

# AURIZON NETWORK

## FY18 Capital Expenditure Report - Amended

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16 November 2018



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## Introduction

The Queensland Competition Authority (**QCA**) has approved a Regulatory Asset Base (**RAB**) for the Central Queensland Coal Network (**CQCN**). The 2016 Access Undertaking (**UT4**) provides for the QCA to approve any additions to the RAB. This approval process involves the annual assessment of Aurizon Network's Capital Expenditure submission.

In the financial year commencing 1 July 2017 and concluding 30 June 2018 (**FY18**) Aurizon Network commissioned capital projects with investments of **\$211,188,417** excluding Interest During Construction (**IDC**), for a total of **\$212,768,146** including IDC. This value encompasses **58** projects across the CQCN, details of which are outlined in **Appendix A: Capital Expenditure Project List**.

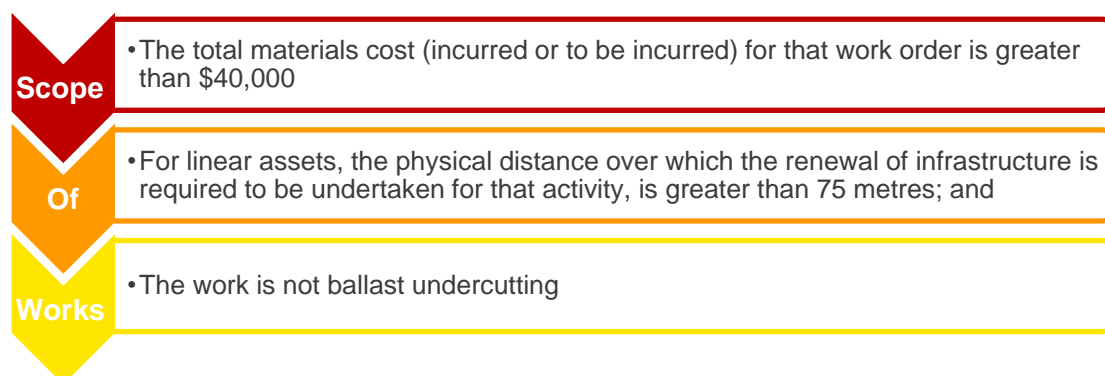
This report details Aurizon Network's submission for capital expenditure to be assessed and accepted by the QCA into the RAB in accordance with clause 2 of Schedule E of UT4.

The purpose of this submission is to provide information to the QCA for the QCA's assessment of whether the capital expenditure is prudent and efficient under clause 2 of Schedule E of UT4, and in particular to provide clarity about the circumstances relevant at the time of making the decision to incur the capital expenditure.

## Delineating Between Capital and Operating Expenditure

For the purposes of delineating between capital expenditure and operating expenditure, Aurizon Network has applied consistent criteria across all work scopes which are assigned an activity number. This ensures a consistent methodology has been applied to every aspect of work.

The criteria applied by Aurizon Network to define scope of works as Capital Expenditure are:



Those costs which have been categorised as capital expenditure for work completed in FY18 are included in this submission for inclusion in the Regulatory Asset Base and are discussed in detail in the **Capital Project Disciplines** section of this report

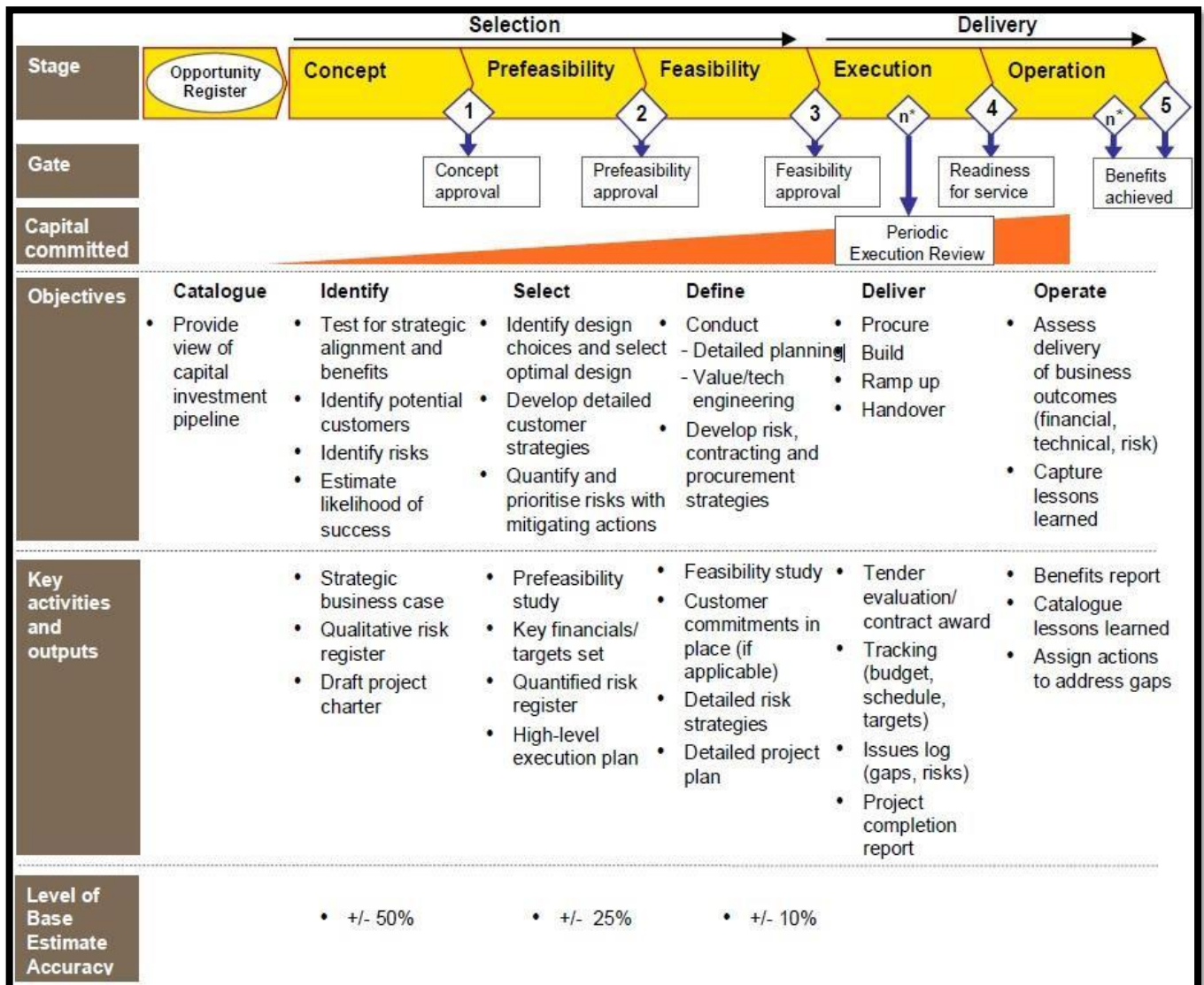
## Investment Framework

Aurizon Network follows a rigorous regime for the commitment of capital investments. This is governed by a process known as the Aurizon Investment Framework. The purpose of the investment framework is to facilitate sound investment decisions and to ensure:



- Investments have a high degree of success;
- Investment decisions are made on a consistent basis;
- Capital is optimised; and
- Learnings from investments are recorded and improved approaches to manage investment opportunities are realised.

The investment framework aligns with the requirements of UT4 in terms of prudence and efficiency of scope, standard and cost for capital expenditure. **Figure 1** provides an overview of the capital investment stage gates that Aurizon Network utilises for its capital projects.



**Figure 1 - Aurizon Capital Investment Stage Gates**

This stage gate process commences from the moment a capital investment opportunity is registered and moves to the concept phase. Following this, the investment opportunity is assessed at multiple stage gates (that is concept to prefeasibility, and then to feasibility). The costs committed to the investment opportunity increases after the passing of each stage gate. Conversely, the variance in the estimated cost of the investment opportunity reduces as it moves closer to execution phase. Capital Renewal submissions generally commence at the feasibility stage in the investment approval process.

