Review of Self Insurance Risk Premium – Access Undertaking UT5

Aurizon

November 2016

finity

finity

Actuarial and Insurance Consultants

22 November 2016

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Dear Jon

Review of Self Insurance Risk Premium – Access Undertaking UT5

We are pleased to present our report documenting our estimate of the self-insurance losses of the Central Queensland Coal Network for the four year period 2017/18 to 2020/21.

This report is prepared in accordance with our engagement letter dated 20 June 2016.

Please do not hesitate to contact either of us should you have any queries in relation to the report.

Yours sincerely

Mark Hurst

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Review of Self Insurance Risk Premium – Access Undertaking UT5

Part I Executive Summary

1 Introduction and Scope

Finity Consulting Pty Limited (Finity) has been engaged by the Network division of Aurizon to provide actuarial advice in relation to the self-insured risks of the Central Queensland Coal Network (CQCN). Our advice has been prepared pursuant to our engagement letter dated 20 June 2016. This is the third time we have advised Aurizon in relation to their self-insured losses.

2 Background

CQCN is a stand-alone network managed by Aurizon. The rail infrastructure (also known as "below rail" as opposed to "above rail" which is the train services) includes:

- track, including main lines, branches and sidings
- bridges and other infrastructure, such as tunnels, embankments and cuttings
- overhead wires
- signalling equipment
- train control communication equipment.

The CQCN primarily provides freight services to Queensland's coal mines. There are four lines that make up the network:

- Goonyella
- Blackwater
- Moura
- Newlands.

Aurizon's activities are subject to regulation by the Queensland Competition Authority (QCA). Applications for access to the rail network by third parties are handled under a process set down in the Access Undertaking (AU). The AU defines the rules for open access to the CQCN rail infrastructure including setting reference tariffs for users of the network.

We understand that Access Undertaking UT3, which was expected to expire on 30 June 2013, continues to apply. Access Undertaking UT4, which was expected to apply from 2013/14 to 2016/17, is yet to be approved but is expected to be approved soon and to apply until 30 June 2017. Access Undertaking UT5 is then expected to apply from 1 July 2017 for a four year period.

The main purpose of our advice is to estimate the annual losses arising from the self-insured risks as input for the 2017 Access Undertaking, UT5.

3 Scope

The scope of our review includes:

- Advising on the estimated cost of CQCN self-insurance losses (or risk premium) for the four year period 2017/18 to 2020/21 for:
  - derailment risks for a stand-alone network
  - weather losses below the adopted pass-through threshold
  - other uninsured losses (e.g. below-deductible liability losses)
- Outlining appropriate pass-through provisions for weather losses. Events that give rise to losses greater than this figure will be excluded, in total, from our self-insurance estimate.

Note that our self-insurance estimates are based on Aurizon's expected insurance arrangements for the four year regulatory period.

We are advised by Aurizon that some estimated losses, referred to as uninsured losses in this report, are in fact subject to insurance policies. This is particularly the case for derailment losses which are covered under the umbrella Industrial Special Risk policy where the damage to rail infrastructure by rolling stock is an included risk. Given the integrated nature of this policy and the difficulty of disaggregating the premium amounts to the relevant risk components we are instructed by Aurizon that the self-insurance premium estimated in this report is intended to be a proxy for this premium allocation and estimation of losses below the deductible.

Note that the scope of this assessment is limited to the CQCN lines. The use of these lines is not limited to coal, although we understand that the amount of other goods transported is limited.

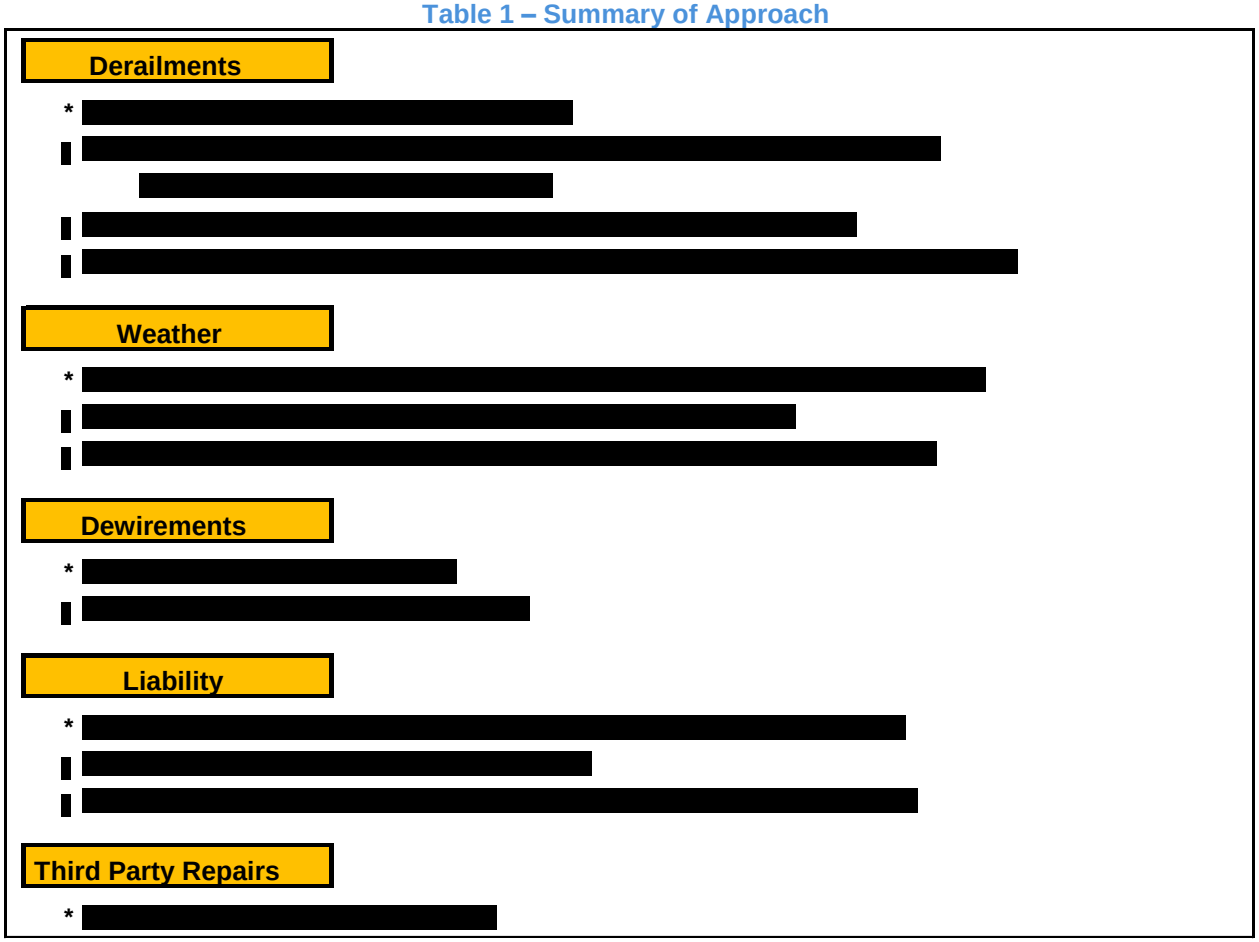
4 Approach

We received loss history data for the following significant exposures not covered by insurance (or where the insurance premiums are not included in Aurizon's AU):

- Derailment losses
- Weather-related losses
- Dewirements
- Below-deductible liability losses, and
- Third party losses.

Based on this historical data we have projected future self-insured losses for the forthcoming regulatory period (2017/18 to 2020/21) using the approach summarised in the following diagram.

Table 1 – Summary of Approach



We have assumed that the following events will be subject to pass through:

- Major weather events where below-rail losses to the network exceed $1 million
- Catastrophic damage to the network from perils such as earthquakes and other natural disasters where the cost exceeds $1 million
- Liability losses which exceed $8 million.

If Aurizon (or the QCA) were to adopt different pass through thresholds this may change our results.

Note that following discussions with Aurizon we understand that damage to the network caused by war or terrorism cannot be passed through.

5 Summary of Projected Costs

Table 2 summarises our estimate of the self-insured losses for CQCN by loss type. Please note that these results:

- Are based on a party-party assessment of liability for derailment losses (i.e. only including costs relating to below rail losses)
- Allow for future growth in CQCN's operations, as advised to us by Aurizon
- Are expressed in nominal dollars.

