconstruction is more appropriate and which also applies to the 2015/16 year.

2.3.5 Mechanised Resleepering

In response to the QCA data request, Queensland Rail provided details of the timber sleeper survey of ineffective sleepers.

Between Rosewood and Jondaryan the average percentage of defective sleepers is 11% with some rates as high as 31% in loops or yards. This is still only 1 in 3. Between Jondaryan and Miles/Columboola, the average rate is 19% with maximums of 34% on the mainline. The response to the data request did not detail the resleepering areas being targeted by the Mechanised Resleepering program but presumably the bulk of the work will be in the Jondaryan to Columboola section.

The program submitted by Queensland Rail is shown in Figure 12.

Figure 12 Mechanised Resleepering Program

8.1.4 Mechanised Resleepering

The allocations are outlined in the following table:

Table 8.5: Maintenance Costs Mechanised Resleepering (nominal $'000)

Track	2015/16	2016/17	2017/18	2018/19	2019/20
Mechanised Resleepering	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total	**16,987**	**0**	**0**	**0**	**0**

Queensland Rail have based their expenditure on a unit cost in 2015/16 of $[redacted]/sleeper (1 July 2014 $).

There are two matters relating to unit costs that require some analysis.

The first matter relates to Queensland Rail explaining that sleeper plates with a contribution of $[redacted] per sleeper are a major component. One area of focus for the resleepering has been indicated at section 4.3 of the Asset Management Plan as being:

> *Currently there is interspersed timber and steel-sleepered track with defective timber sleeper percentages approaching Civil Engineering Track Standards (CETS) limits between Macalister and Chinchilla. Intervention in these areas has been progressed by maintenance gangs however the efficiencies of mechanised resleepering are required.*
>
> *Sections of track are creeping east on the Western Line between Malu and Bowenville. This section is 1-in-2 interspersed steel and in line with CETS, the*

timber sleepers are not anchored. While they supply load bearing support, they do not provide any longitudinal rail constraint.

This is the section of track west of Jondaryan with an annual coal tonnage of approximately [redacted] million net tonnes or approximately 2.8m to 3m gross tonnes[18]. The weekly return train paths in this section is forecast at [redacted] in "Table 4 2015-20 volume forecast (2015-2020)" of the Volume 2 2015 DAU submission.

The timber sleepers to be replaced are in a 1 in 2 steel sleeper pattern on these sections of track. We note that Queensland Rail has performed a detailed study into the needs for timber sleeper replacement on a like for like basis since the 2013 DAU. Details have already been discussed.

The applicable Queensland Rail Standard, provided in the response to the data request, CETS3, Table 3.7 shows the standard for Plating Requirements for speed less than or equal to 80 kmph a requirement only for Double Shouldered Sleeper Plates (DSSP) on curves with a radius of less than or equal to 400m. According to Queensland Rail documentation[19] the speed is restricted in these sections for all trains to 80kmph.

In Figure 13 the extract of curve configuration for the applicable sections shows curves with a total distance of 731m. By far the majority of track between Jondaryan and Chinchilla/Columboola is straight track.

Figure 13 Extract from Curve Configuration Jondaryan to Chinchilla

			This is toowoomba west																				
2	District	Line Prefix	Bridge Master	Line Section	Yard	Road	Equipment	Short Text	Track	Start KM	End KM	Length	Rail Type	Sleeper Type	Gauge	Category	Complex	Complex Indicator	Long Text	Direction	Radius	Angle	Comment
72	WEST REGION	WL	23I	354			8.1E+07	WL CURVE 66.719	1	66.719	66.759	0.04	41KG	1in 2 Steel	Q - Qld Gauge		0				0		
73	WEST REGION	WL	23I	354			8.1E+07	WL CURVE 66.823 DN RD	5	66.823	66.862	0.039	41KG	1in 2 Steel	Q - Qld Gauge		0				0		
74	WEST REGION	WL	23I	354			8.1E+07	WL CURVE 66.825 UP RD	4	66.825	66.86	0.035	41KG	1in 2 Steel	Q - Qld Gauge		0			L	0		
75	WEST REGION	WL	23I	354			8.1E+07	WL CURVE 67.565 DN RD	5	67.565	67.598	0.033	41KG	1in 2 Steel	Q - Qld Gauge		0				0		
76	WEST REGION	WL	23I	354			8.1E+07	WL CURVE 77.207	1	77.027	77.245	0.218	41KG	1in 2 Steel	Q - Qld Gauge		0			L	0		
77	WEST REGION	WL	23I	354			8.1E+07	WL CURVE 77.307 UP RD	4	77.307	77.343	0.036	41KG	1in 2 Steel	Q - Qld Gauge		0			L	0		
78	WEST REGION	WL	23I	354			8.1E+07	WL CURVE 77.312 DN RD	5	77.312	77.351	0.039	41KG	1in 2 Steel	Q - Qld Gauge		0			R	0		
79	WEST REGION	WL	23I	354			8.1E+07	WL CURVE 78.051 DN RD	5	78.051	78.084	0.033	41KG	1in 2 Steel	Q - Qld Gauge		0			R	0		
80	WEST REGION	WL	23I	354			8.1E+07	WL CURVE 78.138	1	78.138	78.422	0.284	41KG	1in 2 Steel	Q - Qld Gauge		0			L	0		
81	WEST REGION	WL	23I	354			8.1E+07	WL CURVE 79.007	1	79.007	79.111	0.104	41KG	1in 2 Steel	Q - Qld Gauge		0			L	0		
82	WEST REGION	WL	23I	354			8.1E+07	WL CURVE 81.445	1	81.445	81.732	0.287	41KG	1in 2 Steel	Q - Qld Gauge		0			L	0		
83	WEST REGION	WL	23I	354			8.1E+07	WL CURVE 82.410	1	82.41	82.456	0.046	41KG	1in 2 Steel	Q - Qld Gauge		0			0	0		
84	WEST REGION	WL	23I	354			1E+07	WL CURVE 83.342	1	83.342	83.493	0.151	41KG	1in 2 Steel	Q - Qld Gauge		0			R	300		
85	WEST REGION	WL	23I	355			1E+07	WL CURVE 104.222	1	104.22	104.43	0.211	41KG	1in 2 Steel	Q - Qld Gauge		0			R	1600		
86	WEST REGION	WL	23I	356			1E+07	WL CURVE 114.628	1	114.63	114.88	0.255	41KG	1in 2 Steel	Q - Qld Gauge		0			L	1600		
87	WEST REGION	WL	23I	356			1E+07	WL CURVE 161.255	1	161.26	161.37	0.114	41KG	1in 2 Steel	Q - Qld Gauge		0			L	1600		
88	WEST REGION	WL	23I	356			1E+07	WL CURVE 163.997	1	164	164.22	0.224	41KG	1in 2 Steel	Q - Qld Gauge		0			L	400		
89	WEST REGION	WL	23I	201			1E+07	WL CURVE 164.318	1	164.32	164.48	0.166	41KG	1in 3 Steel	Q - Qld Gauge		0			R	200		
90	WEST REGION	WL	23I	201			1E+07	WL CURVE 165.976	1	165.98	166.17	0.19	41KG	1in 3 steel	Q - Qld Gauge		0			L	371		
91	WEST REGION	WL	23I	201			1E+07	WL CURVE 182.898	1	182.9	183.52	0.618	41KG	1in 3 Steel	Q - Qld Gauge		0			L	1590		
92	WEST REGION	WL	23I	201			1E+07	WL CURVE 191.411	1	191.41	191.76	0.348	41KG	1in 3 Steel	Q - Qld Gauge		0			R	1520		
93	WEST REGION	WL	23I	202			1E+07	WL CURVE 194.345	1	197.31	197.56	0.244	41KG	1in 3 Steel	Q - Qld Gauge		0			L	1540		
94	WEST REGION	WL	23I	202			1E+07	WL CURVE 200.738	1	200.74	200.89	0.154	41KG	1in 3 Steel	Q - Qld Gauge		0			R	1200		
95	WEST REGION	WL	23I	202			1E+07	WL CURVE 203.993	1	203.99	204.24	0.242	41KG	1in 3 Steel	Q - Qld Gauge		0			L	1200		
96	WEST REGION	WL	23E	202			1E+07	WL CURVE 209.046	1	209.05	209.72	0.675	41KG	1in 2 Steel	Q - Qld Gauge		0				1000		
97	WEST REGION	WL	23E	202			8E+07	WL CURVE 209.046 LOOP	1	209.05	209.72	0.675	41KG	1in 2 Steel	Q - Qld Gauge		0				1000		

[18] At a gross tonne to net tonne ratio of 1.8

[19] http://www.queenslandrail.com.au/NetworkServices/Documents/Western%20System%20Information%20Pack%20-%20Issue%202%20-%20March%2006.pdf

For timber sleepers to be replaced in the more onerous Rosewood to Toowoomba section, double shoulder sleeper plates on curves are essential but given the long history of attention it is doubtful that many timber sleeper would be unplated.

We conclude that a small number of double shouldered sleeper plates may be required for a small number of timber sleepers and allocate the equivalent of $[redacted] per sleeper in place of $[redacted] for that purpose. The unit rate for resleepering with this adjustment is therefore $245.33 bringing the expenditure to $14,503,950 from $16,987,000 (nominal) or to $13,946,400 from $16,334,000 (real $ in the AMP).

The second matter relates to the much lower coal and non-coal paths now being forecast and the improvement in productivity that could be expected from that situation.

On the Jondaryan to Columboola section, where most resleepering will occur, there are only [redacted] return path trains expected per week: a little over 2 per day. The productivity should be high and contrasts with the 2013 DAU submission forecast path usage.

We conclude that labour productivity should be much higher and which accounts for approximately one third of the total cost (including resurfacing) and therefore with a 15% improvement in productivity translates to 5% unit cost reduction or approximately $12 per sleeper to bring the unit rate to $233.33. At this rate the expenditure is $13,794,510 (nominal) in 2015/16 or $13,249,080 (real $) and this our suggestion and reflected in the “Recast Maintenance Asset Management Plan” in Figure 1.

2.3.6 Trackside Systems

The Trackside Systems proposal is consistent with previous budgets, and presents no surprises in its profile, reflecting relatively fixed costs associated with preventative maintenance. The program is shown in Figure 14 which we support unaltered.

Figure 14 Queensland Rail's Trackside Systems Proposal

Trackside Systems

The allocations are outlined in the following table:

Table 8.6: Maintenance Costs Trackside Systems (nominal $'000)

Track	2015/16	2016/17	2017/18	2018/19	2019/20
Prevent Tele Bkbone Ntwrk Mtce	107	116	121	126	131
Phone/Data Maintenance	5	6	6	7	7
Prevent Signalling Field Mtce	853	890	926	963	1,001
Correct Signalling Field Mtce	246	260	256	252	247
Signalling Level Xing Protect	534	562	584	608	632
Cable Route Maintenance	204	212	221	230	239
Signalling Train Protect System	53	55	57	59	62
Wayside Monitoring System Mtce	57	66	68	71	74
Total	**2,060**	**2,168**	**2,241**	**2,315**	**2,393**

2.3.7 Maintenance for Cessation of Coal Transport in 2032

The assessment of the maintenance scope and costs of Queensland Rail's 2015 DAU in this report has been based on the continuation of coal transport through the metropolitan area in 2032.

This section of the report will assess the impact on maintenance costs assuming coal transport ceases.

The Capital program without embargo (perpetual) shows that a greater degree of capital expenditure is warranted because the assets will not be able to be kept fit for purpose indefinitely.

The Maintenance program for the "without embargo" scenario therefore is underpinned by a larger capital program. Prima facie, the Maintenance program and costs for an embargoed scenario should see some increases compared to the "without embargo" scenario.

The areas in which the Capital program for the "without embargo" scenario are greater than those for "embargoed" scenario:

- Bridge works
- Drainage
- Checkrail curves

Corresponding reductions in maintenance activity should be evident in these areas.

However, in relation to bridge works and drainage, it is our assessment that the condition warrants a “catch up” and we are reluctant to reduce maintenance budgets for those works under an “embargo” scenario.

We also understand the impact of replacing checkrail assets is not immediate and that benefits will not accrue or be noticeable until after the end of the Regulatory Period. We have therefore not made further adjustments in this area.

Overall, while capital budgets would be greater in the “no embargo” scenario compared to the “embargoed” scenario we forecast no noticeable effect of that increase on either of the Maintenance Cost scenarios, in the Regulatory Period being considered. In later Regulatory Periods the impact of the two scenarios should become more noticeable.

3 BENCHMARK 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 Queensland Rail 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. 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. The West Moreton System maintenance cost is in the high $50,000’s per km per year.

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.

4 FIXED AND VARIABLE MAINTENANCE COSTS

4.1 Background

As part of this assessment of Queensland Rail's 2015 DAU maintenance proposal, an analysis of maintenance costs on the basis of the fixed and variable components was undertaken, to understand the structure of the maintenance regime.

The QCA's 2000 Working Paper 2[20], identified the trend that as tonnages increase, so does the wear and tear component of the maintenance function with replacement of components and refurbishment through activities such as rail grinding and ballast cleaning. At small tonnages the maintenance effort is directed to time related activities such as inspections.

4.2 Methodology

In this analysis of Queensland Rail's maintenance proposal, an estimate of each activity's fixed and variable component has been made and then a weighted average, based on this report's previous Recast Maintenance Asset Management Plan as shown in Figure 1.

At Queensland Rail's projected task, approximately 7 MGT[21], the task is midrange in that it is not dominated either by high wear and tear, such as the Central Queensland Coal Network, or by very low tonnage such as the rural lines of Queensland. Activities then could be expected to display a portion of time related activity and replacement or refurbishment due to wear and tear.

The portion of fixed and variable cost will vary from year to year as the activities change. For example, in the years that timber resleepering occurs, this high expenditure item is mainly related to time because timber deteriorates with time, whereas inspections are only slightly related[22] to task.

In the context of the task variation over the Regulatory Period, and also to 2032 and beyond, a sustainable bulk haul railway will require a reasonably constant level of attention and while individual years may fluctuate in activity a "levelised[23]" approach will retain the railway in reliable condition.

The context of the analysis shown in Table 1 is to hypothecate a large variation in activity such as that observed between Queensland Rail's DAU submission of 2013 and

[20] Working Paper 2, "Usage related infrastructure maintenance costs in railways", QCA, DAU QR Draft Decision, 2000

[21] Weighted average over the whole network, (gross tonne kilometres)/(track kilometres), refer section 2.3.4.7

[22] Inspection frequency is expected to increase with high levels of task but only in discrete steps.

[23] Activity intensities are reasonably consistent as is expenditure

this current 2015 DAU. The large variation has occurred because non-coal traffic has plummeted and coal traffic reduced moderately[24].