Each stage gate contains an Investment Approval Request (**IAR**) that must be reviewed by the Network Investment Committee (**NIC**) and approved in accordance with the delegation framework. All IAR's are now also reviewed and endorsed by the Aurizon Investment Committee (**AIC**). The investment opportunity then translates into a capital project which is executed. Capital Renewal submissions are discussed in detail in the **Capital Project Disciplines** section.

The type of assessment process applied for renewal capital investments will depend on the project value, its level of risk and Aurizon Network's internal delegations from the Board to executive management. Lower value (IAR's less than \$1m) and lower risk projects may go through a simplified version of the capital

investment stage gates. Although the IAR is simpler, it still provides for robust review of proposed scope and cost, including options analysis and procurement details.

The structure of this process provides a robust methodology for assessing the potential scope of projects presented for investment approvals and ensure the costs which are then committed to the project are viable. This framework aids in the delivery of sufficient supporting evidence to determine the prudence and efficiency of the capital expenditure under clause 2 of Schedule E of UT4.

## Regulatory Framework

Aurizon Network may provide the QCA with the details of capital expenditure that Aurizon Network considers should be included in the RAB with sufficient supporting evidence to determine the prudence and efficiency of the capital expenditure under clause 2 of Schedule E of UT4, including as applicable:



- Any relevant Business Case or Feasibility Study;
- Evidence of actual expenditure of the capital expenditure, commissioning of the associated assets; and
- Capacity Modelling, if any, undertaken as part of the Business Case or Feasibility Study and on commissioning of the asset.<sup>1</sup>

Details of key supporting documentation available to support of prudence and efficiency under clause 2 of Schedule E of UT4. is are outlined in the Prudence and Efficiency section.

Information provided to the QCA under clause 1.3 of Schedule E of UT4 must be accompanied by a statement signed by Aurizon Network's Executive Officer confirming that, to the best of their knowledge, the information is, in all material respects, correct<sup>2</sup>. This Executive Officer Statement has been provided to the QCA.

Failure by Aurizon Network to obtain the QCA's approval of any matters under clause 2 of Schedule E of UT4 in relation to a capital expenditure project or part of the capital expenditure for a project, does not affect its right to seek approval under clause 2 of Schedule E of UT4 at a later time in respect of part or all of the capital expenditure<sup>3</sup>.

The QCA must approve capital expenditure for inclusion into the RAB if that capital expenditure is for the prudent and efficient value of the assets that are used or intended to be used by Aurizon Network to provide the service taken to be declared under section 250(1)(a) of Schedule E of UT4, namely "*the use of a coal system for providing transportation by rail*".

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<sup>1</sup> Clause 1.3(a), Schedule E, UT4

<sup>2</sup> Clause 1.3(d)(i), Schedule E, UT4

<sup>3</sup> Clause 2.1(d), Schedule E, UT4

In determining the prudence and efficiency of capital expenditure, the QCA must have regard to the following:

Scope	Standard	Costs
<ul style="list-style-type: none"><li>• <b>Scope</b> of works for the project, including whether the requirement for the works is prudent and efficient.</li></ul>	<ul style="list-style-type: none"><li>• <b>Standard</b> of works for the project, including whether the standard could be expected to deliver the requirements for that project without it being oversized or likely to deliver a capital works project which is beyond the requirements of its scope.</li></ul>	<ul style="list-style-type: none"><li>• <b>Costs</b> of that project are prudent and efficient, having regard to the scope and standard of work undertaken or to be undertaken for the project, which must include having regard, where relevant, to a list of factors for each element of scope, standard and cost.</li></ul>

The QCA must assessing, under clause 2.2(b) of Schedule E of UT4, whether capital expenditure is prudent and efficient, consider only the circumstances relevant at the time of making the decision to incur the capital expenditure (or in relation to assessing prudence of costs, at the time when the costs were incurred, or the capital expenditure project was undertaken, as applicable)<sup>4</sup>.

This FY18 Capital Expenditure submission provides the QCA with the details of capital expenditure that Aurizon Network considers should be included in the RAB in accordance with clause 2 of Schedule E of UT4.

## Prudence and Efficiency

This report demonstrates Aurizon Network has sought to construct new infrastructure and undertake renewal works using existing rail standards developed by Aurizon Network or applicable Australian or industry standards. **Appendix A: Capital Expenditure Project List** sets out the details for each of the FY18 capital expenditure projects, and supporting documentation is available for all of these projects to demonstrate that the scope, standard and costs are prudent and efficient. Where there has been an additional cost incurred or a change in scope since the prior approval by the QCA of the investment value, supporting documentation is available for these projects. Further information can be provided to the QCA, if required, upon request.

## Costs

The QCA is required to consider the costs of projects in determining prudence and efficiency of FY18 capital expenditure, as outlined in clauses 2.2(b)(iii)(B) and (C) of Schedule E of UT4.

The framework under which Aurizon Network manages investment decisions is detailed in the **Investment Framework** section of this report, specifically the use of **funding requests** to seek approval for an investment opportunity and effectively initiate a capital project. These documents provide evidence of Aurizon Network's consideration of the extent to which the project promotes economically efficient operation of, use of or investment in the Rail Infrastructure, as required in clause 2.2(b)(i)(E) of Schedule E of UT4.

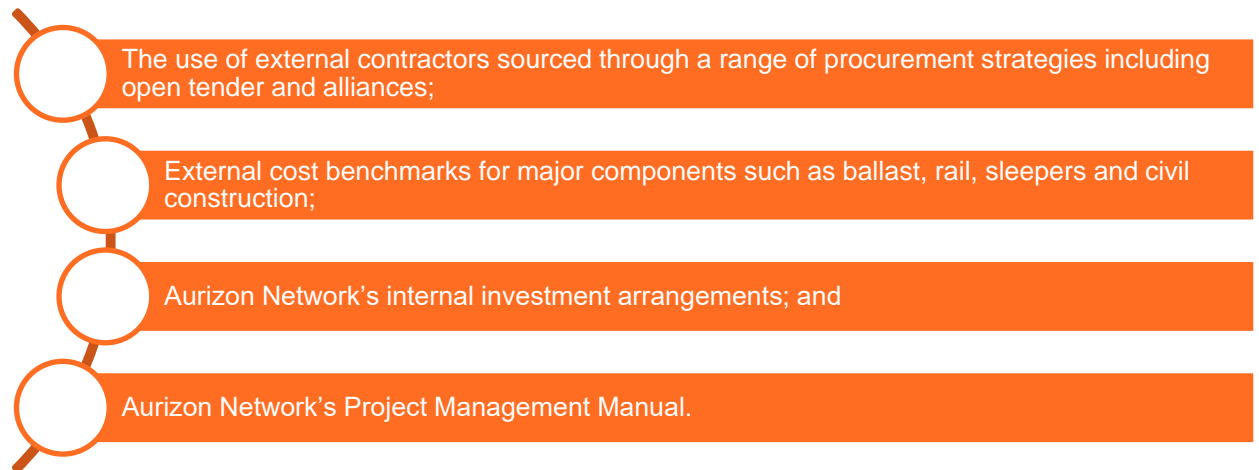
The actual approval of physical budgets is managed via a **delegation framework**. This framework ensures that decisions to assign capital to activities are made at the appropriate level for the investment being made or the residual risk of the project in achieving assigned budgets.

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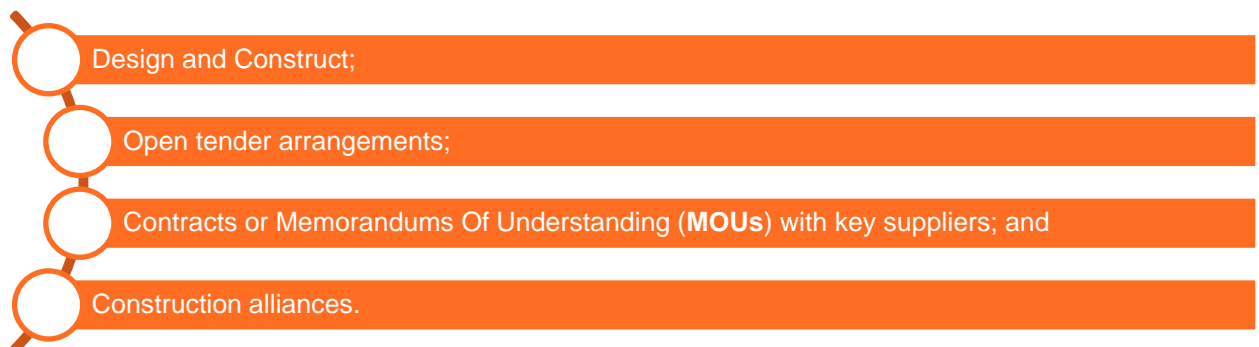
<sup>4</sup> Clause 2.2(g), Schedule E, UT4

Aurizon Network utilises SAP as its accounting and reporting platform for projects from initial funding; budget allocation and work break down structuring of the approved budget; project delivery and the drawdown of sub-project budgets; project close out including final cost reporting and transfer from Assets Under Construction to the Fixed Assets Register.

