Attachment 5: West Moreton System DAU2 Maintenance Costs 2020-21 to 2024-25

West Moreton System
DAU2 Maintenance Submission

14 July 2018

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1. Overview

1.1 Context

Queensland Rail's West Moreton System provides rail infrastructure access to two coal mines on the West Moreton System—New Hope Coal's New Acland Stage 2 mine at Jondaryan and Yancoal's Cameby Downs mine that rails from Columboola. These two mines are forecast to move around [redacted] tonnes in 2018-19. New Hope Coal's New Acland Stage 2 mine is nearing the end of its life, with the likelihood that coal reserves at this mine may be exhausted by mid-2020.

In September 2017, under section 133 of the *Queensland Competition Authority Act 1997* (QCA Act), the Queensland Competition Authority (QCA) has requested Queensland Rail to submit a draft access undertaking for the period 1 July 2020 to 30 June 2025 (DAU2), by 31 July 2018. If approved by the QCA, DAU2 will become the Queensland Rail Access Undertaking 2 (AU2).

As part of the DAU2 process, Queensland Rail has developed reference tariffs for the West Moreton System based on the 'building blocks' approach. This submission provides information supporting Queensland Rail's proposed maintenance program.

The DAU2 submission has been developed with considerable uncertainty about the potential future coal volumes that are likely to be moved on West Moreton coal system. In particular, New Hope Coal is yet to receive approval to develop the New Acland Stage 3 mine. New Hope Coal is continuing to progress with its development application, although there is no certainty about the potential outcome of this process.

For this reason, two maintenance scenarios have been developed and are presented in this submission:

- a [redacted] scenario—assuming that only Yancoal's mine at Cameby Downs is producing coal and hauling on the West Moreton System
- a [redacted] scenario—assuming the New Acland mine is developed and produces [redacted] of coal for hauling from Jondaryan, in addition to the [redacted] from Cameby Downs.

To assist stakeholders and the QCA in making a comparison of maintenance costs used for the Queensland Rail Access Undertaking 1 (AU1) period, Queensland Rail also makes comparison to a constant tonne scenario of [redacted]

1.2 Proposed DAU2 West Moreton System maintenance costs

Queensland Rail is proposing two potential maintenance cost forecasts for 2020–21 to 2024–25 (the DAU2 period):

- $101.825 million ($2020–21) to support the movement of [redacted] see **Table 1**
- $140.921 million ($2020–21) to support the movement of [redacted] see
- **Table** 2.[1]

Table 1: West Moreton coal maintenance costs—DAU2 ($2020–21 million)—[redacted]

	2020-21	2021-22	2022-23	2023-24	2024-25	Total DAU2
Track	$16.426	$16.461	$16.498	$16.536	$16.576	$82.497
Structures	$2.719	$2.517	$2.322	$2.112	$1.884	$11.553
Trackside systems	$1.467	$1.467	$1.467	$1.467	$1.467	$7.337
Facilities/Other	$0.088	$0.088	$0.088	$0.088	$0.088	$0.438
Total	**$20.700**	**$20.533**	**$20.374**	**$20.202**	**$20.015**	**$101.825**

Table 2: West Moreton coal maintenance costs—DAU2 ($2020–21 million)—[redacted]

	2020-21	2021-22	2022-23	2023-24	2024-25	Total DAU2
Track	$23.975	$24.049	$24.126	$24.207	$24.293	$120.649
Structures	$2.953	$2.717	$2.496	$2.286	$2.044	$12.497
Trackside systems	$1.467	$1.467	$1.467	$1.467	$1.467	$7.337
Facilities/Other	$0.088	$0.088	$0.088	$0.088	$0.088	$0.438
Total	**$28.483**	**$28.321**	**$28.177**	**$28.048**	**$27.891**	**$140.921**

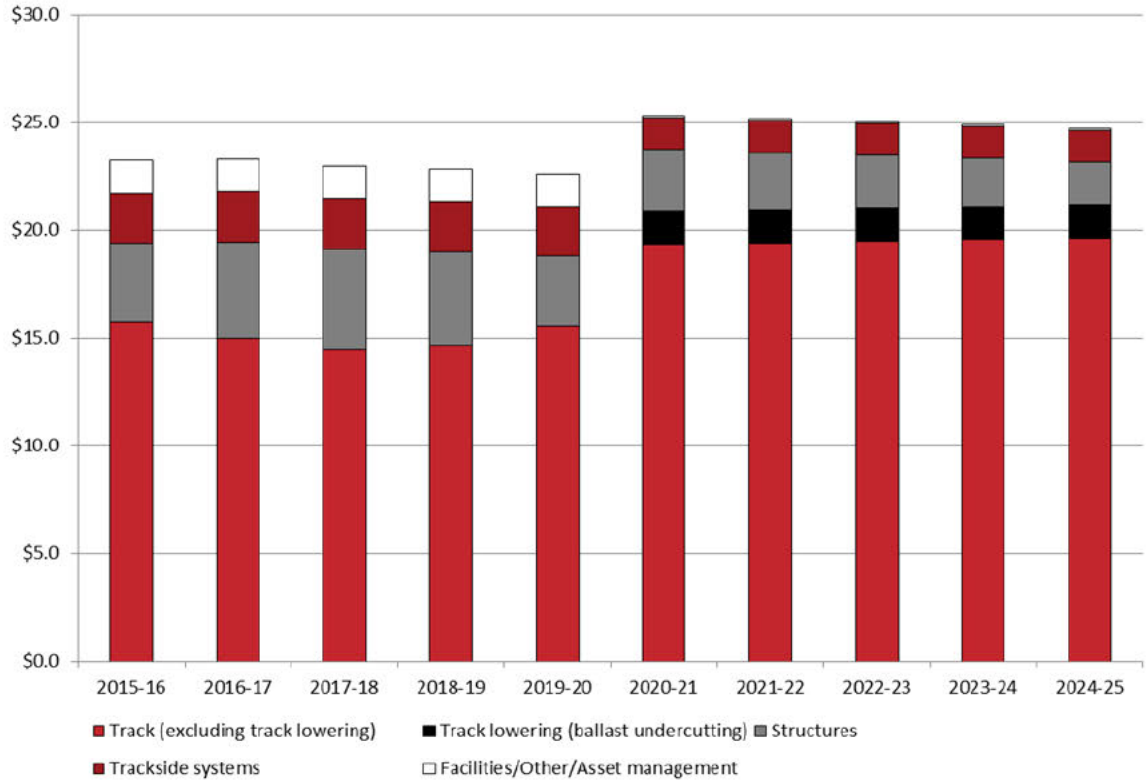
As shown in **Figure 1**, compared to a constant tonne scenario, the DAU2 maintenance costs are estimated to be, on average 8.7 per cent higher per annum in real terms than the AU1 maintenance allowance approved by the QCA.

However, if the effect of re-including $1.5 million per annum ($2020–21) in ballast undercutting costs in the DAU2 maintenance allowance is excluded,[2] DAU2 maintenance costs are forecast to be an average 2 per cent per annum higher over the DAU2 period.

1 The [redacted] scenario for DAU2 assumes that New Hope Coal's proposed Acland Stage 3 mine receives the necessary environmental approvals, and that the new mine commences production on 1 July 2020 to coincide with the approval of the new undertaking.

2 For AU1 the QCA decided that this activity was capital in nature, however the track lowering activities do not meet Queensland Rail's capitalisation guidelines and Queensland Rail will seek to have the QCA decision reversed as part of the DAU2 process.

Figure 1: Comparison of West Moreton coal maintenance costs—DAU2 ($2020–21 million)—assuming constant tonnes [redacted]



This submission has been prepared in the context of the *2018–19 West Moreton System Asset Management Plan* (AMP) which outlines the system's characteristics, traffic types, business environment, key drivers and details the high level asset descriptions and strategies by which the system is managed.

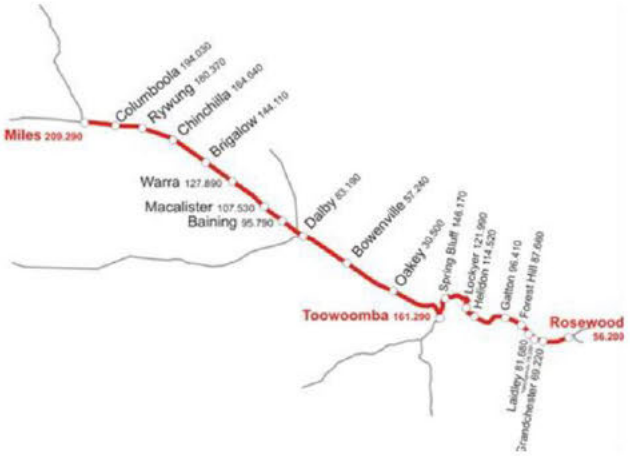
2. Background

2.1 Overview of system characteristics and current infrastructure

The West Moreton System is an important link in the supply chains that exports coal and agricultural products from areas of south-west Queensland through the Port of Brisbane. The system begins on the western side of Rosewood on the Main Line and runs through Toowoomba to Miles on the Western Line. This section is the predominant coal corridor for the system. The West Moreton System does not include the Glenmorgan Line which runs from Dalby and now stops at Meandarra, the South Western Line from Toowoomba to Wyreema and beyond or the Ebenezer loading loop, which is part of the Metropolitan System.

Figure 2: West Moreton System characteristics and infrastructure

Route length	321 km narrow gauge
Track length	407 km narrow gauge
Rail size	41, 50, 60 kg/m
Mainline sleepers	Concrete, interspersed steel and timber sleepers, predominantly 1 in 2
Maximum axle load	15.75 tonne axle load (tal)
Max. operating speed	80 km/h
Signalling	RCS and DTC
Reference train length	673.8 metres



2.2 Current traffic types, operators and key customers

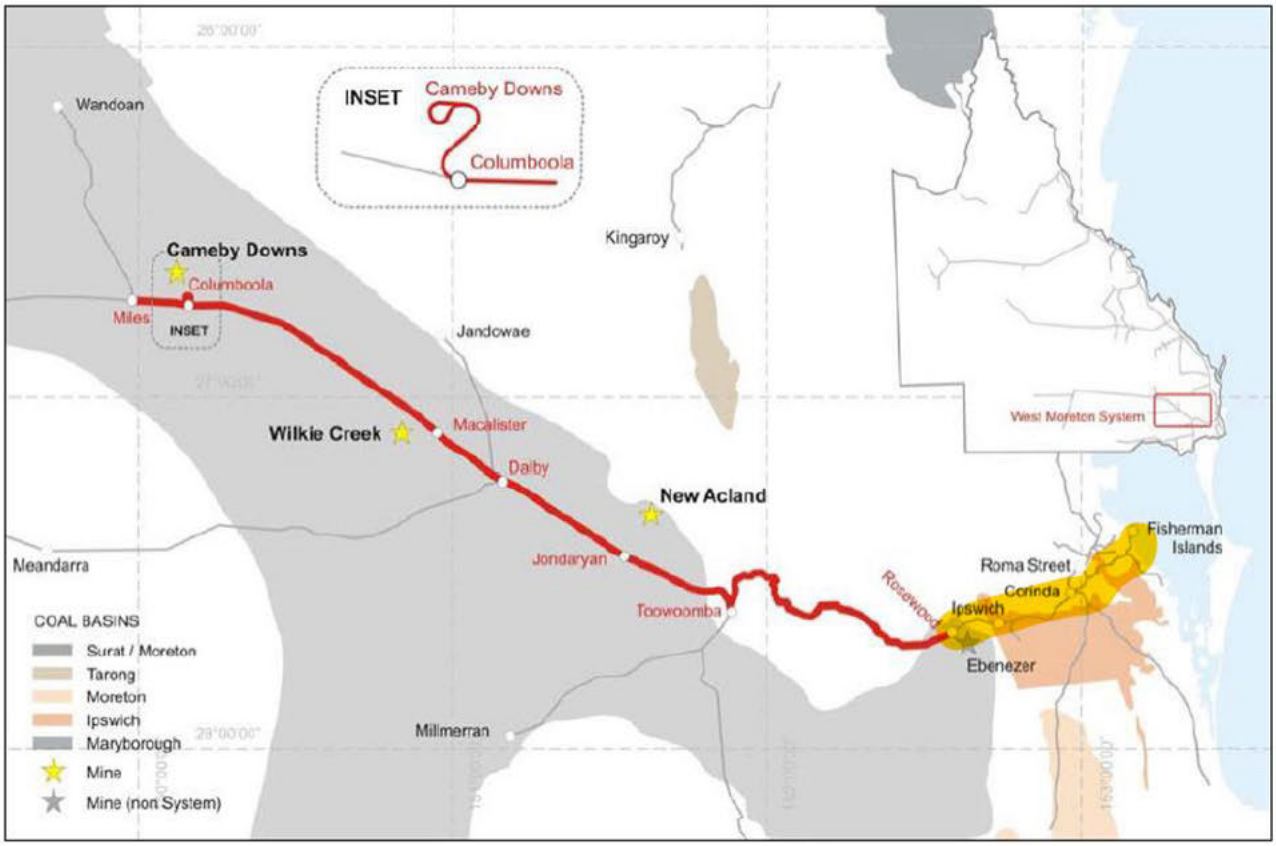
The West Moreton System is a multi-use system with coal, freight and passenger utilising paths. Coal dominates traffic from west of Toowoomba and is the predominant driver for the asset strategies for the system. Trains are limited to 15.75tal with a reference train length of 673.8m.

As at 30 June 2018, Aurizon is the only freight service operator on the West Moreton System. However, Graincorp has announced that it will contract with Watco from the end of 2019 for the movement of bulk grain in Queensland, including the South West.

Agricultural traffic from the South West System joins the West Moreton System at Toowoomba. The South West System carries seasonal grain traffic. The Queensland Government has provided Queensland Rail with funding to increase tunnel clearances on the Toowoomba and Little Liverpool ranges, with the intention that 9'6" high shipping containers can be moved down the ranges. This should allow for the carriage of cotton by rail, with no cotton movements on the rail system since 2013.

Queensland Rail is the passenger service operator running the Westlander from Brisbane to Charleville. Traffic from the South West System joins West Moreton at Toowoomba. The South West System carries bulk grain traffic with Aurizon as the current freight service operator.

Figure 3: Surat / Moreton Coal Basin



3. Maintenance Strategy

3.1 Queensland Rail's maintenance philosophy

3.1.1 Maintenance and supply chain efficiency

A key way that Queensland Rail can contribute towards the development and ongoing enhancement of an efficient coal supply chain is via its network maintenance strategy. This is by ensuring that the system is maintained to a standard that delivers an appropriate level of service to users.

Maintenance can impact service quality in a number of ways. The fundamental means is by ensuring that the system can be consistently operated at its maximum operational capability (that is, to the maximum speed and axle load that it has been designed to carry), which in turn enables throughput to be maximised. Service quality will be degraded by the introduction of speed restrictions or disruptions to network availability due to incidents such as derailments or unplanned possessions.

The management of possessions can also influence service quality. Track closures are a necessary part of being able to maintain the network. Their timing and duration have an impact on throughput, particularly where there is limited stockpile capacity at the port and/or mines. The management of possessions is, therefore, an important part of Queensland Rail's maintenance strategy. As part of Queensland Rail's management of possessions, Queensland Rail actively seeks ways to undertake the required maintenance task without increasing possessions.

3.1.2 Trade-offs in the maintenance strategy

The cost of maintenance is driven by the standard required to achieve a given level of service quality. There is clearly a trade-off between these two factors; given there will be a direct relationship between the standard of the network and the cost of maintaining the network to that standard. Queensland Rail's maintenance regime seeks an appropriate balance between service quality and cost.