Table 1 Estimate of Queensland Rail's Fixed Maintenance Costs

	% Fixed	FY16		FY17		FY18		FY19		FY20	
	B&H Estimate	B&H Estimate '$000	Proportion '$000	B&H Estimate '$000	Proportion '$000	B&H Estimate '$000	Proportion '$000	B&H Estimate '$000	Proportion '$000	B&H Estimate '$000	Proportion '$000
Structures and Civil	80%	3,167	2,534	3,829	3,063	4,032	3,226	3,724	2,979	2,828	2,262
Ballast Undercutting	10%	0	0	0	0	0	0	0	0	0	0
Earthworks	95%	15	14	150	143	150	143	100	95	100	95
Minor Yard Maintenance	0%	0	0	0	0	0	0	0	0	0	0
Rail Joint Management	90%	1,641	1,477	1,520	1,368	1,260	1,134	1,050	945	1,050	945
Rail renewal	70%	0	0	0	0	0	0	0	0	0	0
Turnout maintenance	50%	150	75	150	75	150	75	150	75	150	75
Track reconditioning & removal	50%	0	0	0	0	0	0	0	0	0	0
Mechanised resleepering	80%	13,249	10,599	0	0	0	0	0	0	0	0
Monument Signage	70%	357	250	360	252	60	42	60	42	60	42
Maintenance Ballast	30%	1035	311	600	180	550	165	500	150	500	150
Sleeper Management	50%	375	188	225	113	360	180	540	270	1,080	540
Fire & Veg Management	90%	1,391	1,252	1,400	1,260	1,400	1,260	1,400	1,260	1,400	1,260
Rail Stress Adjustment	50%	500	250	500	250	500	250	500	250	500	250
Track Inspections	90%	781	703	785	707	785	707	785	707	785	707
Track Cleanup	0%	0	0	0	0	0	0	0	0	0	0
Rail Lubrication	70%	256	179	260	182	260	182	260	182	260	182
Top & Line Spot Resurfacing	40%	1,372	549	1,370	548	1,370	548	1,370	548	1,370	548
Rail Repair	60%	1,548	929	1,250	750	1,150	690	1,080	648	1,080	648
Track maintenance		22,655		8,420		7,845		7,695		8,235	
Resurfacing	30%	1,800	540	2,590	777	2,340	702	2,090	627	2,090	627
Rail Grinding	10%	781	78	482	48	829	83	496	50	738	74
Track monitoring	80%	415	332	416	333	416	333	416	333	416	333
Plant maintenance		0		0		0		0		0	
TRACK AND CIVIL TOTAL		28,833		15,887		15,612		14,521		14,407	
FACILITIES Total	50%	150	75	150	75	150	75	150	75	150	75
Telecommunications	90%	108	97	114	103	114	103	114	103	114	103
Signal MAINTENANCE	90%	1,873	1,686	1,891	1,702	1,878	1,690	1,866	1,679	1,853	1,668
SIGNALLING Total		1,981		2,005		1,992		1,979		1,966	
GENERAL Total	70%	1,180	826	1,175	823	1,175	823	1,175	823	1,175	823
GRAND TOTAL		32,144	22,942	19,217	12,750	18,929	12,409	17,825	11,840	17,698	11,405
Weight Average per Year			71.4%		66.3%		65.6%		66.4%		64.4%
										Weighted Average of Regulatory Period	67.4%

4.3 Conclusion

Queensland Rail's maintenance costs for the West Moreton Network comprise approximately 67% fixed and 33% variable costs. While individual activities and variations occur from year to year and the estimates of fixed costs can vary slightly on an individual maintenance element basis, at the tonnages projected, the average over the period is expected at these levels.

[24] Explanatory Submission – Queensland Rail's Draft Access Undertaking 1 (2015) Volume 2, May 2015, section 1.2.2.2 Forecast coal services

5 FIXED AND VARIABLE OPERATING COSTS

5.1 Background

In this review, we have not reassessed Queensland Rail's Operating Costs because a significant program of reform had been previously committed.

However, in a similar manner to maintenance costs, Operating Costs consist of fixed and variable components and this section estimates the fixed component contribution.

5.2 Methodology

In this analysis of Queensland Rail's Operations proposal, an estimate of each Operating activity's fixed and variable component has been made and then a weighted average, based on Queensland Rail's own 2012/2013 financial results[25], which also reflect the committed reform targets, has been undertaken.

5.3 Factors to Consider

While trains operate on a 24 hour basis, the main component of Operation Costs, namely Train Control, requires some presence. Large changes in the operation would be required to significantly affect the cost base. The "infrastructure" associated with Train Control, communications systems, buildings, and software is substantially fixed when the configuration of the safeworking system is established. That is, when it was decided to use a certain type of signalling and control system, a number of capital items were procured that "locked" Queensland Rail into an operational method.

However, some components of operating cost display a variable component. Moderately variable components consist of labour resources as the operation become more and less complicated and congested.

In Train Control for example, the "boards" used to manage a network can be split or amalgamated depending on the amount of traffic. Since Queensland Rail uses a centralised facility in Brisbane, it should be able to adjust resources as the traffic varies. For example, while the coal operations will remain at constant or increased levels during the middle of the night, the suburban operations will slow down and one could expect that the opportunity for flexible "board" operation would become apparent.

We also note that with the forecast task becoming lower and simpler, because a mine has closed recently and non-coal traffic is projected to minimal, the task of business management and path planning, together with decision making on priority, all become easier.

We have reflected these factors in the estimate of fixed costs in each of the Operating Cost components in Table 2.

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[25] The Train Control estimate is from Queensland Rail's Table 17, 2015 DAU Submission – Volume 2 "Other operating costs (whole of network) – base year translation". The other elements in Table 2 are reconciled with the other costs shown in Table 17 of the Submission.

Table 2 Estimate of Queensland Rail's Fixed Operating Costs

Queensland Rail 2012/13 Below Rail Financial Statements

Operating Expenses:	'$000	Fixed % B&H Estimate	Fixed Contribution
Train Operations Management:			
Train Control	$2,000	90%	$1,800
Corridor Management	$87	70%	$61
Planning & Systems (Allocated)	$328	70%	$229
Sub total	**$2,415**		**$2,090**
Other Expenses:			
QCA Fees	$0	100%	$0
Regional Costs (i.e. Council Rates & Power)	$216	100%	$216
Engineering Services (Allocated)	$102	80%	$82
Business Management (Allocated)	$446	50%	$223
Group Management (Allocated)	$505	50%	$253
Operational Telecommunications (Allocated)	$189	95%	$179
Business Telecommunications (Allocated)	$0	80%	$0
Other (Allocated)	$33	79%	$26
Sub total	**$1,490**		**$978**
Corporate Overhead (Allocated)	$1,568	80%	$1,254
TOTAL OPERATING EXPENSES	**$5,473**		**$4,323**
Return on Buildings, Plant, Software & Inventory	$1,056	95%	$1,003
GRAND TOTAL OPEX	$6,529		$5,326
Weighted Average Fixed		**82%**	

5.4 Conclusion

Queensland Rail's Operating costs for the West Moreton Network comprise approximately 82% fixed and 18% variable costs. While individual activities and variations occur from year to year and the estimates of fixed costs can vary slightly on an individual operating element basis, at the tonnages projected, the average over the period is expected at these levels.

6 REVIEW OF 2015 DAU CAPITAL COST ESTIMATES (WITH NO 2032 EMBARGO)

6.1 Our Approach in this Assessment

In this Section we have considered the Capital Cost Estimates assuming coal transport continues beyond 2032[26].

In Section 7 we consider any changes to the assessment if it is assumed that coal transport ceases in 2032.

In our approach to coordinate the maintenance and capital aspects of the Queensland Rail Submission, we have, similar to the maintenance assessment, proposed our own version of the Capital AMP and this is shown in Figure 2. We have not duplicated the need for the Toowoomba Range Capacity and Clearance Upgrade in the Capital AMP because it is clearly not coal related and we have not duplicated the need for the Plant Maintenance Depot because it has not been included in Queensland Rail's tariff model.

We note that the costs in the AMP are constant dollar (real $) costs dated July 2014 and do not include capitalised interest.

In doing so we have made an assessment of:

- The capacity of Queensland Rail to perform the works with what is indicated will be mainly with "internal resources"
- The capacity of the network to absorb the delays that will be experienced in train operation due to the works
- The respective maintenance plans that augment capital works
- The engineering and economic life of assets
- The history of expenditure including the actual versus forecast history and recent timing of similar expenditure

6.2 Assumption of Context

6.2.1 Capacity Expansion

This review does not seek to establish whether Queensland Rail's proposed method for treating capacity expansion[27] is valid or not. The QCA will no doubt determine the efficacy of that proposal. This review will simply comment on the logic of the proposals and whether they fit within the context of coal train transport.

[26] We have also described this scenario as an embargo
[27] 2015 DAU Submission, Volume 2, Section 2.1.2

6.2.2 Replacement Capital

In considering the efficacy of replacement capital we note the statement[28] in the Queensland Rail Submission "*Consequently there are no 'hard and fast' rules that are applied by Queensland Rail in evaluating capital expenditure versus maintenance, other than ensuring that this is routinely considered in planning decisions based on a whole-of-life analysis*"..

We also note the policy[29] "*The annual Network Maintenance Plan forecasts work to be undertaken each year, whilst the Asset Management Plan considers a 10 year maintenance horizon*".

We consider a 10 year horizon inadequate for assets that have 50 year lives and that depreciate accordingly. In the scenario involving the embargo expressed as "*will not continue through the SEQ network beyond 2032*"[30] the justification for long life assets for coal transport is weak commercially. There may be other reasons why assets would be replaced and only be useful for 17 years from 2015, but commercially there is little sense.

In fact there has been no options analysis, either for individual projects or for the AMP as a whole. The embargo scenario is one such instance, which has the potential to significantly alter the capital and maintenance strategy over many years. In the capital project documentation there is little regard to "do nothing" or alternative strategies to expenditure, while only alternative delivery strategies of the favoured solution are discussed. Where significant maintenance activities are proposed there is little regard to options involving network operations management such as managing a permanent speed restriction in particular cases.

We have not seen any such discussion or evaluation of the alternative scenarios or of the impact of the embargo and it is apparent that the capital program and maintenance programs have been considered by Queensland Rail in isolation despite their assertion that "*this is routinely considered in planning decisions based on a whole-of-life analysis".*

We have therefore made our own evaluation and recast the capital AMP shown in Figure 2 for the scenario of perpetual (No Embargo) transport. We have also recast the capital AMP as shown in Figure 15 for the scenario where it is assumed that an Embargo of coal transport through the Metropolitan area takes effect in 2032.

6.3 Assessment of Capital Plan Elements

The following items of the 2015 DAU Capital Projects have been reviewed and comments made and some projects have had recommendations made as to more appropriate expenditure.

[28] Section 4.2, Appendix 4, Maintenance Submission 2015 DAU
[29] Section 5.1.1. Appendix 4, Maintenance Submission, 2015 DAU
[30] 3.4 Investment Drivers and Triggers, Asset Management Plan, 2015 DAU

All other 2015 DAU capital projects in Queensland Rail's Capital Submission have no comment or alteration to estimates.

6.3.1 Formation Repairs/Formation Strengthening - West Moreton System

We note that the detailed sheets explaining individual program items of the Capital Program use the term "Formation Repairs" while the Asset Management Plan uses the term "Formation Strengthening – West Moreton System". We have interpreted these terms as meaning the same. The project ID is B.04044.

We have combined Ballast Undercutting[31], a maintenance item, into this capital plan category because it is a highly invasive activity, is a large expenditure and it provides a similar result to formation repairs.

In addition, an advantage of this treatment is that it better reflects the condition of the "track support" structure providing a base for reliable train operation.

The overall magnitude of these two programs, together with other indicators such as the amount of resurfacing planned, indicates that the formation is life expired.

We have maintained the overall expenditure in the Capital Plan because the formation is life expired.

6.3.2 Timber Bridge Upgrades, Bridge Elimination and Strengthening

Queensland Rail's program of bridge capex remains because, notwithstanding there is no logic presented by Queensland Rail as a consolidated bridge strategy, or any bridge inspection data, it is clear[32] that the bridges need attention. Therefore, we have not altered the total expenditure but modified the program for more judicious timing on each of the identified projects[33].

Retention of the expenditure is a nominal budget by the authors that could be used for replacement of complete bridges or of critical timber components using concrete or steel to produce a longer life. In fact with appropriate bridge inspection data and the prospect of perpetual coal transport, a larger program of replacements may be justified, but that data is not available to the authors to make that judgement.

6.3.3 Toowoomba Range Slope Stabilisation

This activity is sensible and is supported but there are issues about the level of expenditure based on previous budget outcomes. We note that it is an allowance of $1.5m per year (real $) and the actual scope quanta is unknown. It would be prudent for Queensland Rail to provide an estimate based on the advice of the technical expert and

[31] See section 2.3.4.1
[32] Speed restrictions and visual examination by B&H
[33] There are a number of individual projects included in the bridge Capex category

to press the technical expert for prioritisation and probability of remedial work required so that scope quanta can be forecast.

It assumed that the only reason that this program is capitalised is that it involves large expenditure because as noted in the Capital Plan document "This project involves monitoring and repairing locations" and there is no objective to improve the functionality or train capacity of the network except by way of reliability.

We also note that recent years' expenditure has been less than $1m per year and therefore we suggest $1m as being a more appropriate allowance.

6.3.4 Drain Renewal

The Drain Renewal program proposed by Queensland Rail is ambitious, appears to be a nominal allocation because it has no scope and is "rounded" to the nearest million dollars.

Nevertheless, a program does need to be acted upon and where the future coal railings are perpetual an aggressive program for "drainage" is warranted. "Drainage" could include bridge/culvert replacement or associated complimentary work to slope stabilisation. Therefore we have retained the allocation but suggest that all avenues of drainage improvement be investigated to optimise the value. Alternative solutions and alternative scenarios for this expenditure should be an integral part of the submission.

6.3.5 ISAAC St Timber Bridge Upgrade

This project has been carried over into the 2015DAU and appears to have been a long time in the making involving consultation although the Toowoomba Council provides no record in its meeting minutes of the need to replace or eliminate the bridge.

We have suggested a longer timeframe in the 2015DAU for expenditure on the bridge because if after 2 years of discussion and consideration there has been no resolution and Toowoomba Council has not considered the matter then it is unlikely resolution will come before 2016/17 in which case expenditure will not occur until later.

6.3.6 Toowoomba Plant Maintenance Depot

As there were no details of the proposal provided in the submission and the expenditure is not included in Queensland Rail's tariff model, this item has not been considered and no Capex is shown in the B&H assessment of the AMP.

6.3.7 Check Rail Curves – Toowoomba Range and Little Liverpool Range

In this "No Embargo" scenario our estimate is that at least 10% reduction in cost (from the prototype costs used) and moderate extension of the program is justified and we have made the adjustments accordingly. Our view is that the prototype cost could be expected to be higher than the "production" cost.

6.3.8 Relaying (Rerailing) Program Rosewood - Helidon

Rerailing for head wear reasons is unavoidable. We have included the maintenance item “Rail Renewal” in this category because it better reflects the type of work, extension to asset life and magnitude in cost. This is discussed in section 2.3.4.5.

6.3.9 Relay Oakey to Jondaryan

We have not sought to modify this program at all since it is a legacy program.

6.3.10 Level Crossing Reconditioning West Moreton

We have noted other level crossing programs including maintenance and construction and recondition.

We have also suggested operational alternatives that may be available with the much lower number of train movements expected, reduced delays at crossing loops and considerable other works in the program.

Therefore we have suggested a program in this category of one half indicated by Queensland Rail and also one that includes 2015/16 rather than its maintenance accounting treatment as discussed in 2.3.4.25.

7 REVIEW OF 2015 DAU CAPITAL COST ESTIMATES WITH 2032 EMBARGO

7.1 2032 Embargo Context

In this section we consider the differences that may exist between the base scenario, where there is continued coal transport, at the proposed DAU rate, indefinitely beyond 2032 and where an embargo causes the cessation of coal transport in 2032.

7.2 Capital Plan Elements Showing Differences

The elements of Queensland Rail's capital plan where differences between the No Embargo and Embargo scenarios exist are in the following sections and the "Recast Capital Asset Management Plan for Embargo Scenario" is shown in Figure 15.