Aurizon Network can demonstrate that the costs associated with projects commissioned and presented to the QCA for acceptance are prudent and efficient. This is based on the following factors impacting the cost build-up:



Aurizon Network has employed a number of approaches to achieve value for money in the design and civil construction of infrastructure projects. This includes selecting a 'best for project approach' for project procurement. This is a choice between the following types of contracting arrangements:



**Procurement documentation** supporting project expenditure may include tender information and evaluation records, alliance agreements and the identification of works completed as part of the procurement process.

In addition, Aurizon Network's **Project Management Plans, funding submissions** (e.g. Capital Funding Requests (**CFRs**) and Investment Approval Requests (**IARs**)) and **Project Completion Reports** outline the project budget information, reconciliations and lessons learnt from project outcomes.

## Access Agreements and Contractual Obligations

The QCA is required to have regard to Aurizon Network's obligations under Access Agreements in considering the prudence and efficiency of capital expenditure in line with clause 2.2(b)(i)(B) and 2.2(b)(ii)(A) of Schedule E of UT4, along with any contractual timeframes as relevant to clause 2.2(b)(iii)(E)(8) of Schedule E. In particular, Growth projects are often linked to an **Access Agreement** held between Aurizon Network and another party, and there may be other **contracts** in place for an individual project.

## Network Development Plan

The Network Development Plan is Aurizon Network's medium to long term planning document which sets out a range of options to increase the capacity of the CQCN. The QCA is required to have regard to any relevant **Network Development Plan** in considering the prudence and efficiency of capital expenditure in line with clauses 2.2(b)(i)(A) and 2.2(b)(iii)(A) of Schedule E of UT4. The Network Development Plan also demonstrates consideration of supply chain impacts, as required by clause 2.2(b)(iii)(E)(7) of Schedule E of UT4.

Where relevant, current and likely future usage levels are considered in developing projects and these are recorded in **modelling** and **stakeholder communications** as required for the particular project, supporting prudence and efficiency with respect to 2.2(b)(i)(C) and 2.2(b)(ii)(B) of Schedule E of UT4.

## Asset Management Plans

In determining the prudence and efficiency of Aurizon Network's capital expenditure, the QCA is required to have regard to the age and condition of existing assets and any Asset Management Plan which has been accepted by the QCA under clause 3 of Schedule E of UT4. Whilst there are not currently any QCA-approved Asset Management Plans, Aurizon Network's **Asset Maintenance and Renewal Policy** clearly documents defined assumptions that sit behind plans for managing assets.

Aurizon Network's **asset management documentation**, including **Condition Assessments** and **Prioritisation Models**, further supports prudence and efficiency of the FY18 capital expenditure under clauses 2.2(b)(i)(D), 2.2(b)(ii)(D) and 2.2(b)(iii)(D) of Schedule E of UT4, where applicable.

## Standards, Specifications and Policies

The QCA is required to have regard to the standard of works for the project, where relevant to Aurizon Network's design standards and relevant Australian design and construction standards, as detailed in clauses 2.2(b)(ii)(C) and (E) of Schedule E of UT4. In support of the QCA's decision, Aurizon Network's **suite of standards, specifications and policies** are available. This includes Aurizon Network's design standards arising from the Safety Management System.

The requirements contained in these documents are based on the requirements of the relevant Australian Standard(s) and technical knowledge and experience. Any additional or non-standard requirements are outlined in project documentation such as **Client Requirement Briefs** and **Project Management Plans**, or similar.

Aurizon Network's project completion processes include **Project Commissioning Certificates** (or similar) and **Project Completion Reports** to record that the specified standards were implemented. Where relevant, these are further supported by **As-Built Drawings** and **Quality Management documentation** including, **Inspection and Test Plans**, **Track Validation Certification**, **Practical Completion Certificates** and **photographs** of completed works.

Further, these documents, support Aurizon Network meeting its legislative and tenure requirements, including those relating to rail safety, workplace health, safety and environmental requirements, as required by clause 2.2(b)(i)(G) of Schedule E of UT4. In relation to this requirement, Aurizon Network has a fully-integrated Safety, Health and Environment Management (**SHEM**) system that supports the management of incidents, hazards, near misses and safety interactions. This system and related documentation also support Aurizon Network's compliance with Laws and the requirements of Authorities, as required by clauses 2.2(b)(ii)(F) and 2.2(b)(iii)(E)(3) of Schedule E of UT4.

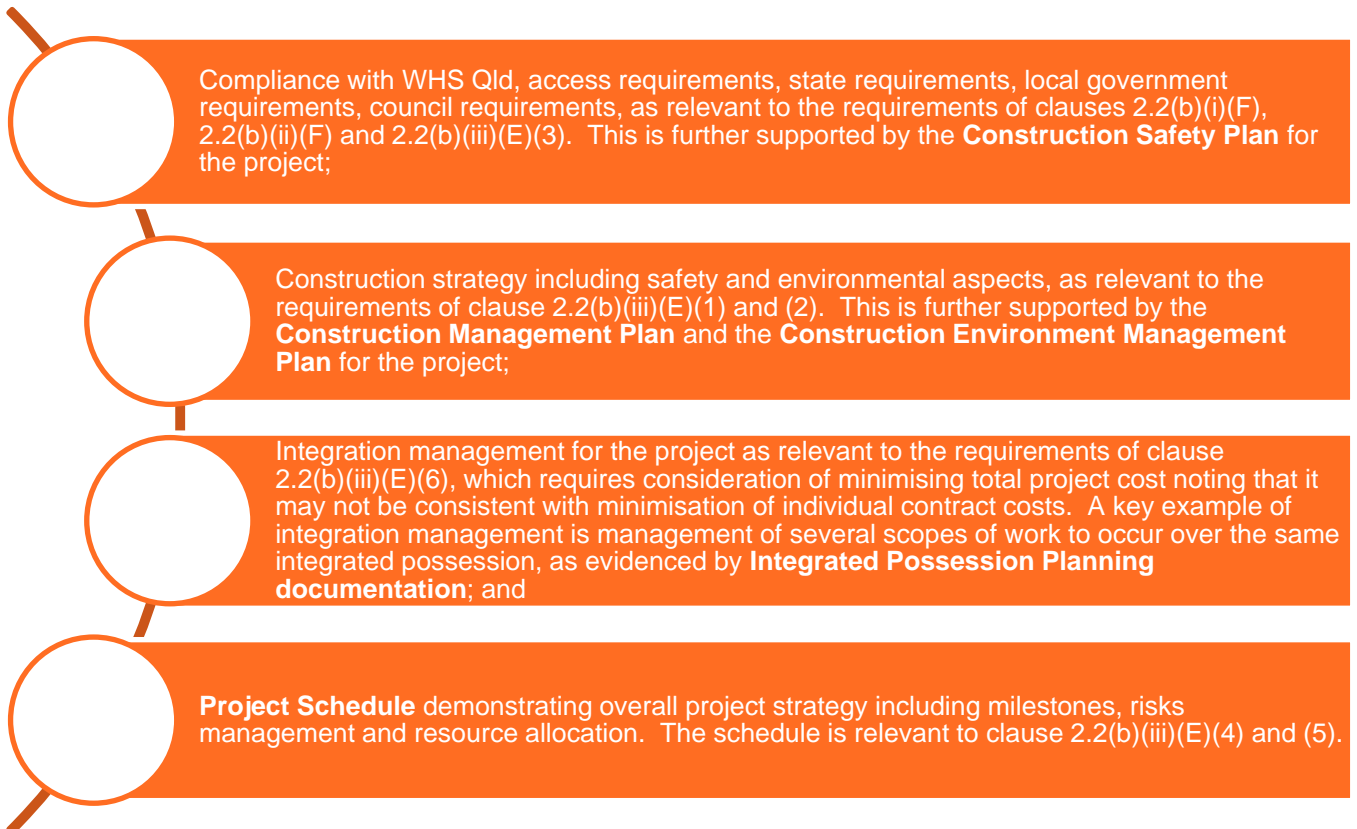


## Stakeholder Engagement

Where relevant, Aurizon Network consults with Access Seekers and Access Holders who may be impacted by the capital expenditure, in support of clause 2.2(b)(i)(G) of Schedule E of UT4. Matters raised by Funding Users are also considered, in line with the requirements of clauses 2.2(b)(i)(H), 2.2(b)(ii)(G) and 2.2(b)(iii)(F) of Schedule E of UT4.