If the asset is under-maintained, reduced costs and fewer maintenance possessions are experienced in the short term, however in the longer term, network availability could be reduced as speed restrictions are imposed (to ensure that safety is maintained) and the number and duration of unplanned maintenance possessions increases. It can also result in capital expenditure being brought forward where assets must be replaced due to early failure.

If an asset is over-maintained, users may be bearing a higher cost of maintenance than is necessary to maintain the desired level of service quality. It could also mean that network availability is being compromised as planned possessions are likely to be more frequent.

The balance between service quality and cost can change through time. For example, if the system is not capacity constrained, there may be a higher degree of tolerance for track closures and speed restrictions to the extent that this has less of an impact on the ability of users to meet the requirements of their customers. At the same time, Queensland Rail still has to maintain the network to an appropriate standard to preserve the long-term integrity of its assets and ensure safety is not compromised.

Maintenance of the network to a high standard is particularly important given the implications that speed restrictions and unplanned possessions could have on network availability. At the same time, while unplanned maintenance needs to be minimised it cannot be avoided, so Queensland Rail needs to maintain sufficient flexibility to be able to respond quickly and effectively where unforeseen issues arise. In the current environment, the opportunity cost of foregone throughput to the mines will be very high. However, this will still necessitate taking possession of the track for maintenance in a manner that minimises the impact on users.

A focus on achieving contracted tonnage throughput does not mean that cost becomes less important. Queensland Rail is acutely aware that the costs need to be reasonable and efficiencies should still be extracted to the extent possible. The implications of this on the maintenance strategy (and its associated cost) are a key consideration for Queensland Rail.

The appropriate balance between capital expenditure and maintenance requires the application of judgment and will vary depending on:

- the nature of the asset
- the historical maintenance regime
- current market conditions.

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.

3.1.3 Vision for the maintenance program

Queensland Rail's vision for maintenance is to maintain the network to a standard that maximises supply chain efficiency in a manner that is consistent with the level of service quality desired by users. This is done within the context of a maintenance strategy that maintains the long-term integrity and safety of the network.

3.2 Planning, implementing and managing the program

3.2.1 Maintenance planning

Queensland Rail, as maintenance provider, develops a forecast of the expected works required. This forecast is done on a number of levels. The annual System Maintenance Plan forecasts work to be undertaken each year, whilst the Asset Management Plan considers a 10 year maintenance horizon.

3.2.2 Asset monitoring and analysis

Asset monitoring and analysis is also a very important part of maintenance planning and delivery. Asset monitoring technology and the associated analytical tools are becoming increasingly sophisticated; delivering more accurate and robust data that is then directly fed into the maintenance planning process. More accurate monitoring of potential defects enables a more proactive maintenance program, which should also generate efficiencies over the longer term. In 2014 Queensland Rail implemented an Enterprise Asset Management System which enables Queensland Rail to better understand and monitor the actual condition and degradation of the network.

3.2.3 Preventative versus reactive maintenance

One of the key trade-offs in the maintenance regime is preventative versus reactive maintenance. Preventative maintenance is maintenance that is undertaken at regular programmed intervals to maximise availability and reliability. It is a more proactive approach that seeks to anticipate the likely maintenance effort required based on an understanding of the asset's characteristics and the impact of throughput on its performance. Further, as mentioned, this assessment is improved by regular asset monitoring and analysis.

Reactive maintenance is performed in response to a defect, noting that assets can require attention for a number of reasons (including incidents on the network). This will generally need to be prioritised depending on the risks arising from the defect failure. Immediate corrective maintenance will be undertaken where the defect has a potentially significant safety, environmental or operational risk. Deferred corrective maintenance, which may be identified during the course of preventative maintenance, is performed where the potential risk is not significant. The maintenance may be deferred because of the scale and scope of work required.

It could be argued that the more preventative maintenance is carried out, the less corrective maintenance is required; however, this does not mean preventative maintenance should not be efficient and targeted. There are levels of preventative maintenance beyond which additional maintenance is not efficient (that is, it is effectively 'over maintaining' the asset). In addition to this there are circumstances that could lead to asset failure, which are independent of the level of preventative maintenance that has been undertaken, such as extreme weather events or derailments that are not caused by track defects. Maintenance planning therefore needs to achieve an appropriate balance between preventative and reactive maintenance, taking into consideration constraints imposed by possessions.

3.3 Driving efficiency and innovation in maintenance

Driving continuous improvement needs to be an integral part of the maintenance regime irrespective of the current demand environment. However, the constraints imposed by demand pressures may determine what is regarded as 'efficient'. For example, efficiency is not necessarily limited to doing more with less, or finding ways to reduce costs.

4. Key drivers for DAU2 maintenance costs

4.1 History of the West Moreton System and relationship to maintenance costs

The West Moreton System was constructed and opened to traffic in 1865 between Ipswich and Grandchester, with subsequent extensions reaching Toowoomba in 1867. Historically the line catered for passenger, livestock, freight and primary products (e.g. grain and cotton).

Coal carrying services commenced in 1982 initially from mines located just west of Ipswich. Rail export commenced via rail from Macalister in 1994 (closing in 2013), Jondaryan in 2002 and from Columboola in 2010.

The network's historical origins present continuing challenges for its operation. The West Moreton System was initially constructed on black soil plains with no engineered formation; resulting in regular failures requiring reconstruction to ensure suitable track geometry is maintained.

Early track standards have resulted in an alignment that is lower than contemporary standards for stand-alone heavy haul railway built specifically for coal carrying services. As a consequence of the network's age and track standard, the section between Rosewood and Miles in particular requires a higher level of intervention than would be required for a more modern, stand-alone heavy haul railway in order to safely and reliably deliver contracted tonnages.

The age and history of the West Moreton System, particularly the relationship between maintenance and the value of assets was considered extensively as part of the QCA's approval of AU1—including approval of the Regulated Asset Base (RAB) and maintenance cost allowance. While Queensland Rail has been slowly improving the quality of the track through the capital program, the same maintenance issues associated with the history of the network still drive the maintenance requirements for DAU2.

For the DAU2 period, Queensland Rail has proposed what it considers to be efficient maintenance costs for the West Moreton System having regard to the age and condition of the network, and the volumes proposed to be hauled over a network that was not originally designed for this purpose.

4.2 Current condition of the West Moreton System

4.2.1 West Moreton System asset management plan

The West Moreton System AMP provides an overview of the condition of individual components of the system. A summary is provided in **Table 3.**

Table 3: Summary of asset condition, by rail infrastructure component, as at 1 July 2018

Rail infrastructure component	Condition
Formation	There are many challenges with the current formation that result in sub-optimal performance. These include age, tonnage and use, seasonal weather conditions such as heavy rain and unstable ash deposits from the original steam trains. These challenges stem from the historical use of non-engineered formations built on black soil plains. Over the past decade approximately 30km of formation has been upgraded. Works are prioritised on the extent of the formation failure together with location and speed restriction impacts. Repair activities include the renewal of the formation and installation of drains. High level estimates show that there is approximately 200km of formation to be upgraded to ensure that the poor black soil and ash formations are removed and an engineered solution is put in place. The Toowoomba Range has suffered major landslides in recent history due to flooding. The range is geotechnically unstable which presents challenges to the reliability of the West Moreton System in the supply chain.
Rail	The Toowoomba Range and Little Liverpool Range have tight radius 41kg check rail curves which are subject to high wear rates. This wear contributes to the degradation and failure of check rail bolts. The 41kg rail in the system is in fair condition, with wear and emerging internal defect issues becoming apparent. The majority of rail defects picked up through Non Destructive Testing (NDT) are found in the 41kg rail sections. The 41kg rail on the Western Line west of Jondaryan is still in an operational condition, however between Jondaryan and Dalby it needs to be closely monitored having shown high defect levels in 2010 and 2011. The immediate issue west of Jondaryan is rail creep and the occasional broken joint/pull apart. Work is being done to weld rails into 220m lengths to reduce the number of joints and gain stability. Creep will be monitored and anchorage of timber sleepers may be necessary.
Sleepers	The West Moreton System has approximately 635,000 sleepers. The average life of a timber sleeper is less than 17 years as opposed to 20 years in the past. This is due to poor supply of quality hardwood timbers. Rosewood to Toowoomba has sections of 100 per cent concrete, steel and timber as well as sections of timber interspersed with steel. At completion of the Toowoomba Range tunnel lowering project the Toowoomba Range will have 100 per cent concrete sleepers with check rails on curves where required. Toowoomba to Miles has 100 per cent concrete sleepers to the 45km mark (Jondaryan) with 1in2 steel/timber pattern from Jondaryan to Miles. The concrete sleeper on tight radius curves are proving to have some operational issues with excessive pad wear and lack of ability to adjust gauge to allow for side wear on rails. This is leading to rail pads and rail being replaced at excessively short intervals. 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 initiated 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.
Ballast	The ballast fouling is due predominantly to the lack of engineered formation. This fouled condition causes poor drainage, breakdown of the ballast stone, formation damage and loss of top and line. This is managed through planned ballast renewals and track lowering.

Rail infrastructure component	Condition
Turnouts	Turnouts in the system are in good condition with the main line turnouts being upgraded to 60kg Rail Bound Manganese (RBM) on concrete bearers over the last decade. Seven Swing Nose Crossings (SNX) were installed east of Toowoomba. Timber bearer turnouts are in place where joining infrastructure enters the system. The Willowburn Yard has turnouts that are in poor condition. The four access turnouts are sites of recent derailments.
Structures	The current defect situation shows that the bridges in the system are in a reasonable condition for the current loading situations. Reductions in bush timber skills and availability of quality materials are becoming an issue for Queensland Rail. Non-standard piers and pier type configurations are more evidenced with capsilling and butt splicing of piles being undertaken in lieu of driving timber piles. This is an issue west of Jondaryan with straight wide-centred piled piers pushing under traffic. Timber bridges on the Toowoomba Range are generally tall, requiring scaffolding and those off the main road are difficult to access in wet conditions. There are two old poured in-situ concrete bridges, one major structure at Lockyer Creek sustaining undermining and cracking in the 2011 floods. These bridges in the West Moreton System have recently been reviewed by AECOM. This high level study was undertaken to determine the structural adequacy of the West Moreton bridge assets for future upgrades of the system to achieve either a combination of increased tonnages, increased axle loads and longer trains. One of the recommendations from the study was a requirement for further detailed investigations into some of the bridges analysed. These bridges were shown to have structurally deficient components, including fatigue, for existing traffic when analysed against the new design requirements. The analysis also showed that the timber bridges were structurally deficient when assessed against the Australian Standard but have been proven to have sufficient capacity to support the existing trains. To allow these bridges to remain in service a performance based assessment is used which requires that the train loadings do not increase and that a maintenance program is in place to preserve their condition. Culverts on the Toowoomba Range are critical to the reliability of the network on the range. These culverts are inspected six-monthly as opposed to the two-yearly requirement of Civil Engineering Structure Standards (CESS). This ensures all culverts are kept in a clean, safe and reliable condition. Many of the culverts are heritage listed and the maintenance to keep them in their original condition is onerous. There are various culverts through the system including culverts between Malu and Bowenville that are of old cast in-situ construction. Two of these culverts are being replaced by the current capital program. Recent inspections have shown that a large set of culverts in Grandchester are also suffering from concrete defects. Maintenance gangs are doing remedial works on these culverts.

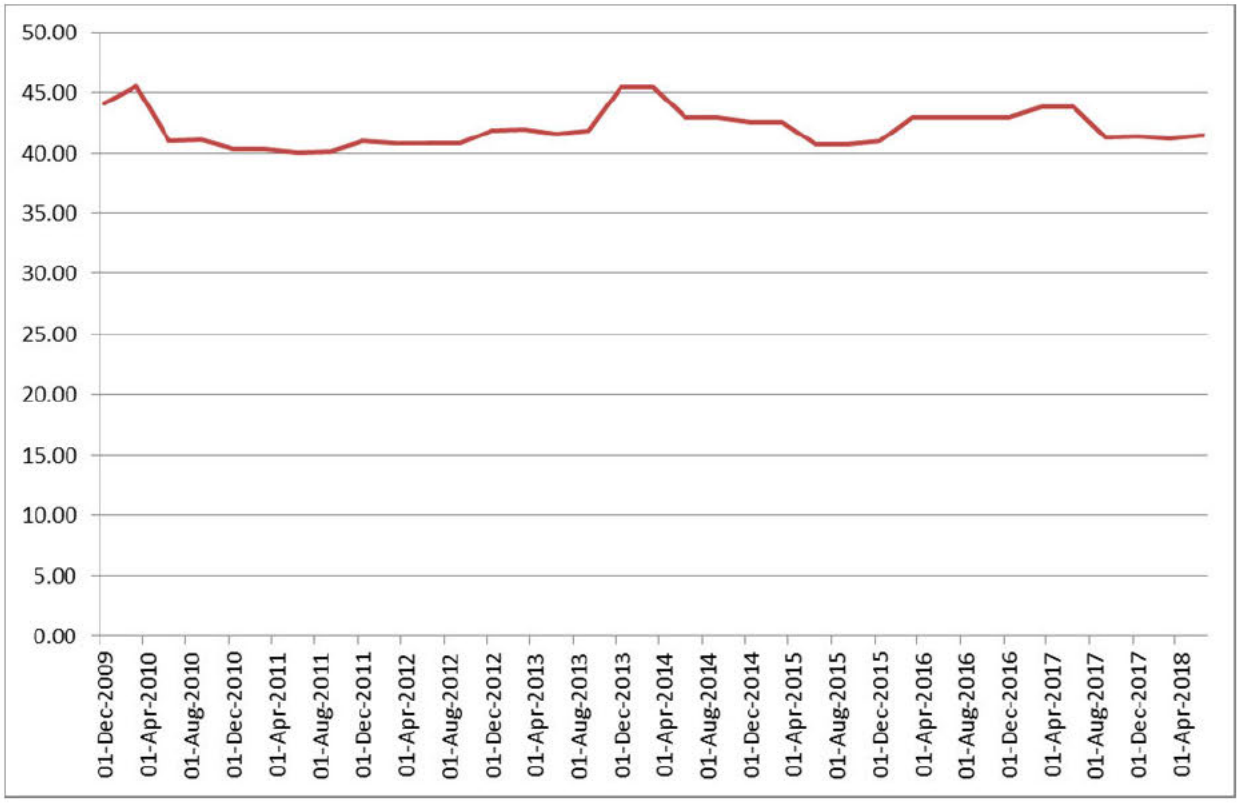
4.2.2 Indicators of track condition on the West Moreton System

AU1 requires Queensland Rail to report of two indicators which are intended to provide some measure of track condition—the Overall Track Condition Index (OTCI) and Temporary Speed Restrictions.

Overall track condition index (OTCI)

Figure 4 shows the OTCI for West Moreton December 2009 to June 2018. The West Moreton System OTCI has been within the 40–45 range over the last decade, the exception being a period over the summer of 2013-14 related to weather.

Figure 4: West Moreton System OTCI, December 2009 to June 2018



The West Moreton's OTCI is higher than those for Aurizon's Central Queensland Coal Network (

Table 4), noting that the lower the indicator, the better the track quality. The higher OTCI for the West Moreton System is in large part a function of the network's history, which was not originally designed to be a heavy-haul railway.