7.2.1 Timber Bridge Upgrades/Steel Bridge/Timber Bridge Strengthening

The analysis for the "embargo" scenario requires greater focus because of the prospect of over-capitalisation, stranding of assets and traffic disturbance during works, which have an effect for an asset life that will be short, concluding in 2032.

This item consists of several projects and they have been considered together in this section of the review since the AMP and the Capital Plan use different terms and different costs for what appears to be similar works. They should also reflect an overall strategy.

The use of the term "upgrades" is used in the AMP but not in the detailed capital plan sheets where "elimination" has been used for the 2015/16 to 2019/20 period. We have had to assume that the terms reflect a common scope of work.

The AMP shows project ID B.04043 ($1.999m) with this name for 2015/16 which is not identified in an obvious manner in the 2015 DAU Project List of the Capital Plan documents of the submission and we assume, since expenditure is only shown for 2015/16, that it is the carry-over from the previous program. The Pre-2015 Capital Project sheets indicate the scope was "*Elimination of three timber bridges on the coal corridor between Rosewood and Jondaryan by replacement with culverts.*" There was also an item "*Bridges to Culverts*" which appears to have been for smaller openings. The term "upgrade" was perhaps inappropriate since there is no scope to improve the functionality.

The AMP also indicates project ID APR 12458 "Timber Bridge Upgrades – West Moreton System" which extends to each year of the period ($3.001m, $5.271m, $6.507m, $6.828m, $6.492m).

We have interpreted these two programs as being "Timber and Steel Bridge Elimination" shown in the Capital Plan with expenditure $5,200m, $6.783m, $7.319m, $7.988m, $7.899m. We have interpreted these later quanta as nominal $ costs while the AMP reflects real costs July 2014 $.

We specifically note the Capital Plan documentation "*The works that comprise this project will be undertaken specifically to benefit coal carrying customers on the West Moreton Network. The project would otherwise not be required to be delivered within the five year 2015 DAU period*".

We assume that the "benefit coal customers" is in terms of elimination of speed restrictions on the bridges since the other traffic, being only 3 return paths per week, will involve grain and or passenger traffic which involves 15.75t axle load and the same if not higher levels of safety for the passenger train.

The "Alternative Options Considered" only considered alternative options to deliver the project and not alternative operating options such as retention or imposition of speed restrictions or maintenance.

In view of the embargo which will cease coal operations in 2032 and the availability of other options together with the unconsidered Inland Rail project we have therefore modified the AMP to spread the expenditure, buying time for decisions on Inland Rail and the Embargo to emerge.

There is also an item "Timber & Steel Bridge Repl. With RCBC West Moreton" in the AMP and we assume this corresponds to Item 4 "Replace Timber and Steel bridges with Reinforced Concrete Box Culverts" of the Capital Plan document. We understand this is a carry over project from pre-2015 and we have no variation to suggest.

We also identify "Steel Bridge Strengthening" in both documentations and we suggest that in order to keep train delays minimised and help smooth expenditure, a more realistic option is to delay that program until 2016/17 because of very high expenditure proposed in other elements of both maintenance and capital. This item is only an allowance at this stage and is not for strengthening but for "remediation and upgrade works" for "having fatigue issues and nearing the end of their fatigue life". At the time of the submission, May 2015, if inspections had not been complete, it will probably take a year to define scopes of work and call contracts in any event.

7.2.2 Drain Renewal

There is no doubt that drainage on the system is important, given the life expired formation and we support a level of scope commensurate with the need to avoid unreliability and avoidance of unnecessary maintenance.

We note that the AMP shows an allowance of $1m in 2016/17 and $2m per year thereafter.

This expenditure profile and the start not being until 2016/17 indicate an urgency which is not immediate. However a program does need to be started so it would be prudent to adopt a program.

We suggest more moderate expenditure, at least until some idea of the scope is known, as it appears not to be known at present. We have suggested half of the expenditure proposed by Queensland Rail due to the fact that no scope currently exists.

7.2.3 ISAAC St Timber Bridge Upgrade

In view of the fact that Queensland Rail has not yet reached a conclusion on the concept and that the 2014/15 financial year is almost complete it is not likely any expenditure will occur before 2017/18. In addition there is considerable uncertainty about the route or routes of railways in the Toowoomba district due to the plans for the Inland Rail and other bypass alternatives.

It would be unwise to invest capital monies into a structure in the Toowoomba area at this time in the context of the Embargo scenario and has therefore been deleted from the plan.

7.2.4 Formation Strengthening

There is no difference between the Embargo and No Embargo scenarios for our estimates but to note that “so called” ballast cleaning has increased the capex estimate.

7.2.5 Toowoomba Plant Maintenance Depot

There is no information of any kind in the submission except the title and proposed expenditure.

It is therefore not possible to ascertain the functionality afforded by a $5m expenditure in the context of an Embargo scenario but it is implied that the current facility needs work or replacement.

As the project Capex is not included in Queensland Rail’s tariff model the project has not been considered and no Capex is shown in this assessment.

7.2.6 Relay Oakey to Jondaryan

We have not sought to modify this program at all since it is a legacy program but in the face of the cessation of coal in 2032 the scope of this work may become too concentrated in specific areas and the expenditure may be better spent across broader categories of work and location. We suggest continued reassessment of the scope.

7.2.7 Checkrail Curves

This program is substantial and there is no doubt the current check rail problems should attract some investment. We note that the maintenance item Rail Repair reduces in magnitude by one third over the Regulatory Period.

For an expenditure of $[redacted]/metre the project is essentially a complete rebuild of the superstructure of the track and includes formation and drainage works. This appears to be a lot more than just the installation of new checkrails. This cost was “actual cost” which must therefore have derived from the first few/two years of the program in 2013/14 and 2014/15.

In the next few years to 2019/20 we would expect to see unit costs reduce because the first two years were in effect protyping the initiative.

With complete rebuilding of the most difficult and maintenance prone sections of track on the network we would expect to see much greater maintenance benefit across all of the maintenance elements if the program was based on the highest priority maintenance cost in order to maintain the safety and reliability of the network.

In view of the suburban embargo and the prospect of a new alignment with Inland Rail, and of the retention of most of the maintenance budget, as well as the expectation that unit costs would reduce with experience, we suggest smoothing the expenditure and this will allow closer assessment of the strategic drivers as they unfold and which may prevent asset stranding.

Smoothing and cost efficiency could be in the form of reassessing the scope to include less formation and drainage works in order to retain the focus on the actual checkrail bolts issue or a time elongation in the number of sites as well as the benefit of experience with the technology as the program unfolds. We have suggested $2m per year through to 2019/20.

7.2.8 Level Crossing Reconditioning West Moreton

Similar to the “No embargo” scenario we have noted other level crossing programs including maintenance and construction and recondition.

We have also suggested operational alternatives that may be available with the much lower number of train movements expected, reduced delays at crossing loops and considerable other works in the program.

Therefore we have suggested a program in this category of one half indicated by Queensland Rail and also one that includes 2015/16 rather than its maintenance accounting treatment.

Figure 15 Recast Capital Asset Management Plan for 2032 Embargo Scenario

		2032 Embargo Scenario											
Project ID	QCA Capital Item	Project Name		2015/16		2016/17		2017/18		2018/19		2019/20	
				QR	B&H	QR	B&H	QR	B&H	QR	B&H	QR	B&H
B.04044	2	Formation Strengthening - West Morton System	CIVIL PROGRAM	3,006	4,176	0	0	0	0	0	0	0	0
APR 12458	3	Timber Bridge Upgrades	CIVIL PROGRAM	3,001	3,001	5,271	3,000	6,507	3,000	6,828	3,000	6,492	3,000
NEWCIVIL5	9	Steel Bridge Strengthening	CIVIL PROGRAM	2,000	0	0	2000	0	0	0	0	0	0
B.04043	3	Timber Bridge Strengthening	CIVIL PROGRAM	1,999	1,999	0	0	0	0	0	0	0	0
APR 12548	1	Toowoomba Range Slope Stabilisation	CIVIL PROGRAM	1,500	1,000	1,500	1,000	1,500	1,000	1,500	1,000	1,500	1,000
APR 12454	4	Timber & Steel Bridge repl. With RCBC	CIVIL PROGRAM	1,000	1,000	1,200	1,200	0	0	0	0	0	0
NEWCIVIL4	2	Formation Strengthening - West Morton System	CIVIL PROGRAM	0	0	3,112	4,512	3,006	4,406	3,006	4,406	3,006	4,406
NEWCIVIL2	5	Drain Renewal	CIVIL PROGRAM	0	0	1,000	500	2,000	1,000	2,000	1,000	2,000	1,000
REGCIV003	3	ISAAC ST Timber Bridge Upgrade	CIVIL PROGRAM	0	0	1,000	0	0	1,000	0	0	0	0
REGCIV017		PROGRAM TRACK PROGRAM - WEST MORETON TRACK	CIVIL PROGRAM	0	0	0	0	0	0	0	0	0	0
	CIVIL PROGRAM TOTAL			12,506	11,176	13,083	12,212	13,013	10,406	13,334	9,406	12,998	9,406
B.04163 (WM Portion)	15	Corridor & Asset Protection (WM Portion)	COND'N MONIT'G	1,298	1,298	460	460	0	0	0	0	0	0
NEW	15	Corridor & Asset Protection (WM Portion)	COND'N MONIT'G	0	0	625	625	400	400	0	0	0	0
	CONDITIONING MONITORING PROGRAM TOTAL			1,298	1,298	1,085	1,085	400	400	0	0	0	0
APR 12657		Toowoomba Range Capacity and Clearance Upgrade	GROWTH	55,735		260		0		0		0	
	GROWTH TOTAL			55,735		260		0		0		0	
SEQFAC015		Toowoomba Plant Maintenance Depot	IMPRVT/EFFICY PROG	500		3,500		1,000		0	0	0	0
	IMPROVEMENT/EFFICIENCY PROGRAM TOTAL			500	0	3,500	0	1,000	0	0	0	0	0
NEWSIGNALWM02	20	Upgrade of 4.5V Solar Track Feed to 12V Helidon to Lockyer (3), Forest Hill to Laidley (3), Yarongmalu	SIGNAL'G PROGRAM	0	0	0	0	100	100	285	285	0	0
NEWSIGNALWM03	21	Upgrade of Model 10 Boom Mech SIGNALLING PROGRAM	SIGNAL'G PROGRAM	0	0	0	0	100	100	100	100	100	100
NEWSIGNALWM04	22	Upgrade Alternators Grandchester, Yarongmalu, Rangeview	SIGNAL'G PROGRAM	0	0	0	0	150	150	150	150	150	150
NEW	16	Digital Telemetry (WM)	SIGNAL'G PROGRAM	0	0	0	0	50	50	455	455	455	455
B.04075 (WM Portion)	11	Level Crossing Compliance - Regional (WM Portion)	SIGNAL'G PROGRAM	1,728	1,728	702	702	1,500	1,500	0	0	0	0
B.04196	13	Siemens AZ S600 Axle Counter Replace West Moreton	SIGNAL'G PROGRAM	1,071	1,071	0	0	0	0	0	0	0	0
B.04073 (WM Portion)	12	Pedestrian Crossing Installations & Upgr (WM Portion)	SIGNAL'G PROGRAM	700	700	450	450	0	0	0	0	0	0
NEWSIGNALWM01	19	Signalling Pole Route Upgrade Grandchester to Laidley	SIGNAL'G PROGRAM	400	400	450	450	0	0	0	0	0	0
B.04115	17	DTC Automatic Code Exchange	SIGNAL'G PROGRAM	280	280	180	180	0	0	0	0	0	0
APR 12445	18	Level Crossing Install Remote Monitoring (WM Portion)	SIGNAL'G PROGRAM	25	25	250	250	250	250	0	0	0	0
B.04064 (WM Portion)	14	ATP Encoder Replacement (WM Portion)	SIGNAL'G PROGRAM	10	10	10	10	240	240	240	240	0	0
B.04086 (WM Portion)	13	Siemens AZ S 600 Axle Counter Replacements West Moreton	SIGNAL'G PROGRAM	0	0	511	511	0	0	0	0	0	0
NEWSIGNALWM05	23	Upgrade Asbestoses Loc Boxes	SIGNAL'G PROGRAM	0	0	0	0	0	0	100	100	350	350
NEW	12	Pedestrian Crossing Installations & Upgr (WM Portion)	SIGNAL'G PROGRAM	0	0	0	0	1,400	1,400	800	800	550	550
REGSIG004		PROGRAM SIGNALLING PROGRAM	SIGNAL'G PROGRAM	0	0	0	0	0	0	0	0	0	0
	SIGNALLING PROGRAM TOTAL			4,214	4,214	2,553	2,553	3,790	3,790	2,130	2,130	1,605	1,605
B.04055 (WM Portion)	24	Train Radio Network Replacement (WM Portion)	TELECOMS PROGRAM	2,125	2,125	0	0	0	0	0	0	0	0
APR 12795 (WM Portion	25	LEDR Radio System Replacement West Moreton System	TELECOMS PROGRAM	69	69	0	0	0	0	0	0	0	0
	TELECOMMS PROGRAM TOTAL			2,194	2,194	0	0	0	0	0	0	0	0
B.04047	6	CHECK RAIL CURVES - TOOMWOOMBA RANGE AND LITTLE LIVERPOOL RANGE	TRACK PROGRAM	3,642	2,000	2,329	2,000	0	0	0		0	
APR 12545	8	RELAYING (Rerailing) PROGRAM ROSEWOOD - HELIDON	TRACK PROGRAM	0	700	2,022	2,722	2,059	2,759	2,059	2,759	2,059	2,759
NEWTRACK6	7	Relay Oakey to Jondaryan	TRACK PROGRAM	1,187	1,187	3,580	3,580	2,580	2,580	2,580	2,580	3,115	3,115
APR 12540	6	CHECK RAIL CURVES - TOOMWOOMBA RANGE AND LITTLE LIVERPOOL RANGE	TRACK PROGRAM	0	0	2,476	0	4,911	2,000	1,899	2,000	0	2000
NEWTRACKWM01	10	Level Crossing Reconditioning West Moreton	TRACK PROGRAM	0	200	400	200	400	200	400	200	400	200
REGTRACK012		PROGRAM TRACK PROGRAM - WEST MORETON TRACK	TRACK PROGRAM	0	0	0	0	0	0	0	0	0	0
	TRACK PROGRAM TOTAL			4,829	4,087	10,807	8,502	9,950	7,539	6,938	7,539	5,574	8,074
			GRAND TOTAL	25,541	22,969	31,288	24,352	28,153	22,135	22,402	19,075	20,177	19,085

8 REVIEW OF PRE 2015 DAU CAPITAL PROJECTS

We notice for the most part that the Pre 2015 DAU capital projects flow through into the 2015 DAU projects list and separate comment is made about the timing and costs associated with those projects.

Suffice to say, most of the programs into 2015 and beyond are exactly the same as they were in the 2013 DAU which is surprising in light of the coal and non-coal drop in traffic. Some moderation could have been expected and further comment is made in this report against each item.

We note that some of these projects have been carried over from TSC funding.

The following assessment's context is that for which was known at the time about traffic levels, but in the light of the latest Queensland Rail Submission may indicate some lessons learned. Only the largest elements have been commented upon.

8.1 Element Review

8.1.1 Western System Asset Replacement (WSAR)

This was a program that included a wide scope of work, essentially rebuilding the weakest parts of the network. It has now been essentially replaced by the new project NEWTRACK6, QCA# 7, Relay Oakey to Jondaryan of the 2015 DAU Track program which is more targeted geographically.

The WSAR included amongst other items the replacement of turnouts which are often the weakest and most unreliable part of the track superstructure. The replacement was with 60 kg/m rail on concrete bearers[34]. There was no reason to use 60 kg/m rail except there were convenient designs in use in the coal network. Perfectly adequate 50 kg/m rail designs were available[35] but not yet used in Queensland.