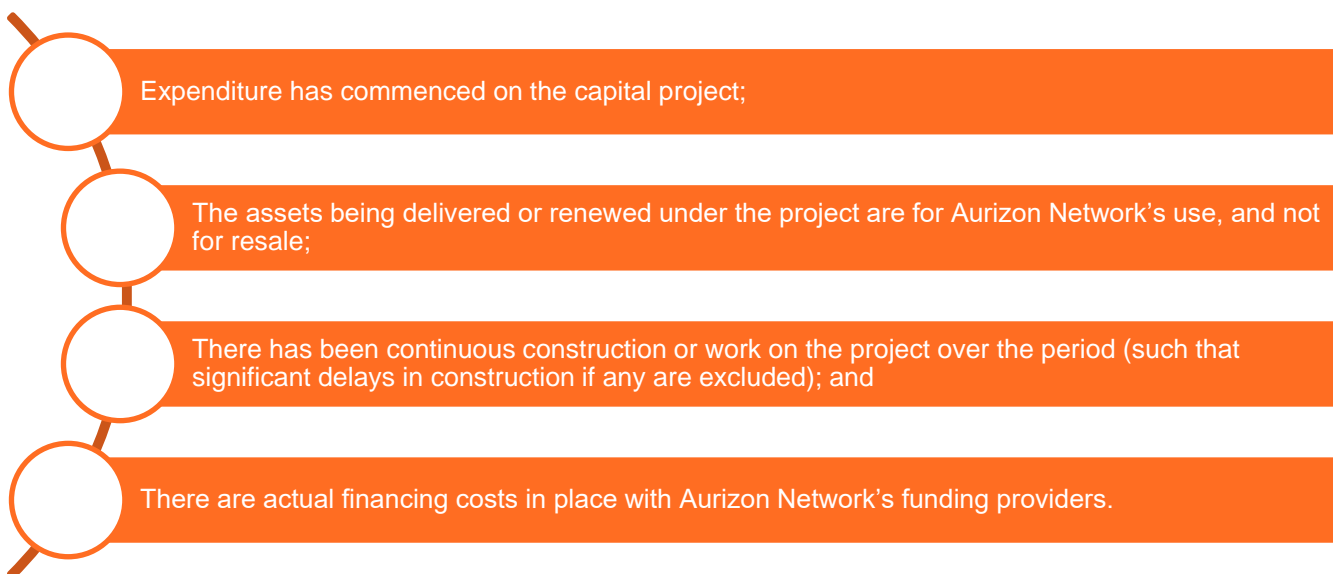
## Project Delivery and Construction

At a project delivery and construction level, **Project Management Plans** set out the methodology and strategy behind a number of key components of the projects, including, where relevant:



## Interest During Construction (IDC)

The financing charges incurred by Aurizon Network during the creation of assets are capitalised as appropriate. Refer to the **IDC Calculation Method** section for detail on how IDC is calculated. These costs associated with the use of funds are identified as **IDC**. Generally, this interest is capitalised where:



## Funding (Gearing) Ratio

The gearing ratio for Aurizon Network to source funds is debt of 55% and equity of 45%. The QCA has noted this is efficient and that the approved weighted average cost of capital (**WACC**) utilising this gearing ratio is appropriate for the calculation of IDC. This has been the method adopted since the approval of UT1 in December 2001.

Aurizon Network has applied the QCA approved regulated WACC to calculate the relevant IDC included in this submission.

## IDC Calculation Method

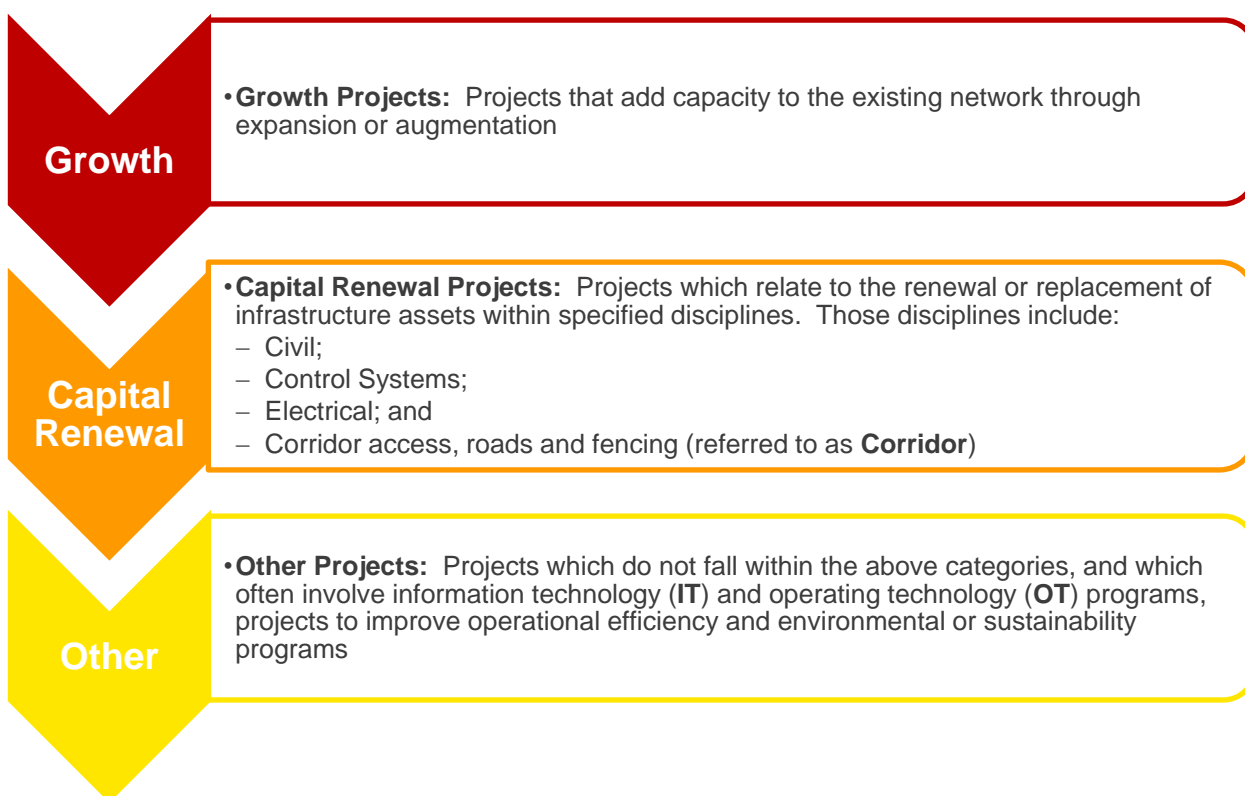
In calculating the IDC for this FY18 Capital Expenditure submission, Aurizon Network has applied the S-curve methodology. This is consistent with the calculation method applied by Aurizon Network, and approved by the QCA, from 2010.

To obtain the IDC amount, the S-curve approach uses monthly cash flow values, multiplied by the applicable interest rate. These cash flows are extracted from Aurizon Network's financial accounting system (**SAP**). The applicable interest rate is the WACC for the relevant regulatory period.

Aurizon Network includes approved capital expenditure into the RAB as at the 1<sup>st</sup> January in the year of commissioning of the project. To do this, the IDC calculation must be conducted to the mid-point in the year the project was commissioned. For the FY18 Capital Expenditure this mid-point is 31 December 2017. Any negative IDC is also calculated from the mid-point of the year, to the conclusion of the financial year.