Table 2 – Summary of Estimates for CCQN by Loss Type

Loss Type	2017/18	2018/19	2019/20	2020/21	Total	Previous (adjusted)[1]	Previous[2]
	$000	$000	$000	$000	$000	$000	$000
Derailment	3,297	3,370	3,446	3,525	13,639	17,732	16,259
Weather	371	379	388	397	1,535	3,727	3,411
Dewirement	304	314	321	329	1,267	859	729
Liability	495	520	533	555	2,103	2,452	1,942
TP Repairs	202	207	211	216	837		
Total	4,669	4,790	4,900	5,022	19,380	24,771	22,341

[1]Adjusted for actual exposure, but based on previous frequency and size assumptions

[2]Shown in previous report

Our estimate of the annual cost starts at $4.7 million for the 2017/18 financial year and increases to $5.0 million in 2020/21. Our estimate across all four years is $19.4 million. The largest component of the estimate is clearly derailment costs as they are typically the most frequent self-insured losses, and the most costly. The yearly increase in our estimates over the four year regulatory period reflects both inflation and the anticipated growth in CQCN's operations (which is minimal).

The estimates shown in the tables above are central estimates (i.e. intended to be the mean or expected value of the liabilities) and include an allowance for future growth in Aurizon's operations. The estimates are not discounted for the time value of money. The above estimates do not contain margins for expenses, reinsurance or profits and hence are expected to be lower than the commercial costs of insurance.

Our estimate for UT5 is around $3 million lower than assumed for UT4 (which related to the period 2013/14 to 2016/17). The main drivers of this change by loss type are:

- Derailments: The number of low severity derailments has continued to trend downwards as result of Aurizon's increased emphasis on preventative maintenance activities and the rail restressing program. In response we have reduced our frequency assumption to reflect more recent experience.
- Weather: Although there have been weather events with a high gross cost to Aurizon since the previous review, pass through provisions have meant that the net cost has been lower than expected. In addition to this, events with a high net cost at the previous undertaking were reviewed by Aurizon staff and it was determined that if these events were to occur in the future their costs would be recoverable. This has resulted in a lower expected cost going forward.
- Dewirements: Dewirements numbers were higher than expected. This is believed to be partially driven by an increased utilisation of electrified track. To account for this we have changed the exposure measure used to project losses from electrified track kilometres to electrified gross tonne kilometres to be better capture any changes in utilisation.
- Liability: Changes to the liability projection have been small and reflect the latest experience.
- Third Party Repairs: This is the first time we have projected third party repairs as the loss information wasn't available at the previous review; hence there is no comparison point.

6 Notional Premium

To estimate the notional premium corresponding to the estimates shown in Table 2 we have allowed for benchmark premium loadings. The benchmark loadings assumed are 10% of premiums for expenses (applied to derailments only) and 20% of premiums for profit and the net cost of reinsurance. These

loadings are based on commercial property insurance benchmarks and are necessarily approximate. The margins sought by insurers can vary significantly depending on the types of risks being written, the level of uncertainty surrounding those risks and the stage of the insurance cycle. The benchmarks applied are thought to be typical of those that might apply for this type of large commercial business.

We note that the profit margin adopted is similar to the average return on capital achieved by Australian general insurers in recent years. We also note that unlike an insurer, Aurizon only gets the opportunity to "re-price" every four years whereas an insurer has the opportunity to re-price annually thus providing greater certainty as they can re-adjust premiums to recoup losses.

Table 3 shows the addition of these loadings to the estimated losses.

Table 3 – Estimation of Notional Insurance Premium

Loss Type	2017/18	2018/19	2019/20	2020/21	Total
	$000	$000	$000	$000	$000
Derailment	4,352	4,448	4,549	4,653	18,003
Weather	445	455	465	476	1,842
Dewirement	364	376	386	394	1,521
Liability	594	625	639	666	2,524
TP Repairs	243	248	254	259	1,004
Total	5,998	6,152	6,293	6,449	24,893

Using these loadings our estimate of the notional insurance premiums corresponding to our central estimate is $24.9 million over the four year period.

7 Reliances and Limitations

The full report sets out the detail and explanation behind our results and should be read in conjunction with this Executive Summary. The reader's attention is drawn to the reliances and limitations associated with our advice set out in Section 11. These should be considered in order to put our findings in their appropriate context.

Part II Detailed Findings

1 Introduction and Scope

Finity Consulting Pty Limited (Finity) has been engaged by the Network division of Aurizon to provide actuarial advice in relation to the self-insured risks of the Central Queensland Coal Network (CQCN). Our advice has been prepared pursuant to our engagement letter dated 20 June 2016. This is the third time we have advised Aurizon in relation to their self-insured losses.

1.1 Scope

The scope of our review includes:

- Advising on the estimated cost of CQCN self-insurance losses (or risk premium) for the four year period 2017/18 to 2020/21 for:
  - derailment risks for a stand-alone network
  - weather losses below the adopted pass-through threshold
  - other uninsured losses (e.g. below-deductible liability losses)
- Outlining appropriate pass-through provisions for weather losses. Events that give rise to losses greater than this figure will be excluded, in total, from our self-insurance estimate.

Note that our self-insurance estimates are based on Aurizon's expected insurance arrangements for the four year regulatory period.

We are advised by Aurizon that some estimated losses, referred to as uninsured losses in this report, are in fact subject to insurance policies. This is particularly the case for derailment losses which are covered under the umbrella Industrial Special Risk policy where the damage to rail infrastructure by rolling stock is an included risk. Given the integrated nature of this policy and the difficulty of disaggregating the premium amounts to the relevant risk components we are instructed by Aurizon that the self-insurance premium estimated in this report is intended to be a proxy for this premium allocation and estimation of losses below the deductible.

Note that the scope of this assessment is limited to the CQCN lines. The use of these lines is not limited to coal, although we understand that the amount of other goods transported is limited.

1.2 Exclusions

Note that our advice does not cover all types of losses or potential losses as follows:

- **excludes** losses associated with Aurizon lines other than the four coal-freight railway lines that make up the CQCN
- **excludes** uninsured workers' compensation losses as these losses are covered under labour costs
- **excludes** losses arising from business risks not typically considered as insurable, for example, stranding. Stranding is the loss of future revenues if customers choose not to use CQCN's network. We understand that the consequences of such a loss of business can be significant for CQCN as assets may be constructed specifically for use by a small number of consumers, and the

cost of the construction is intended to be recovered over a number of years. However, risks of this type are not typically regarded as being within the scope of insurance but are considered a business risk.

- **excludes** losses for which there is no historical loss history, no data, or insufficient reliable data to enable a reasonable estimate to be calculated.

1.3 Self-insured Losses

There are two types of "self-insured" losses that we have included in this assessment:

1. Losses relating to uninsured risks: specifically the tracks and associated infrastructure such as electricity lines. These risks are subject to losses that the commercial insurance markets do not typically have the appetite to underwrite, or where sufficient capacity exists, cannot be relied upon on an ongoing commercial basis. This group also includes risks where self-insurance is considered more efficient than insurance, either because premiums are thought to be higher than the expected cost of self-insurance or because insurance terms are not suitable.
2. Below-deductible losses: relates to below-deductible losses on insured risks where CQCN holds material levels of risk in respect of the self-insured retention, either because of the frequency of such losses or the size of the retention. These losses primarily relate to property and public liability type losses.

1.4 Basis of Estimates

We have prepared our estimates of CQCN's annual self-insured losses on the basis that they:

- Are central estimates (i.e. intended to be the mean value of the range of possible outcomes)
- Include an allowance for the projected growth in the asset values and utilisation of CQCN. The projected asset values and utilisations were provided by Aurizon
- Include an allowance for inflation
- Are not discounted for investment income – in other words represent the estimated cost to be incurred in the relevant financial year and no attempt has been made to express the expected costs over the five years on a net present value (NPV) basis.

Our estimates do not contain any allowance for expenses, reinsurance or profits and hence are expected to be lower than the cost of commercial insurance (if such insurance were available). However, in Section 10, we have included notional estimates of the annual insurance premiums that correspond to our cost estimates.

1.5 Allocation of Costs

Through the QCA, Aurizon is able to include in its budgeted costs:

- Capital expenditure
- Operational expenditure, including
  - maintenance costs
  - insurance premiums
  - self-insurance losses.

Under the QCA regulatory environment there are “pass through” provisions which allow for unanticipated material costs to be passed through to customers after the revenue determination has been made. Aurizon may be eligible for pass-through funding if there are large events during the next regulatory period which exceed the agreed pass-through threshold.

Note that Aurizon, as a listed company, is not eligible for additional funding via Natural Disaster Relief and Recovery Arrangements (NDRRA).

It is important in any claim for self-insurance expenses that there is no double counting of costs. We have endeavoured to achieve this by ensuring that losses allocated to the self-insurance “bucket” only include losses that:

- Are not covered by an insurance policy (or if the losses are covered by an insurance policy the associated insurance premiums are not being claimed in the insurance premium component of the Access Undertaking), and
- Would not be expected to be included in maintenance budgets.