Table 4: Aurizon Network, OTCI by system January–March 2018[3]

OTCI	Blackwater	Goonyella	Moura	Newlands
Jan–March 2018	32.77	29.68	31.11	25.80

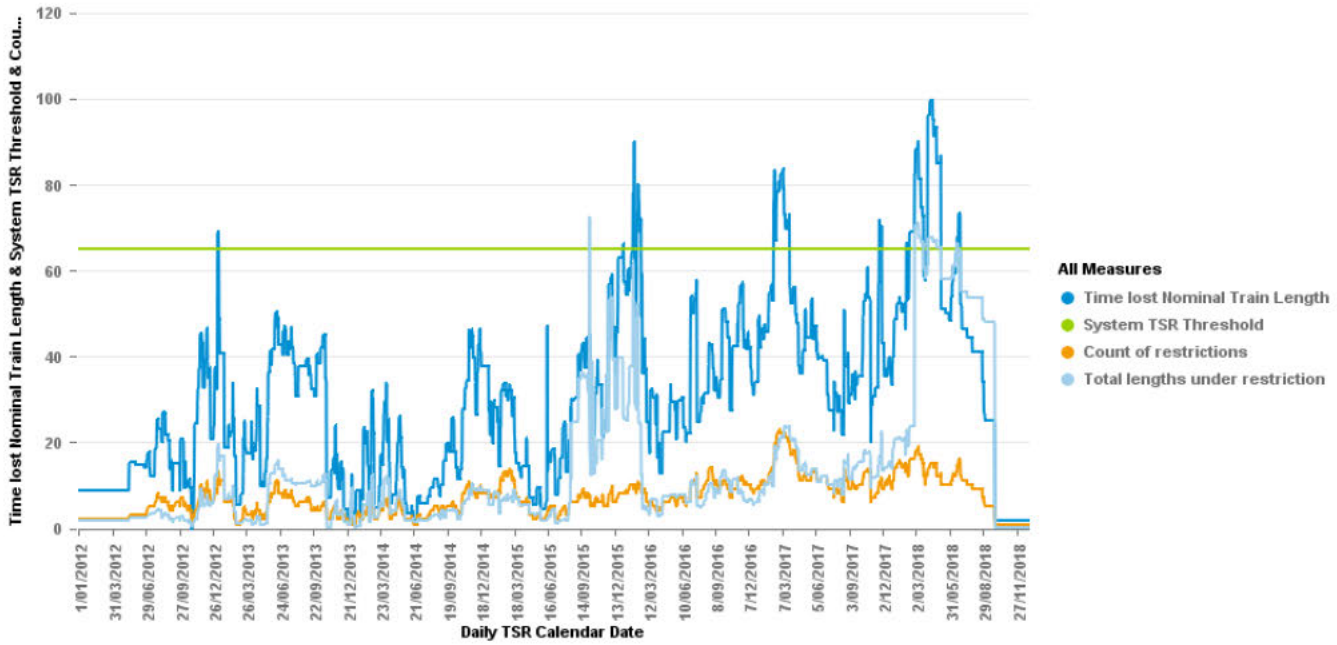
However, Aurizon notes that the OTCI should only be used as an indicator of abnormality. A single number which is an average over a defined length cannot reflect all the variations within a coal system.[4] Worley Parsons also noted significant limitations on use of the OTCI as an indicator:

> *The OTCI is calculated from the mean plus three standard deviation points of the distribution of each Parameter Index over a track section. This means it is a measure of the quality of the very worst track locations. While this can be used to ensure no section of track exceeds an allowable maximum roughness it is not a good indicator of overall track condition.*
>
> *Monitoring the condition of only the very worst track locations can cause problems. It can cause the track maintainer to focus effort on a small number of difficult locations. Lack of attention to other locations can cause the overall track condition to deteriorate.5*

Temporary speed restrictions (TSRs)

Queensland Rail also reports on temporary speed restrictions. Figure 5 shows TSR for the West Moreton System from 1 January 2012 to 30 June 2018.

Figure 5: West Moreton Network Temporary Speed Restrictions, January 2012 to June 2018



3 Aurizon Network, Quarterly Maintenance Cost Report, January–March 2018 p 8

4 Aurizon Network, Quarterly Maintenance Cost Report, January–March 2018 p 8

5 Worley Parsons, QR Network Comments on Service Level Specification for Rail Infrastructure Maintenance Central Queensland Coal Region, p 3

Weather events, the deterioration in track quality prior to scheduled resurfacing and routine maintenance all influence temporary speed restrictions. The periods where TSR have exceeded the System TSR threshold have largely been driven by summer heat events.

4.3 2018–19 maintenance budget as base for DAU2

4.3.1 Implementation of Enterprise Asset Management System (EAMS)

In 2015–16, Queensland Rail implemented a new Enterprise Asset Management System (EAMS) for the planning and management of maintenance and capital expenditure. EAMS replaced the previous system of product reporting, which was used as the base for developing the AU1 maintenance cost allowances.

The implementation of EAMS has included the simplification of the number of maintenance categories for planning and reporting purposes. As Queensland Rail no longer budgets or reports using the previous product reporting, Queensland Rail has used the new EAMS system as the base for estimating DAU2 maintenance costs. Comparison of previous product codes to new EAMS system is provided in Attachment 1.

Queensland Rail notes that the overall maintenance cost forecasts are largely comparable between AU1 and DAU2 at the category level (eg. track, structures, facilities etc.), although a number of activities are no longer directly comparable eg. track repairs now include a range of previous products such as level crossing maintenance and turnout maintenance. Further the previous Asset Management function is no longer separately identified—and these costs are included as part of the build-up of the activity to which asset management relates eg. the allocated asset management costs will be included in rail renewal.

4.3.2 2018–19 West Moreton System maintenance budget ([redacted]

The 2018–19 West Moreton System maintenance budget has been selected as the representative 'base year' to estimate the efficient costs to support [redacted] of coal haulage, as well as the non-coal tonnage for grain and livestock, plus two return Westlander services per week.

The 2018-19 West Moreton maintenance budget has been reviewed to remove 'one-off' expenditure including steel bridge painting, plus any other activities not related to the provision of coal services including stations and depots not supporting West Moreton coal.

Table 5 shows a comparison for the 2018–19 West Moreton coal maintenance budget (developed consistent with EAMS) against the QCA AU1 allowances based on the previous product reporting approach, all escalated to $2020–21. The AU1 maintenance estimates excluding mechanised resleepering in 2015-16, and which have been proposed as capital expenditure for the DAU2 period.

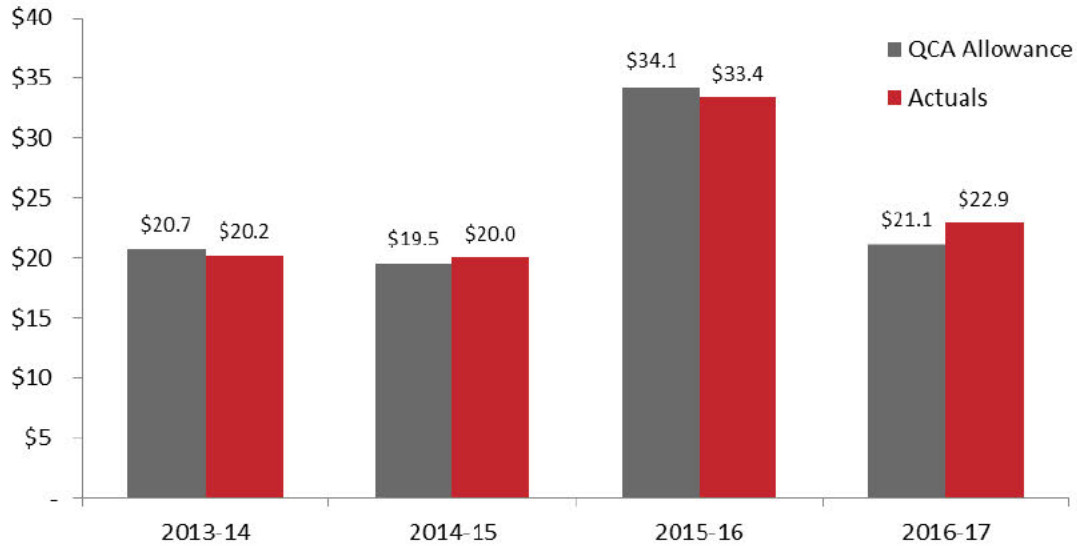
Table 5: AU1 West Moreton coal maintenance and 2018–19 budget for West Moreton coal ([redacted]
($2020-21 million)

	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2022-23	2023-24	2024-25
Track (excluding track lowering)	[redacted]									
Track lowering (ballast undercutting)						[redacted]				
Structures	[redacted]									
Trackside systems	[redacted]									
Facilities/Other/Asset management	[redacted]									
Total	**$23.2**	**$23.3**	**$23.0**	**$22.8**	**$22.6**	**$25.3**	**$25.2**	**$25.0**	**$24.9**	**$24.7**

If the effect of re-including $1.5 million per annum ($2020–21) for track lowering (ballast undercutting) in the DAU2 maintenance allowance is excluded, maintenance costs are forecast to be an average 2.1 per cent per annum higher over the DAU2 period. Including track lowering as maintenance shows that in the 2018-19 constant tonnes scenario, the DAU2 maintenance costs are estimated to be, on average 8.7 per cent higher per annum in real terms than the compared to the AU1 maintenance allowance approved by the QCA.

Queensland Rail also notes that while 2018-19 has been used as the base year for estimation of DAU2 maintenance costs, it actual maintenance costs have been tracking close to the QCA's maintenance allowances for the period 2013-14 to 2016-17.

Figure 6: West Moreton QCA AU1 maintenance allowance and actual maintenance costs—2013–14 to 2016–17 ($million, nominal)



Queensland Rail note there is significant variation in maintenance costs at the activity level as evidenced between 2015-16 and 2016-17. This is not unusual given the relatively small size of the network and the large number of activities carried out, however it means that forming views about individual maintenance activities in the absence of considering the maintenance package as a whole is problematic.

While the overall expenditure across the West Moreton System (excluding track lowering) is forecast to increase by around 2 per cent in real terms, there is a marked difference in the allocation of maintenance costs by section.

For AU1, total maintenance costs for the West Moreton System were split by each corridor's forecast percentage of gtks operated on the system, while for DAU2, with the use of EAMS and the capacity to ascertain maintenance requirements in detail by corridor, the allocation of maintenance costs is proposed to be amended to reflect forecast costs by corridor.

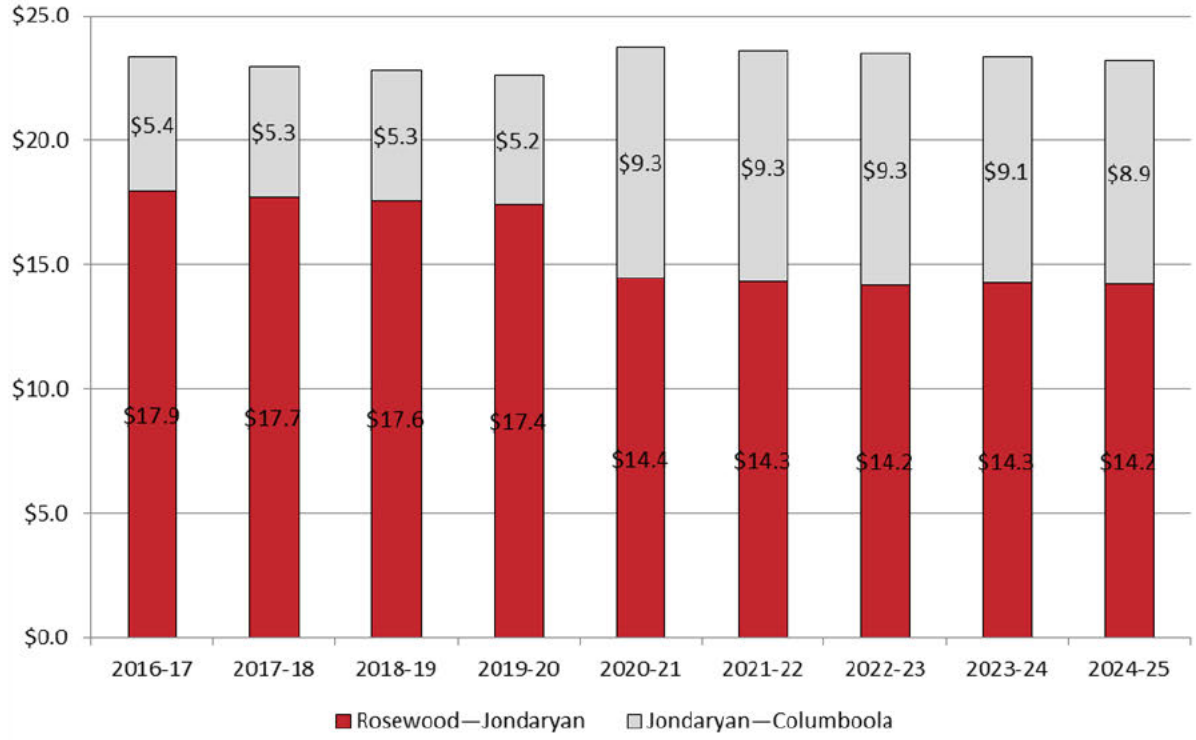
The percentage allocation of costs by corridor for AU1 and DAU2 is shown in **Table 6**, while **Figure 7** shows total maintenance costs split between the two corridors assuming a constant tonne scenario of [redacted]

Table 6: AU1 West Moreton coal maintenance and 2018–19 budget for West Moreton coal ([redacted]) ($2020-21 million)

Corridor	AU1—% of gtks	DAU2—Forecast corridor maintenance
Rosewood—Jondaryan	76—79%	61%
Jondaryan—Columboola	21—24%	39%

Note: The variable costs for AU1 maintenance costs are changed for Endorsed Variation Events and Review Events

Figure 7: West Moreton maintenance costs by corridor—AU1 maintenance allowances and proposed DAU2 maintenance allowance ($2020–21 million)



4.4 Tonnage forecast impacts

One of the key challenges for estimating maintenance costs for the DAU2 period is developing a methodology to estimate the impact of two different tonnage scenarios operating over the network (ie. [redacted] and [redacted]

While Queensland Rail has had some history with the movement of between [redacted] in 2011–12 and 2012–13 (which is closer to the [redacted] scenario), there is no comparable history for a [redacted] scenario. However, extensive consideration was given to the fixed and variable proportion of maintenance costs on the West Moreton system for the AU1 process.

Queensland Rail engaged GHD to review the reasonableness of the QCA's fixed and variable splits for individual maintenance activities on the West Moreton System. GHD's 'bottom up' assessment of Queensland Rail's maintenance costs, by activity, generates a 62:38 fixed: variable split.

Queensland Rail also considered the QCA's estimates for fixed and variable costs, which for the tonnage dependent activities for DAU2 generate an estimated 54.4:46.6 fixed: variable split.

4.4.1 Application of QCA's variable cost estimates

In the interests of reaching agreement on the methodology for adjusting the [redacted] scenario to derive the [redacted] and [redacted] scenarios, Queensland Rail has adopted the QCA estimates for the tonnage dependent maintenance activities. Given the conclusions of the GHD report, Queensland Rail considers that using the QCA's approach is reasonable for the circumstances.

A summary of the QCA's estimate of the fixed and variable proportions of Queensland Rail's maintenance activities is set out in **Table 7**. Queensland Rail has also reviewed the extent to which each of its activities are tonnage or non-tonnage dependent. Table 5 also sets out where Queensland Rail has formed a different view than the QCA on tonnage dependence and the reason for doing so.