## Capital Project Disciplines

Within this report Aurizon Network submits a number of projects which relate to three general project categories, and also the cost of funding such projects including IDC.



A summary of each of these categories, relevant to the FY18 Capital Expenditure, is set out in **Table 1**.

Project Type	Capital Expenditure (excluding IDC) (\$)	Interest During Construction (IDC) (\$)	Capital Expenditure (including IDC) (\$)
Growth	9,543,390	241,029	9,784,419
Capital Renewal	196,368,599	1,423,925	197,792,524
Other	5,276,428	-85,225	5,191,203
<b>Total</b>	<b>\$211,188,417</b>	<b>\$1,579,729</b>	<b>\$212,768,146</b>

**Table 1 – Summary of Capital Expenditure by Project Type**

## Growth Projects

Aurizon Network undertakes certain projects in order to meet its contractual obligations to access holders and address likely future usage levels. These are summarised by project discipline below in **Table 2**.

Project Discipline	Number of Growth Projects	Capital Expenditure (\$) (excluding IDC)
Civil	6	824,227
Expansion	1	8,719,163
<b>Total</b>	<b>7</b>	<b>\$9,543,390</b>

**Table 2 – Summary of Growth Projects by Project Discipline**

## Other Projects

The remaining projects which do not fit the Growth or Capital Renewal categories are summarised below in **Table 3**.

Project Discipline	Number of Capital Renewal Projects	Capital Expenditure (\$) (excluding IDC)
Civil	1	5,151,241
Corridor	1	125,187
<b>Total</b>	<b>2</b>	<b>\$5,276,428</b>

**Table 3 – Summary of Other Projects by Project Discipline**

## Capital Renewal Projects

In order to provide the safe and reliable operation of the CQCN, Aurizon Network undertakes the renewal of the assets used to deliver contractual obligations to access holders. Capital Renewal projects are capital investment works that replace or upgrade life expired infrastructure. Items are identified for renewal based on age, wear, condition and/or obsolescence.

Given the extent of these works, they are generally undertaken by, and reported by project disciplines. The capital expenditure attributed to each of these project disciplines is set out in **Table 4**. The majority of the projects and expenditure for this FY18 submission relate to Capital Renewal Projects.

To provide context, the sections below offer a summary by discipline of the type of works and assets which these renewals seek to address.

Project Discipline	Number of Capital Renewal Projects	Capital Expenditure (excluding IDC) (\$)
Civil	24	130,830,768
Control Systems	18	57,592,033
Electrical	4	6,853,166
Corridor	3	1,092,631
<b>Total</b>	<b>49</b>	<b>\$196,368,599</b>

**Table 4 – Summary of Capital Renewal Projects by Project Discipline**

## Capital Project Asset Types

### Civil

Civil, also known as TACA, projects include those relating to rail formation and ballast, sleepers, rail, turnouts and structures. The details of these asset types are set out in **Table 5** below.

Asset Type	Description	Capital Expenditure (\$) (excluding IDC)
Rail	Renewal of end of life rail	23,532,748
Track	A combination of assets types in works, including ballast, sleepers and rail replacement	28,876,624
Sleepers	Renewal of end of life sleepers, upgrade of timber to concrete sleepers, and upgrade of sleeper fasteners	13,405,462
Structures	Replacement of culverts and concrete drains	18,695,789
Formation / Ballast	Sub-formation, capping layer, ballast renewal and ballast cleaning	21,252,927
Various	Civil works conducted as part of a response to events such as cyclones or flooding	4,527,746
Turnouts	Turnouts and turnout components	14,903,012
Level Crossings	Road and rail interfaces and protection systems	5,636,460
<b>Total</b>		<b>\$130,830,768</b>

**Table 5 – Civil Projects by Asset Type**

## Control Systems

Control Systems projects include those relating to the assets that communicate with the Universal Traffic Control (**UTC**) system which allows train movements, identifies train locations, operates rail points, and activates level crossing protections. These systems are also required to monitor and protect below-rail assets from risk of derailment or infrastructure damage, from rolling stock defects. Control Systems projects also includes telecommunications projects, relating to assets providing the data linkages between field equipment and network control, enabling Aurion Network to manage safe train operations.

The details of the FY18 Projects involving Control Systems are set out in **Table 6**.

Asset Type	Description	Capital Expenditure (\$) (excluding IDC)
Network Controls	Provides Network Control systems, digital and microwave radio systems and information technology system	49,818,571
Signalling Equipment	Provides equipment related to signalling systems	595,541
Operational systems	Provides axle counters, monitoring systems	5,302,237
Telecommunication	Provides data, optic and radio linkages	1,875,684
<b>Total</b>		<b>\$57,592,033</b>

**Table 6 – Control Systems Projects by Asset Type**

## Electrical

Electrical projects cover works associated with all elements of the supply and distribution of electricity for the utilisation of electric traction in the Blackwater and Goonyella Systems. The details of these projects by asset type are set out in **Table 7** below.

Asset Type	Description	Capital Expenditure (\$) (excluding IDC)
Power Systems	Provides feeder stations, track section cabins and supply transformers	1,406,045
Distribution Network	Provides masts and wires of the distribution system	5,447,121
<b>Total</b>		<b>\$6,853,166</b>

**Table 7 – Electrical Projects by Asset Type**

## Corridor

Projects within the Corridor discipline include those which impact on assets within the rail corridor, such as access points, access roads and corridor security including fencing, as detailed in **Table 8** below.

Asset Type	Description	Capital Expenditure (\$) (excluding IDC)
Corridor Access	Provides access to the rail corridor and crew change facilities	1,092,631
<b>Total</b>		<b>\$1,092,631</b>

**Table 8 – Corridor Projects by Asset Type**

## FY18 Material Projects

Given the nature of the expenditure included in this submission, Aurizon Network has elected to provide detailed discussion in this report of only projects which have a claimed value of greater than \$6M. Projects below this threshold are dealt with on a summary basis only in this report see Error! Reference source not found. 9 below.

Project Number	Project Name	Project Type	Capital Expenditure (excluding IDC) (\$)
IV.00049	Radio System Replacement	Capital Renewal	23,351,894
IV.00323	Track Upgrade FY18	Capital Renewal	23,449,382
IV.00322	Rail Renewal FY18	Capital Renewal	21,468,545
IV.00329	Structures Renewal FY18	Capital Renewal	15,054,900
IV.00344	Formation Renewal FY18	Capital Renewal	12,236,291
IV.00364	Turnout Renewal FY18	Capital Renewal	11,500,392
A.04599	Havilah Culverts Upgrade	Growth	8,719,163
IV.00346	Package 1 FY18 Control Systems Renewal	Capital Renewal	8,223,807
IV.00347	Package 2 FY18 Control Systems Renewal	Capital Renewal	8,035,389
IV.00334	Bridge Ballast Renewal Program FY18	Capital Renewal	7,272,262
IV.00321	Sleeper Renewal Program FY18	Capital Renewal	6,747,175
<b>Total</b>			<b>\$146,059,200</b>

**Table 9 – Summary of Material Projects**

### IV.00323 Track Upgrade Program

The Track Upgrade Program, a Capital Renewal project, is a coordinated program renewing the track structure (sleepers, rail, fastenings and in some locations ballast), maximising the efficiency of construction. The renewal of track assets at the scoped locations ensures the ongoing integrity and reliability of the network, facilitating the current and future traffic task in a reliable manner.

The project involves upgrading the track structure to 60kg rail, 28tal concrete sleepers with galvanized Pandrol E clips and new ballast in select locations. Refer below to **Figure 2** for an example of a Pandrol E clip. Sites that have been identified for Track Upgrade in FY18 were spread across the CQCN; Goonyella, Newlands, Moura and Blackwater systems. A track upgrade site is determined by combining a site that has worn rail in need of replacement, and an area of Fist or timber sleepers that require replacement. In some cases (depending on the condition of the ballast), the scope may also request that the ballast be replaced at the same time. Upgrading the track structure at the same time minimises the amount of time that the track is disrupted in that location and the need to incur multiple site mobilisation costs.