All of the work was performed by Queensland Rail resources. This was not necessary as there is a large competitive market for this type of work but it was the prevailing employment practice at the time. Competitive tendering was not employed.

It is not unreasonable therefore to indicate that the work could have been performed for less money and our estimate is 10% and therefore adjust the costs accordingly.

The Rosewood to Jondaryan section would therefore attract $12.517.47m and the Jondaryan to Columboola section would attract $1.145.70m.

[34] These are sleepers, but under turnouts, and are of special dimensions

[35] Robin Stevens, Queensland Rail at the National Turnout Workshop, Perth Nov 2010, at http://www.slideshare.net/informaoz/andrew-matthews-paper-ghd

8.1.2 Malu Extension

With hindsight this extension would not now be required given the very low number of paths[36] forecast west of Jondaryan and with Bowenville only 7 kilometres to the west where crossings could occur.

There are currently 3 turnouts on the mainline servicing GraCorp and Boral Quarries in addition to the two turnouts for the loop on the other side of the mainline track.

The scope of work in the Submission is not detailed enough to indicate whether the opportunity was taken to swap the loop for the mainline so that the turnouts servicing GrainCorp and Boral Quarries were from the loop thereby reducing the number of mainline turnouts but we hope the opportunity was taken in order to reduce maintenance costs.

8.1.3 Toowoomba Range Stabilisation

This is an on-going program and understandable in the circumstances. We note expenditure around $0.75m in past years and we have moderated the “allowance” of $2m for the forward program to $1m in the 2015 DAU forecast capex.

8.1.4 West Moreton Timber Bridge Upgrades

This is an elimination of timber bridge program rather than an “upgrade” as such and the program is carried into the 2015DAU Capital Plan.

We assume from the assertion that “The works that comprise this project will be undertaken specifically to benefit coal carrying customers on the West Moreton Network.” The other users of the bridges will be able to tolerate:

- Reduces maintenance costs associated with component degradation/replacement.
- Reduces exposure to old technology and labour intensive practices.
- Reduces exposure to defect and related speed restrictions on bridges and approaches

But these are general benefits and the costs should be apportioned across all users.

8.1.5 Formation Strengthening - West Moreton

There is little doubt and from our own inspection that the formation on the West Moreton system is physically life expired and that a program of rectification is necessary. Given the quantum of expenditure and the long life extension of the asset the work is rightly capitalised. Over time this should result in lower maintenance costs.

[36] Approximately 3 return paths per day

The type of work involved emanates from the repeated application of coal train loads which degrades the formation structure. Therefore the benefits are assessed as being to coal only traffic.

We assume from the assertion that "*The works that comprise this project will be undertaken specifically to benefit coal carrying customers on the West Moreton Network*" in the project description that other users would be able to tolerate the speed restrictions and derailments indicated in the benefits if the works were not done.

8.1.6 Bridges To Culverts

Any cost effective way to reduce the maintenance and other risks associated with timber bridges should be explored and this program is moderate in its approach. We assume from the assertion that "*The works that comprise this project will be undertaken specifically to benefit coal carrying customers on the West Moreton Network* in the project description that other users would be able to tolerate not having the benefits of:

- *Reduces the risks associated with working on bridges.*
- *Reduces costs associated with maintenance and eliminates labour intensive work practices.*
- *Reduces exposure to defect and work related speed restrictions.*

But it is not obvious to us that this is the case. These benefits are equally applicable to other traffic and should be apportioned accordingly.

8.1.7 Drain Upgrade West Moreton

A program to refurbish or replace drains[37] affected by calcium chloride is a realistic program provided the necessity for the drain has been re-established[38] and that the most cost effective method to "*reduce the risk of culvert failure which would result in transit time delays and/or derailments*" has been employed. Three drains were completed for $1,065,000 or approximately $340,000 each. It is not possible to ascertain the size and complexity of those drains but at that unit price they must be very large or in very difficult positions. The most modern practices use a sleeve arrangement jacked into position.

8.1.8 Check Rail Curves

This program represents the first two years of an extensive and on-going program in which we have learned from the 2015DAU projects attract a unit cost of $[redacted]/metre as "*actual cost*" report in that program which no doubt was derived from this pre-2015DAU program.

[37] These appear to be culverts, not drains which usually mean open drainage structures as distinct from covered culverts
[38] Given other structures and waterway evolution

We have made suggestions about reducing the unit cost and the scope of the extensive works undertaken during these first two years of the program in the 2015DAU Capital Plan.

8.1.9 Forest Hill Timber Bridge Replace

This project has been coordinated with other flood remedial works and appears to be an essential part of Queensland Rail's community cooperation.

8.1.10 Isaac St

This project has been carried over into the 2015DAU and appears to have been a long time in the making involving consultation although the Toowoomba Council provides no record in its meeting minutes of the need to replace or eliminate the bridge.

We have suggested a longer timeframe in the 2015DAU for expenditure on the bridge because if after 2 years of discussion and consideration there has been no resolution and Toowoomba Council has not considered the matter then it is unlikely resolution will come before 2016/17 in which case expenditure will not occur until later.

8.1.11 Siemens Axle Counters

This is a necessary program which is encountered in many locations around Australia.

8.2 Summary Table

In Figure 16 we have summarised the comments and any budget variations considered in the forgoing section.

Figure 16 Pre-2015 DAU Capital Projects

B number	No.	Project	Corridor	2013/14	2014/15	Total	Comment
B.03656	1	WSAR	Rosewood - Jondaryan	$7,836,340	$6,072,332	$15,182,307	Reduce by 10% with benefits to coal only
			Jondaryan - Columboola	$1,128,967	$144,668		
B.04018	2	Malu Extension	Rosewood - Jondaryan	$0	$0	$924,291	Benefits all users
			Jondaryan - Columboola	$924,291	$0		
B.04042	3	Toowoomba Range Stabilisation	Rosewood - Jondaryan	$131,242	$757,279	$888,521	Benefits all users
B.04043	4	West Moreton Timber Bridge Upgrad	Rosewood - Jondaryan	$112,082	$2,989,760	$3,101,842	Apportion across all users
			Jondaryan - Columboola	$0	$0		
B.04044	5	Formation Strength - West Moreton	Rosewood - Jondaryan	$1,858,619	$1,136,079	$7,178,620	Benefits to coal only
			Jondaryan - Columboola	$630,801	$3,553,121		
B.04045	6	Bridges To Culverts	Rosewood - Jondaryan	$19,023	$10,190	$155,699	Apportion across all users
			Jondaryan - Columboola	$30,568	$95,917		
B.04046	7	Drain Upgraded West Moreton	Rosewood - Jondaryan	$0	$0	$1,065,000	Benefits all users
			Jondaryan - Columboola	$0	$1,065,000		
B.04047	8	Check Rail Curves	Rosewood - Jondaryan	$450,964	$3,577,067	$4,028,031	Benefits all users
B.04075	9	Level Crossing Compliance - Regiona	Rosewood - Jondaryan	$0	$0	$370,000	Benefits all users
			Jondaryan - Columboola	$0	$370,000		
B.04142	10	Forest Hill Timber Bdge Replace	Rosewood - Jondaryan	$256,434	$2,239,310	$2,495,743	Benefits all users
B.04207	11	Isaac St	Rosewood - Jondaryan	$0	$97,954	$97,954	Benefits all users
B.04196	12	Siemens Axle Counters	Rosewood - Jondaryan	$10,000	$1,408,000	$1,418,000	Benefits all users
B.04198	13	LEDR Radio system replacement	Rosewood - Jondaryan	$0	$163,422	$163,422	Benefits all users
			Jondaryan - Columboola	$0	$0		
B.04055	14	Train Radio Network Replacement Pr	Rosewood - Jondaryan	$221,000	$0	$295,000	Benefits all users
			Jondaryan - Columboola	$0	$74,000		
B.04163	15	Corridor and Asset Protection	Rosewood - Jondaryan	$0	$440,979	$587,973	Benefits all users
			Jondaryan - Columboola	$0	$146,994		
Total				$13,389,331	$24,563,072	$37,952,402	$36,434,171

9 ASSESSMENT OF THE DORC

9.1 Summary

At the request of the QCA 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, albeit some assets are maintenance-intensive (e.g. timber sleepers) and some assets require very little maintenance (e.g. tunnels)
- 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. We have calculated an Initial Asset Value (IAV) which is the replacement value of the asset in $2013 where an asset has not already exceeded its expected life and the remaining life as of June 2013 has been calculated 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 17 and the notes underpinning the pictorial shown in Table 3.

Some assets comprise “asset bundles” where Capex was expended on a particular project (such as the Jondaryan Track Upgrade) and this is shown on the pictorial accordingly.

The pictorial[39] indicates that the Remaining Asset Value in 2013 was $235.91m which is 71% of the Initial Asset Value. The Rosewood to Jondaryan section represented 68.2% of the remaining asset value of the total route with a value of $160.96m, the Jondaryan to Macalister section represented 12.5% of the remaining asset value of the total route with a value of $29.60m, while the Macalister to Columboola section represented a remaining 19.2% of the remaining asset value of the total route with a value of $45.35m[40].

Figure 17 – Timeline Analysis of Queensland Rail Assets on the West Moreton System

[39] QCA Draft Decision model to QR 2015 DAU_Western System_080915 (for BnH)_MB.xlsm with formatting adjustments of “QCA Draft Decision model to QR 2015 DAU_Western System_080915 (for BnH).xlsm”.

[40] These estimates include Queensland Rail’s AFD funded capex

Figure 17 – Timeline Analysis of Queensland Rail Assets on the West Moreton System

Asset	1867/1875……1967/1975	1995	2013	IAV/RAV (with IDC)	Rosewood to Jondaryan	Jondaryan to Macalister	Macalister to Columboola	
Legend	THE REGULATORY PERIOD OVER WHICH THE ASSET IS FUNCTIONAL		THE PERIOD OF MAINTENANCE					
Tunnels	First 1867 Last 1875 LIFE OF ASSET		ALL MAINTENANCE	Remaining IAV $0.00m 2013				
Timber Bridges			Last 1970 LIFE OF ASSET	IAV $2013: $13.19m Remaining IAV $8.31m 2013	27.90% R-J 63.00% wght'd rem'g life 2013 R-J	0.00% J-M 100.0% wght'd rem'g life 2013 J-M	72.10% M-C 63.00% rmnng lf 2013 M-C	Life to 2070
Concrete Bridges		First 1970 LIFE OF ASSET	Last 2007	IAV $2013: $42.38m Remaining IAV $35.06m 2013	76.37% R-J 84.60% wght'd rem'g life 2013 R-J	22.04% J-M 76.9% wght'd rem'g life 2013 J-M	1.59% M-C 74.00% rmnng lf 2013 M-C	Life to 2107
Concrete/steel Culverts		First 1957 LIFE OF ASSET	Last 2004	IAV $2013: $30.90m Remaining IAV $15.27m 2013	68.17% R-J 51.4% wght'd rem'g life 2013 R-J	20.92% J-M 45.9% wght'd rem'g life 2013 J-M	10.91% M-C 44.0% wght'd rem'g life 2013 M-C	Life to 2104
Timber sleepers All maintenance		ALL MAINTENANCE		Remaining IAV $0.00m 2013				
Steel sleepers All maintenance		First 1984 MAINTENANCE	Last 2005	Remaining IAV $0.00m 2013				
Concrete sleepers			First 1997 LIFE OF ASSET	IAV $2013: $24.58m Remaining IAV $19.95m 2013	95.89% R-J 81.5% wght'd rem'g life 2013 R-J	4.11% J-M 72.6% wght'd rem'g life 2013 J-M	0.00% M-C	Life to 2057
Ballast		First 1995 LIFE OF ASSET	Last 2007	IAV $2013: $4.07m Remaining IAV $2.15m 2013	95.89% R-J 53.8% wght'd rem'g life 2013 R-J	4.11% J-M 31.5% wght'd rem'g life 2013 J-M	0.00% M-C	Life to 2027
Fences		First? Last pre-1995 LIFE OF ASSET	MAINTENANCE					
Earthworks	LIFE OF ASSET	MAINTENANCE	Last 2007 MAINTENANCE	IAV $2013: $0.15m Remaining IAV $0.14m 2013	77.19% R-J 93.5% wght'd rem'g life 2013 R-J	22.81% R-J 93.5% wght'd rem'g life 2013 J-M	0.00% M-C	Life to 2107
Signals & telcomms Incl Lxings		First 1976 LIFE OF ASSET	Last 2006	IAV $2013: $2.31m Remaining IAV $0.66m 2013	100.00% R-J 28.5% wght'd rem'g life 2013 R-J	0.00% J-M	0.00% M-C	Life to 2026
41kg/m Rail (at 50 yrs max life)			First 1983 Last 2013 LIFE OF ASSET	IAV $2013: $105.69m Remaining IAV $59.13m 2013	42.46% R-J 26.0% wght'd rem'g life 2013 R-J	26.32% J-M 52.0% wght'd rem'g life 2013 J-M	31.2% M-C 100.00% rmnng lf 2013 M-C	Life to 2063
50kg/m Rail Straights (at 50 yrs max life)		Adjustments made for max 50 year life of rail	First 2006 LIFE OF ASSET	IAV $2013: $13.72m Remaining IAV $11.80m 2013	100.00% R-J 86.0% wght'd rem'g life 2013 R-J	0.00% J-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 LIFE OF ASSET	IAV $2013: $14.46m Remaining IAV $10.39m 2013	100.00% R-J 71.9% wght'd rem'g life 2013 R-J	0.00% J-M	0.0% M-C	Life to 2036
50kg/m HH Curves (at 50 yrs max life All R-J)		Adjustments made for max 50 year life of rail	First 2013 LIFE OF ASSET	IAV $2013: $6.30m Remaining IAV $6.30m 2013	100.00% R-J 100.0% wght'd rem'g life 2013 R-J	0.00% J-M	0.0% M-C	Life to 2063
Top 600		Has never existed		Remaining IAV $0.00m 2013				
Turnouts All maintenance		MAINTENANCE		Remaining IAV $0.00m 2013				
Roads All maintenance	LIFE OF ASSET		MAINTENANCE	Remaining IAV $0.00m 2013				
Power Systems		First 1975 LIFE OF ASSET	Last 1996	IAV $2013: $3.14m Remaining IAV $0.94m 2013	76.69% R-J 29.95% wght'd rem'g life 2013 R-J	14.57% J-M 30.00% wght'd rem'g life 2013 J-M	8.7% M-C 30.00% rmnng lf 2013 M-C	Life to 2026
Pre 2007 Capex not Included in IAV (2007)	Western System Historical Capex 1995-2007 These items included in previous assets							
Jondaryan Track Upgrade Post 2007	Includes Track, Bridges, Culverts		First 2008 Last 2011 LIFE OF ASSET	IAV $2013: $15.17m Remaining IAV $13.81m 2013	100.00% R-J 91.0% wght'd rem'g life 2013 R-J	0.00% J-M 0.0% wght'd rem'g life 2013 J-M	0.0% M-C	Wtd Lf - 2059
Columboola to Fisherman Islands Project (Main Line) Post 2007	Includes Track, Signals, Culverts, Earthworks and Telecomms	On the basis of page 3 table in business case, ratio of expenditure and track length	First 2011 Last 2013 LIFE OF ASSET	IAV $2013: $27.12m Remaining IAV $25.31m 2013	75.16% R-J 93.5% wght'd rem'g life 2013 R-J	7.78% J-M 93.3% wght'd rem'g life 2013 J-M	17.06% M-C 92.63% rmnng lf 2013 M-C	Wtd Lf - 2053
Western System Asset Replacement Post 2007	Track including turnouts only		First 2007 Last 2013 LIFE OF ASSET	IAV $2013: $28.54m Remaining IAV $26.66m 2013	92.29% R-J 93.4% wght'd rem'g life 2013 R-J	7.71% J-M 93.4% wght'd rem'g life 2013 J-M	0.0% M-C	Wtd Lf - 2048

Total IAV $2013: $331.75m	IAV $2013: $230.69m R-J	IAV $2013: $49.60m J-M	IAV $2013: $51.46m M-C
Of Total IAV	R-J 69.5%	J-M 15.0%	M-C 15.5%
Rem'g Asset Value $235.91m 2013	RAV $2013 R-J $160.96m	RAV $2013 J-M $29.60m	RAV $2013 M-C $45.35m
Of Remaining IAV	R-J 68.2%	J-M 12.5%	M-C 19.2%
71%			

9.2 Historical Asset Considerations

9.2.1 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 Jondaryan, Jondaryan to Macalister and Macalister to Columboola sections we have further interrogated the data and made the necessary allocations.