Table 7: Assessment of the application tonnage and non-tonnage activities, and QCA fixed cost assessment

Maintenance activity	Tonnage dependent	QCA AU1 Fixed Proportion (%)[6]	Comments
Structures and civil	Y	75%	
Ballast Undercutting	Y	10%	
Earthworks—non-formation (including drainage).	N	n.a.	For AU1, the QCA applied a 5% variable component to earthworks maintenance. Queensland Rail does not consider that this activity is affected by tonnes and is more likely to be related to weather and age. As well as non-formation and drainage work, this activity includes the maintenance of access roads, walkways, disposal of surplus material, the reshaping and cleaning of surface drains, reshaping cess drains, widening cuttings, building up embankments, widening cesses, and maintaining cuttings and embankments by the removal of rocks and loose materials. In recent years there have been significant experiences relating to land slips/slides, rock falls, embankment failures, and washouts. The majority of the challenges relating to non-formation earthworks are on the Toowoomba and Little Liverpool Ranges where there is need for a continual program of drainage and access road maintenance.
Minor yard maintenance	N	n.a.	For AU1, the QCA considered that 50% of this minor yard works were variable and related to tonnes. Queensland Rail does not consider that this activity is affected by tonnes. This activity covers all day to day maintenance works performed within rail yards that do not have their own corridor code or functional location. This includes any maintenance performed by local or mechanised work groups.
Rail joint management	Y	80%	
Rail renewal	Y	50%	
Turnout maintenance	Y	30%	

6 B&H Supplementary Report Master relating to submissions by stakeholders in response to the QCA's Draft Decision of Queensland Rail DAU 2015 (May 2016), p 12

Maintenance activity	Tonnage dependent	QCA AU1 Fixed Proportion (%)[6]	Comments
Signage	N	n.a.	For AU1, the QCA considered that 30% of signage/monument maintenance was variable and related to tonnes. The activity covers all activities associated with the survey and erection of track monuments, mast information plaques, creep markers and general signage such as speed boards. It does not include signage at level crossings. It is difficult to see how this activity would be affected by the number of tonnes running over the network.
Maintenance ballast	Y	20%	
Sleeper management	Y	40%	
Fire & vegetation management	N	n.a.	For AU1, the QCA considered that 15% of fire and vegetation costs were variable and related to tonnes. It is difficult to see how fire & vegetation management would be affected by the number of tonnes running over the network. Queensland Rail has not applied the QCA's estimate of variable costs for this activity.
Rail stress adjustment	N	n.a.	For AU1, the QCA considered that 30% of rail stress adjustment costs were variable and related to tonnes. This activity includes rail stress testing, creep marker monitoring, and the complete process of rail stress adjustment, for example additional rail and anchors. Due to the nature of the task, track closure is necessary to carry out the works. The costs included in this product include restressing of sections where track works and modifications have occurred. Queensland Rail has assessed this activity not to be tonnage dependent, with rail stress adjustment related to a range of other factors including track condition (with higher costs on the 41kg track), track length and weather. In areas where rail stress presents as an issue, the greatest variation in rail neutral temperature is caused by temperature related lateral shifts, that is, a curve pulling in due to the rails contracting in a cold winter, after which the track does not return to the original alignment, thus lowering the neutral temperature and leaving the track susceptible to buckling in the following summer.
Asset inspections	N/Y	80%	Queensland Rail undertakes both routine asset inspections, and inspections for non-compliance of assets. Queensland Rail has applied QCA's fixed cost estimate to non-compliance asset inspections, with only this activity tonnage dependent.
Rail lubrication	Y	50%	
Top & line resurfacing	Y	20%	
Rail repair	Y	50%	
Resurfacing	Y	20%	
Rail grinding	Y	5%	
Facilities	N	n.a.	
Tele-communications	N	n.a.	For AU1, the QCA considered that 10% were variable and related to tonnes. However, the QCA provided insufficient information about what aspects of telecommunications were affected by tonnes for Queensland Rail to make a considered assessment. Queensland Rail considers that maintenance of the telecommunications network will be related to the age of the asset—and is not tonnage dependent.

Maintenance activity	Tonnage dependent	QCA AU1 Fixed Proportion (%)[6]	Comments
Signalling	N	n.a.	For AU1, the QCA considered that 20% were variable and related to tonnes. However, the QCA provided insufficient information about what aspects of signalling were affected by tonnes for Queensland Rail to make a considered assessment. Similar to telecommunications, Queensland Rail considers that maintenance of signalling systems is related to the age of the asset—and is not tonnage dependent.

4.4.2 Estimated tonnage impact on maintenance costs for DAU2

To estimate total maintenance costs for DAU2 under the two scenarios, the QCA's fixed costs percentages were applied to the Rosewood—Jondaryan section, using the [redacted] scenario as the base. No change was made to the Jondaryan—Columboola section, which is assumed to carry [redacted] under both scenarios.

Applying the QCA's fixed cost estimates to the tonnage dependent Rosewood—Jondaryan activities provides a weighted average fixed to variable split of 54.4:45.6 fixed: variable for the DAU2 period The fixed proportion estimated for DAU2 is lower than the QCA's estimate for AU1, with the ratio of 57.3 per cent fixed, 42.7 per cent variable. The lower fixed proportion on the DAU2 tonnes is largely driven by the removal of mechanised re-sleepering from the maintenance costs.

Figure 8 shows the build-up of the total maintenance costs to a [redacted] scenario, with the incremental costs of increasing tonnes from [redacted] to [redacted] shown.

Figure 8: Assessment of the application tonnage and non-tonnage activities, and QCA fixed cost assessment

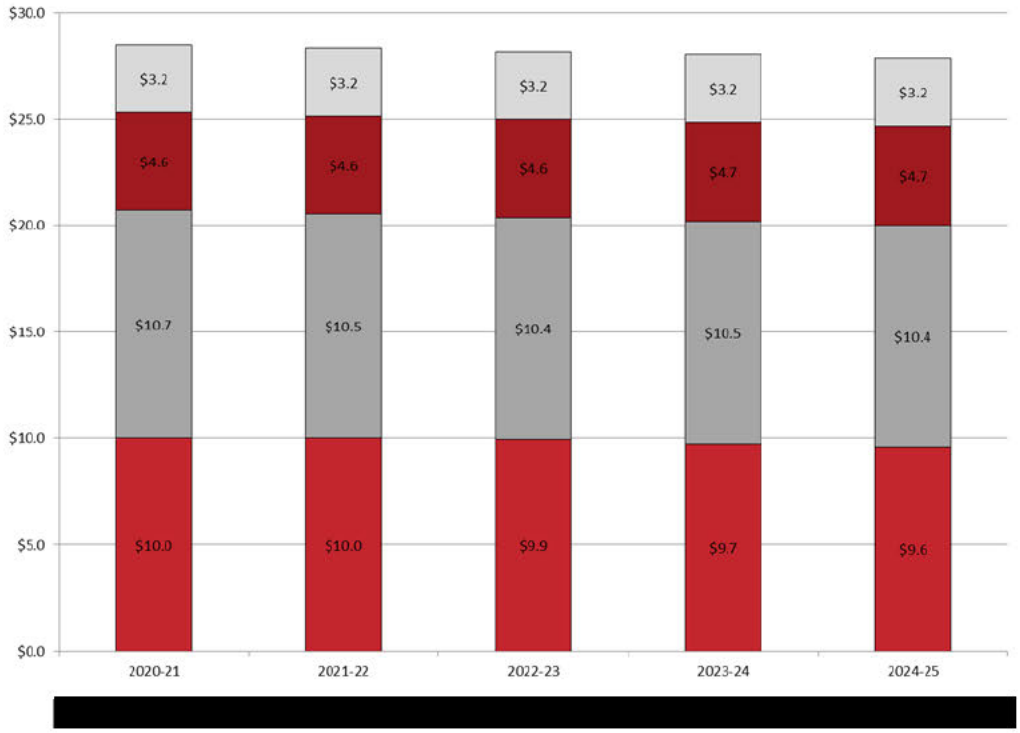
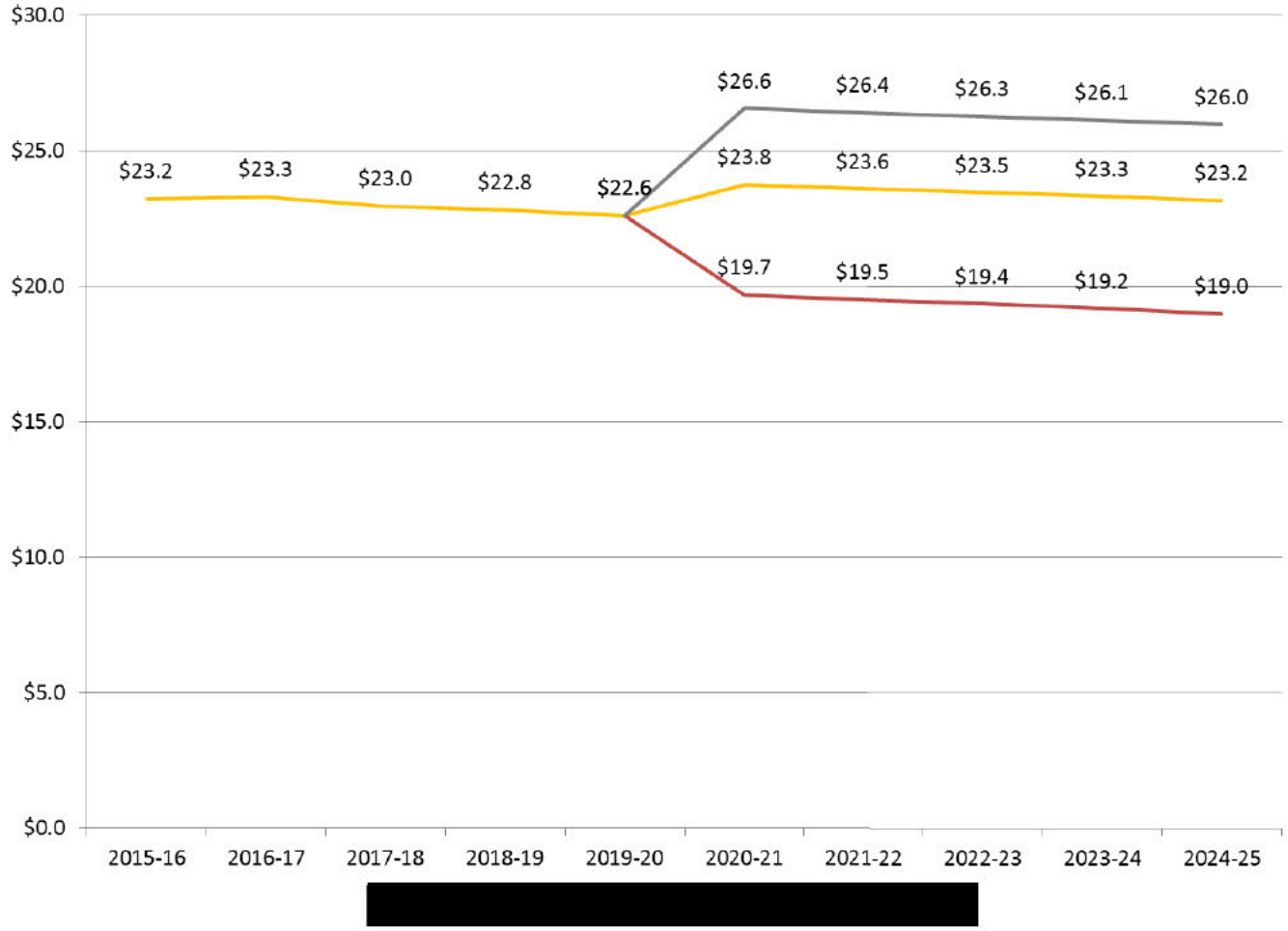


Figure 9 shows the effect of applying the QCA's fixed allocations to the [redacted] constant tonnes scenario, and makes a comparison to the AU1 QCA allowances. The forecast decline in real costs over the DAU2 period for all scenarios is driven by maintenance cost reductions for timber bridges as bridges are progressively replaced through the capital program.

The [redacted] scenario is 17 per cent lower over five years than the [redacted] constant tonnes scenario, while the [redacted] scenario shows a 12 per cent increase. To provide a 'like for like' comparison, to AU1, the effect of re-including track lowering (ballast undercutting) in the maintenance allowance has been excluded.

Figure 9: AU1 maintenance allowance and proposed DAU2 maintenance allowance (excl. ballast undercutting), by tonne scenario ($2020-21 million)



4.5 Inland Rail

Consideration has been given to the possible construction of the Inland Rail which would eventually strand Queensland Rail Network assets between Toowoomba and Rosewood. Queensland Rail has considered the maintenance required to ensure that investment in the network is targeted to ensure the reliable operation of the network while avoiding unnecessary expenditure.

4.6 Maintenance planning assumptions

The following assumptions have been made when determining the forecast asset maintenance programs:

- 5 x 4 day closures (planned possession); 2 x 3 day closures; 2 x 2 day closures; and 6 x 12 hour closures per year
- 15.75 tonne axle load
- speed of 60km/hr (loaded train) and speed of 80km/hr for empty trains
- a reference train comprised of 2 x 90 tonne locomotives plus 41 coal wagons.

4.7 Cost indexation

The $2018–19 cost estimates have been indexed to $2020–21 with an assumed rate of 2.5 per cent per annum. This is based on the inflation trend implied by the Statement on Monetary Policy issued by the Reserve Bank of Australia.

4.8 Independent peer review

The projects presented in this document have been subject to an internal peer review process and have been externally reviewed by GHD. The GHD report is provided separately for the QCA's consideration.

5. DAU2 maintenance costs

Chapter 5 sets out in detail Queensland Rail's proposed maintenance costs under two potential maintenance scenarios:

- [redacted] assuming that only Yancoal's mine at Cameby Downs is hauling coal from Columboola to Rosewood (and then through the Metropolitan Network to Fisherman Islands)
- [redacted] assuming the New Acland Stage 3 mine is developed and rails [redacted] of coal from Jondaryan, in addition to the [redacted] from Cameby Downs. For simplicity, Queensland Rail has assumed that the commencement of coal haulage from the New Hope Coal's Stage 3 mine coincides with the QCA's approval of DAU2 on 1 July 2020.

The maintenance costs forecasts are for the movement of all coal and non-coal (including passenger) services on the network between Rosewood and Miles. The methodology for the allocation of costs between coal and non-coal services is dealt with separately in the DAU2 submission.

5.1 Total maintenance costs

5.1.1 Total maintenance costs—[redacted] coal

Queensland Rail has proposed a maintenance cost estimate of $101.825 million ($2020–21) over the DAU2 period for the movement of [redacted] of coal, with [redacted] of maintenance costs on the Rosewood—Jondaryan section and [redacted] of costs from Jondaryan—Columboola.

Table 8: Proposed DAU2 West Moreton coal maintenance costs by function ($2020-21 million)—[redacted]

	2020-21	2021-22	2022-23	2023-24	2024-25	Total DAU2
Track	$16.426	$16.461	$16.498	$16.536	$16.576	$82.497
Structures	$2.719	$2.517	$2.322	$2.112	$1.884	$11.553
Trackside systems	$1.467	$1.467	$1.467	$1.467	$1.467	$7.337
Facilities/Other	$0.088	$0.088	$0.088	$0.088	$0.088	$0.438
Total	**$20.700**	**$20.533**	**$20.374**	**$20.202**	**$20.015**	**$101.825**

Table 9: Proposed DAU2 West Moreton coal maintenance costs by corridor ($2020-21 million)—[redacted]

	2020-21	2021-22	2022-23	2023-24	2024-25	Total DAU2
Rosewood—Jondaryan	$10.705	$10.538	$10.431	$10.470	$10.424	$52.568
Jondaryan—Columboola	$9.995	$9.995	$9.943	$9.733	$9.591	$49.257
Total	**$20.700**	**$20.533**	**$20.374**	**$20.202**	**$20.015**	**$101.825**

5.1.2 Total maintenance costs—[redacted] coal

For the [redacted] scenario, Queensland Rail has proposed a maintenance cost estimate of $140.921 million ($2020–21) over the DAU2 period, with [redacted] of maintenance costs on the Rosewood—Jondaryan section and [redacted] of costs from Jondaryan—Columboola.