The minimum scope to be completed at a location is driven by the amount of worn rail needing to be replaced, however consideration is also given to maximising the productivity of mobilising resources to that location. As labour and machinery are charged on a daily basis, the preference is to maximise the productivity from the costs being incurred by undertaking additional Fist or timber sleeper replacements in that location. As a result, in those locations where the Track Laying Machine (**TLM**) was utilised, the amount of sleeper replacement being undertaken may be increased to fully utilise the already paid for plant and labour, with the only additional cost being the sleepers and associated clips and pads.

In the early 1980's mainline track was constructed with 22.5tal concrete sleepers with 'fist clips'. mainline track was constructed with 22.5tal concrete sleepers with 'fist clips'. These fist clips fasten the rail to the sleeper by leveraging via a pin and clip arrangement through the body of the sleeper. With constant exposure to the coal and coastal environments, the pins and clips of these sleepers are becoming severely

corroded. The clips and pins are losing tension which can result in wide gauge and eventual failure of sleeper. Furthermore, these sleepers are rated at 22.5tal while the current track standard calls for 28tal sleepers.

The pins corrode within the sleeper, so the extent of corrosion is not fully evident on visual inspection. Given the increasing wide gauge issues, maintenance inspection of the affected areas has been increased to reduce the risk of gauge issues and likelihood of derailment. To manage this sleeper failure, a rolling sleeper replacement program has been implemented over the last couple of years. The replacement of the fist sleepers are on a priority basis determined by the condition of the sleeper. This is in addition to manual replacement during routine maintenance. Where rail is approaching the end of its life and is supported by timber sleepers which have a poor condition or fist sleepers, it is replaced with a concrete pandrol sleeper to meet current axle loads.

Aurizon manages its below rail renewal and replacement project using the project management function within the Engineering and Project Development area, with all asset renewal activity managed by the Asset Renewal Program Manager. One of the key benefits of this approach is that the Program Manager, along with the relevant Asset Manager, has a complete view of proposed works and can program numerous projects to occur concurrently by deferring or bringing forward works in a like location. For example, if a section of sleepers in a location are programmed for replacement and on review the sleepers are expected to require replacement in 2 years and the ballast renewed in 3 years, as it is more efficient both in resource use and track possession to complete all three activities at the one time. This completion of multiple works at a single location is classed as Track Upgrade works.



**Figure 2 - Pandrol E clip**



#### IV.00049 Radio System Replacement

The Radio System Replacement Project, is a Capital Renewal project, the objective of which is to replace all existing Analogue radio networks in the CQCN with a TETRA Voice Private Mobile Radio Network (**PMR**). The project has been broken down into two main work packages:

1. Infrastructure Phase: the supporting infrastructure designed by Aurizon Infrastructure Engineering and delivered by tendering the work to the Telecommunications Installation Panel. The project has directly procured the materials from the preferred Aurizon Network material vendors and free issued these to the delivery contractors. A total cost of \$23.4M was attributable to this successfully completed phase of the project and is included within this Capital Expenditure Claim.
2. Deployment of TETRA radios: Radio System Design and Construct package. The deployment of TETRA radios commenced on 9 July 2018 and is anticipated to be commissioned and included in the FY19 Capital Expenditure Claim.

The replacement of Aurizon Network's analogue system is driven by two requirements: legislative compliance and system reliability. The telecommunications regulator, the Australian Communications and Media Authority (ACMA), has recently reallocated radio spectrum in the band that the Aurizon (and other rail network) radio systems currently occupy. As a result, Aurizon is required to upgrade the majority of its infrastructure and systems.

This forced change results in a changed frequency band allocation (out of the government band and into the Rail Industry allocated bands) and has changed the channel bandwidths (25kHz to 12.5kHz) necessitating a replacement of the existing radio system.

Aurizon Network's existing Ultra High Frequency (**UHF**) radio systems employed across the CQCN was designed and deployed in the early to mid-1990s. The majority of the existing radio 'base' equipment is beyond its original 15-year design life and was therefore becoming increasingly difficult and expensive to maintain due to the limited number of spare parts available as analogue radio networks become obsolete.

Aurizon Networks radio systems are critical and vital for the safe and efficient operation of the CQCN and include the interaction of the following systems:

- Train Control Radio (**TCR**) – Provides the voice communications between Network control and train crew;
- Maintenance Supervisory Radio (**MSR**) – Provides the voice communications between field staff and Network control;
- Wayside Monitoring and Telemetry (**WM&T**) – Provides data communications for connection of field equipment to systems used and monitored by Network Control;
- Automatic Train Protection (**ATP**) – Provides the data communication between Network control and field signals, turnouts and other remote infrastructure;
- Shunting and Yard Systems – provides communications within rail yards;
- Current train radio communications used within the CQCN are based on a UHF analogue Frequency Modulation (**FM**) 25kHz voice radio system.

#### IV.00322 Rail Renewal Program

Aurizon Network has 2,760KMs of track in the CQCN, the majority of which was installed in the 1980s and 1990s. The main reason for the rail renewal program, a Capital Renewal project, is due to rail wear as a result of friction between wagon wheels and the rail. Lubrication of curved rail and appropriate rail grinding is necessary to ensure rail reaches its maximum rail life. The greater the train weight the higher the friction and the greater the wear, meaning tracks carrying loaded trains will wear at a faster rate than tracks carrying empty trains. Refer below to **Figure 3** for an image of worn rail requiring repair.

The Rail Renewal Program for the CQCN aims to renew damaged or worn rail assets to ensure compliance with the mandatory Civil Engineering Track Standard (**CETS**) Network Safety Management System. CETS Module 2 prescribes the standards for the design, construction, monitoring, maintenance and modification of rail used in the CQCN and outlines specific thresholds for rail wear.

Rail wear limits are determined by a number of factors including; curve radius, axle load, rail type, rail size and curve leg. Rail wear is captured by manual measurements from Track Inspections and data from the Rail Inspection Vehicle (**RIV**) which measures the head loss of the rail at set intervals along the track. Wear measurements over the history of the curve can be used to determine the wear rate and the date in which replacement is required. Wear rates are directly associated with the level of traffic which passes over any respective track segment.

At high annual gross tonnages, the rate of growth of rail defects may become the limiting rail life factor. Rail wear reduces the rail cross section and does not transfer loads over the required number of sleepers and consequently internal rail stress becomes excessive, increasing the likelihood of rail bending.

Aurizon Network's rail renewal strategy supports the proactive replacement of life expired rail or defective rail before it can adversely impact safety and operational performance. The Rail Renewal Program is a long-term Asset Renewal Program with a prioritised program of works developed and funded yearly.



**Figure 3 – Rail wear**

#### IV.00329 Structures Renewals Program

This upgrade is a Capital Renewal project which will facilitate the current and future traffic and provide an asset suitable to the corrosive environments within the CQCN. Culverts and structures on the CQCN were predominantly installed during the initial track construction in the 1960's. Refer below to **Figure 4** for an image of a Culvert. These structures were designed for lower axle load and traffic tonnages than current operational requirements. The impact of running larger and heavier trains across these culverts since being installed have led to their accelerated degradation.

Due to overstress or condition deterioration culverts may collapse, leading to loss of top and line of the overlying track. Failure mechanisms will depend on the shape and dimension of the cross-section, maintenance undertaken to date as well as the culvert material. Culvert outlets and inlets which exhibit signs of scour are also a concern as the scour may advance towards the track and if unchecked may undermine the culvert and track itself. At best, speed restrictions would then be required to be imposed until repair/renewal of culverts is carried out while the worst case could see train derailment and track closures enforced until such time as the culverts are replaced and track reinstated.

The renewal or upgrade of the culverts increases the strength of the culverts to align with Civil Engineering Structures Standards (**CESS**), providing increased confidence in the asset and progressively improving the track infrastructure to enable future growth. The upgrading of the culverts is in line with Australian Standards and Aurizon's Code of Practice.

The Structural Renewal Program involves significant upfront site inspection, survey, design and approval activities. Currently there are 3,809 culverts and 339 bridges across the CQCN. Routine inspections, in accordance with CESS, identify structures approaching the end of their life which are then prioritised for completion under the project, using a priority rating model. Benefits of the project include less maintenance works, reduced inspection requirements, removal of speed restrictions and reduction of risk of derailments.