9.2.2 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 Queensland Rail that relates to specific projects undertaken in the recent past, from 2007 to 2013, and further historical projects 1995 to 2007.

Spreadsheets accessed were:

- West Moreton System Model AU1 - QCA 28.06.13 (R2M).xls
- West Moreton System Model AU1 - QCA Sub 23.04.15 (R2J).xlsm
- West Moreton System Model AU1 - QCA 24.07.13 (M2C Split)
- West Moreton System Model AU1 - QCA Sub 23.04.15 (J2C).xlsm
- Queensland Rail Tariff Model[41] group

[41] Includes West Moreton System Model AU1 - QCA Sub 23.04.15 (R2J), West Moreton System Model AU1 - QCA Sub 23.04.15 (J2C), West Moreton System Model AU1 - QCA Sub 23.04.15 (BM)

- DORC Valuation 080715 Appendix B - Excel - Historical application.xls[42]

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.

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 "UT3 Historical Capex" tab.

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[43] where Connell Hatch[44] deduced its estimate using an ORC methodology and which was later reviewed by Everything Infrastructure[45] 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. However, where data is available from the Queensland Rail "Historical Capex" tab, in the "West Moreton System Model" spreadsheets, that data has been used because it is a direct report on the expenditure actually incurred.

Thus, in the main, the data for the scope, asset category and Initial Asset Value have been derived from primarily Queensland Rail's spreadsheets for the period 1996/97 to 2006/07, the Connell Hatch data for assets prior to 1996/97, and then from the projects undertaken since that time. For capex undertaken prior to 1996/97, some of the assets have already fully depreciated so their remaining values are zero and they have not been reported.

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

9.3 Asset Value Estimates

In this section each of the assets indicated in the pictorial (Figure 17) are discussed. The assets are grouped in this section as they are in Figure 17. The reader should note that 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.

9.3.1 Tunnels

Tunnels were constructed well over 100 years ago[46] but have an ascribed life for depreciation of 100 years. Since no Queensland Rail information or any other source has identified capital expense, their remaining life for depreciation is zero. We conclude that the

[42] Connell Wagner, created: 15/07/2008, author: stacyn
[43] Draft Decision Queensland Rail Network 2009 Draft Access Undertaking December 2009
[44] Final Estimate Report, Western System Depreciated Optimised Replacement Cost (DORC) Assessment Queensland Rail, 6 August 2008, in Appendix B
[45] Queensland Rail Network's 2009 Access Undertaking Assessment of Western System Asset Valuation November 2009
[46] The tunnels were constructed by 1867 and as of 2013 were 146 years old

tunnels have had their life extended by way of maintenance, although we recognise that tunnels get very little maintenance, and therefore the IAV has been ascribed as zero.

9.3.2 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 and we conclude that their lives have been extended by way of maintenance, so have fully depreciated.

9.3.3 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. Other records were sourced from Queensland Rail's 1996 to 2007 Historical Capex Data. We have included these works for estimating the IAV.

9.3.4 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 as well as Historical Capex from Queensland Rail data suitably inflated and adjusted for remaining life.

9.3.5 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.

9.3.6 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.

9.3.7 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[47]. Records[48] indicate that concrete sleepers were first installed in 1996/97 and that by 2006/07 they had been incorporated into the other programs dealt with below.

9.3.8 Ballast

The ballast in this label represents ballast that would not have been included in a project[49] but was identified as a specific Capex item in any other historical capital cost, either Queensland Rail data or in Connell Hatch data. The last record of ballast placement in this

[47] The post 2007 projects
[48] West Moreton System Model AU1 - QCA 28.06.13 (R2M) Historical Application-B&H July 15.xls
[49] Post 2007 project

way was in 2007. Since ballast life is estimated to be 20 years, the last ballast to be depreciated for this item will expire in 2027.

9.3.9 Fences

Queensland Rail has not provided information of Capex for fencing. Given an expected life of 15 years, the presence of fencing in Queensland Rail's asset base means that its original life must have been extended with maintenance and its remaining value is therefore zero.[50]

9.3.10 Earthworks

This item relates to stand-alone earthworks activities. In 2007 a small amount of earthworks activities was recorded as Capex in Queensland Rail's spreadsheet ('historical capex' tab). The original earthworks asset included cuttings, embankments, earth drainage structures and the rail corridor including access roads. All of these assets receive selective maintenance which is indicated in Figures 8 and 9 of this report as items such as vegetation control, drain cleaning and minor earthworks maintenance. Most of the earthworks asset receives no maintenance on a year to year basis. Thus the earthworks on the system was constructed more than 100 years ago and has retained its physical life either through minor maintenance or through an integrated project which has been shown separately in the Figure 17.

9.3.11 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 Queensland Rail's "Historical Capex" tab in the West Moreton System Models.

9.3.12 Rail

Due to the long life of these assets, and the considerable history of replacement, we have been unable to rely on Queensland Rail's "West Moreton System Model" or on the Hatch report and have instead relied on the configuration data provided by Queensland Rail in 2014 in response to an information request and confirmed by Queensland Rail in 2015 are spreadsheets generally in the form of "Curves Toowoomba West WL WM System.xls" covering the whole system. In those spreadsheets are detailed rail size and location.

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 (Queensland Rail) 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.

[50] See also Figure 9 for Queensland Rail's fencing maintenance program in the 2015 DAU.

In relation to unit cost 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.

9.3.12.1 41kg/m rail[51]

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.

9.3.12.2 50kg/m rail straights[52]

There is 37kms of track using 50kg/m[53] rail on straights with a remaining life averaging 43 years all in the Rosewood to Jondaryan section.

9.3.12.3 50kg/m rail curves[54]

There is 39kms track using 50kg/m[55] rail in curves with a remaining life averaging 23 years all in the Rosewood to Jondaryan section.

9.3.12.4 50kg/m HH curves[56]

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

9.3.13 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 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.

9.3.14 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. Maintenance of turnouts is a regular occurrence as indicated in Figure 9 and as reported by Queensland Rail in their response to the Information Request as historical maintenance expenditure.

[51] at 50 yrs max life
[52] at 50 yrs max life
[53] Standard carbon 50kg/m rail, not Head Hardened
[54] at 32 yrs max life
[55] Standard carbon 50kg/m rail, not Head Hardened
[56] at 50 yrs max life

9.3.15 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.

9.3.16 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. Maintenance on these assets is a regular occurrence as noted in Figure 14 such as with “Cable Route Maintenance”. The data used is from the Connell Hatch and Everything Infrastructure considerations.

9.3.17 Pre 2007 Capex not Included in IAV (2007)

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

9.3.18 Jondaryan Track Upgrade

This is a project that was begun in 2008 and concluded in 2011. Data is from Queensland Rail’s spreadsheet ‘UT3 Historical Capex’ tab.

9.3.19 Columboola to Fisherman Islands Project

This is a project that was begun in 2011 and concluded in 2013. The balloon loop and spur at Columboola is not included in the estimate since that was coal-only capex.

9.3.20 Western System Asset Replacement

This is a 10-year project that has various stages and was begun in 2007.

9.3.21 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.

9.3.22 Notes to Estimates

Table 3 indicates the assumptions, sources of data and any adjustments to previously published works used in this estimate.

Table 3 Notes Accompanying Figure 17

1. CPI has been applied to IAVs that were assessed in 2007 and modified for EI recommendations at the rate used by QCA								
	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13
	4.19%	2.60%	5.07%	1.98%	3.23%	3.86%	0.90%	1.99%
2	IAVs (Initial Asset Values) assessed in 2007 were performed by Connell Hatch where direct capex information was not available from Queensland Rail and the data used a base for asset numbers and proportionate asset values							
3	Bridges and culverts have been assigned a life of 100 years because the Australian Standard AS5100 adopts a 100 year design life							
4	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							
5	The "First" label shows when the asset began its life, which could be at the start of a program							
6	The "Last" label shows when the last of the asset was constructed							
7	For the projects since 2007 derivation has been from Queensland Rail's West Moreton System Model AU1 - QCA Sub 23.04.15 (R2J).xlsm West Moreton System Model AU1 - QCA Sub 23.04.15 (J2C).xlsm							
8	For track components, the B&H Report "Review of the Queensland Rail West Moreton Maintenance, Capex, Opex, DORC May 2014 Final.docx" has been used and this refers to Queensland Rail's asset data in "Curves ML WM System.xls" and similar as response to QCA's Data request and recently confirmed in 2015							
9	Some unit rates for IAV were extracted from Hatch's Valuation of 2008 " DORC Valuation 080715 Appendix B - Excel.xls".							
10	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							
11	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							
12	Siding and Balloon Loop (S&B) not included in M2C assets of Columboola Project because they are coal-only assets with contribution from client							

9.3.23 Other Components of the Estimates

Estimates in Figure 17 have been derived from the sources identified in section 9.2.2 as well as other advice as follows:

- Inflation at the appropriate rate since the time of construction and shown in Table 3.
- Interest incurred during the construction (IDC) at a WACC rate as being applicable at the time of the works, generally over a 2 year period for the individual components of the IAV. WACC for UT1 (before 2004/05) and for UT2 (2005/06-2008/09). Post-2007 capex projects already included IDC.

10 SUBURBAN SYSTEM IMPACT

10.1 Background

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.

The possible causes of loss of operational capacity[57] of the West Moreton system are:

1. Unreliability caused by unplanned breakdowns of the coal operator on the Western System
2. Unreliability caused by unplanned breakdowns of any other operator on the Western System
3. Unreliability caused by unplanned infrastructure maintenance on the Western System
4. Unreliability caused by unplanned breakdowns of the coal operator on the suburban system
5. Unreliability caused by unplanned breakdowns of the suburban system operators other than coal on the suburban system
6. Unreliability caused by unplanned infrastructure maintenance on the suburban system
7. Planned infrastructure maintenance on the Western System causing loss of coal capacity
8. Planned infrastructure maintenance on the suburban system causing loss of coal capacity
9. Interference by the normal workings of the suburban system operators causing loss of capacity.
10. Interference by other operators on the Western System through the normal course of operation such as with regional passenger services
11. Interference by other freight service operators on the Western System through the normal course of operations such as with grain services

The following sections discuss the operations of the suburban system.

[57] Operational capacity takes into account both above rail and below rail matters.

10.2 Suburban Saturated Diagram

Queensland Rail has provided saturated diagrams for coal trains entering the suburban system and the following discussion assesses the impact of the suburban operations.

The “West Moreton Saturated Diagram small_pw.pdf” shows 21 (one direction) trains of a maximum 24 trains per day (from the Western System) are able to be operated through the suburban system. The omitted trains are TF03, 05, 25 in the forward loaded journey, and FT14, 32, 34 in the return journey. From the diagram it appears that the minimum pathway gap in which a coal train is permitted to operate between suburban trains is 10 minutes.

The maximum of 24 in each direction appears to be on the basis of the passing siding spacing Rosewood to Toowoomba. QR has previously indicated a longest sectional running time of 26.5 minutes between Toowoomba and Rosewood, and it appears this has been rounded to 30 minutes, presumably to operate a symmetric service. An asymmetric service could assume to contain an extra 11.7% capacity (3.5 in 30) although the actual practicalities of operating an asymmetric service would most likely reduce that possibility due to “clockface” rounding. Nevertheless, some capacity is available and could be used for surge or catch-up.

It appears that the junction at Yeerongpilly is a main bottleneck because a narrow gauge train coming from Toowoomba has to come out onto the narrow gauge suburban lines in order to get onto the dual gauge line and interferes with Salisbury to South Brisbane trains in the morning peak (TP11 to TP25 - illegible identification) using the dual gauge track affecting FT 14 and TF 03 & TF 05. The Up and Down restrictions appear to coincide in timing.

Similar circumstances apply at the same location for TF25 and this also corresponds to FT32 and FT34 in the afternoon peak.

These interferences occur at the same time as interferences near Corinda between the hours of 7.30am and 9.30am and to a lesser degree in the afternoon peak an hour either side of 5pm.

Paths TF03 & TF05 correspond to paths FT20 & FT22 assuming a 2 hour unloading time at the port or FT22 & FT24 assuming 3 hours, or FT24 & FT26 assuming 4 hours, up to FT28 & FT30 assuming 6 hours unloading. These scenarios are possible if previously run train sets are available to remain at the port to fill the paths that would be their natural return trip. That is, at the port, trains would be staggered and waiting for the next available path which is at least 2 hours longer than if they returned as soon as they were unloaded, in order to satisfy a saturated schedule. There would need to be at least 2 train storage lengths at the port in addition to the train being unloaded for this to be feasible. This is possible with the current configuration at the port is sidings ‘coal” and “grain#1” are used, but it is an impost on the operator who’s trains are under-utilised.

Paths FT32 and FT34 correspond to TF15 and TF17 if the loaded trains were returned immediately on unloading. Again, as long as 2 loaded trains could be staged to wait for available paths and remain at the port for at least 2 hours longer than their “natural” departure, then the system could operate in a saturated state minus the 3 pathways lost due to suburban saturated interference.

10.3 Impact of Suburban Operations on Coal Trains Weekdays

The saturated train diagram shows that 3 coal train paths are impossible due to the impact of suburban services on weekdays. In order to operate in a saturated manner at least 2 coal trains need to be staged (waiting) at the port while another is being unloaded.

At a saturation of 30 minutes for the longest sectional running on the Western System this is 3 in 24 trains or 12.5% for weekday services. If a 26.5 minute sectional running time was adopted then 27 trains would be possible but most probably[58] another path would be lost due to the suburban train interference. This would be 4 in 27 or 14.8%.

10.4 Impact of Suburban Train Running All Days

For the weekends the MTP diagrams provided by QR (eg MTP Sun Week BD Mar 2015 pw.pdf) are only MTP. That is, they only show what is expected to operate on that day rather than the saturation or capacity of the network. The suburban trains are shown and one could conclude that there is no effective impediment to capacity on the weekends, because the suburban system is running at 15 minute intervals on the sections of line most impacted.

Therefore, the loss of coal train capacity due to the suburban operation is (3x5) 15 trains in 168 or 8.9% per week. Where public holidays are scheduled for weekdays the impact could be less except where special events are scheduled for weekends and public holidays there would be a moderating impact. Overall an approximation of 9% is estimated.

10.5 Impact of Suburban System Unreliability

Suburban trains will operate out of timetable, due to breakdowns or other operating problems. The QR suburban system operated at 97.03% on time running[59]. This statistics doesn't provide an exact measure of the impact on coal services because "on time" means any running within 4 minutes 59 seconds. Within this timeframe it is probable that train controllers would delay the progress of a coal train, especially during peak periods or shoulder[60] periods.