Naturally where costs have historically been included as maintenance (or in other budgets) Aurizon will need to ensure these costs are excluded in the future to take into account any costs that form part of the self-insured program. We understand from discussion with Aurizon that this is their intention.

1.6 Structure of Report

The remainder of this report is structured as follows:

- Section 2 includes some **background** information relevant to this assessment
- Section 3 sets out the **data** provided for this review, including limitations in the historical data, and recommendations regarding data collection going forward
- Section 4 outlines our **approach** to the assessment and our methodology for estimating CQCN’s self-insured losses
- Section 5 details the **categories of losses** that we have considered
- Section 6 summarises the **exposure** measures used in this assessment
- Section 7 sets out our valuation of **uninsured losses in respect of derailments**
- Section 8 sets out our valuation of **uninsured losses in respect of other loss types**
- Section 9 sets out our valuation of **below-deductible losses**
- Section 10 summarises the **results** of our review
- Section 11 sets out the **reliances and limitations** associated with our advice.

The Appendices set out further details of our review.

2 Background

2.1 Aurizon

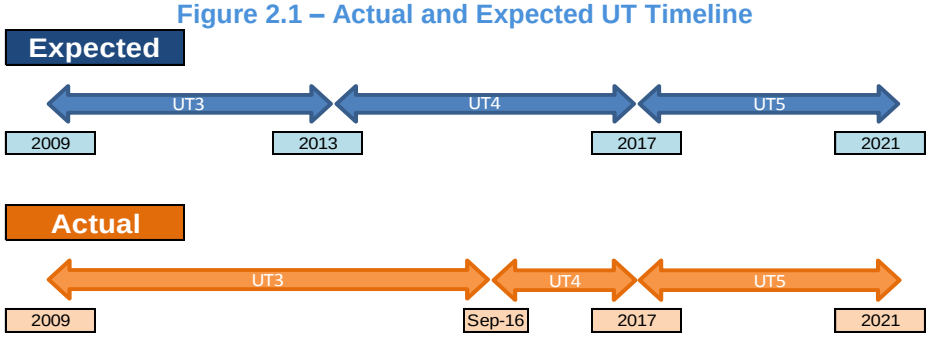
The CQCN incorporates the entire rail infrastructure (also known as “below rail” as opposed to “above rail” which is the train services) including:

- Track, including main lines, branches and sidings
- Bridges and other infrastructure, such as tunnels, embankments and cuttings
- Overhead wires
- Signalling equipment
- Train control communication equipment.

Aurizon is responsible for providing, maintaining and managing access to the rail network and associated rail infrastructure. The rail network totals over 2,400 kilometres. Every application for access to the rail network is managed under a detailed process approved by the competition regulator, the Queensland Competition Authority (QCA). The applications for access to the rail network are handled under a process set down in the Access Undertaking (AU). The AU defines the rules for open access to the CQCN rail infrastructure including setting reference tariffs for users of the network. Part of the tariff charged reflects the network’s self-insurance costs.

Each Access Undertaking period is intended to cover a four year period, however delays in the approval process for UT4 means that UT3 which was intended to expire on 30 June 2013 continues to apply. The revised timeline is summarised in Figure 2.1 below.

Figure 2.1 – Actual and Expected UT Timeline



We understand that the impact of UT4 will be backdated to June 2014 despite the late approval. The next AU, UT5, will apply for the four year period from 2017/18 to 2020/21. Aurizon is required to submit a draft AU to the QCA for review and approval by 9 September 2016.

The purpose of our advice is to estimate the annual losses arising from the self-insured risks as input for the UT5 AU.

2.2 Central Queensland Coal Network

CQCN consists of the part of the Aurizon that primarily provides freight services to Queensland’s coal mines. There are four lines that make up the network:

- Goonyella

- Blackwater
- Moura
- Newlands.

Our scope is limited to estimating the self-insured costs relating to these lines. The use of these lines is not limited to coal, although we understand that the amount of other goods transported is limited. Further information on these lines, including track lengths and utilisation, is provided in Appendix A and Appendix B.

2.3 CQCN Insurance Program 2016/17

We were provided with a summary of Aurizon's insurance programme for 2016/17. The program covers a number of risk areas, including:

- Property including Business Interruption
- Public and Products Liability.

We understand that the insurance program includes other classes of insurance. However, we were advised that these other classes are not significant in respect of this review and as a result we have not been provided with details of associated losses (e.g. motor vehicle, marine). We assume for the purposes of CQCN's self-insured losses any below-deductible amounts for these classes is not significant and have not discussed these other classes of insurance further.

3 Data

3.1 Information Provided

The data we received for this review included:

- **Exposure data**
  - Fact sheets for each of the four coal lines: Blackwater, Goonyella, Newlands and Moura.
  - Track kilometres by line – historical to 2015/16.
  - Network utilisation statistics in the form of Gross Tonne Kilometres (GTK) and Electrified Gross Tonne Kilometres (EGTK) including details of the amount of coal transported per line per year historically and estimated future loads.
- **Turnover**
  - Historical and projected turnover to 2020/21.
- **Loss data**
  - Loss files were received each year from 2010/11 to 2015/16 containing the following information:
    - Type of loss (derailment, weather, dewirement or third party repair)
    - Location/Coal Line of Loss
    - Revision code (an identifier code)
    - Basic start date (start date of repair works).
  - Liability loss data
    - A listing of individual above deductible liability claims
    - Below deductible liability claims relating to livestock.
  - In addition to the derailment data relating to CQCN we also utilised publicly available accident information from the US rail network.
- **Other information**
  - Individual review of weather events over the period by Aurizon staff to ensure that we have captured the correct net cost for each event.
  - Historical and future inflation assumptions.
  - A summary of Aurizon's 2016/17 insurance programme assumed to remain in place for UT5.
  - Premium details for 2015/16 by class of business.
  - Internal safety performance reports.

In addition to the above information, we had several discussions with Aurizon in order to understand the data and to ensure we were using the most appropriate data for our review.

3.2 Comments on data

The data provided has improved since our previous review with fewer sources of derailment data provided. Despite this there were still a number of data issues that had to be resolved which are set out below in Table 3.1.

Table 3.1 – Summary of Data Issues

Loss Type	Data Received	Data Issues	Action/Approach
Derailments, dewirements and weather losses	Non Contract Costs from 2010/11 to 2015/16	[redacted]	[redacted]
Derailments, dewirements and weather losses	Non Contract Costs from 2010/11 to 2015/16	[redacted]	[redacted]
Derailments	Non Contract Costs from 2010/11 to 2015/16	[redacted]	[redacted]
Weather losses	Non Contract Costs from 2010/11 to 2015/16, individual event submissions, advice from Aurizon	[redacted]	[redacted]

3.3 Data Reconciliations

We have relied on the accuracy and completeness of all information provided to us by Aurizon, both qualitative and quantitative, for the purpose of this review. We have checked the data for reasonableness and internal consistency between the various reports provided. However, we have not independently verified or audited the data against source documents. Nor was it possible to reconcile the information to the audited accounts.

We have compared the information provided for this review with that provided for UT4. Specifically, we requested the loss file from 2010/11 as losses from this year were also received for the UT4 review and could serve as a check point to ensure that the data was consistent between the current and previous review. Upon checking the total losses by type for the 2010/11 loss files received at the current and previous valuation it was apparent that the total losses within these files did not reconcile. Further investigation indicated that this was due to costs being accounted for differently. That is, where the total cost of a derailment may have been fully contained in the 2010/11 loss file previously, this time the cost

may have been spread across the 2010/11 and 2011/12 files. A description of how this cost allocation discrepancy was addressed is provided in Table 3.1.

In addition to the timing differences associated with the loss files, a significant number of derailments had changed maintenance categories. As derailments are analysed within these maintenance type categories a new method of segregating derailments had to be devised to ensure continuity in our analysis. This is broadly described in Table 3.1 with further detail provided in Appendix C.

We discussed summarised historical data with Aurizon staff to confirm that the annual loss costs appeared reasonable and where there have been strong trends in the data reasons were sought to understand the drivers of these movements.

We consider the data provided to be of sufficient quality to produce reasonable estimates of future self-insured losses. Despite this, there are improvements to the data collection that could streamline the analysis and provide more robust results. Aurizon have suggested that at the completion of this review Finity and Aurizon work together to create a database that will serve to improve the processes and data at the next undertaking.

If for any reason, there is any material error or omission in the information provided, then this may materially impact our estimates in which case our advice may need to be revised.

4 Approach

In this section we describe the approach we have adopted for the various components of our review.