The FY18 Structures Renewals Program aimed to replace life-expired or near life-expired structures throughout the CQCN with new structures compliant to a 300LA design loading configuration (Australian Standard) and design flood immunity of Q100 (to top of rail) and Q50 (to top of formation).



**Figure 4 - Culvert**

#### IV.00344 Formation Renewal Program

The Formation Renewal Program, Capital Renewal, is a rolling Asset Renewal Program with a prioritised program of works developed and funded yearly. Scope is determined using track geometry (carried out by the Track Recording Car) which covers the entire CQCN and highlights areas of concern. Once a location has a geometry defect identified and it is determined to be due to formation failure it is then condition and risk assessed and prioritised. Refer to **Figure 5** for an example of Formation.

The criteria used to determine scope for FY18, similar to previous years, has been identified as follows:

- The current condition of the formation;
- The impact of traffic and frequency of tonnages on that track section;
- The probability of negative impact to the Network; and
- The availability of access to the track location if failure did occur.



**Figure 5 – Formation**

#### IV.00364 Turnout Renewal Program

The Turnout Renewal Program, a Capital Renewal project, is a rolling Asset Renewal Program with a prioritised program of works developed and funded yearly. The program objectives encompass the replacement of whole turnouts, upgrading of existing components and removal of turnouts that are no longer required to maintain the system capacity. Refer to **Figure 6** for an example of a Turnout.

The FY18 Turnout project successfully completed:

1. The renewal of six turnouts across the CQCN;
2. The removal of nine turnouts; and
3. The renewal of turnout components at 99 different sites.

By delivering this renewal program Aurizon Network will increase the reliability of the entire network's supply chain, while minimising the cost of the maintenance task.

Other benefits Include:

- Reduced risk of adverse network performance arising from rail defects.
- Improved supply chain benefit through decreased transit time and increased reliability
- Improves operational safety of the network.



**Figure 6 – Turnout**

## IV.00346 Package 1 & IV.00347 Package 2 - FY18 Control Systems Renewal

Control Systems Assets include Aurizon Network's train control system, asset protection and signalling control assets as well as managing Australia's largest non-commercial telecommunications data network. This program of works seeks to maximise the performance and reliability of network assets whilst maintaining safety. The program consists of a total ten projects separated into Package 1 (IV.00346) and Package 2 (IV.00347). Each project has a prioritised scope identified within the Network Assets Scope Priority Model.

There are four projects in **Package 1 (IV.00346)** discussed in further detail below:

### 1. Train Detection:

This project is the renewal of train detection assets in order to replace end of life track circuit related equipment and reduce fault impacts experienced by the network operators and reduce maintenance effort on the track circuit equipment.

### 2. Interlocking Assets:

Interlocking assets are the signalling components which control local signalling equipment e.g. signals and track circuits according to predetermined functional and safety rules. Interlocking assets allow Network Control to operate Remote Control signalling equipment which displays to the train controller via UTC status of signals and points and shows the passage of train through the CQCN Rail Network.

### 3. Power Resilience:

Trains have been delayed due to instability of the older signalling power systems, particularly during storm activity. The solution to this problem has been achieved by the rollout of a new Power Equipment Rooms (**PER**) that house uninterruptable power supplies that reduce significantly power instability caused by storms. This project delivered a reduction in signals being restored to stop during power changeover. This had a flow on effect of reducing train delays.

### 4. UTC/DTC Upgrade

The UTC/DTC upgrade project provided software and hardware updates to the key train control systems Universal Train Control (**UTC**) & Direct Train Control (**DTC**) which operate throughout the CQCN. The upgrades included software changes to the UTC system to improve safety & reliability and hardware changes to improve telemetry systems and Networking equipment that enables communications with field signalling equipment and the UTC and DTC system elements. These updates maintain and extend the life of the existing train control systems.

The project scope was determined through joint communication of the working group that meets quarterly to reprioritise the updates and proposed scope.

- A safety enhancement, providing an additional screen icon for items that currently only have text prompts
- An enhancement to upscale the UTC into the internet age, replacing aging modem infrastructure and bearers with IP based modern equivalents. This improves system reliability, allows self-healing networks, cheaper telemetry carriers and greatly simplifies disaster recovery.
- A safety enhancement, this improvement prevents accidental release of blocking placed on the UTC in support of isolations or electrical incidents.
- A safety enhancement, building the functionality of the Track Access System (**TAS**) system, providing additional location identifying features and enhanced electronic forms.
- An obsolescence replacement. The Train Overview System (**TOS**) System provides train information to external systems, primarily the widely used Realtime Train Overview (**RTOA**). TOS itself is Windows NT based and was moved to a virtual environment in FY17, however the system requires upgrade to ensure its future viability. Any changes to TOS will also obviously require changes to RTOA.

There are six projects in **Package 2 (IV.00347)**, discussed in further detail below:

1. Transmission Renewal

This project renewed elements of both the DMR and Optic Fibre (**OF**) based Synchronous Digital Hierarchy (**SDH**) transmission systems to provide a reliable telecommunications system that enables communications from central control systems to field sites for Train Control, Traction Power Control and Radio Systems throughout the CQCN.

2. Diagnostic Computer Renewals

This project replaced life expired Signalling Diagnostic Computers at seven sites across the CQCN. The project objective was to improve fault detection and reduce signalling outage time in the network.

3. Asset Protection

The asset protection replacement was a technology refresh program driven by equipment obsolescence and legislative changes. This project replaced end of life and obsolete asset protection equipment in order to preserve the level of protection they provide.

4. Vital Disabling Release

The Vital Disabling Release Project improved the operational efficiency of the signalling network. This project can be measured by the operational impact that is caused by installing temporary safe working alterations at level crossings.

5. Control Systems Infrastructure Renewal

The project renewed elements of the telecommunications and signalling operational network that provide optical fibre cabling and equipment rooms and generators that provide the base infrastructure that the signalling, telecommunications and control systems require to enable and support train operations throughout the CQCN. Key Benefits of this project are extending life of the control systems infrastructure assets, improved reliability, and reduced maintenance cost. Newer generators assets have a richer monitoring and remote diagnostic features.

6. Location Cases

This project renewed 21 location cases and relocated them outside of the Danger Zone in line with the Asset Policy. Location cases are generally replaced in the shadow of larger interlocking replacements. The housing itself has a long life in excess of 50 years.

## **A.04599 Havilah Culverts Upgrade**

Between 2007 and 2012 Aurizon Network completed an expansion project, the Goonyella to Abbot Point Expansion project (GAPE), which linked the Goonyella coal system with the Newlands Systems, enabling the transportation of up to 50Mtpa of coal to the port at Abbot Point. This project was initiated in response to strong industry demand for increased capacity in the Northern Bowen Basin (**NBB**). Upgrades were required to enable the expansion to handle the heavier 26.5-tonne axle loads, including four culverts at Havilah which were identified to have reached end of life in 2012. Havilah Culverts Upgrade project is essentially the replacement of these four culverts that were not completed as part of the GAPE scope due to time constraints.

Last year, two of the four culverts (135.53km and 143.10km). were included within the FY17 Capital Expenditure Report approved as prudent and efficient by the QCA (\$4.2M) in its decision dated 19 July 2018. This year the remaining two culverts (139.20km and 145.10km) are included within the FY18 Capital Expenditure Report (\$9.0M).

#### IV.00334 Bridge Ballast Program

The Bridge Ballast Renewal Program seeks to renew and replace ballast depth and profile in line with the Civil Engineering Track Standard (**CETS**) limit at priority sites across CQCN. Bridge Ballast Renewals are not included as part of Aurizon Network's maintenance allowance budget under Ballast Undercutting and as such is dealt with as a renewal activity. Aurizon Network has approximately 19.0km of ballast on 258 ballast-deck bridges across the CQCN.

The replacement of fouled ballast on bridges ensures that the track is able to drain freely, and the ballast is able to absorb and transfer the weight of trains evenly. This prevents the development of 'mud holes' and prevents the track from 'pumping', issues that can lead to a rail break which could lead to a derailment.