Table 10: Proposed DAU2 West Moreton coal maintenance costs by function ($2020-21 million)—[redacted]

	2020-21	2021-22	2022-23	2023-24	2024-25	Total DAU2
Track	$23.975	$24.049	$24.126	$24.207	$24.293	$120.649
Structures	$2.953	$2.717	$2.496	$2.286	$2.044	$12.497
Trackside systems	$1.467	$1.467	$1.467	$1.467	$1.467	$7.337
Facilities/Other	$0.088	$0.088	$0.088	$0.088	$0.088	$0.438
Total	**$28.483**	**$28.321**	**$28.177**	**$28.048**	**$27.891**	**$140.921**

Table 11: Proposed DAU2 West Moreton coal maintenance costs by corridor ($2020-21 million)—[redacted]

	2020-21	2021-22	2022-23	2023-24	2024-25	Total DAU2
Rosewood—Jondaryan	$18.488	$18.326	$18.234	$18.316	$18.300	$91.664
Jondaryan—Columboola	$9.995	$9.995	$9.943	$9.733	$9.591	$49.257
Total	**$28.483**	**$28.321**	**$28.177**	**$28.048**	**$27.891**	**$140.921**

5.2 Track

5.2.1 Summary of track maintenance costs DAU2

Track maintenance for the West Moreton System includes rail, ballast, sleepers and formation. The main track-related activities performed are:

- Periodic inspections
- General repairs, including replacement of defective components
- Sleeper replacement
- Ballast maintenance
- Mechanised rail grinding
- Rail lubrication and joint management, including welding/destressing
- Track resurfacing and geometry recording
- Track lowering and re-profiling
- Fire and vegetation management and control.

Queensland Rail has proposed $82.497 million ($2020–21) for track maintenance for the [redacted] scenario, 81 per cent of the total maintenance costs proposed for the DAU2 period. For the [redacted] scenario, the track maintenance costs are estimated at $120.649 million ($2020–21), [redacted] of the total maintenance costs for the DAU2 period.

Track maintenance costs for the Jondaryan—Columboola corridor are the same in both scenarios—Table 11. Track maintenance costs for Rosewood—Jondaryan under the [redacted] scenario and [redacted] scenario are shown in Table 12 and Table 13 respectively.

Table 12: Forecast track maintenance costs, Jondaryan—Columboola, by activity ($2020-21 million)

	2020-21	2021-22	2022-23	2023-24	2024-25	Total DAU2
Asset inspections	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Planning & technical support	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Repairs	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Rail grinding	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Resurfacing	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Track lowering	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Other	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total	**$7.799**	**$7.799**	**$7.809**	**$7.819**	**$7.829**	**$39.056**

Table 13: Forecast track maintenance costs, Rosewood—Jondaryan [redacted] by activity ($2020–21 million)

	2020-21	2021-22	2022-23	2023-24	2024-25	Total DAU2
Asset inspections	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Planning & technical support	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Repairs	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Rail grinding	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Resurfacing	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Track lowering	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Other	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total	**$8.627**	**$8.662**	**$8.698**	**$8.737**	**$8.777**	**$43.500**

Table 14: Forecast track maintenance costs, Rosewood—Jondaryan [redacted] by activity ($2020–21 million)

	2020-21	2021-22	2022-23	2023-24	2024-25	Total DAU2
Asset inspections	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Planning & technical support	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Repairs	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Rail grinding	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Resurfacing	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Track lowering	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Other	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total	**$16.175**	**$16.249**	**$16.327**	**$16.408**	**$16.493**	**$81.652**

5.2.2 Asset inspections

Regular inspections are undertaken to maintain both track and civil infrastructure. These inspections ensure that the infrastructure operates safely and effectively. These inspections are carried out in accordance with *Queensland Rail's Civil Engineering Track Standards Module CETS 1—Track Monitoring.*

Defects found during these inspections are entered into the EAMS for actioning and repairing. From EAMS, work programs are developed to remove/repair the defects within the timeframes that are specified. Queensland Rail targets zero overdue repairs in line with its business principles.

The following inspections are undertaken to maintain track and civil infrastructure:

- Scheduled hi-rail patrol inspection every 96 hours (twice a week)
- Front of train general inspection every four months
- Planner hi-rail patrols at six week intervals
- Track recording car inspections every four months
- Asset Manager hi-rail Inspection every six months
- Engineering hi-rail Inspection yearly
- Hot weather/flood hi-rail inspection when the ambient temperature exceeds 38 degrees celsius or when local flooding is evident
- Sleeper inspections, every timber sleeper is inspected every five years
- Periodic walking Inspection by the planner
- Points and Crossings Inspection by the planner
- Other inspections/events that generate defect identification (eg. driver reports, noise complaints, derailments)

The track asset inspection costs are forecast to remain unchanged from the AU1 period to the DAU2 period, in real terms with the 2018-19 budget year applied as the base year.

Queensland Rail has applied the QCA's estimate of 20 per cent variable cost to the non-compliance asset inspections to estimate the [redacted] and [redacted] scenarios for the Rosewood—Jondaryan corridor. No change in costs is proposed to routine inspections, which are not tonne dependent.

5.2.3 Rail grinding

Rail grinding is an essential maintenance function that Queensland Rail performs for the West Moreton System. Wear and surface defects are the dominant factors in determining the life of rails and wheels. Rail and wheel profiles are designed to maintain a controlled average 'contact band', with sufficient contact radii to cater for a range of wear conditions.

It is imperative that wheel/rail contact be accurately maintained and conditions not allowed to depart too far from the average. The objectives are to efficiently introduce, and thereafter maintain appropriate rail profiles, and to remove small surface fatigue cracks. Benefits include, extending rail life, reducing resurfacing cycles (predominately for turnouts), extending track component life, reducing wear rates on rolling stock wheels, and reducing wheel squeal and flange noise.

The different types of rail grinding work carried out are as follows:

- profile establishment (i.e. modification of rail head shape to establish a new shape)
- profile maintenance (i.e. grinding of rail to maintain rail profile shape)
- corrective profiling (i.e. rails with surface defects)
- profile modification (i.e. stress reduction to allow increased axle loads)
- removal of rail corrugations.

Mainline rail grinding

The maintenance grinding frequency is determined by the combined effects of gross tonnages, axle loads, train speeds, alignment curvature and traffic loads. These are the dominant factors in deciding return frequencies.

Rail grinding is currently outlined in the Civil Engineering Track Standards (CETS) as to be performed every:

- 10 million gross tonnes (MGT) on curves less than 1,000m radius
- 20 MGT on curves between 1,001m and 2,500m radius
- every 40 MGT on other track.

Through implementing a grinding regime, rail life is significantly increased. Without rail grinding the life of the rail is drastically reduced for curves less than 1000 m radius. From a risk perspective, once the 40 MGT threshold is reached without a grinding cycle, the risk of the rail breaking due to the propagation of a surface initiated cracking defects increases dramatically.

Current grinding plans are to grind all curves less than 1000m radius and selected straights where there are defects such as corrugations or where new rail has been installed. The grinding of new rail is done to ensure the wheel-rail interface is optimal and reduces rail and wheel wear.

The Civil Engineering Track Standards are based around grinding for 20TAL lines and hence consideration needs to be given to the grinding on the 15.75TAL West Moreton System. Grinding in the future financial years is to be refined 6-12 months prior to grinding occurring through inspections and rail wear measurements. These measurements are taken using specialised rail wear equipment and monitoring the change in rail profile.

All major rail grinding in the West Moreton System is currently done by contract with Aurizon, with the existing contract based on rail grinding to support the movement of coal based on the AU1 coal tonne forecasts.

Queensland Rail would need to negotiate new arrangements for a different tonnage profile. However, to estimate the rail grinding estimates for DAU2, Queensland Rail has applied the QCA's estimate of rail grinding being 95 per cent variable to the estimate rail grinding costs for 2018–19.

5.2.4 Earthworks—Non-formation

The railway is designed to manage surface and groundwater flows through the use of drains along the side of the railway (known as cess drains) and across ridges and spurs on slopes above the railway (known as diversion drains), and culverts diverting water flow below the railway.

This activity comprises of all non-formation related earthworks and drainage construction and maintenance. Other tasks include the maintenance of access roads, walkways, disposal of surplus material, the reshaping and cleaning of surface drains, reshaping cess drains, widening cuttings, building up embankments, widening cesses, and maintaining cuttings and embankments by the removal of rocks and loose materials. In recent years there have been significant experiences relating to land slips/slides, rock falls, embankment failures, and washouts.

The majority of the challenges relating to non-formation earthworks are on the Toowoomba and Little Liverpool Ranges where there is need for a continual program of drainage and access road maintenance.

The close proximity (typically 1.5-2 meters) between the railway and the cut slopes, and the tight radius curves required to manage the steep topography limits the opportunity to re-align the track further away from the toe of the cut slope to create a buffer to geotechnical hazards.

Vegetation and surface water drainage have a significant influence on contributing to small scale slope instability and rock fall. If not diverted into adjacent gullies, water run-off shedding down the spurs and ridges above the railway will wash over the cutting face and recharge these slopes, increasing the potential of circular-type slumping failure in weathered rock.

The West Moreton System requires regular re-establishment of the original diversion drains across the topography upslope of railway cuttings to effectively minimise the flow of surface water run-off away from the cuttings. This reduces the risks associated with elevated pore water pressures causing slumps, and scouring of surface water aggravating dislodgement of rocks. This work involves accessing the slopes to clear the diversion drains of re-growth vegetation, and re-establishing the flow of water along the drains by removing silt and rock build-up.

These actions assist in reducing water flow over the face of cuttings and significantly reduce the risk of rock fall or larger geotechnical slope failure. The cess drains along the edge of the railway on the ranges' areas' are generally adequate to manage normal rain fall events (e.g. rain fall <25 mm per day), but in many areas are filled with fine material washed from the slope, or rock fall debris. This reduces their ability to adequately manage water flow from high rain fall events resulting in potential track washout issues.

The cess drains require routine clearing of fine material and rock debris to promote water flow towards the established culverts. In many areas, the cess drain is very close to the railway, and will present access issues for earthmoving equipment.

Queensland Rail is proposing maintaining earthworks—non-formation costs constant in real terms from the 2018–19 maintenance budget. Queensland Rail does not consider this activity to be tonnage dependent.

5.2.5 Fire and vegetation management

Fire and vegetation management activities involve the control of vegetation by chemical and mechanical means; burn offs to eliminate vegetation interference with train running and track maintenance. This includes the following processes: vegetation control around bridges, slashing, brush cutting, hi rail and manual herbicide treatment, tree surgery, fire and vegetation management, fire breaks, burning off, tree planting, firefighting and pest management plans. This activity does not typically require track closures.

Queensland Rail has externally contracted some of this activity to an external party. The DAU2 estimates have been adjusted to reflect these costs. Despite the view formed by the QCA for AU1, Queensland Rail does not consider this activity to be tonnage dependent.

5.2.6 Ballast maintenance

This activity involves the purchase, freight and running out of ballast for restoration of ballast profile only. The majority of maintenance ballast costs are associated with the deploying of ballast trains.

Ballast maintenance is tonnage dependent with costs for Rosewood—Jondaryan adjusted from the [redacted] cost estimates to reflect the [redacted] and [redacted] scenario, applying the QCA's estimate that these costs are 80 per cent variable. No other adjustments have been proposed for this activity.

5.2.7 Rail joint management

Rail joint management includes all activities associated with the maintenance of a rail joint. This encompasses welding of joints, bolt and fish plate maintenance, glue joint maintenance, joint lifting, top and lining joints.

This product takes into account the cost associated with the works currently being done and planned for welding of 220m lengths through the timber and steel sleepered sections.

Rail joint management is tonnage dependent with costs for Rosewood—Jondaryan adjusted from the [redacted] cost estimates to reflect the [redacted] and [redacted] scenario, applying the QCA's estimate that these costs are 80 per cent variable. No other adjustments have been proposed for this activity.

5.2.8 Rail renewal

Controlling the rate of rail wear is a critical aspect of optimising rail life. Managing rail wear rates through rail husbandry and monitoring ensures safety and commercial objectives are met.

Rail wear occurs as table wear, side wear or as a combination of both. The manner in which rail wears will depend upon a number of factors including; wheel and rail profiles, rail size, rail metallurgy, track structure, track geometry, traffic type, traffic loading, and traffic mix.

Queensland Rail's civil maintenance staff examine the rail head profile for excessive wear on a regular basis. The side and table wear of the head of the rail is measured and the percentage head wear loss is determined. Queensland Rail programs replacement of rail so that the limits of wear specified in Civil Engineering Track Standard are not exceeded.

All curves are measured a minimum of once a year with tangent track measured when deemed necessary based on rail age, tonnage, ultrasonic testing results and walking inspections. Queensland Rail System has established a rail wear database to keep accurate records that enable rail life predications to be made and have systems in place to ensure that worn rail is replaced in a timely manner.

In general, all new rail installed on tight radius curves is now 50 kg/m head-hardened rail which will give an extended rail life and longer intervals between remedial grinding. Head hardened rail does not give the same benefits in tangent and larger radius curves as there have been examples where defects propagate quicker in these applications.

The scope of the Rail Renewal program in the Maintenance Plan is replacing life expired 50kg/m rail with new 50kg/m head-hardened rail, predominantly in curves with radius less than 300 metres between Rosewood and Jondaryan. There is 36.4km of these curves in this area, and the average life of the rail based on wear is 15–18 years. Approximately 2.8km of these curves requires rail renewal per year at the proposed tonnage. The wear rate is based on the high leg rail on the curves, which would certainly wear faster than the low leg, and the scope will concentrate on the high leg only, for this assessment period. The unit rate for renewal of single rail in a curve is approximately [redacted].

Queensland Rail's *Specification MD-12-376 Capitalisation of Expenditure* applies the following rules rail replacement:

- *•Where only the dual rail lines are replaced, the replacement costs, including demolition costs are to be capitalised where the track is at least 110 metres in length. Any replacement costs of track shorter than 110 metres must be expensed as incurred and the existing track is not disposed of.*
- *Where only a single rail line is replaced due to wear and tear, the entire costs of replacement are expensed as incurred.*

The rail renewal costs including the DAU2 maintenance budget are only for those rail renewal costs that do not meet the definition for capitalisation ie. where one rail only is renewed for any length, or both rails for a length less than 110 metres. Where both rails are renewed for a length greater than 110metres, these costs are capitalised.

Rail renewal is tonnage dependent with costs for Rosewood—Jondaryan adjusted from the [redacted] cost estimates to reflect the [redacted] and [redacted] scenario, applying the QCA's estimate that these costs are 30 per cent variable. No other adjustments have been proposed for this activity.

5.2.9 Rail repair

Rail repair includes all activities associated with spot renewal or repair of rail due to identified defects. Failures or defects in rail such as wheel burns, defective welds, internal rail defects, defect glued joints, broken bolts and other associated activities such as distribution, unloading rail, and flagging are all concerned with this activity. This product also includes the repair of running rail by maintenance or arc welding.

Queensland Rail has also proposed a four per cent real increase in the annual cost of rail repair from the 2018–19 budget, to take account of the variability in rail repair work—with the budget for 2018–19 lower than actual costs in 2016-17.