4.1 Categories of Losses

[redacted]

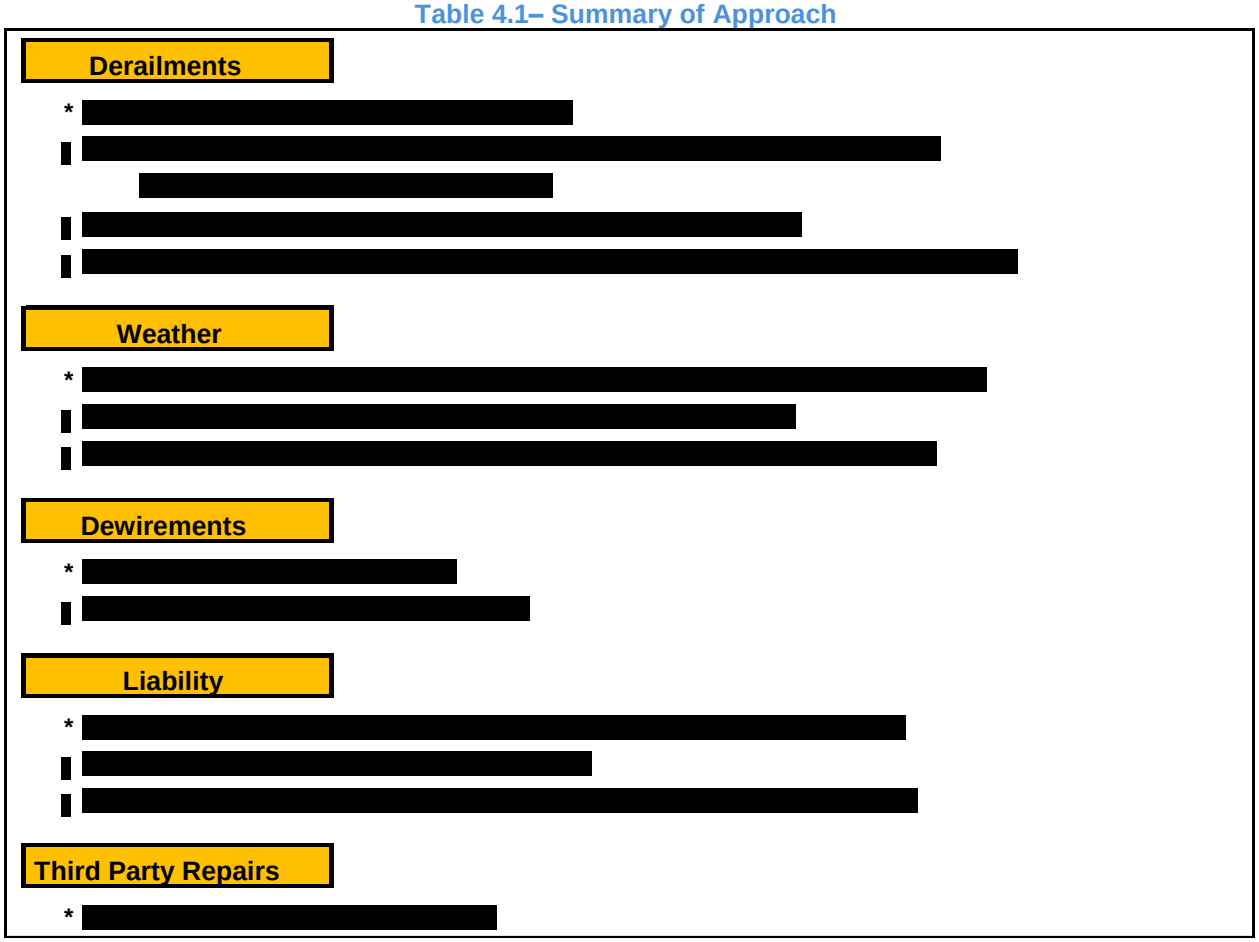
4.2 Summary of Approach

We received loss history data for the following significant exposures not covered by insurance (or where the insurance premiums are not included in Aurizon's AU):

- Derailment losses
- Weather-related losses
- Dewirements
- Below-deductible liability losses, and
- Third party losses.

Based on this historical data we have projected future self-insured losses for the forthcoming regulatory period (2017/18 to 2020/21) using the approach summarised in the following diagram.

Table 4.1– Summary of Approach



We have assumed that the following events will be subject to pass through:

- Major weather events where below-rail losses to the network exceed $1 million
- Catastrophic damage to the network from perils such as earthquakes and other natural disasters where the cost exceeds $1 million
- Liability losses which exceed $8 million.

If Aurizon (or the QCA) were to adopt different pass through thresholds this may change our results.

Note that following discussions with Aurizon we understand that damage to the network caused by war or terrorism cannot be passed through.

4.3 Our Approach to Assessing Derailment Losses for CQCN

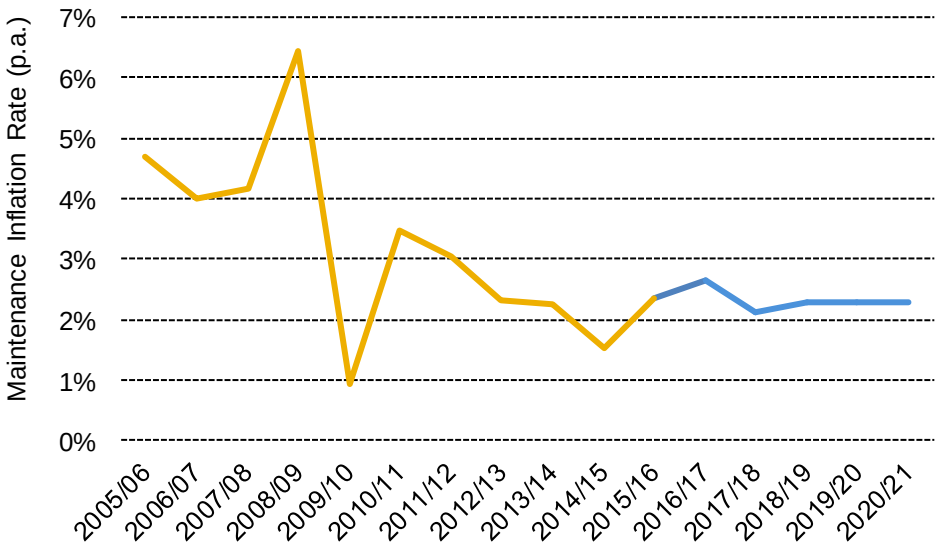
We understand that the derailment losses provided for this review have been valued on a party-party assessment basis. This means that derailment costs for below-rail (Aurizon) and above rail are assessed separately on a no fault basis with each party bearing their own costs. This is the same approach as adopted for UT4.

4.4 Inflation

Aurizon have provided us with historical and future inflation rates. We understand the rates provided are consistent with other components of Aurizon's regulatory submission. The historical average loss sizes

have been inflated to June 2017 dollar with the index provided in order to select a future average claim size assumption. In addition, our projected self insurance losses are expressed in nominal dollars of the year of payment using Aurizon's future inflation rates. We understand that the index is based on the level of inflation experienced in Aurizon's maintenance costs, weighted to allow for the relative level of expenditure by CQCN's on labour, consumables, accommodation and fuel. The historical and projected adopted inflation rates as provided by Aurizon are shown in the figure below.

Figure 4.1 – Aurizon's Maintenance Historical and Future Inflation Rates



Aurizon's maintenance index was not available for periods prior to 2004, and so inflation adjustments for earlier periods were based on Australian CPI.

5 Categories of Losses

In this section we describe the different loss categories.

5.1 Below-Deductible Losses for CQCN

The following below-deductible losses have been considered:

Property Losses

In practice, little of the CQCN is covered by the Aurizon combined property insurance policy. Coverage is limited to CQCN property within Aurizon premises but does not, in general, include tracks and related wires, signalling and communication equipment.

Following discussions with Aurizon, we understand that the value of CQCN below-deductible losses relating to the Aurizon combined property policy are likely to be small and hence we have not provided an estimate for this category of self-insured loss.

Public and Product Liability Losses

For UT4 we were advised that the insurance deductible for liability would be increased to [redacted] and provided estimates on that basis. To date the deductible has remained at [redacted] although Aurizon have asked us to assume that it will increase to [redacted] for the UT5 regulatory period.

[redacted]

- [redacted]
- [redacted]
- [redacted]
- [redacted].

Using this information we have estimated future CQCN liability losses as shown in Section 9.

[redacted]

Other Classes of Losses

We have not been provided with any information in relation to other classes of below-deductible losses and hence we are unable to provide any comment on the nature or extent of potential other losses.

5.2 Uninsured Risks

The most significant category of uninsured risk relates to CQCN's uninsured property risk, i.e. the property risk for the uninsured track and associated infrastructure.