In some instances a delayed suburban passenger train will not impact a coal train such as in non-peak times or weekends. Nevertheless there will be some impact and an impact of 1% is estimated. This corresponds to approximately 1 in 3 suburban recorded train delays but also includes delays of less than 4 minutes 59 seconds where coal trains are impacted. Overall this is equivalent to 1 to 2 coal trains per week and includes above rail and below rail delays.

[58] This was not calculated but the wait incurred by FT12 in the morning peak would indicate a second path would be interrupted at this time (in addition to the non-existent FT14).

[59] Queensland Rail Annual Report 2013-14 Page 10

[60] Edge of peak periods

10.6 Western System Maintenance

Queensland Rail has previously indicated that 19 hours per week (11.3%) is the maintenance "allowance" in their planning[61].

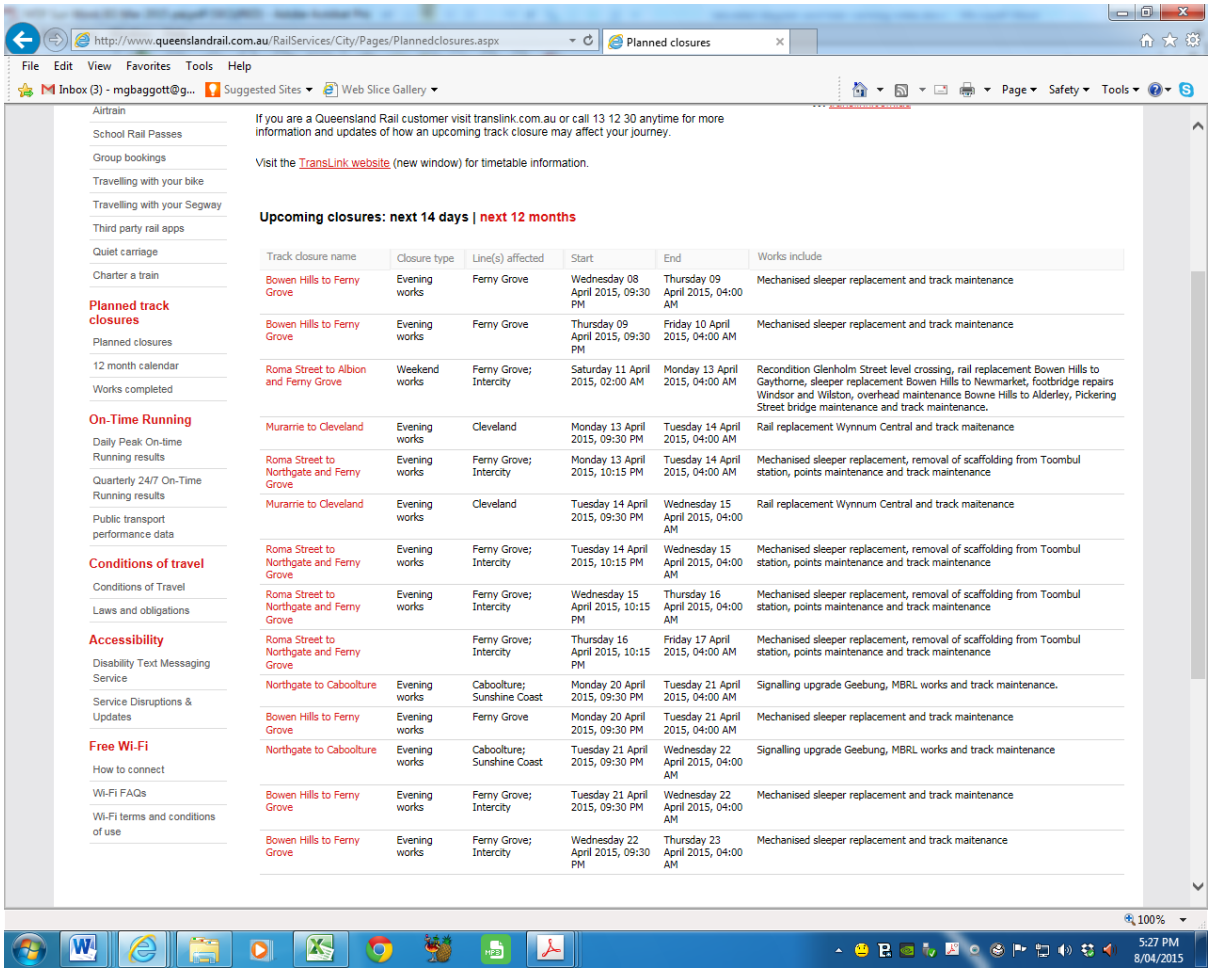
10.7 Impact of Suburban Planned infrastructure Maintenance

Queensland Rail has verbally advised that suburban system maintenance and Western System maintenance is coordinated and that wherever possible they are concurrent.

Prima facie, suburban system maintenance is carried out at night or on extended possessions over weekends, which unfortunately are the times when normal timetabled suburban operations least affect coal train operations, whereas, Western System maintenance is mainly conducted through weekday daylight hours.

A snapshot of the next 14 days from 8th April is shown in Figure 18

Figure 18 Snapshot of Maintenance Works



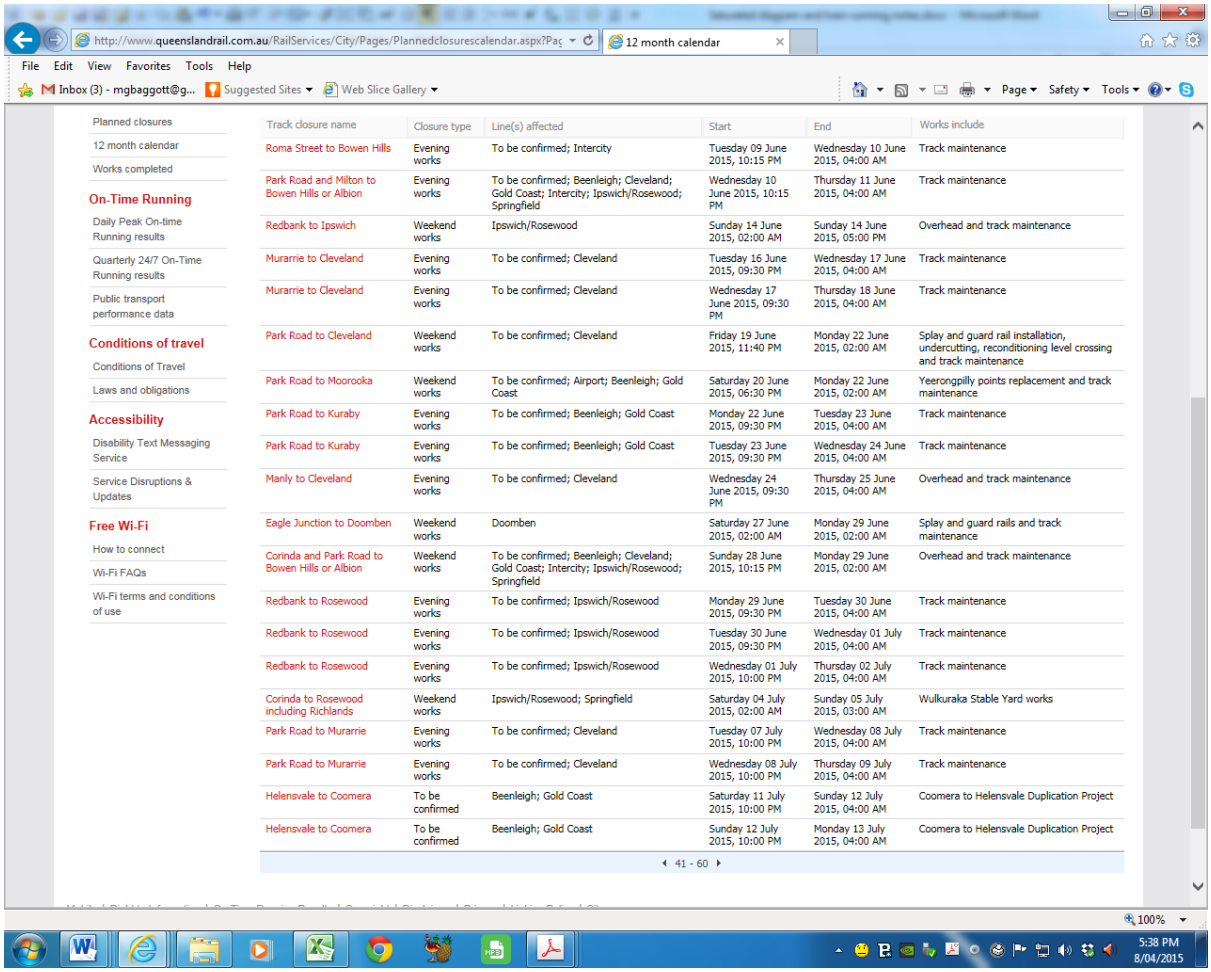
This shows the clear dominance of evening works extending to approximately 0400 in the morning.

From April 9 to December 17, 2015 there will be 112 occasions of evening or weekend works. Weekends extend from early Saturday morning to early Monday morning.

[61] 2013 Information Request response

The snap shot shown in Figure 19 includes works on the coal route.

Figure 19 Future Works on Coal Route



Track closure name	Closure type	Line(s) affected	Start	End	Works include
Roma Street to Bowen Hills	Evening works	To be confirmed; Intercity	Tuesday 09 June 2015, 10:15 PM	Wednesday 10 June 2015, 04:00 AM	Track maintenance
Park Road and Milton to Bowen Hills or Albion	Evening works	To be confirmed; Beenleigh; Cleveland; Gold Coast; Intercity; Ipswich/Rosewood; Springfield	Wednesday 10 June 2015, 10:15 PM	Thursday 11 June 2015, 04:00 AM	Track maintenance
Redbank to Ipswich	Weekend works	Ipswich/Rosewood	Sunday 14 June 2015, 02:00 AM	Sunday 14 June 2015, 05:00 PM	Overhead and track maintenance
Murarrie to Cleveland	Evening works	To be confirmed; Cleveland	Tuesday 16 June 2015, 09:30 PM	Wednesday 17 June 2015, 04:00 AM	Track maintenance
Murarrie to Cleveland	Evening works	To be confirmed; Cleveland	Wednesday 17 June 2015, 09:30 PM	Thursday 18 June 2015, 04:00 AM	Track maintenance
Park Road to Cleveland	Weekend works	To be confirmed; Cleveland	Friday 19 June 2015, 11:40 PM	Monday 22 June 2015, 02:00 AM	Splay and guard rail installation, undercutting, reconditioning level crossing and track maintenance
Park Road to Moorooka	Weekend works	To be confirmed; Airport; Beenleigh; Gold Coast	Saturday 20 June 2015, 06:30 PM	Monday 22 June 2015, 02:00 AM	Yeerongpilly points replacement and track maintenance
Park Road to Kuraby	Evening works	To be confirmed; Beenleigh; Gold Coast	Monday 22 June 2015, 09:30 PM	Tuesday 23 June 2015, 04:00 AM	Track maintenance
Park Road to Kuraby	Evening works	To be confirmed; Beenleigh; Gold Coast	Tuesday 23 June 2015, 09:30 PM	Wednesday 24 June 2015, 04:00 AM	Track maintenance
Manly to Cleveland	Evening works	To be confirmed; Cleveland	Wednesday 24 June 2015, 09:30 PM	Thursday 25 June 2015, 04:00 AM	Overhead and track maintenance
Eagle Junction to Doomben	Weekend works	Doomben	Saturday 27 June 2015, 02:00 AM	Monday 29 June 2015, 02:00 AM	Splay and guard rails and track maintenance
Corinda and Park Road to Bowen Hills or Albion	Weekend works	To be confirmed; Beenleigh; Cleveland; Gold Coast; Intercity; Ipswich/Rosewood; Springfield	Sunday 28 June 2015, 10:15 PM	Monday 29 June 2015, 02:00 AM	Overhead and track maintenance
Redbank to Rosewood	Evening works	To be confirmed; Ipswich/Rosewood	Monday 29 June 2015, 09:30 PM	Tuesday 30 June 2015, 04:00 AM	Track maintenance
Redbank to Rosewood	Evening works	To be confirmed; Ipswich/Rosewood	Tuesday 30 June 2015, 09:30 PM	Wednesday 01 July 2015, 04:00 AM	Track maintenance
Redbank to Rosewood	Evening works	To be confirmed; Ipswich/Rosewood	Wednesday 01 July 2015, 10:00 PM	Thursday 02 July 2015, 04:00 AM	Track maintenance
Corinda to Rosewood including Richlands	Weekend works	Ipswich/Rosewood; Springfield	Saturday 04 July 2015, 02:00 AM	Sunday 05 July 2015, 03:00 AM	Wulkuraka Stable Yard works
Park Road to Murarrie	Evening works	To be confirmed; Cleveland	Tuesday 07 July 2015, 10:00 PM	Wednesday 08 July 2015, 04:00 AM	Track maintenance
Park Road to Murarrie	Evening works	To be confirmed; Cleveland	Wednesday 08 July 2015, 10:00 PM	Thursday 09 July 2015, 04:00 AM	Track maintenance
Helensvale to Coomera	To be confirmed	Beenleigh; Gold Coast	Saturday 11 July 2015, 10:00 PM	Sunday 12 July 2015, 04:00 AM	Coomera to Helensvale Duplication Project
Helensvale to Coomera	To be confirmed	Beenleigh; Gold Coast	Sunday 12 July 2015, 10:00 PM	Monday 13 July 2015, 04:00 AM	Coomera to Helensvale Duplication Project

Western System disruptions commonly occur because of suburban works such as that shown in Figure 20 and Figure 21. Figure 20 shows the disruption caused to the Westlander due to suburban works. The Westlander is able to proceed to Toowoomba, indicating no maintenance west of Toowoomba, but is curtained beyond Toowoomba.

On the weekend of 2nd May 2015 significant works will be occurring in the suburban area of "Sherwood to Rosewood" and evening works throughout the month on "Redbank to Ipswich". Evening works occur in the hours of 9.30pm to 4.00am, and allowing for travel time from the coal mines, appears to be outside of hours when daytime works would be occurring on the Western System. Night works are rare on the regional lines because of the extra expense in lighting and shift allowance as well as the increased risk to employee injuries from night time work.

Essentially, night work is only undertaken in the suburban area as a last resort because day operations for commuters excludes the option.