Rail repair is tonnage dependent with costs for Rosewood—Jondaryan adjusted from the [redacted] cost estimates to reflect the [redacted] and [redacted] scenario, applying the QCA's estimate that these costs are 40 per cent variable.

5.2.10 Rail stress adjustment

This activity includes tasks such as rail stress testing, creep marker monitoring, and the complete process of rail stress adjustment, for example additional rail and anchors. Due to the nature of the task, track closure is necessary to carry out the works. The costs included in this product include restressing of sections where track works and modifications have occurred.

Rail stress adjustment costs have been, on average, nine per cent higher for Jondaryan—Columboola section than on the Rosewood—Jondaryan section. The Jondaryan—Columboola section has also exhibited considerable year on year variability, while Rosewood—Jondaryan has been stable. The difference in costs is a related to the difference in track structure 50kg rail on concreate sleepers compared to the 41kg rail on timber/steel sleepers.

The [redacted] constant tonne scenario has been adjusted for the Rosewood—Jondaryan section to reflect the three year average expenditure from 2015-16 to 2017-18. Queensland Rail has increased the proposed cost estimate for the Jondaryan—Columboola section to take account of the significant variation evident in these costs over the last three years.

Queensland Rail does not consider that rail stress adjustment is tonnage dependent, with track quality, length and weather more likely to be a cost driver.

5.2.11 Repairs

Repair costs include turnout maintenance, level crossing maintenance and minor year maintenance, with turnout maintenance being the largest cost driver within this activity.

The turnout maintenance component of repairs is tonnage dependent with costs for Rosewood—Jondaryan adjusted from the [redacted] cost estimates to reflect the [redacted] and [redacted] scenario, applying the QCA's estimate that these costs are 30 per cent variable. No other adjustments have been proposed for this activity.

5.2.12 Sleeper management

In the interspersed timber and steel sections of track the sleeper management task encompasses activities such as spot insertion of sleepers, reboring, regauging, plating, respacing and fastener installation by local track teams. Typically the most significant task in sleeper cluster management. Due to the nature of the task, track closures are necessary to carry out the works.

In the concrete sleeper sections of track, particularly in tight radius curves, the sleeper management task includes replacing warn and crushed rail seat pads, gauge foot spacers and clip fastenings to maintain gauge and toe load. Heavy duty spacers have been developed to reduce crushing, and options have been developed to facilitate adjusting gauge in as rail wears in 3mm increments.

Sleeper management is tonnage dependent with costs for Rosewood—Jondaryan adjusted from the [redacted] cost estimates to reflect the [redacted] and [redacted] scenario, applying the QCA's estimate that these costs are 60 per cent variable. Sleeper management costs have also been escalated by 5 per cent per year to take account of the additional maintenance costs prior to the next periodic mechanised resleepering program. Escalation commences in 2021-22 for Rosewood-Jondaryan and 2022-23 for Jondaryan-Columboola.

5.2.13 Top and line resurfacing

Top and line spot resurfacing encompasses all activities associated with restoring top and line to track using manual or mechanically assisted processes. It involves restoring top and line on bridge ends, open track, using manual processes or small spot tampering machinery (e.g. modified bobcat, portable tamper, mini excavator etc.). Top and line resurfacing excludes activities undertaken by major production resurfacing machines.

Top and line resurfacing is tonnage dependent with costs for Rosewood—Jondaryan adjusted from the [redacted] cost estimates to reflect the [redacted] and [redacted] scenario, applying the QCA's estimate that these costs are 80 per cent variable. No other cost adjustments have been proposed for this activity.

5.2.14 Mechanised resurfacing

Mechanised resurfacing is a standard railway maintenance function applied to keep track within design geometry parameters. It assures correct levelling and lining, which keeps vertical and lateral forces and accelerations within acceptable limits by shifting the track into the correct position.

Mechanised resurfacing is performed at intervals depending on numerous conditions, including speed, tonnage and deterioration rate of the track to name a few. The task is completed using self-propelled on-track machines that are able to lift and line the track to a pre-determined level, and compact the ballast under the rail seat to support the new track position.

Scope of the resurfacing products has been forecast based on the historical performance of the asset whilst taking into account new capital investments that will reduce the maintenance demand over the duration of the DAU2. The scope for mechanised resurfacing is generally driven by:

- gross tonnes across the track
- the standard of track construction (e.g. rail size, sleeper type, etc.)
- the current condition of the track and formation components
- the historical performance of the infrastructure in service
- weather events (i.e. high rain fall).

The planning of track maintenance works, particularly to maintain track geometry, requires considerable skill and experience to achieve cost-effective outcomes. Long term resurfacing programs have been developed based on fixed protocols to minimise changes. This plan has allocated "shifts" where resurfacing machines will be available to work within the West Moreton System. Work has been done working with the train operations planning team to plan for opportunities to maximise possession windows within each shift.

The mechanised resurfacing costs have been based on number of shifts required to maintain the West Moreton System at [redacted] tonnes in the 2018-19 West Moreton maintenance budget and escalated to [redacted] for DAU2. No other amendments have been made to the forecast costs.

5.2.15 Rail lubrication

This product includes all activities associated with rail lubrication which involves the lubrication of track on curves, including maintenance and filling of the lubricators. The majority of lubricators in the district are a Portec mechanical type lubricator.

Rail lubrication is tonnage dependent with costs for Rosewood—Jondaryan adjusted from the [redacted] cost estimates to reflect the [redacted] and [redacted] scenario, applying the QCA's estimate that these costs are 50 per cent variable. No other cost adjustments have been proposed for this activity.

5.2.16 Track lowering (ballast undercutting)

Queensland Rail is seeking for the QCA to reconsider its treatment of track lowering (recorded against the ballast undercutting—other cost code in EAMS, for lack of a specific cost code for this activity).

For AU1, the QCA decided that the ballast undercutting was actually *track reconditioning* involving lowering of the track by removing the track and grading the ballast and that these costs should be capitalised.[7]

Queensland Rail's track lowering maintenance activities are associated with managing excessive ballast depth, which affect track stability and poor vertical alignment. Track lowering is not a substitute for formation repairs. This activity predominantly reuses existing ballast and removes excessive ballast depth to regain stability of the track structure—it is not an extension of the ballast life, but simply a reduction in top and line and track stability issues. Track lowering includes all works involved in either:

- undercutting of track sections
- lowering of excessively ballasted sections of track.

Undercutting works are performed in the district by the use of an excavator mounted under cutter bar. Track lowering is generally carried out in large sections and is done by removing the track and grading ballast away and then replacing the track. Ballast during track lowering exercises is generally reused some new ballast is required for undercutting works.

Queensland Rail's proposed track lowering activities for the West Moreton System fail the first two criteria for asset definition set out in *Queensland Rail Specification - Capitalisation of Expenditure – MD12-376*:

- Will the expenditure generate future savings through increased revenue or decreased expenses?
- Does the expenditure relate to a) a new asset or b) the improvement of an existing asset?8

Track lowering is part of the routine maintenance costs required to provide safe and reliable services on the West Moreton System, with no future savings arising as part of the activity. Further, unlike track reconditioning, there is no new asset components involved, with ballast, sleepers and rail all placed back into position after the track has been lowered. Track lowering does no improve the service quality of the existing asset; with this maintenance undertaking to ensure the asset remains 'fit for purpose'.

Queensland Rail's Specification - Capitalisation of Expenditure – MD12-376 guidelines also show that for this activity, the length of track subject to track lowering is also not a consideration for whether the asset should be expensed of capitalised.

Table 15: Queensland Rail guidelines for capitalisation of track specific costs as operating expenditure[9]

Asset condition	Expenditure Type	Area	Rail	Ballast	Sleepers
Not expired / Expired / Damaged	Like replacement	Regional	< 2000 meters	< 2000 meters	< 1 in 4 (25%) or less than 500 meters
	Improvement	Regional	< 2000 meters	N/A	< 1 in 4 (25%) or less than 500 meters
	Single rail	Statewide	Any length	N/A	N/A
	Undercutting (track height adjustment only)	Statewide	N/A	Any length	N/A
	Resurfacing(top up)	Statewide	N/A	Any length	N/A

7 B&H Supplementary Report Master relating to submissions by stakeholders in response to the QCA's Draft Decision of Queensland Rail DAU 2015 (May 2016), p 14

8 Queensland Rail Specification—Capitalisation of Expenditure—MD12-376, p59

9 Queensland Rail Specification—Capitalisation of Expenditure—MD12-376, p 20

Track lowering is tonnage dependent with costs for Rosewood—Jondaryan adjusted from the [redacted] cost estimates to reflect the [redacted] and [redacted] scenario, applying the QCA's estimate that these costs are 10 per cent variable (the estimated used by B&H in September 2015). No other cost adjustments have been proposed for this activity.

5.3 Structures

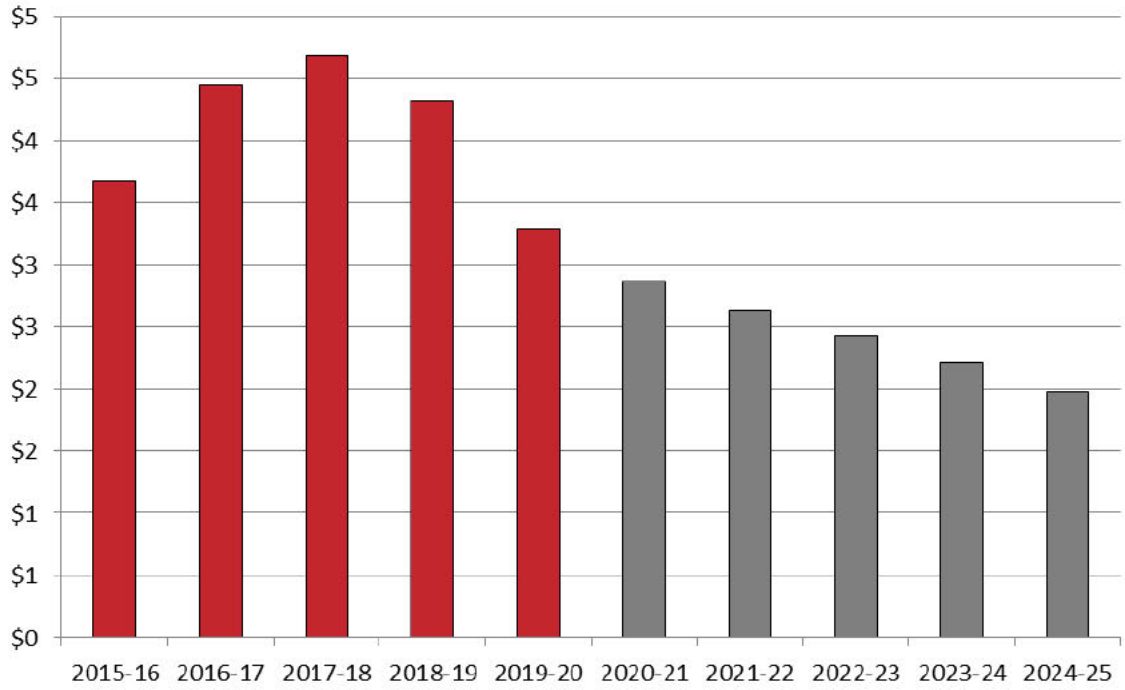
Activities included under structures maintenance are those that relate to maintenance that effect structures that support rail over road crossings, road over rail crossings and those structures that provide drainage under the track. The main structures-related activities are:

- Periodic asset inspections
- General repairs, including replacement of defective components
- Bridge bearing replacement
- Pier replacement.

Queensland Rail has been progressively replacing timber bridges on the West Moreton System, as part of the capital expenditure program under AU1, as well as undertaking periodic maintenance on steel bridges.

Noting the limitations on making exact comparison between the AU1 maintenance allowance and the proposed DAU2 maintenance allowance, Figure 10 shows the projected reduction in maintenance expenditure on structures, assuming the continuation of the [redacted] scenario.

Figure 10: Comparison of forecast structure allowance AU1 to DAU2 constant tonnes [redacted] ($2020–21 million)



5.3.1 Summary of structures maintenance costs DAU2

Queensland Rail has proposed $11.553 million ($2020-21) for structures maintenance for the [redacted] scenario, 11 per cent of the total maintenance costs proposed for the DAU2 period. For the [redacted] scenario, the structures maintenance costs are estimated at $12.497 million ($2020-21), 9 per cent of the total maintenance costs for the DAU2 period.

Structures maintenance costs for the Jondaryan—Columboola corridor are the same in both scenarios—Table 16. Structures maintenance costs for Rosewood—Jondaryan under the [redacted] scenario and [redacted] scenario are shown in Table 17 and respectively.

Table 16: Forecast structures maintenance costs, Jondaryan—Columboola, by activity ($2020–21 million)

	2020-21	2021-22	2022-23	2023-24	2024-25	Total DAU2
Asset inspections	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Repairs	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total	**$1.714**	**$1.714**	**$1.662**	**$1.452**	**$1.311**	**$7.853**

Table 17: Structures track maintenance costs, Rosewood—Jondaryan [redacted] by activity ($2020–21 million)

	2020-21	2021-22	2022-23	2023-24	2024-25	Total DAU2
Asset inspections	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Repairs	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total	**$1.004**	**$0.803**	**$0.660**	**$0.660**	**$0.574**	**$3.700**

Table 18: Forecast structure maintenance costs, Rosewood—Jondaryan [redacted] by activity ($2020–21 million)

	2020-21	2021-22	2022-23	2023-24	2024-25	Total DAU2
Asset inspections	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Repairs	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total	**$1.239**	**$1.003**	**$0.834**	**$0.834**	**$0.733**	**$4.644**

5.3.2 Asset inspections

Inspections are undertaken to maintain the civil infrastructure. These inspections ensure that the infrastructure operates safely and effectively. These inspections are carried out in accordance with Queensland Rail's Civil Engineering Track Standards Module CETS 1—Track Monitoring.

Defects found during these inspections are entered into the EAMS for actioning and repairing. From EAMS, work programs are developed to remove/repair the defects within the timeframes that are specified. Queensland Rail target's zero overdue repairs in line with its business principles.

The following inspections are undertaken to maintain track and civil infrastructure:

- Patrol Inspection
- General inspection
- Detailed inspection—unscheduled

- Detailed inspection—scheduled
- Deck / ground level inspection
- Stage inspection
- Underground inspection
- Visual inspections under traffic
- Underwater inspection.

Structures inspection costs are forecast to decline over the DAU2 period as timber bridges are progressively replaced.

5.3.3 Repairs

Timber bridges

This activity includes all maintenance and repairs to timber bridges that involve the replacement/renewal of any components. This includes walkway/escape repairs, pier/abutment renewals, top and lining, tightening fastenings, component renewal/repairs (e.g. corbels, headstocks, girders, transoms, and piles).

The majority of existing bridges in the West Moreton System are rated to 15.75 TAL. These bridges were originally designed for 12 TAL (Imperial) and dynamic loads imparted by B16 steam locomotives. The bridges from Rosewood to Miles have been assessed with respect to their suitability to the axle configuration of existing traffic and loading of consists. The desktop assessment has shown that, under the existing loadings, these bridges are operating at the limit of their capability.

Due to the existing gross tonnages on the West Moreton System, timber bridges are incurring high maintenance costs, increased closure requirements and carry an elevated risk of derailment compared to concrete and steel alternatives.

Maintenance of timber bridges is necessary due to the biodegradation of timber, mechanical wear and damage, corrosion of fasteners, erosion of wood at joints and insect attack. All of these factors cause a timber bridge to deteriorate and become less serviceable until maintenance is undertaken.

Timber bridges require a substantial quantity of timber for their maintenance. With the supply of timber decreasing these trends indicate that wood production is unlikely to meet forecast demand in the near future increasing the price of raw materials.