The CQCN is subject to property losses from a range in perils, including:

- Derailment
- Weather:
  - Storm (including wind and cyclone generally)
  - Flood (including washouts and landslips)
  - Extreme Heat
- Earthquake
- Fire and Bush Fire
- Accidental and malicious damage.

We have been provided with detailed data for derailment and weather losses. We have modelled the historical losses from these perils to estimate future losses for the next regulatory period.

In relation to other perils, such as fire and accidental and malicious damage, where there is no information on the nature and extent of any historical losses, we have not provided any estimates. There are also other perils such as earthquake, war, invasion and terrorism, that exist but there are, we understand, no historical losses. We have not estimated a cost for these losses even though in practice the expected losses are greater than zero.

We understand there are no other significant classes of uninsured risks and the data we have received contains no information on other types of uninsured losses.

5.3 Pass through Events

Under the QCA regulatory environment, there are pass through provisions which allow for unanticipated material costs to be passed through to customers after the revenue determination has been made.

Pass through is used when the insurance for an event is considered to provide poor value for money, or is simply unavailable. Pass through is also used where historical data is not sufficient to allow a self-insurance estimate to be prepared.

We believe that the pass through option is an efficient way of dealing with extreme events which occur very infrequently and are extremely difficult to model. The alternative of receiving an annual allowance to be placed in a reserve is problematic as the reserve may need to be maintained, theoretically, for a significant period of time. There is also the possibility that an extreme event may occur well before the reserve has reached the expected size for the event.

We understand that Aurizon would like to adopt the following pass through thresholds:

- $1 million for damage to the network from events such as earthquakes, floods and cyclones, and
- $8 million for liability losses.

By definition CQCN will need to ensure, and be able to demonstrate to the QCA, that any costs stated as subject to pass through are not included elsewhere in the CQCN's cost base (either in the self-insurance, insurance maintenance or capital expenditure budgets).

For the purpose of estimating self-insured costs we have assumed that any event that generates self-insured losses, not otherwise covered by insurance, in excess of the assumed thresholds stated above will be subject to pass through. Note that the full ground-up cost of these pass through events is excluded from our self-insured cost estimates.

6 Exposure

Figure 6.1 and
Figure 6.2 show Aurizon's historical and projected exposure, both Gross Tonne Kilometres (GTK) and mainline track kilometres. This information was provided by Aurizon. The GTK figures are based on Aurizon's contract figures as opposed to the corporate plan and are split between Electrified GTK (EGTK) and Other GTK.

Figure 6.1 – Historical and Projected Gross Tonne Kilometres

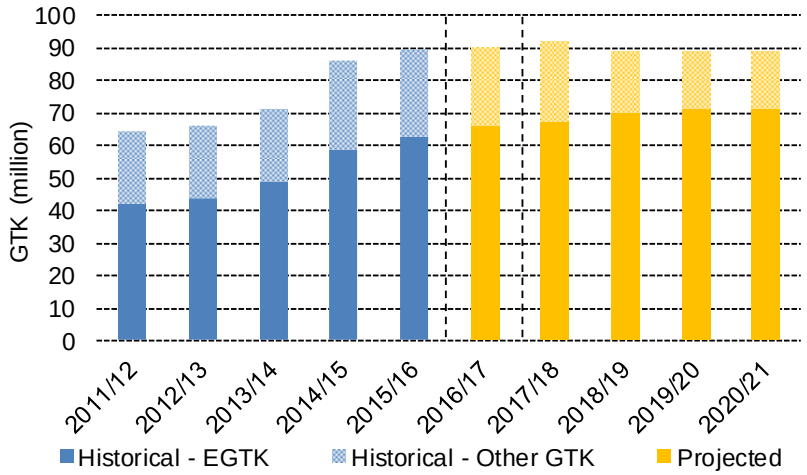
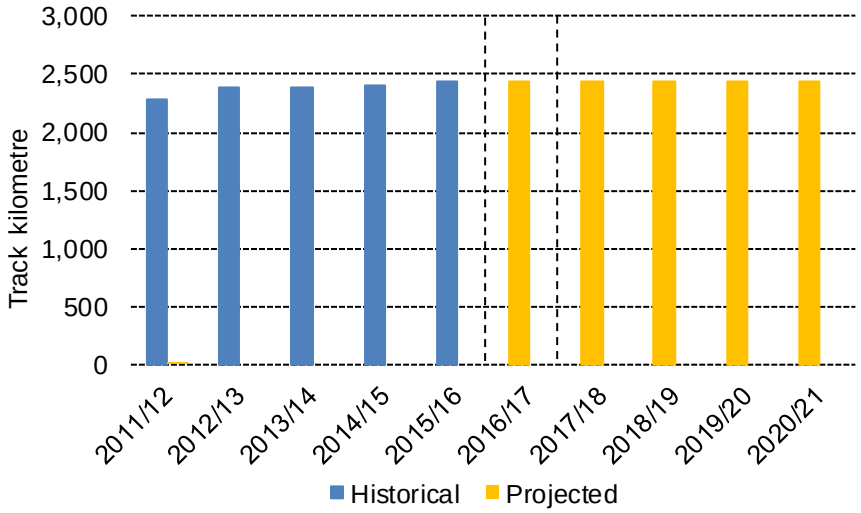


Figure 6.2 – Historical and Projected Track Kilometres



Over the period from 2010/11 to 2014/15 the growth in both GTKs and mainline track kilometres was associated with the Goonyella Abbott Point Expansion (GAPE) and Wiggins Island Rail Project (WIRP). We understand that there are currently no plans for further network expansion; hence the projected GTK and track kilometres are expected to be stable for the UT5 period.

Historically, EGTK's represented around 70% of total GTK's each year. [redacted]

Figure 6.3 shows Aurizon's historical and projected turnover per million dollars. [redacted]

7 Valuation of Uninsured Losses – Derailments

In this section we set out our valuation of CQCN's uninsured losses in respect of derailments.

7.1 Overview

[redacted]

The following sections provide further detail on our approach and projections.

7.2 US Benchmark Data

Overview

We obtained information from the US Federal Railroad Administration Office of Safety and Analysis. Aurizon previously provided us with a document explaining the meanings of the fields in the data. The US data consisted of:

- US railroad accident (derailment) data – including date of incident, name of railroad operator, track class, derailment cause and cost. Cost information was split between track and equipment damage for each train involved as well as being provided for the accident in total. Data was analysed for the period January 1987 to June 2016.
- US railroad exposure data, consisting of train miles by railroad and month, separately for passengers and freight. Exposure in terms of gross tonne kilometres was not available. We

converted the exposure measure to train kilometres. Train kilometre data was available for the period January 1997 to April 2016.

As advised by Aurizon at our previous review we selected three railroads from the data to construct our benchmark. The selected railroads were: Burlington Northern Santa Fe Railroad (BNSF), CSX and Union Pacific. These companies are major freight railroad operators with a focus on bulk freight transportation and were therefore considered to be an appropriate benchmark for CQCN. While these railroads are not specialist coal networks, the very high volumes of traffic on these railroads makes them a reasonable benchmark for the CQCN.

We inflated the financial amounts in the benchmark data using US price inflation and converted costs to Australian dollars. We separately identified "large" derailments defined as those incidents with a below-rail cost of more than AU$500,000 (after inflation adjustment).

Comments on analysis

Our analysis is based on track classes 4-6 where the carriage length was 65 or greater as the trains on these tracks is similar to those on the CQCN, unchanged from UT4.

Due to the differences between railroads, any results obtained from analysis of the US data cannot be applied directly to Aurizon. However, the US data is based on a large sample of derailment experience, both in terms of annual train kilometres travelled and the number of years for which data is available. Therefore the benchmark provides a relevant indication of frequency and cost of derailments and is particularly relevant for large derailments where there is limited data available from the CQCN.

Detailed results of our benchmark analysis are shown within this section and in Appendix H.

7.3 Actual v Expected Experience

Table 7.1 shows the actual derailment loss experience for CQCN for the period from 2012/13 to 2015/16 relative to expectations. The expected losses are the projected costs from our previous UT4 review.

[redacted]

The above table shows that relative to our projections:

- [redacted]

7.4 Frequency

Data Processing

[redacted]

[redacted]

[redacted]

[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]

[redacted]

Historical and Selected Loss Frequencies

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

US Benchmark

The derailment frequencies from the US benchmark are compared to Aurizon's own experience in Appendix H. We note that:

- The frequency of large derailments for CQCN continues to be very similar to the US benchmark, both of which have been quite stable over the period shown.
- For other derailments, the rate of US derailments lies between CQCN's track-only rate and CQCN's rate for all derailments (including derailments in yards or sidings). It is reasonable that the US benchmark should lie between the two given the way that the benchmark has been constructed, noting the US data has a reporting threshold that excludes many small losses.