Figure 20 Westlander Disruptions

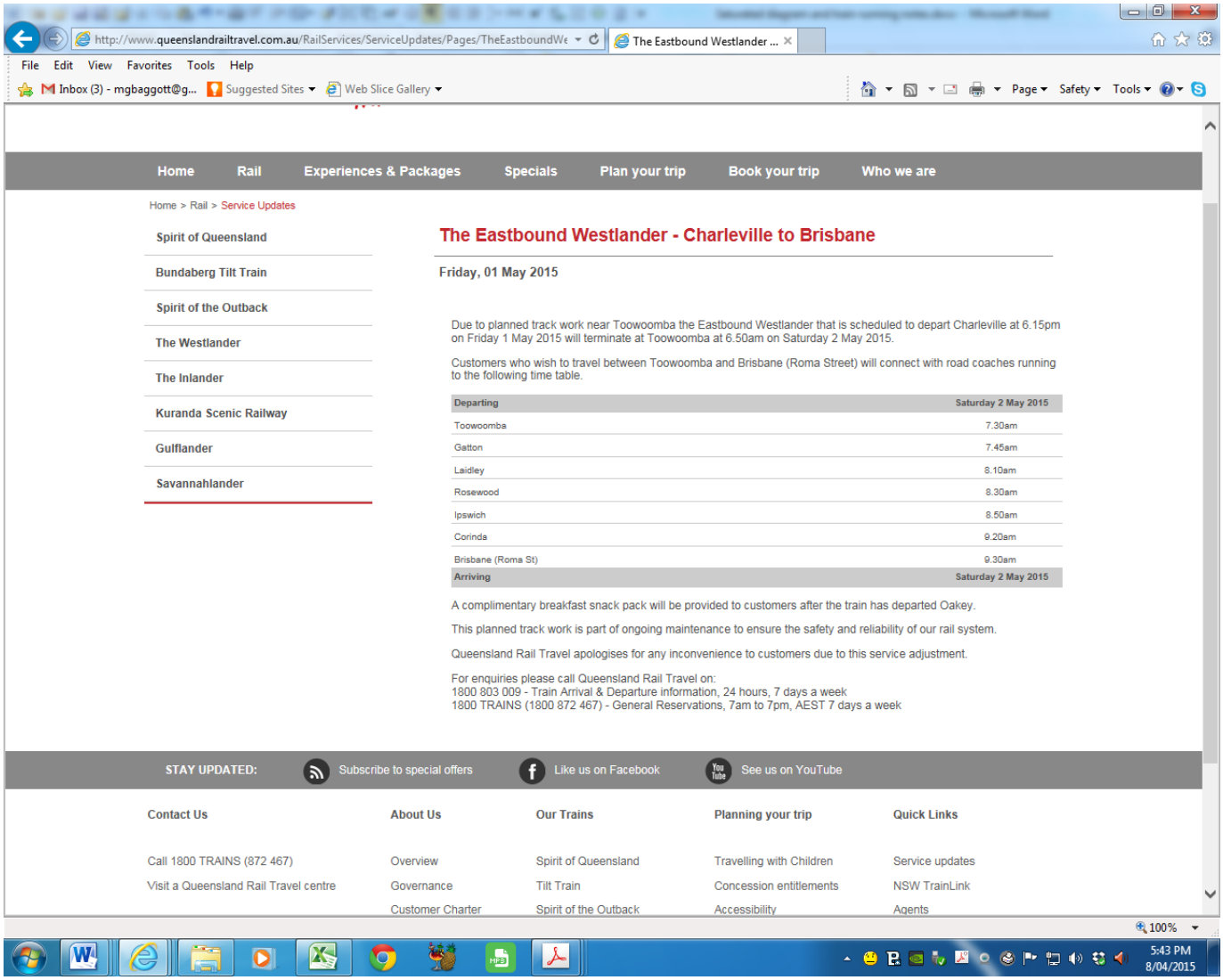
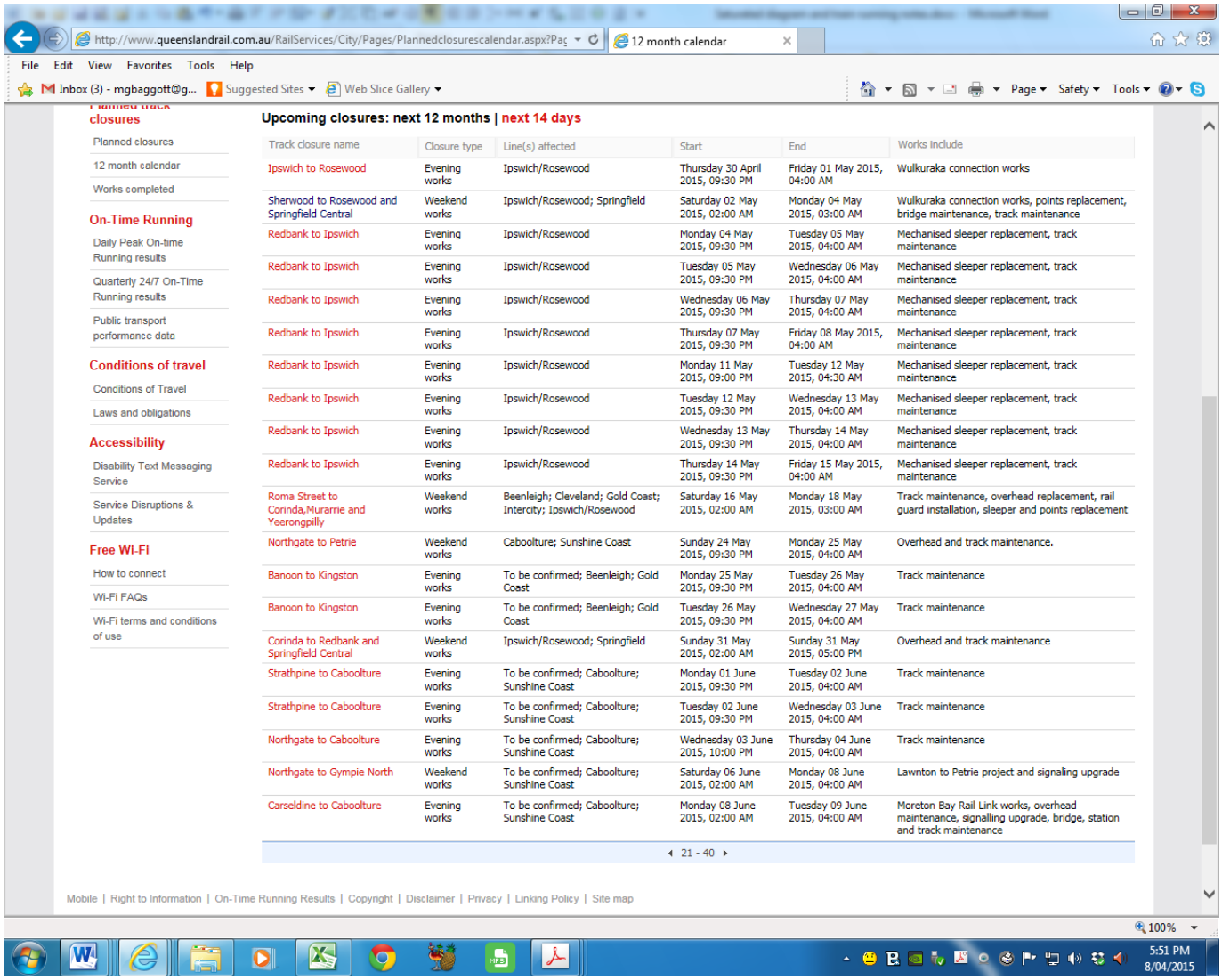


Figure 21 Weekend Works on the Suburban System Affecting Westlander



http://www.queenslandrail.com.au/RailServices/City/Pages/Plannedclosurescalendar.aspx?Pag — 12 month calendar

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closures

Planned closures
12 month calendar
Works completed

On-Time Running
Daily Peak On-time Running results
Quarterly 24/7 On-Time Running results
Public transport performance data

Conditions of travel
Conditions of Travel
Laws and obligations

Accessibility
Disability Text Messaging Service
Service Disruptions & Updates

Free Wi-Fi
How to connect
Wi-Fi FAQs
Wi-Fi terms and conditions of use

Upcoming closures: next 12 months | next 14 days

Track closure name	Closure type	Line(s) affected	Start	End	Works include
Ipswich to Rosewood	Evening works	Ipswich/Rosewood	Thursday 30 April 2015, 09:30 PM	Friday 01 May 2015, 04:00 AM	Wulkuraka connection works
Sherwood to Rosewood and Springfield Central	Weekend works	Ipswich/Rosewood; Springfield	Saturday 02 May 2015, 02:00 AM	Monday 04 May 2015, 03:00 AM	Wulkuraka connection works, points replacement, bridge maintenance, track maintenance
Redbank to Ipswich	Evening works	Ipswich/Rosewood	Monday 04 May 2015, 09:30 PM	Tuesday 05 May 2015, 04:00 AM	Mechanised sleeper replacement, track maintenance
Redbank to Ipswich	Evening works	Ipswich/Rosewood	Tuesday 05 May 2015, 09:30 PM	Wednesday 06 May 2015, 04:00 AM	Mechanised sleeper replacement, track maintenance
Redbank to Ipswich	Evening works	Ipswich/Rosewood	Wednesday 06 May 2015, 09:30 PM	Thursday 07 May 2015, 04:00 AM	Mechanised sleeper replacement, track maintenance
Redbank to Ipswich	Evening works	Ipswich/Rosewood	Thursday 07 May 2015, 09:30 PM	Friday 08 May 2015, 04:00 AM	Mechanised sleeper replacement, track maintenance
Redbank to Ipswich	Evening works	Ipswich/Rosewood	Monday 11 May 2015, 09:00 PM	Tuesday 12 May 2015, 04:30 AM	Mechanised sleeper replacement, track maintenance
Redbank to Ipswich	Evening works	Ipswich/Rosewood	Tuesday 12 May 2015, 09:30 PM	Wednesday 13 May 2015, 04:00 AM	Mechanised sleeper replacement, track maintenance
Redbank to Ipswich	Evening works	Ipswich/Rosewood	Wednesday 13 May 2015, 09:30 PM	Thursday 14 May 2015, 04:00 AM	Mechanised sleeper replacement, track maintenance
Redbank to Ipswich	Evening works	Ipswich/Rosewood	Thursday 14 May 2015, 09:30 PM	Friday 15 May 2015, 04:00 AM	Mechanised sleeper replacement, track maintenance
Roma Street to Corinda,Murarrie and Yeerongpilly	Weekend works	Beenleigh; Cleveland; Gold Coast; Intercity; Ipswich/Rosewood	Saturday 16 May 2015, 02:00 AM	Monday 18 May 2015, 03:00 AM	Track maintenance, overhead replacement, rail guard installation, sleeper and points replacement
Northgate to Petrie	Weekend works	Caboolture; Sunshine Coast	Sunday 24 May 2015, 09:30 PM	Monday 25 May 2015, 04:00 AM	Overhead and track maintenance.
Banoon to Kingston	Evening works	To be confirmed; Beenleigh; Gold Coast	Monday 25 May 2015, 09:30 PM	Tuesday 26 May 2015, 04:00 AM	Track maintenance
Banoon to Kingston	Evening works	To be confirmed; Beenleigh; Gold Coast	Tuesday 26 May 2015, 09:30 PM	Wednesday 27 May 2015, 04:00 AM	Track maintenance
Corinda to Redbank and Springfield Central	Weekend works	Ipswich/Rosewood; Springfield	Sunday 31 May 2015, 02:00 AM	Sunday 31 May 2015, 05:00 PM	Overhead and track maintenance
Strathpine to Caboolture	Evening works	To be confirmed; Caboolture; Sunshine Coast	Monday 01 June 2015, 09:30 PM	Tuesday 02 June 2015, 04:00 AM	Track maintenance
Strathpine to Caboolture	Evening works	To be confirmed; Caboolture; Sunshine Coast	Tuesday 02 June 2015, 09:30 PM	Wednesday 03 June 2015, 04:00 AM	Track maintenance
Northgate to Caboolture	Evening works	To be confirmed; Caboolture; Sunshine Coast	Wednesday 03 June 2015, 10:00 PM	Thursday 04 June 2015, 04:00 AM	Track maintenance
Northgate to Gympie North	Weekend works	To be confirmed; Caboolture; Sunshine Coast	Saturday 06 June 2015, 02:00 AM	Monday 08 June 2015, 04:00 AM	Lawnton to Petrie project and signaling upgrade
Carseldine to Caboolture	Evening works	To be confirmed; Caboolture; Sunshine Coast	Monday 08 June 2015, 02:00 AM	Tuesday 09 June 2015, 04:00 AM	Moreton Bay Rail Link works, overhead maintenance, signalling upgrade, bridge, station and track maintenance

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Notwithstanding Queensland Rail's desire to coordinate maintenance works there is no doubt that maintenance in the suburban area affects the capacity of the coal chain.

Of the 112 closure occasions planned for infrastructure maintenance in the suburban area between 9th April and 17th December 2015:

- 24 will be "weekend works", predominantly early Saturday morning to early Monday morning, 12 of which will be on the coal route
- 86 will be "evening works", 10pm to 4am, 36 occasions on the coal route.
- Making a total of 816 hours on the coal route over a period of 252 days (6048 hours) or 13.5% of the time.
- All of these hours of closure fall outside the hours which have been affected by the peak hour congestion which precludes coal trains.
- The timing of coal trains "coming or going down or up the hill" may alleviate some fringe impacts on evening works but not of weekend work which is by far the largest proportion (600 hours weekend, 216 hours evenings) and a reasonable estimate is that one quarter of the works can be simultaneous resulting in a reduction of 10.1% due to this factor.

10.8 Summary

Coal train capacity is diminished by approximately 9% due to the impact of peak commuter services assuming a 24 (loaded) train service is attempted. However, due to the Western System's own maintenance requirements 2 to 3 trains (11.3%) are lost per day.

The impact of losing 3 trains per day as displayed on the Saturated Diagram would be a capacity reduction of approximately 10% if the effect of the maintenance and the congestion were to be cumulative. If Western System maintenance could be simultaneous with suburban congestion restrictions then this would result in a lower reduction and for the purpose of this summary it is estimated a reduction of capacity of 9.5% is a reasonable median given that it would not be feasible to coordinate all Western System maintenance and Suburban peak hour timing to provide for simultaneous closures.

Coal train capacity is further diminished by suburban planned infrastructure maintenance, which occurs outside of the hours of peak hour congestion and outside the hours of much of the Western System maintenance. An estimate of a reduction of 10.1% capacity is applied from this factor and this assumes that one quarter of the maintenance is simultaneous.

Another factor for a reduction in coal train capacity reduction includes the factors associated with unreliability or unplanned events of the suburban train service, above rail and below rail which is estimated at 1 or 2 coal trains per week, 0.6% to 1.2% on the basis of 24 trains per day, with a reasonable median being 0.9%.

Further reductions may occur through the unreliability of non-suburban trains and non-coal trains, such as with other freight and interstate passenger services. No data on reliability is available but would be minor.

On these bases, the overall reduction of infrastructure capacity of coal train services due to operations in the suburban area is approximately 20.5%. If the absolute capacity is considered, one that assumes an asymmetric schedule based on the longest section running time of 26.5 minutes rather than 30 minutes, and if the coordination of maintenance is not possible then a greater reduction is evident.

A final factor to consider is one given in a verbal briefing on 19th June 2015 by Queensland Rail, that "freight paths are not always affected in a suburban shutdown" and which by implication means that in some circumstances the impact on suburban services is more severe than on freight services when suburban works occur. Quantification of this impact was not provided. Nevertheless, it is a significant factor and some amelioration is warranted.

Taking all of these factors into account we consider a reduction of 17% in coal train capacity is estimated due to suburban system operations.

11 CALCULATION OF CAPACITY

11.1 General

This assessment has considered the forecast tonnages of the Regulatory Period as well as the infrastructure capacity[62] of the infrastructure.

The simple comparison of the same configuration of the network during the period 2012 to 2015 tonnage and path requirements alongside the Regulatory Period indicates that the capacity of the network will be much greater than that required for the forecast task. This is because the number of coal train paths and tonnage has dropped and the number of paths required for the non-coal task has also dropped, and the configuration has not changed.

Notwithstanding this observation it is necessary to consider the path capacity of the network and the path requirements in the context of the efficiency of maintenance activities because the ratio of paths consumed[63] compared with total available paths is an indicator of the efficiency of "possessions" and the length of time available to carry out maintenance work.