While the rate of hardwood plantation establishment has increased in recent years this timber is not suitable for most timber bridge components until it is of the order of 40 to 50 years old. In addition, hardwood saw millers have started to rationalise and amalgamate their operations reducing the supply of such construction material.

Timber bridge general maintenance involves checking of alignment and tightening of bolts to the correct geometry. A typical six metre timber span has six piles, two headstocks, six corbels, three girders and 12 transoms which, as well as the need for general maintenance, requires care for, and replacement of components. Wood is a biological material, and is therefore subject to various types of degradation, fungal decay, wood destroying insects, weathering and fire, all of which can lead to hazardous situations, and to which concrete and steel are largely immune.

Concrete and steel bridges do not require regular component replacement. Concrete and steel structures general maintenance involves inspections and monitoring of cracks of all components and bearings. Steel structures require regular cyclic maintenance involving painting and transom replacement. Timber bridge maintenance is resource intensive compared to the maintenance regime required for concrete or steel structures.

It is becoming very difficult to recruit and retain skilled people in the regional areas of Queensland. Timber bridge carpentry is a specialised skill and one that very few other industries require. Maintenance of steel and concrete

structures, as well as not being as labour intensive as that for timber structures, is adequately serviced by skills that are readily available in the labour market place.

Timber bridges on the low tonnage freight lines can sustain timber bridging for many more years. However, timber bridges on the West Moreton System are subject to large annual tonnages with most axles being loaded to the bridges' maximum capabilities making maintenance of these old structures a continuing task.

At the beginning of DAU2 there will be approximately 2,540 metres of timber bridges remaining in the West Moreton System. Queensland Rail is of the view that a strategy to continue the reduction in the amount of timber bridging is essential to manage the reduced supply of timber, accommodate skilled labour shortages, and provide structures that meet contemporary performance standards. Achieving this goal will take decades and therefore the continued maintenance of these assets is necessary.

Timber bridge repair costs are forecast to decline over the DAU2 period as timber bridges are progressively replaced.

Timber bridge repairs are tonnage dependent with costs for Rosewood—Jondaryan adjusted from the [redacted] cost estimates to reflect the [redacted] and [redacted] scenario, applying the QCA's estimate that these costs are 75 per cent variable. No other adjustments have been proposed for this activity.

5.3.4 Other (including steel bridges/drainage and pest control)

The activities include:

- all repairs to steel and steel and concrete composite bridges that involve the replacement/renewal of any components. This includes walkway repairs, pier/abutment renewals, top and lining, transoms renewal, girder repairs and tightening fastenings;
- the general maintenance activities in maintaining drainage structures. The Toowoomba Range is a critical link that relies on the adequate operation of drainage structures
- pest control on all structures and termite control and other pest management activities.

These activities are not tonnage dependent with the 2018-19 budget applied as the base for the DAU2 forecast, noting that the one-off costs of steel bridge painting during the AU1 period have not been carried forward into DAU2.

5.4 Trackside systems

There are two main forms of maintenance within Trackside systems—preventative and corrective: maintenance. These are defined as:

- Preventative maintenance is undertaken on equipment at regular programmed intervals to maximise its availability and reliability. In the TSMS database assets are categorised into asset classes with each asset class including various types of equipment. For each piece of equipment up to five scheduled maintenance services may apply (known as A, B, C, D and E services). Each of these services has a check sheet that details the activities undertaken.

- Corrective maintenance involves actions performed as a result of a known defect to restore an item or asset to its predetermined condition (as far as possible). Corrective maintenance is also known as repair or unplanned maintenance. The factors that cause assets to develop defects are many. Corrective maintenance can be classified into two forms, immediate and deferred corrective maintenance.

5.4.1 Summary of trackside systems maintenance costs DAU2

Queensland Rail has proposed $7.337 million ($2020-21) for trackside system maintenance over the DAU2 period, five per cent of the total maintenance costs proposed. Trackside system maintenance is not considered to be tonnage dependent, so is the same for the [redacted] scenario and [redacted] scenarios.

Proposed DAU2 trackside system maintenance for the Jondaryan—Columboola and Rosewood—Jondaryan corridors are shown in Table 19 and Table 20 respectively.

Table 19: Forecast trackside system maintenance costs, Jondaryan—Columboola ($2020–21 million)

	2020-21	2021-22	2022-23	2023-24	2024-25	Total DAU2
Signalling	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Telecommunications	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total	**$0.451**	**$0.451**	**$0.451**	**$0.451**	**$0.451**	**$2.253**

Table 20: Forecast trackside system maintenance costs, Rosewood—Jondaryan ($2020–21 million)

	2020-21	2021-22	2022-23	2023-24	2024-25	Total DAU2
Signalling	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Telecommunications	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total	**$1.017**	**$1.017**	**$1.017**	**$1.017**	**$1.017**	**$5.083**

5.4.2 Signalling

Activities included under signalling maintenance are those that relate to the overall performance of the signalling infrastructure. These activities ensure that the signalling system is maintained to a safe and appropriate operating level.

Signalling activities include:

- preventative maintenance of field equipment associated with signalling control including cabling. This activity takes up approximately 30 per cent of the time of the trackside system teams and primarily involves maintenance of signalling systems assets
- corrective maintenance of field equipment associated with signalling control including cabling. A significant proportion of signalling equipment is maintained on a 'fix on failure' basis, as a result there is a requirement to have a 24/7 callout roster in place
- scheduled maintenance and repair of level crossing protection installations including pedestrian gates
- maintenance and repair of cableways, markers, troughing, cable pits and cables with the exception of fibre testing and repairs
- investigations into performance issues in relation to the Automatic Train Protection (ATP), replacement of faulty transponders and adjustment of radio levels
- maintenance and repair of trackside monitoring and measuring equipment such as Dragging Equipment Detectors (DEDs), Hot Bearing Detectors (HBDs), Wheel Impact Load Detectors (WILDs), weather monitors, out-of-gauge detectors and level crossing monitors.

Queensland Rail is proposing maintaining signalling costs constant in real terms from the 2018–19 maintenance budget for the DAU2 maintenance allowance. Queensland Rail does not consider this activity to be tonnage dependent.

5.4.3 Telecommunications

Telecommunication maintenance are those maintenance activities that relate to the overall performance of the telecommunications infrastructure. Telecommunications activities include:

- preventative maintenance of the major bearer systems and infrastructure providing bandwidth for voice and data services as well as the base network for train control and maintenance radio systems
- corrective maintenance of the major bearer systems and infrastructure providing bandwidth for voice and data services as well as the base network for train control and maintenance radio system
- installation, moves or changes to phone and fax services including horizontal cabling installation, moves or changes to tail modem links, horizontal cabling and dumb terminal equipment for mainframe and Local Area Network (LAN) services.

Queensland Rail is proposing maintaining telecommunications costs constant in real terms from the 2018–19 maintenance budget for the DAU2 maintenance allowance. Queensland Rail does not consider this activity to be tonnage dependent.

Attachment 1: Comparison of product codes to EAMS

Old Code & Description	Old Definition	New Code	New Description
A01 Derailment & Collision Repairs	All activities associated with derailment damaged infrastructure eg investigation costs, inspections, restoration, clean up, future monitoring, hire of equipment	N14	Derailments, Collisions& Dewire
A02 Flood & Natural Disaster Repairs	All activities associated with flood/ natural disasters damaged infrastructure eg as above	N22	Flood & Natural Disaster Repair
A05 Plant Procurement/Disposal	Plant Procurement/Disposal	N10	Commissioning/Procurement
A06 Accident Investigation	Accident Investigation	N25	Investigation
A09 Consulting/Technical Advice	This relates to the provision of specialist advice, implementation of systems (eg. SAMS), coordinating warranty type work, design, providing technical advice or specific business improvement initiatives to satisfy customer requirements.	N12	Consulting/Technical Advice
A10 Above Rail Operator Support	Unplanned Above Rail Operator Support - unbudgeted and as requested	N46	Rolling stock Support
A13 External Work	All activities required to perform non-infrastructure related activities for external customers (ie external to QR). This includes providing TPOs to external customers.	N20	External Work
A16 3rd Party Damage Repairs	Any abnormal damage or repairs from 3rd Parties	N59	3rd Party Damage Repairs
A18 Project Management & Services	Any activities associated with the project management of capital programs	N38	Project Management & Services
A24 Line Pull up	All activities associated with a line pull up	N16	Disposal / Decommissioning
A25 Audits	All activities associated with audits -Track audits, Alliance Audits and Safety Audits	N05	Audits
A26 Unclaimable 3rd Party Damage Repairs	Any abnormal damage or repairs from 3rd Parties that is either unclaimable or no third party is able to be identified	N59	3rd Party Damage Repairs
B04 Repairs Concrete Bridges	All repairs to concrete bridges which results in the replacement/renewal of any components. Inc. kerb raising, walkway repairs, pier/abutment renewals, top & lining and ballast replacement.	N45	Repairs
B05 Repairs Steel Bridges	All repairs to steel and steel &concrete composite bridges which results in the replacement/renewal of any components. Including walkways/escape repairs, pier/abutment renewals, top & lining, transoms renewal, girder repairs, tightening fastenings	N45	Repairs
B06 Repairs Timber Bridges	All repairs to timber bridges which results in the replacement/renewal of any components. inc. walkways/escape repairs, pier/abutment renewals, top & lining, tightening fastenings, component renewal/repairs eg corbels, headstocks, girders, transoms, piles	N45	Repairs
B07 Tunnel Repairs	Repairs to tunnels which results in the replacement/renewal of any components. Escape repairs, fixed fastening maintenance, repairs to portals eg rail to concrete slab	N45	Repairs
B10 Steel Bridge Paint (Contract)	Painting of steel bridges and/or components using contract labour (contract painting), (excludes structural repairs)	N35	Painting
B12 Concrete Bridge Construction	Construction of prestressed concrete bridge. Including bridge elimination where replaced by a concrete bridge. Includes walkway construction	N11	Construction
B13 Steel & Concrete Bridge Construction	Construction of steel and concrete bridge. Including bridge elimination where replaced by steel & concrete bridge including walkway construction.	N11	Construction
B15 Steel Bridge Painting (Spot Paint)	Painting of steel bridge components using QR day labour. Includes spot painting, painting of bridge components (excludes structural repairs)	N35	Painting

Old Code & Description	Old Definition	New Code	New Description
B50 Structures Inspections	All inspections of structures. CESS inspections, pile exams, stage exams, underwater inspections, maintenance team inspections, termite inspections, structures master audits, construction audits	N04 / N03	Assets Compliance Inspection / Asset Inspections Non Compliance
B51 Structures Pest Control	Pest control on all structures. eg termite control and other pest management activities (excludes C44 Vegetation Control)	N36	Pest Control
B52 Drainage construction	Construction of drainage by use of concrete and/or steel components eg culverts, helicor pipes, includes bridge elimination where replaced by a drainage structure.	N11	Construction
B53 Drainage maintenance	Repairs to drainage including maintenance activities such as drain cleaning and grouting repairs	N45 / N09	Repairs / Cleaning/Clean up
B54 Retaining wall construction	Any work in relation to construction of retaining walls	N11	Construction
B55 Retaining wall maintenance	Any work in relation to repairs of retaining walls	N45	Repairs
B56 Ancillary structure const.	Construction of ancillary structures. eg buffer stops, foundations for gantry cranes, inspection pits, noise barriers, tank stands, light towers, electrification barriers, positions of safety	N11	Construction
B57 Ancillary structure maintenance.	Repairs to ancillary structures. eg buffer stops, foundations for gantry cranes, inspection pits, noise barriers, tank stands, light towers, electrification barriers, positions of safety	N45	Repairs
B58 Footbridge Construction	All activities associated with the construction of footbridges	N11	Construction
B59 Footbridge Maintenance	All activities associated with maintenance of footbridges at stations and within the corridors	N45	Repairs
B60 Walkways Construction	All activities associated with construction of walkways on Bridges	N11	Construction
B61 Walkways Maintenance	All activities associated with the maintenance of walkways on bridges	N45	Repairs
C02 Ballast Undercutting (Other)	Involves excavation of the fouled ballast, mud holes from beneath the sleepers by a ballast undercutter or other means, after which fresh ballast is added to the track and then tamped to restore the track to correct height and ballast depth.	N06	Ballast Undercutting
C03 Ballast Undercutting - Turnout	Involves excavation of the fouled ballast, mud holes from beneath turnouts/ diamonds by a ballast undercutter or other means, after which fresh ballast is added to the track and then tamped to restore the track to the correct height and ballast depth.	N06	Ballast Undercutting
C05 Formation Repairs	Includes all activities associated with formation repairs. Works may Include limeslurry injection, top 600 renewal, shear keys installation, cantrel drains and track reinstatement including ballast, welding, resurfacing and restressing of rail if required	N62	Formation repairs
C06 Earthworks - Non Formation	Includes all non-formation related earthworks and drainage construction and maintenance. Involves access roads, disposal of surplus materials, walkways, cleaning out, reshaping surface drains, reshaping cess drains, widening cuttings, building up embankment	N17	Earthworks - NonFormation
C07 Fencing	Any activity associated with the construction and maintenance of fencing. New fencing, complete replacement, repairs, gates, warning signs, removal of fencing, any earthworks, flagging associated with fencing. (excludes noise barriers refer B11)	N45	Repairs
C08 Rail Joint Management	All activities associated with the maintenance/ replacement of a rail joint. Includes flashbutt welding, thermite welding of joints, bolt and fish plate maintenance, glued joint maintenance/replacement, joint lifting, top lining joints and associated rest	N41	Rail Joint Management
C09 Rail Renewal	All activities associated with rail replacement in a section of track because of upgrading or fatigue reasons. Replacement of rail that has worn outside of CETS limits. Works include related rail restressing.	N63	Rail Renewal

Old Code & Description	Old Definition	New Code	New Description
C10 Turnout Maintenance	Any maintenance associated with turnout where activities include the repair or replacement of components such as switches, vees, guard rails, associated jewellery including bolts, chair lubrication, spot tie replacement (manual), maintenance welding, top	N45	Repairs
C11 Complete Turnout Replacement	Any replacement of a complete turnout including ties. Only to be used if the complete turnout is to be replaced including all components and ties	N44	Renewals
C12 Track Reconditioning & Removal	Extensive track maintenance attention given to a section of track, to restore it to an acceptable condition. Includes removal of redundant track infrastructure and extensive (over 50%) renewal of sleepers, rail, rail restressing and additional ballast use	N55	Track Reconditioning & Removal
C18 Mechanised Resleepering	Replacement of any sleepers including turnout ties in a pattern or at random by a specialised re-sleepering team that uses purpose designed machines to achieve high production rates. Includes resleepering components/ fastenings, sleepers.	N31	Mechanised Resleepering
C19 Mechanised Resurfacing	All maintenance resurfacing carried out on track excluding resurfacing associated with other products. Involves mechanical lifting, lining and tamping of the track with a Tamper Liner, followed by the profiling of the ballast by a Ballast Regulator.	N32	Mechanised Resurfacing
C23 Mechanised Resurfacing - Turnouts	All maintenance resurfacing carried out on turnouts excluding resurfacing associated with other products. Involves mechanical lifting, lining and tamping of the track with a Tamper Liner, followed by the profiling of the ballast by a Ballast Regulator.	N32	Mechanised Resurfacing
C24 New Track Laying	Complete construction of new track including all components such as ballast, sleepers, rail and associated jewellery. (excludes formation works, culverts and bridges)	N11	Construction
C25 Rail Grinding - Mainline	High production process of establishment and maintenance of rail head profile on mainline track. Conducted by mechanised rail grinders and any associated work (eg removal of lubricators). (excludes Rail Strategy Inspections see C50)	N40	Rail Grinding
C26 Rail Grinding - Turnouts	High production process of establishment and maintenance of rail head profile on turnouts. Conducted by mechanised rail grinders.	N40	Rail Grinding
C28 Minor Yard Maintenance	All day to day maintenance works performed within rail yards that do not have their own corridor code or functional location. This includes any maintenance performed by local or mechanised work groups regardless of the product being undertaken.	N45	Repairs
C29 Track Geometry Recording	Operation of specialist track vehicles and rolling stock used to measure and record the physical geometric characteristics of track. (Includes onboard vehicle ride accelerometers)	N54	Track Geometry Recording
C30 Ultrasonic Test Ontrack Machine	Comprises the ultrasonic testing of rail and associated components by on-track testing vehicles as well as rail testers using hand held non-destructive testing equipment to validate defects from the vehicle. (Includes any support activities such as rail t	N57	Ultrasonic Test Ontrack Machin
C34 Bridge Screen Installation	Bridge Screen Installation	N11	Construction
C36 Mast/Gantry Erection	Mast/Gantry Erection Overhead and Signalling Construction only	N11	Construction
C37 Monument /Signage Maintenance	All activities associated with the survey and erection of track monuments, mast information plaques, creep markers and general signage such as speed boards etc. (Specifically excludes Level Crossing Signage refer C04)	N45	Repairs
C39 Platform Construction	Platform Construction support works	N11	Construction
C42 Maintenance Ballast	Includes the purchase, freight and running out of ballast for restoration of ballast profile only. This specifically includes ballast used for C18 Mechanised Resleepering. (excludes all other ballast work)	N30	Maintenance Ballasting