We conclude that the frequencies in the CQCN data are broadly consistent with the US benchmark. We therefore make our frequency selections based on Aurizon's own data without specific adjustment based on the benchmark experience.

7.5 Size of loss

As described in Section 3, loss data for derailments was sourced from the loss files provided for incidents that have occurred since the previous review, while derailments in 2010/11 and prior are based on the information provided previously.

[redacted]

7.6 Selected Average Claim Size

Figure 7.2 summarises the historical and selected average size of losses assumptions for derailment losses. Average sizes are expressed in inflated June 2017 dollars.

US Benchmark

The claim size results of the US benchmark analysis are summarised in Table 7.3 below. The financials have been inflated in line with the US CPI and converted to Australian dollars. Note that, as for the previous review, we have focused on the category Tracks 4 to 6 (Freight and with carriage length 65+) as the carriage length of trains is similar to the CQCN.

Table 7.3 – Summary of Average Below Rail Costs – US Benchmark

Period	Basis	Derailment Type	Number of Derailments	Average Cost (AU$)
Current	Tracks 4 to 6	All	3,425	191,782
	Freight, Carriage Length 65+	Low Severity	1,137	9,288
	BNSF,UP,CSX lines	Medium Severity	1,951	158,901
	Count below rail only	High Severity	337	997,858
Previous	Tracks 4 to 6	All	3,762	171,998
	Freight, Carriage Length 65+	Excl large	3,502	103,533
	BNSF,UP,CSX lines	Large only	260	901,677

Table 7.3 shows that the average cost of large US derailments ($998,000) is similar to the average large derailment size we have adopted for this review of $1.1 million (refer Figure 7.2). The average large US derailment size in Table 7.3 is slightly greater than for the previous review as we have changed our counts to only include unique derailment incidents for this review. Further, for this review we have relabelled large derailment as High severity derailments, and categorized non-Large derailments into Low severity and Medium severity derailments. We have applied the same definition when analysing the US data.

The US data provides us with confidence that our selected average size for High severity derailments is not unreasonable. This is because the average cost of High severity derailments for Tracks 4 to 6 is in the same "ballpark" relative to the average size of CQCN derailments. However, as stated before, the US data has a somewhat higher frequency of derailments for non-Large severities and a reporting threshold that excludes many small losses. Therefore, the average costs for Low and Medium severity derailments are higher in the US data. As a result, the US data has a higher average derailment size across all derailments compared to CQCN's overall size of [redacted].

7.7 Projected cost

The estimated total derailment cost for the next regulatory period is obtained by multiplying the estimated frequency, projected exposure and the assumed average cost per derailment for each period. A summary of our derailment projection results is shown below.

More detailed results are shown in Appendix F.

Table 7.4 – Projected Derailment Costs

Financial Year	GTK (millions)	Estimated Number of Derailments	Estimated Cost per Derailment	Estimated Total Cost ($000)	Previous Total ($000)[1]	Previous Total ($000)[2]
2017/18	88.8	34	98	3,297	4,287	3,525
2018/19	88.8	34	100	3,370	4,381	3,948
2019/20	88.8	34	102	3,446	4,481	4,247
2020/21	88.8	34	104	3,525	4,583	4,539
Total				13,639	17,732	16,259

[1] Allowing for actual exposure and inflation, but previous frequency and size assumptions

[2] Shown in previous report

Our estimated cost of derailment losses for the UT5 period 2017/18 to 2020/21 is $13.6 million. This is lower than estimated for UT4 estimate of $16.3 million. The main factors contributing to the change over this period are:

- Changes in projected derailment frequency, the largest of which is the reduction in assumed frequency for low severity incidents.
- Changes in projected derailment size, the largest of which is the reduction in assumed loss size for medium severity incidents.

8 Valuation of Uninsured Losses – Other Loss Types

8.1 Weather Related Losses

Aurizon provided us with details of weather-related losses to the CQCN for the 17 year period to June 2016. The majority of the losses have been caused by floods and cyclones. Full details are shown in Appendix G.

To estimate the future cost of weather-related losses to the network we:

- Calculated the historical annual losses from weather events per mainline track kilometre
- Excluded (in total) pass-through events
- Applied a selected annual loss per track kilometre to projected mainline track kilometres.

We have been informed that there have been six pass through events over this period, as follows:

- Queensland Flooding/Cyclone Olga January to February 2010
- Flood Repairs December 2010 to January 2011
- Queensland Flood Damage Isaac Shire December 2010
- Queensland Floods 2013
- Cyclone Marcia 2015
- Queensland Flooding 2016.

We have removed $45 million of cost from our analysis in respect of these events; with $34 million of this relating to events that have occurred since our previous review (refer Appendix G).

Figure 8.1 shows the net cost of weather losses by year, along with our current selection for UT5 and our previous selection for UT4. All figures are inflated to June 2017 dollars.

As large weather losses are eligible for pass through consideration (and if eligible have nil net cost to Aurizon) the greatest risk in respect of natural events for Aurizon comes from multiple events where the total loss falls short of the $1 million pass through threshold. This seems to be the case for the years that have the highest net cost in Figure 8.1. It also means that periods where significant damage was sustained due to adverse weather, don't necessarily correspond to periods with a high net cost. For example, as shown in the graph above, 2012/13 flooding caused damage in excess of $18 million, yet the net cost of this event was nil.

[redacted]

[redacted]

We estimated future losses in respect of weather-related damage to the network by multiplying the assumed cost per kilometre by the projected number of mainline track kilometres for the four lines in the CQCN. The calculation is shown in Table 8.2 below (and in more detail in Appendix G). We have assumed that costs per kilometre would increase at the future rates of inflation for maintenance and repair costs provided by Aurizon. The length of track in the CQCN is based on estimates provided.

Table 8.2 – Estimated Future Claims – Weather Related

Financial Year	Estimated track kms	Estimated Cost per km per year ($)	Estimated Cost ($000)	Previous Total (adjusted) ($000)[1]	Previous Total ($000)[2]
2017/18	2,448	152	371	901	815
2018/19	2,448	155	379	921	840
2019/20	2,448	158	388	942	865
2020/21	2,448	162	397	963	891
Total			1,535	3,727	3,411

[1]Allowing for actual exposure and inflation, but previous frequency and size assumptions

[2]Shown in previous report

Our estimated cost of weather-related losses for the UT5 period 2017/18 to 2020/21 is $1.5 million. This is significantly lower than estimated for UT4 mainly due to the reduction in the net cost of weather-related losses per track kilometre as described above.

8.2 Dewirements

At the previous review, we included dewirements for the first time in Aurizon's self-insurance allowance. The data used and approach is similar to that of derailments as shown in Table 4.1. The exposure measure used has been changed from the previous review from electrified track kilometres to Electrified Gross Tonne Kilometres (EGTK). This change was made in response to a higher than expected number of dewirements over the period from 2012/13 to 2015/16. Discussions with Aurizon staff indicated that although there was only modest growth in the actual electrified track kilometres over this period the utilisation increased more dramatically and is a better predictor of the future number of dewirements.

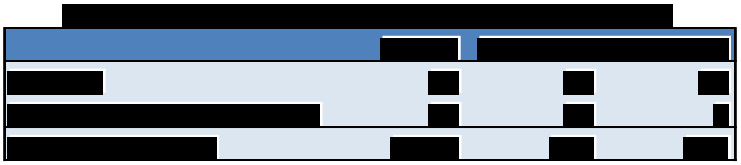
Figure 8.2 shows the historical and projected frequency per million EGTK.

[redacted]

[redacted]

[redacted]

[redacted]



[redacted]

[redacted]

- [redacted]
- [redacted]
- [redacted].

This gives an implied cost per million electrified track kilometre of around $4,000. The total loss estimate over four years is $1.3 million, as illustrated in Table 8.4.

Table 8.4 – Projected Dewirements

Financial Year	Electrified GTK (millions)	Cost per million EGTK per year ($)	Estimated Total Cost ($000)	Previous Total ($000)[1]	Previous Total ($000)[2]
2017/18	70.3	4,320	304	208	172
2018/19	71.0	4,415	314	212	172
2019/20	71.2	4,516	321	217	193
2020/21	71.2	4,619	329	222	193
Total			1,267	859	729

[1]Allowing for actual exposure and inflation, but previous frequency and size assumptions

[2]Shown in previous report

The projected total cost dewirements over the next four years is higher than our previous allowance of $0.7 million ($0.9 million adjusted for inflation and exposure) due to higher than expected numbers of dewirements and the use of EGTKs to project the future number of dewirements.