Possessions[64] form an integral part of the planning and resource requirements for maintenance and are a major planning tool that need to be taken into account when considering the available infrastructure paths otherwise called "capacity" in this context. Generally, if only short possessions are available, greater resource requirements are needed to complete a similar task. The cost of maintenance could be expected to rise. Similarly, if longer possession time is available it is reasonable to assume that some efficiency in maintenance would result. We have made comment on this situation in the commentary for the maintenance tasks.

11.2 Queensland Rail's Submission

In 24th June 2015 Queensland Rail confirmed their basis for the calculation of capacity of the network. The salient points were:

- Maintenance needs, 19 hours per week
- Average sectional run time, 26 minutes
- Reduction factor[65] 65%
- Annual railings based on 50 week year

Leading to the conclusion that 112 one-way paths are available each week on the network.

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[62] Inherent infrastructure capacity due to the configuration and nature of the infrastructure and not to be confused with operational capacity on an historical basis or hypothetical basis where paths are consumed by above rail operators' inefficiencies or other parties' actions. The definition of "capacity" in the consideration of access was first stated in 2000 in the QCA's Draft Decision on QR's Draft Undertaking for the Central Queensland Coal Network in Definitions

[63] Or planned to be consumed

[64] Times where that portion of the network is not available for trains because it is blocked with maintenance work that put the track out of operation.

[65] Although called a reduction factor it is actually applied as the net sum rather than the sum reduced from the base. Thus 65% of X, or a reduction of 35%.

We note that the reduction factor is influenced by a number of factors:

- The prevailing weather conditions
- Temporary speed restrictions
- Minor signal and trackside equipment faults
- Reduced locomotive and rollingstock performance
- Individual train dynamics and driving techniques
- Unplanned above rail incidents

In taking these factors into account Queensland Rail is providing the methodology for an estimate of the operational capacity of the network for the current operations. That is, its estimate of the number trains that can operate for the current operator and operations. But it is not the infrastructure capacity because above rail inefficiencies are a matter for the contract between the above rail operator and Queensland Rail.

These factors identify that the operator is effectively consuming more than one infrastructure path and those paths are not available for sale to other operators.

Only those factors that are inherently associated with the infrastructure should be used for a reduction factor. Those factors are assessed in this report as:

- Weather conditions (the line is situated in a particular climatic location and is subject to the climate in that location)
- Temporary Speed Restrictions (TSRs): which we assume are associated with "minor signal and trackside equipment faults" but which we have discovered are greatly associated with maintenance methods discussed below. Inherently, infrastructure is not 100% reliable and it is reasonable to assume that components will fail from time to time.

We also note that Queensland Rail has assumed a 50 week operation for the purposes of estimating annual volumes. This is reasonable because it represents the "force majeure" events associated with mine and port interruptions. However the calculation does not influence the capacity in paths per week.

The remaining factors are those where the operator is in control and represent factors that estimate the number of paths an operator may require, not the number of paths the infrastructure can provide. These factors imply that Operators consume more than one path per train.

11.3 Previous Reduction Factor Estimates

In 2000 QR (now Aurizon) submitted capacity calculations indicating a "reduction factor" due to infrastructure requirements, including planned maintenance of 85%. Modelling at the time, performed by Maunsell (now AECOM) assumed a reduction factor of 95% due to unplanned maintenance.

In Queensland Rail's response to the data request it refers to ARTC's reduction factor as a usual method of estimating capacity and 65% is quoted as an adjustment used in the Hunter Valley studies. But again, this factor refers to the operational capacity of the network, not the infrastructure capacity, and includes all of the factors associated with above rail operations

and exigencies of the port and the mine interface. Some port and mine factors and weather event factors are subsummed in the assumption of 50 weeks per year operation.

Queensland Rail also submitted with their response to the data request a record of "Train Delays" that have occurred due to various reasons over the last 6 years. Weather conditions, TSRs and minor infrastructure faults consume between 53% and 74% (av 61%) of the delays. The others are above rail factors. Minor infrastructure fault delays consume only 4%.

Whether the delays lead to lost paths and to what extent are unknown but it is clear that the West Moreton System experiences a high degree of weather related issues which stem from the poor level of construction in susceptible terrain, both the Ranges area and the black soil area. The so called TSRs might be related to the weather events as well as to planned maintenance. But it is concerning that so many delays are caused by TSRs when the track geometry condition of the network is very good, as displayed in Queensland Rail's reponse to the data request. In this response the Track Condition Index falls well within the "maintenance bandwidth", 10 points away from the "review threshold" and 15 points awayfrom the "exceedence threshold". Presumably, most of the TSRs are associated with maintenance activities.

If "delays" are a proxy for path loss, then 61% of all paths lost are lost due to infrastructure problems. That does not mean 61% of paths will be lost, but applies to the (100%-65%) 35% of paths lost estimated[66] by Queensland Rail. That is, after planned maintenance possessions Queensland Rail estimate a further 61% of 35% (21%) will be lost due to infrastructure issues.

The possession paths lost do not include any paths lost due to TSRs caused by those activities. 39% of all delays, including Above Rail delays, were caused by TSRs. This is an alarming number and Queensland Rail are effectively restricting infrastructure capacity by using maintenance methods that use paths due to both "possession" requirements as well as TSRs. Further pressure on path requirements would require Queensland Rail to alter their maintenance methods. The current impact on train operation costs of TSRs due to maintenance methods is an analysis that would be required to optimise the below rail/above rail economy, since TSRs are a convenient method to reduce maintenance costs.

11.4 Conclusion

For the Western System, eliminating the effects of above rail factors for the reasons given, the author's own experience and the prior evidence, we conclude that, in addition to 19 hours per week planned maintenance (11.3% week) a further "reduction factor" of 79%, and not Queensland Rail's proposition of 65%, should apply.

This means that using 19 hours for maintenance, as per Queensland Rail's submission, 8,940 minutes are available for train operation. Applying a 79% reduction factor and 26 minutes longest sectional running time, allows 271 one way paths per week.

In practical terms this is an infrastructure capacity of 135 return paths per week.

[66] The reduction is actually 35%, and the Reduction Factor of 65% is multiplied by a total (after planned maintenance)

12 METROPOLITAN CAPEX ASSESSMENT

12.1 Background

This assessment seeks to evaluate the scope, standard and rationale/purpose and benefits of the capital projects undertaken by Queensland Rail in the Brisbane suburban system.

In response to QCA's information/data request Queensland Rail has submitted a paper "2015 DAU Metropolitan Network Capital, COMMERCIAL-IN-CONFIDENCE, August 2015" which addresses QCA's request for "Brisbane Metro UT3 historical capital expenditure (incurred during 2007/08 to 2012/13)" and more particularly, as noted by Queensland Rail, "project B01858 "*Columboola to Fisherman Islands*" is the only project covered by this information request".

The major elements of the scope and rationale are discussed below.

12.2 Main Purpose

The Queensland Rail document indicates "The project was to enable Syntech to develop the Columboola (Cameby Downs) mine and transport 1.4 mtpa of coal from the Cameby Downs mine to the Port of Brisbane".

The physical and operational benefits arose from the creation of new assets resulting in greater rail infrastructure capacity, upgrade to existing assets resulting in a reduction in derailments and improved safety and efficiency generally, together with financial benefits to stakeholders.

12.3 Scope and Benefits

In Table 4 an analysis with comments and conclusion of each of the work activities identified by Queensland Rail is shown. Since different activities occurred in different parts of the network, different rates of benefit apply. Estimates of average cost in $ nominal (2010-2013) have been applied in order to conclude with an overall assessment of the Columboola Project to the benefit to Columboola Coal.

Table 4 Assessment of Scope and Benefits

Scope of Work	Interpretation of Scope	Comment	Conclusion	B&H Estimate of Cost	Benefit in Cost Terms
• Turnout Replacements: - Turnout 364 at 37.92km, Main line Ipswich (incl suburban). - Turnout 396B at 26.99km, Main line Redbank (incl suburban). - Turnout 118 at Fisherman Islands (freight only). - Turnout 119 at Fisherman Islands (freight only).	These works are replacements and therefore exhibit no new functionality except to improve reliability. The older turnouts must have been in condition that they could not reliably transport an extra 20% tonnage. Being replacements rather than "upgrades", axle load or speed were not increased. Functionality therefore was not improved.	Either, the task increase by 20% was the tipping point for the reliability of the existing assets or the existing assets were in maintenance deficit. Most likely, the turnouts were of 41kg/m rail design which were worn out being in a slow speed environment and had never been upgraded.	These works were a result of ineffective maintenance and while the turnouts would have been required eventually, the project offered the opportunity to have them renewed. Our conclusion is that the project caused 20% of the expenditure, the other 80% being maintenance deficit corresponding to the tonnage increase..	Replacement of Turnouts at $300,000 each[67] Total $1.2m	Benefit in cost terms in proportion to the traffic increase Total benefit 20% of $1.2m is $0.24m
• Removal of Turnouts on Tennyson Branch: - Turnout 613 at 0.38km Tennyson (freight only) - Turnout 426A at 18.68km (incl suburban) - Turnout 489B at 1.03km Corinda to Yeerongpilly (incl suburban). - Turnout at Ampol sidings 2.17km (freight only)	The works are removals, essentially redundant equipment, which may become unreliable with extra tonnage. Removal consists of replacing the turnout with plain track and associated signalling adjustments.	The extra tonnage is only 20%. The turnouts were previously redundant because extra tonnage couldn't have made them redundant unless others were being constructed (which weren't in this vicinity). These works were always required.	These works were already required and the project was an opportunity to clean up assets that may reduce reliability of the system. Project benefit caused 20% of the expenditure corresponding to the tonnage increase	Removal of turnouts at $100,000 each[68] Total cost $0.4m	Benefit in cost terms in proportion to the traffic increase Total benefit 20% of $0.4m is $0.08m

[67] B&H estimate

[68] B&H Estimate

Scope of Work	Interpretation of Scope	Comment	Conclusion	B&H Estimate of Cost	Benefit in Cost Terms
• Re-railing on the Main line: - 48.30km to 50.61km Up Road (incl suburban). - 52.10km to 53.40km Down Road (incl suburban). - 41.913km to 43.674km Up Road Ipswich to Rosewood (incl suburban).	These projects consist of the replacement of rail on the suburban network where suburban trains operate. Of the 5.371kms rerailed, 4.071kms or 76% occurred on the (empty coal) line. 24% of the rerailing occurred on the (loaded) Down line.	Replacement of rail on the (empty coal) Up line is unlikely to have been due in the majority to coal traffic because at empty train tonnages rail of 41kg/m size typically has a life of 200-400 million gross tonnes. The extra 20% tonnage caused by the Columboola project is a very small component of the total tonnage including suburban fleets.	Assuming that all of the 20% increase in task caused the 24% (Loaded) Down Line rerailing and that half (10%) increase caused the 76% (Empty) Up Line rerailing then overall the Columboola project benefitted by 12.4% of the cost, the other benefit being to the suburban system on the basis of maintenance deficit.	Rerailing at $500,000 per track kilometre[69] including welding, adjustment, purchase and transport. Total cost $2.685m	Benefit in cost terms in proportion to the traffic increase Total benefit 12.4% of $2.685 is $0.333m

[69] Approx 10% lower than quoted in Queensland Rail's 2015 DAU West Moreton Reference Tariff Reset Capital Submission, "8. Rerailing Program"

Scope of Work	Interpretation of Scope	Comment	Conclusion	B&H Estimate of Cost	Benefit in Cost Terms
• Track Reconditioning: - 1.00km to 1.35km Up Road and Down Road, Tennyson Branch through Tennyson Platform (freight only). - 50.85km to 51.75km, Main line Ipswich to Rosewood (incl suburban). - 3.88km to 4.85km Fisherman Islands (freight only).	These projects consist of reconstructing the track which may have included formation reconstruction, as well as capping reconstruction, ballast replacement, (timber) sleeper replacement with concrete, and rail replacement. Total track length is 2.22kms	Tennyson station had been closed since the early 2000's. Platform tracks are difficult to upgrade because the tracks are difficult to access. This work should have been completed beforehand. The mainline Ipswich to Rosewood is used by suburban trains. Fisherman's Islands is only used by freight trains. Coal comprised 92.52% of freight traffic[70].	For the Tennyson Platform work, this project merely completed deferred work. We allocate half the 20% increase as benefit. The mainline Ipswich work is shared by suburban trains. We allocate half of the 20% increase in benefit. For Fisherman's Islands, 92.52% of the 20% increase in traffic is allocated. Making a weighted total of 13.7% of the benefit.	Track reconditioning, including rerailing, sleeper replacement, ballast replacement and capping consolidation, supplementary drainage. Works are in constrained locations and high cost. At $2m per km[71] over 2.22kms Total cost $4.44m	Benefit in cost terms in proportion to the traffic increase Total benefit 13.7% of $4.44 is $0.608m
• Additional Road to Fisherman Islands: (coal only) - Signal Design. - Signal Construction - Civil Works - Track works. - Freight. - Civil Design.	This work provides for new asset, presumably to permit an additional train to queue for arrival or departure.	Works of this type are required when the current train fleet occupies available positions in the queue or where current congestion may require new trains to be stored at other locations, therefore incurring extra expense for movement and reliability.	All of these works are required for the Columboola Train.	An additional "road" would require approximately 1.2kms track plus turnouts, points/turnout equipment, drainage, formation preparation, capping for an all up cost of $3m per km[72]. Total costs $3.6m	Total benefit $3.6m

[70] QR Network's Access Undertaking (2009), Western System (SEQ Cluster), Maintenance Costs, November 2008, Section 7.1 Allocation to Non-Coal Traffics

[71] B&H estimate

[72] B&H estimate

Scope of Work	Interpretation of Scope	Comment	Conclusion	B&H Estimate of Cost	Benefit in Cost Terms
• Infrastructure Works Inspectors IWI: - IWI Officers. - Construction Audit.	These activities are necessary for supervision	In the proportion to the work requirements	At the same benefit ratios as previous job scopes	Estimated at 5% of other costs	5% of other benefits
• Traction: - Traction design and construction (suburban only)	The scope of this work is not clear but since coal trains use only diesel power this work is assumed to be associated with works on the suburban network used by suburban electric trains and was performed for the benefit of the suburban trains in removal, rerailing or track conditioning.	Since the areas of interface relate to work that is already shared by electric trains, the benefit to the Columboola project is not evident	No benefit accrues to the Columboola Project	No benefit	No benefit
• Track Possessions.	These are events where track has to be closed for the work to proceed. The cost of Track Possessions is mainly incurred through the use of busses for passenger operations. Costs for delayed or deferred coal transport would not normally arise because the works are programmed in the usual possession allowances.	In the proportion to the work requirements	At the same benefit ratios as previous job scopes	Benefits are accrued to passenger operations but are paid for by freight. Estimate of $0.15m for all of the bus costs for all of the possessions.	Total benefit $0.01m

Scope of Work	Interpretation of Scope	Comment	Conclusion	B&H Estimate of Cost	Benefit in Cost Terms
• Signal. - Signal Design. - Signal Construction.	We note this category duplicated the Fisherman's Island works and therefore is not applicable to those works. It is applicable as a secondary activity to the other works where "adjustment" is required in the projects of rerailing, reconditioning and removal of track assets.	These secondary works can be very expensive as they are works that can only be performed at the start and end of the track works. In the proportion to the work requirements for replacements, removal, reconditioning and rerailing	At the same benefit ratios as previous job scopes of replacements, removal, reconditioning and rerailing	Costs are estimated at 20% of the job costs.	20% of other benefits
		Cost estimate as per Queensland Rail Submission		$15,604,693 (excl. Capitalised Interest).	$5.111m which represents approximately one third of the project costs