Old Code & Description	Old Definition	New Code	New Description
C43 Sleeper Management	Spot insertion of sleepers, reboring and regauging by Local Track Teams. (i.e. excludes any activities NOT carried by the Major Resleepering Teams in C18). Includes local sleeper tests, resleepering components/fastenings, and sleepers. Also clipping up of con	N51	Sleeper Management
C44 Fire & Vegetation Management	Vegetation control by chemical, mechanical and burning off operations to eliminate interference with train running and track maintenance. This includes the following processes: vegetation control around bridges (previously B09), slashing, brush cutting	N21	Fire & Vegetation Management
C47 Rail Stress Adjustment	Any activities associated with the "standalone product" of rail stress testing and adjustment. Works include rail stress testing, creep marker monitoring, rails stress adjustment and documentation.	N42	Rail Stress Adjustment
C48 Ultra Sonic Testing (Manual)	Any activities associated with the manual ultrasonic testing of rail and other non-destructive testing methods. Works includes rail testers, ultrasonic testing of rail, turnout components and welds.	N56	Ultra Sonic Testing (Manual)
C50 Track Inspections	All inspections of track. CETS inspections such as engineering inspections, road patrols, engine inspections, turnout, walking, track stability, track clearance, level crossings, hot weather, yard inspections, trackmaster audits, construction audits, ZET	N04 / N03	Assets Compliance Inspection / Asset Inspections Non Compliance
C51 Track Clean-up	All activities associated with investigating and rectifying the spillage of coal and other materials on the rail network. Coal removal from turnouts, track and loadouts. Acid trains spillage, grain spillage, removal of animal remains from corridor.	N09	Cleaning/Clean up
C52 Rail Lubrication	All activities associated with rail lubrication. Involves the lubrication of track on straights and curves, maintenance & filling of any lubrication systems or devices.	N29	Lubrication
C53 Top & Line Spot Resurfacing	All activities associated with restoring top and line to track using manual or mechanically assisted processes. This does NOT include activities undertaken by major production resurfacing machines. Involves restoring top and line on bridge ends, open tra	N53	Top & Line Spot Resurfacing
C54 Rail Repair	All activities associated with "spot renewal or repairs to rail" due to identified defects. Failures or defects in rail such as wheel burns, defective welds, internal rail defects, other associated activities such as distribution, unloading rail, flagging	N64	Rail Repair
C55 Graffiti Management	Removal of all and any graffiti from QR property including signs, building, speed boards, machinery etc. (Replaces C27).	N23	Graffiti Management
C57 Level crossing maintenance	All activities associated with the construction, elimination and replacement of ALL level crossings. Involves the renewal of any track components such as rail, sleepers, plates, signage, ballast & the renewal/repair of the road surface.	N45	Repairs
C58 Level crossing construction/reconditioning.	All activities associated with the repair of ALL level crossings. Involves the renewal of any track components such as rail, sleepers, plates, signage, ballast & the renewal/repair of the road surface. Works include activities such as track resurfacing, t	N11	Construction
F01 Facilities/Building Construction	Capital funded construction for Facilities only	N11	Construction
F21 Plumbing	Plumbing maintenance	N37	Plumbing
F22 Carpentry	Carpentry maintenance	N08	Carpentry
F23 Electrical	Electrical Maintenance	N18	Electrical
F24 Painting	Painting Services	N35	Painting
F25 Locksmith	Locksmith services	N28	Locksmith
F26 Tiling	Tiling services	N52	Tiling
F27 Signage	Signage - managed and arranged by Facilities	N50	Signage Management

Old Code & Description	Old Definition	New Code	New Description
F28 Plumbing Compliance	Inspections and testing of buildings and associated assets as required by statutory authorities or QR standard/policy ie: Detail and Safety inspections	N04	Assets Compliance Inspection
F29 Electrical Compliance	Inspections and testing of buildings and associated assets as required by statutory authorities or QR standard/policy ie: Detail and Safety inspections, Electrical test and tag	N04	Assets Compliance Inspection
F30 Fire Compliance	Inspections and testing of buildings and associated assets as required by statutory authorities or QR standard/policy ie: Detail and Safety inspections	N04	Assets Compliance Inspection
F31 Asbestos Compliance	Inspections and testing of buildings and associated assets as required by statutory authorities or QR standard/policy ie: Detail and Safety inspections	N04	Assets Compliance Inspection
F32 Height Compliance	Inspections and testing of buildings and associated assets as required by statutory authorities or QR standard/policy ie: Detail and Safety inspections	N04	Assets Compliance Inspection
F33 Pole Compliance	Inspections and testing of buildings and associated assets as required by statutory authorities or QR standard/policy ie: Detail and Safety inspections	N04	Assets Compliance Inspection
F34 Confined Space Compliance	Inspections and testing of buildings and associated assets as required by statutory authorities or QR standard/policy ie: Detail and Safety inspections	N04	Assets Compliance Inspection
F35 Graffiti Management	Work associated with the removal of graffiti from QR's assets	N23	Graffiti Management
F36 Vandalism	Work associated with the repair of acts of vandalism to QR's assets. (does not include graffiti)	N58	Vandalism Management
F37 Litter Control	Corridor Enhancement litter control (Corridor litter control only - to NA customer)	N09	Cleaning/Clean up
F38 Grass Cutting	Corridor enhancement verge control (particularly SEQ - to NA only)	N21	Fire & Vegetation Management
F39 Tree Management	Corridor enhancement vege control (particularly SEQ - to NA only) - cutting of trees	N21	Fire & Vegetation Management
F40 Fencing Management	Construction and maintenance of fences	N45	Repairs
F41 Asphalt Management	Work associated with bitumen activities	N45	Repairs
F42 Air Conditioner Management	Maintenance of Air conditioners	N45	Repairs
F44 Property Management	Management of residential tenancies and the payment of rates and electricity on behalf of QR Business Groups	N39	Property Management &Utilities Search
F45 Car Park Management	Maintenance of Car Parks	N45	Repairs
F46 Precinct Management	all activities of beautifying a station - vege control, litter control, and misc activities undertaken while there at the station performing vege control & litter control	N45	Repairs
F47 Estimates / Quotes	Provide estimates or Quotes for major tasks	N19	Estimates / Quotes / Planning
F48 Lifts & Escalators Maintenance	Maintenance of Lifts and escalators	N45	Repairs
F49 Building Compliance	Inspections and testing of buildings and associated assets as required by statutory authorities or QR standard/policy ie: Detail and Safety inspections	N45	Repairs
F50 Pest Control	Pest Control Services	N36	Pest Control
F51 Industrial Waste Removal	Waste removal services	N24	Industrial Waste Removal
F52 Cleaning	Cleaning services	N09	Cleaning/Clean up
P00 SAM System Inspections	SAM System Inspections	N04 / N03	Assets Compliance Inspection / Asset Inspections Non Compliance

Old Code & Description	Old Definition	New Code	New Description
P02 Defect Repairs	Repairs that are undertaken following a planning process. These repairs can be deferred, as they do not significantly affect machine productivity or safety.	N45	Repairs
P04 Shutdown (planned)	The machine is shut down in the field for planned repairs ie. it is not part of the overhaul program for the machine. A period (usually 2-10 days) when the machine is withdrawn from service to allow trades staff un-hindered access to perform routine, strat	N45	Repairs
P06 Preventative / Scheduled Maintenance	Preventative / scheduled maintenance	N45	Repairs
P08 Overhauls	The machine is taken out of production as part of the overhaul program and is completely stripped down and overhauled. A period (usually 8-16 weeks) nominally every 6-10 years when a machine will be returned to a major workshop for a full strip to frame a	N43	Refurbishment / Overhaul
P09 Commissioning	Commissioning	N10	Commissioning/Procurement
P11 Training	Provide training to trade staff, this would include the co-ordination and delivery of training courses put on by the MPO and courses provided by external service providers.	N33	Training
P16 Condition Monitoring	Includes oil sampling, thermal imaging, noise measurement and vibration monitoring.	N04 / N03	Assets Compliance Inspection / Asset Inspections Non Compliance
P20 Component Refurbishment	Component refurbishment of plant. This will only affect inventory items.	N43	Refurbishment / Overhaul
P50 Fitter/Operator Maintenance	Fitter/Operator Maintenance	N45	Repairs
P51 Fleet Compliance	All activities associated with mechanised fleet inspections for Plant Engineering for special yearly inspections on all on track equipment.	N04 / N03	Assets Compliance Inspection / Asset Inspections Non Compliance
P52 Fleet Elect Compliance	Any activities associated with the Electrical Services Unit for Plant Engineering who completes inspections for all of the On Track equipment on a legal compliance basis.	N04 / N03	Assets Compliance Inspection / Asset Inspections Non Compliance
T04 Locomotive Support	Maintenance of fixed radios on locomotives used for accessing train control, yard shunting/loading/unloading systems and maintenance radio systems as well as locomotor control operation: and maintenance of hardware of on-board DTC and ATP equipment. All c	N46	Rolling stock Support
T05 Mobile Radios	Maintenance/moves/changes/installs of fixed radios on road based vehicles and non-locomotive on track machines used for accessing train control, yard shunting/loading/unloading systems and maintenance radio systems.	N45	Repairs
T06 Passenger Information Systems	Maintenance of station platform monitors and associated controlling equipment provided to display or control and communicate passenger related train information to the public address systems located in QR facilities	N45	Repairs
T08 Portable Radio & Yard Shunt Systems	Maintenance of portable radios used for accessing train control, yard shunting/loading/unloading systems and maintenance radio systems as well as the associated yard repeater/base equipment	N45	Repairs
T10 Prevent Tele Bkbone Network Maintenance	Preventative maintenance of the major bearer systems and infrastructure providing bandwidth for voice and data services as well as the base network for train control and maintenance radio systems. Also see MAT definition of preventative maintenance on Pag	N04 / N03 / N45	Assets Compliance Inspection / Asset Inspections Non Compliance / Repairs
T11 Correct Tele Bkbone Network Maintenance	Corrective maintenance of the major bearer systems and infrastructure providing bandwidth for voice and data services as well as the base network for train control and maintenance radio systems. Also see MAT definitions of repairs – on site and repairs –	N45	Repairs
T12 Telecoms Backbone Modification	Upgrades and improvements to the major bearer systems and infrastructure for voice and data services as well as the base network for train control and maintenance radio systems that are not covered by capital works funding	N34	Modifications

Old Code & Description	Old Definition	New Code	New Description
T13 Phone/Data Maintenance	Maintenance and repairs of phone and fax services including horizontal cabling. Maintenance of tail modem links, horizontal cabling and dumb terminal equipment for mainframe and LAN services.	N45	Repairs
T14 Phone/Data Move/Change/Install	Installation, moves or changes to phone and fax services including horizontal cabling. Installation, moves or changes to tail modem links, horizontal cabling and dumb terminal equipment for mainframe and LAN services.	N34	Modifications
T24 Preventative Overhead Maintenance	Preventative maintenance of the overhead network which includes isolations that are required for maintenance, repair of traction bonds, heights and staggers adjustment etc	N18	Electrical
T25 Corrective Overhead Maintenance	Corrective maintenance of the overhead network which includes isolations that are required for maintenance, repair of traction bonds, heights and staggers adjustment etc, patrols as a result of trips. Dewirements should be charged to product 365.	N45	Repairs
T26 Preventative FS & TSC Maintenance	Preventative maintenance of Feeder Stations, Track Section Cabins Motorised Isolators and Auto Transformers including RTU's and Fault locators.	N18	Electrical
T27 Corrective FS & TSC Maintenance	Corrective maintenance of Feeder Stations, Track Section Cabins Motorised Isolators and Auto Transformers including RTU's and Fault locators.	N45	Repairs
T28 Prevent Signalling Field Maintenance	Preventative maintenance of field equipment associated with signalling control including cabling	N18	Electrical
T29 Correct Signalling Field Maintenance	Corrective maintenance of field equipment associated with signalling control including cabling	N45	Repairs
T30 Traction Power Renewals	Long term or one-off maintenance programs/upgrades. Includes replacement of copper ply wire used in the Brisbane overhead system, replacement of Yugoslavia disc insulators, vapour phasing and re-winding of autotransformers for the Blackwater and Goonyella	N44	Renewals
T50 Signalling Renewals	Long term or one-off maintenance programs/upgrades. Includes refurbishment of level crossings, points machines, level frames, overhaul of diesel standby alternators etc. Upgrades include installation of lighting arrestors, replacement of interlocking.	N44	Renewals
T52 Weighbridge Maintenance	Maintenance and repair of in motion weighing equipment used for freight measurement and overload detection	N45	Repairs
T53 Signalling Level Xing Protect	Maintenance and repair of level crossing protection installations including pedestrian gates	N45	Repairs
T54 Signalling Control Systems	Maintenance of control centre based equipment relating to the signalling and power systems control of trains (including SCADA	N45	Repairs
T56 Tramway Crossing	Maintenance and repair of tramway crossings	N45	Repairs
T57 Scales	Maintenance and repair of static weighing equipment used for freight measurement	N45	Repairs
T58 Cable Route Maintenance	Maintenance and repair of cableways, markers, troughing and cables with the exception of fibre testing and repairs	N45	Repairs
T62 Signalling Train Protect System	Maintenance and repair of ATP, ATC and AWS equipment	N45	Repairs
T63 Wayside Monitoring System Maintenance	Maintenance and repair of trackside monitoring and measuring equipment such as DED's, HBD's, WILDs, Weather Monitors, Out-of-gauge detectors etc	N45	Repairs
T64 11KV Substation/Low Voltage Maintenance	Maintenance and repair of yard lighting and non-traction sub-stations	N45	Repairs
T65 Dewirement	Dewirement	N14	Derailments, Collisions& Dewirement
T67 CCTV Systems	Design, Maintenance and repair of closed circuit television equipment	N45 / N15	Repairs / Design
T68 Property Utilities Search	Property search to identify cables, power etc.	N39	Property Management &Utilities Search