We assume that in the event that exceptional dewirement costs were incurred, for example, following a major cyclone, that Aurizon would seek pass through.

8.3 Third Party Repairs

Third party repair costs relate to damage to the Aurizon network caused by third parties net of any recovery that can be made against the responsible party. This is the first time we have projected third party losses. We have measured and projected them relative to track kilometres.

Figure 8.4 shows the historical annual net third party cost per track kilometre along with our selection.

Table 8.5 shows our projected cost of $0.8 million for third party repairs over UT5.

Table 8.5 – Projected Third Party Repairs Cost

Financial Year	Estimated track kms	Estimated Cost per km per year ($)	Estimated Total Cost ($000)
2017/18	2,448	83	202
2018/19	2,448	84	207
2019/20	2,448	86	211
2020/21	2,448	88	216
Total			837

Other Events

The historical data only covers a relatively short period of time and does not include losses relating to all possible events. As a result, it is possible that in the next regulatory period that CQCN could incur a substantial loss from a peril that we have not modelled. We note that CQCN is exposed to some risks which have a very low probability of occurrence, but a very high cost if they do occur, for example an earthquake. These types of events are likely candidates for pass through.

9 Valuation of Below–deductible Losses

9.1 Liability

[redacted]

[redacted]

- [redacted]
- [redacted]
- [redacted]
- [redacted]
- [redacted]

[redacted]

Public Liability - Analysis

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

Our estimates of CQCN's below-deductible liability losses for UT5 are shown in Table 9.2.

Table 9.2 – Results – Public Liability

Financial Year	Turnover ($m)	Cost per $million of turnover ($)	Projected ($000)	Previous Total (adjusted) ($000)[1]	Previous Total ($000)[2]
2017/18	[redacted]	456	495	577	457
2018/19	[redacted]	466	520	607	476
2019/20	[redacted]	476	533	621	495
2020/21	[redacted]	487	555	647	514
Total			2,103	2,452	1,942

[1] Allowing for actual exposure and inflation, but previous frequency and size assumptions

[2] Shown in previous report

Our estimated cost of liability losses for the UT5 period 2017/18 to 2020/21 is $2.1 million compared to $2.5 million from our previous review.

Public Liability - Catastrophe Losses

Aurizon is exposed to possible catastrophic public liability claims. For example, claims of many millions of dollars could arise if Aurizon was held liable for property damage arising from a serious bushfire deemed to be started by their infrastructure. A catastrophe loss could also take the form of a very high number of small or large losses not covered by insurance.

10 Results

This section summarises the results of our valuation of Aurizon's self-insured losses with respect to:

- Uninsured derailment losses
- Other uninsured losses
- Below-deductible losses.

The results are shown on a party-party basis as described in Section 4.4 (i.e. Aurizon will be fully responsible for all below rail losses and have no liability for above rail losses). If this basis were to be changed our results should be reviewed.

10.1 Summary of Projected Costs

Table 10.1 summarises our self-insurance allowance for the UT5 period by loss type. All figures are expressed in nominal dollar of the year of loss.

Table 10.1- Summary of Estimates for CQCN by Loss Type

Loss Type	2017/18	2018/19	2019/20	2020/21	Total	Previous (adjusted)[1]	Previous[2]
	$000	$000	$000	$000	$000	$000	$000
Derailment	3,297	3,370	3,446	3,525	13,639	17,732	16,259
Weather	371	379	388	397	1,535	3,727	3,411
Dewirement	304	314	321	329	1,267	859	729
Liability	495	520	533	555	2,103	2,452	1,942
TP Repairs	202	207	211	216	837		
Total	4,669	4,790	4,900	5,022	19,380	24,771	22,341

[1] Adjusted for actual exposure, but based on previous frequency and size assumptions

[2] Shown in previous report

Our estimate of the annual cost starts at $4.7 million for the 2017/18 financial year and increases to $5.0 million in 2020/21. Our estimate across all four years is $19.4 million. The largest component of the estimate is clearly derailment costs as they are typically the most frequent self-insured losses, and the most costly. The yearly increase in our estimates over the four year regulatory period reflects both inflation and the anticipated growth in CQCN's operations (which is minimal).

Note that it is not possible to directly compare estimates for self-insurance costs of different companies, as variation in costs could be attributed to a range of factors including:

- The breadth of the self-insurance program (as opposed to maintenance or insurance programs)
- Level of deductibles and limits selected for insurance programs
- Nature of the assets exposed (i.e. the relative design strength of the assets)
- Nature of the perils applicable.

We note that it would not be appropriate to make direct comparisons between entities without allowing for these differences.

The estimates shown in the tables above are central estimates (i.e. intended to be the mean or expected value of the liabilities) and include an allowance for future growth in Aurizon's operations. The estimates

are not discounted for the time value of money. The above estimates do not contain margins for expenses, reinsurance or profits and hence are expected to be lower than the commercial costs of insurance.

Comparison to UT4 Estimates

Our estimate for UT5 is around $3 million lower than assumed for UT4. The main drivers of this change by loss type are:

- Derailments: The number of low severity derailments has continued to trend downwards as result of Aurizon's increased emphasis on preventative maintenance activities and the rail restressing program. In response we have reduced our frequency assumption to reflect more recent experience.
- Weather: Although there have been weather events with a high gross cost to Aurizon since the previous review, pass through provisions have meant that the net cost has been lower than expected. In addition to this, events with a high net cost at the previous undertaking were reviewed by Aurizon staff and it was determined that if these events were to occur in the future their costs would be recoverable. This has resulted in a lower expected cost going forward.
- Dewirements: Dewirements numbers were higher than expected. This is believed to be partially driven by an increased utilisation of electrified track. To account for this we have changed the exposure measure used to project losses from electrified track kilometres to electrified gross tonne kilometres to be better capture any changes in utilisation.
- Liability: Changes to the liability projection have been small and reflect the latest experience.
- Third Party Repairs: This is the first time we have projected third party repairs hence there is no comparison point.

Summary of Losses by Exposure Measure

The results shown in Table 10.1 are driven by projected exposure measures. In the event that projected exposure changes, and for ease of updating the results, we have illustrated the losses per unit of exposure specific to that particular loss. The dollars shown in Table 10.2 are as at the start of the UT5 period.

Table 10.2– Summary of Losses by Exposure Measure

Loss Type	Exposure Measure	Cost per Unit of Exposure ($)
Derailment	GTKs (millions)	36,734
Dewirement	EGTKs (millions)	4,275
Weather	Track km	150
Third Party Repairs	Track km	82
Liability	Turnover (millions)	451

10.2 Notional premium

To estimate the notional premium corresponding to the estimates shown in we have allowed for benchmark premium loadings. The benchmark loadings assumed are 10% of premiums for expenses (applied to derailments only) and 20% of premiums for profit and the net cost of reinsurance. These loadings are based on commercial property insurance benchmarks and are necessarily approximate. The margins sought by insurers can vary significantly depending on the types of risks being written, the level of uncertainty surrounding those risks and the stage of the insurance cycle. The benchmarks applied are thought to be typical of those that might apply for this type of large commercial business.

We note that the profit margin adopted is similar to the average return on capital achieved by Australian general insurers in recent years. We also note that unlike an insurer, Aurizon only gets the opportunity to "re-price" every four years whereas an insurer has the opportunity to re-price annually thus providing greater certainty as they can re-adjust premiums to recoup losses.

Table 10.3 shows the addition of these loadings to the estimated losses.

Table 10.3 – Estimation of Notional Insurance Premium

Loss Type	2017/18	2018/19	2019/20	2020/21	Total
	$000	$000	$000	$000	$000
Derailment	4,352	4,448	4,549	4,653	18,003
Weather	445	455	465	476	1,842
Dewirement	364	376	386	394	1,521
Liability	594	625	639	666	2,524
TP Repairs	243	248	254	259	1,004
Total	5,998	6,152	6,293	6,449	24,893

Using these loadings our estimate of the notional insurance premiums corresponding to our central estimate is $24.9 million over the four year period.

11 Reliances and Limitations

We have relied on the accuracy and completeness of the data and other information (qualitative, quantitative, written and verbal) provided to us by Aurizon for the purpose of this advice. We have not independently verified or audited the data, but we have reviewed the information for general reasonableness and consistency. The reader of this report is relying on Aurizon and not Finity for the accuracy and reliability of the data. If any of the data or other information provided is inaccurate or incomplete, our advice may need to be revised and the report amended accordingly.

In estimating future self-insured costs the result depends on a number of assumptions including assumptions regarding the insurance coverage which will apply and deductible levels, the treatment of the specified losses as self-insured (as opposed to maintenance) and that pass through is accepted at the level assumed within the report. These assumptions are subject to policy decisions by Aurizon, market forces and regulatory determination. Should there be any variation in these assumptions our results will change and should be reviewed and updated accordingly.

We have prepared our estimates on the basis that they represent our current assessment of the likely future experience of Aurizon. Sources of uncertainty include the limited number of past events on which to base our assumptions and the presence, or absence, of large losses. Although the estimates we have prepared are best estimates, deviations of the actual experience from our estimates are normal and to be expected.

In making our estimates we have placed considerable reliance on the past experience of the portfolios. To the extent that estimates and assumptions are required there is a degree of uncertainty in the analysis. This is particularly due to the impact of a small number of large events. There are no margins included in our results to offset the potential impact of such uncertainty other than shown in Table 10.3.

This report has been prepared for the sole use of Aurizon for the purpose stated in Section 1. It is not intended, nor necessarily suitable, for any other purpose. Members of Finity staff are available to answer any queries, and the reader should seek that advice before drawing any conclusions or any issues in doubt. The report should be considered as a whole.

We understand that Aurizon may wish to provide a copy of our report to the QCA. Permission is hereby granted for such distribution on the condition that the entire report, rather than any excerpt, is distributed. No other use of, or reference to, this report should be made without prior written consent from Finity Consulting, nor should the whole or part of this report be disclosed to any other person.

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Part III Appendices

A Network Summary

Figure A.1 – Network Map 1 – Blackwater

Figure A.2 – Network Map 2 – Goonyella

Figure A.3 – Network Map 3 – Newlands

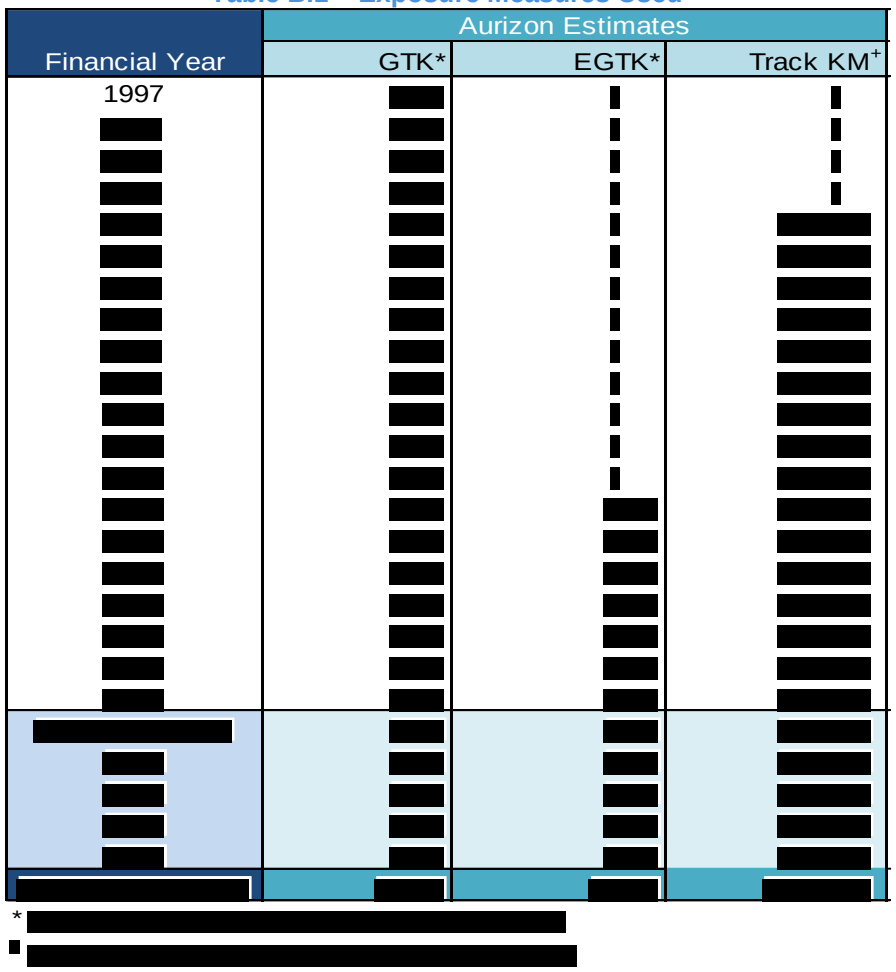
Figure A.4 - Network Map 4 – Moura

Mou

B Exposure

Table B.1 – Exposure Measures Used

Financial Year	Aurizon Estimates		
	GTK*	EGTK*	Track KM+
1997			



C Derailment – Categorisation

[redacted]

We believe that these graphs indicate that the approach is appropriate given the data limitations.

D Derailment – Frequency

E Derailment – Size of Loss

F Derailment – Results

Table F.1 – Summary of Key Assumptions

Derailment Frequency (per million GTK)

Derailment Cost ($)

Table F.2 – Derailment Losses by Severity

Financial Year	Estimated GTK	Derailment Type	Derailment Frequency per million GTKs	Estimated Number of Derailments	Estimated Below Rail		Previous Total ($000)[1]	Previous Total ($000)[2]
					Per Derailment ($000)	Total ($000)		
2017/18								
2018/19								
2019/20								
2020/21								
Total								

[1] Allowing for actual exposure and inflation, but previous frequency and size assumptions

[2] Shown in previous report

G Weather Related and Other Events

Table G.1 – Weather Related Events – CQCN

Financial Year	Event/Description	Expenditure ($)		
		Gross	Net	Annual Net
[redacted]				

H US Derailment Benchmark

Table H.1 - Summary of Derailments – Benchmark – Total (BNSF, CSX, UP)

Number of Derailments

	Number of Derailments by Financial Year - All Derailments																
	Prior	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	Total
Track Class 4	1158	127	133	135	139	134	120	100	93	101	102	18	96	101	88	21	2666
Track Class 5	260	48	44	40	47	50	44	43	25	32	30	7	35	11	19	2	737
Track Class 6	5	0	0	0	0	2	0	0	0	1	0	0	5	8	0	1	22
Total	1423	175	177	175	186	186	164	143	118	134	132	25	136	120	107	24	3425

	Number of Derailments by Financial Year - High Severity Derailments																
	Prior	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	Total
Track Class 4	109	22	20	21	17	20	17	7	11	15	9	1	14	16	26	1	326
Track Class 5	52	10	9	8	9	8	3	4	2	6	3	0	6	2	4	0	126
Track Class 6	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2
Total	161	32	29	29	26	28	20	11	13	21	12	1	20	20	30	1	454

Exposure

	Prior	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	
Train kms (000s)																	
Total	644,680	655,684	675,818	702,594	717,604	751,143	702,339	669,716	557,022	601,347	623,995	161,146	638,030	660,132	622,807	186,387	

Frequency (per million train kms) All derailments

	Prior	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	
Train kms																	
Total	2.21	0.27	0.26	0.25	0.26	0.25	0.23	0.21	0.21	0.22	0.21	0.16	0.21	0.18	0.17	0.13	

Frequency (per million train kms) High Severity derailments

	Prior	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	
Train kms																	
Total	0.25	0.05	0.04	0.04	0.04	0.04	0.03	0.02	0.02	0.03	0.02	0.01	0.03	0.03	0.05	0.01	

Table H.2 - Summary of US Benchmark Financial Data ($) – Tracks 4 to 6, Freight, Carriage Length 65+

	Total Cost				Track Costs only (Below Rail Costs)			
US Lines	BNSF,UP,CSX				BNSF,UP,CSX			
Track Classes	4-6				4-6			
Carriage Length	65+				65+			
Derailments	All	Low Severity	Medium Severity	High Severity	All	Low Severity	Medium Severity	High Severity
Number of derailments	4,325	1,033	2,184	1,108	3,425	1,137	1,951	337
Average Cost ($)	458,784	15,337	140,040	1,500,498	191,782	9,288	158,901	997,858
Minimum Cost ($)	57	57	25,043	500,700	21	21	25,061	500,210
Maximum ($)	10,554,806	24,991	499,751	10,554,806	7,955,965	24,991	499,265	7,955,965
Percentiles								
25%	25,956	11,523	42,282	764,907	15,411	1,905	56,966	592,264
50%	87,918	15,502	84,444	1,128,602	66,239	8,319	121,026	738,294
75%	516,804	19,498	206,996	1,860,264	226,887	15,377	235,134	1,102,495
90%	1,380,957	22,879	353,843	2,794,950	495,110	20,948	345,189	1,784,315
95%	2,148,193	23,801	420,193	3,547,825	731,507	22,692	411,167	2,355,542

Note: Amounts Inflated and converted to Australian dollars at AU$1 = US$ 0.761
Analysis based on derailments for the period January 1987 to June 2016