Ballast is typically made from crushed stone and forms the bed upon which sleepers are laid. Its primary functions are to:

- "lock" track in place
- enable even load distribution to the underlying formation/bridge structure, and;
- facilitate the drainage of water, and;
- enable mechanised reinstatement of top & line

Coal fouling and other contaminants impede the ballast's drainage functionality. As the ballast becomes increasingly fouled normal track maintenance techniques (i.e. resurfacing) are no longer effective and result in the increasing occurrence of track geometry anomalies and rail faults. These defects cause the track to settle unevenly resulting in a weakened track structure that requires regular and often reactive maintenance. It also increases the risk of derailment, train partings and broken rails. Typically, these risks are managed using speed and load restrictions.

In comparison to ballast undercutting practises, ballast renewal on bridge decks pose a unique problem due to their narrow design and the fact that there are often significant safety concerns (working at height) as well as environmental concerns of fouled ballast spilling into creeks and rivers below. The narrow design ensures that ballast undercutting techniques through mechanised, efficient bespoke machinery cannot be utilised. As a result, manual techniques of track de-construction and re-construction are required.

The scope for this rolling program is based on the following analysis:

- Civil Asset Management System (**CAMS**): based on ballast depth, extent and depth of fouling, RIMS defects, track geometry;
- Defects: feedback from Network Asset Maintenance based primarily on track geometry and defects data;
- Speed Restrictions: Bridges with speed restrictions impacting revenue traffic throughput.;
- New technologies: utilisation of ballast matting and membranes in order to reduce the changes in track stiffness between splay set to splay set;
- Track Criticality Rating: location of the bridge has been assessed in accordance with the Criticality Asset Strategy and Policy.



#### IV.00321 Sleeper Renewals Program

This project is to replace priority life expired and ineffective timber sleepers and corroded fist fastened sleepers designed for 22.5tal and selected timber sleepers 'on a face' (i.e replace everything between the start and finish points) with 28tal Pandrol e-clip concrete sleepers at numerous identified sites within the Goonyella, Moura, Newlands and Blackwater systems.

The sleeper is a fundamental component of the track structure and performs four critical functions to ensure the reliable passage of trains:

- Holds the track in alignment both vertically and horizontally;
- Holds the rails on which trains are conveyed and guided to "Gauge";
- Spreads the load of the trains from the wheels to the underlying soil and formation in a controlled and designed manner;
- Provides mass and resistance to lateral forces from trains and thermal effects.

As detailed in the *IV.00323 Track Upgrade Program* section, an ongoing sleeper program has been implemented to carry out sleeper replacement on a priority basis determined by the inspection regime of the track assets.

In addition to the renewal of fist concrete sleepers due to fastenings at end of life, sleeper upgrade and renewal requirements also include:

- Replacement of derailment damaged sleepers previously left in track, but at end of service life under current increased traffic operations;
- Upgrade of timber sleeper track with high sleeper replacement and maintenance requirements;

Derailed damaged sleepers suffer various damages which affect the sleeper performance and hence reliability and transit times of train services traversing them.

Timber sleepers have similar and more dramatic degradation effects. Timber sleepers still constitute a significant portion of the network. Timber, because of its organic nature, degrades and loses life not only by train traffic but also through climate and exposure to the weather environment independently of train traffic.

## FY18 Non-material Projects

The remaining projects, less than \$6M, appear across various categories and in some instances include post-commissioning expenditure. These projects are considered non-material for the purpose of this report, and hence are dealt with by way of summary. **Table 10** summarises the value of non-material projects across each of the categories of Growth, Capital Renewal and Other.

Project Type	Number of Non-material Projects	Capital Expenditure (excluding IDC) (\$)
Capital Renewal	39	58,533,206
Growth	6	1,319,583
Other	2	5,276,428
<b>Total</b>	<b>47</b>	<b>\$65,129,218</b>

**Table 10 – Summary of Non-material Projects**

The expenditure within the Growth and Other projects categories are primarily related to projects which have been approved by the QCA in previous years. Expenditure related to post-commissioning costs which form part of these categories as discussed in the *Post Commissioning Expenditure* section.

The projects within the Capital Renewals category (excluding the material projects detailed above), comprise the largest portion of this submission. These projects have been further segregated by the discipline of the tasks undertaken in those projects. As discussed in the section entitled *Capital Renewal Projects*.

## Post Commissioning Expenditure

A number of projects included in this FY18 Capital Expenditure submission have been commissioned in previous financial years. The substantive expenditure for these projects has been submitted to and approved by the QCA in prior year's submissions.

Accordingly, where expenditure has been captured against those projects post-commissioning, those amounts are being tendered in this submission for inclusion in the RAB as part of the efficient and prudent value of the assets.

Generally, costs relating to specific projects incurred in subsequent years are claimed annually until the project reaches financial close. These expenses are categorised as post-commissioning costs. Aurizon Network defines an asset commissioning as occurring when that asset has been certified as being available for the operation of revenue train services.

Demand for capacity is persistent in the CQCN, and as such to enable access to the rail networks as soon as possible, commissioning of a project – either growth or renewals – many take place prior to the completion of every aspect of work scheduled to be undertaken on a particular project. For example, diesel traction trains can traverse a section of infrastructure before any electrical infrastructure necessary to facilitate electric traction trains is completed. Similarly, trains can traverse new infrastructure under direct train control (**DTC**) whilst signalling works are being completed. Accordingly, these types of work activities are scheduled to be completed towards the end of the project, such that the infrastructure may become operational as soon as safe.

Post commissioning cost may also be incurred on a project when there is a delay in processing invoices for externally contracted works. Costs may also be incurred during any defects or liabilities period prior to 'practical completion' and project handover to Aurizon Network's asset maintenance divisions for ongoing operation and maintenance.

The details of the projects on which Aurizon Network is submitting post commissioning expenditure for approval are set out in **Table 11**.

Project Number	Project Name	Prior QCA Approved Expenditure (\$)	Capital Expenditure (excluding IDC) (\$)
<b>GROWTH</b>			
A.04599	Havilah Culverts Upgrade	4,158,181	8,719,163
A.01731	WIRP1: DINGO TO BLUFF DUPLICATION	207,915,221	550,225
A.02976	WIRP1: North Coast Line	165,185,289	159,332
A.03735	WIRP1: Bauhinia NORTH Upgrade	14,990,500	64,434
A.03686	WIRP1: MOURA SYSTEM UPGRADE	25,415,966	30,112
A.01552	WIRP1: WIGGINS BALLOON LOOP	192,978,405	22,465
A.01631	WIRP1: ROCKLANDS TO STANWELL DUPLICATION	167,882,805	-2,342
<b>RENEWALS</b>			
IV.00145	Track Upgrade FY17	21,590,978	5,145,878
IV.00399	2017 Cyclone Debbie Rectification	8,191,446	4,441,745
IV.00177	Structures Renewal FY17	11,570,468	3,618,047
IV.00146	Sleeper Renewal FY17	11,452,120	2,843,381
IV.00168	Turnout Renewal FY17	7,575,864	2,685,243
IV.00144	Rail Renewal FY17	31,495,740	2,064,204
IV.00154	FY17 Autotransformer Renewal Project	1,805,772	1,437,366
IV.00170	Bridge Ballast Renewals FY17	6,493,554	1,284,390
IV.00032	FY16 Turnout Renewal Program	12,290,474	717,377
IV.00169	Formation Renewal FY17	7,644,084	459,984
IV.00040	Train Detection Renewal Program	8,359,303	360,580
A.04313	Gauge Face Lubrication Asset Renewal	6,236,699	276,873
IV.00271	UTC and DTC Upgrade Program	2,836,843	264,528
IV.00267	Asset Protection Equipment Replacement	902,422	238,851
IV.00171	Level Crossings FY17	4,314,533	214,462
IV.00005	Blackwater Supersite	3,652,531	153,288
IV.00046	Interlocking Renewal Program	2,719,040	92,267
IV.00359	FY16 Goonyella Flood	5,849,021	86,001
A.04357	NR Gladstone Yard Retaining Wall Upgrade	1,279,836	22,842
IV.00260	CQ Access Roads FY17	205,317	14,561
IV.00025	NR Track Upgrade Program FY16	30,434,128	4,491
IV.00257	Minerva Renewals	4,416,762	1,107
IV.00056	Diagnostic Computer Renewal	241,949	-105
IV.00024	NR Vital Disabling Release	1,341,551	-2,585
A.04321	Central Coal UPS Upgrade Project	1,898,789	-9,291
IV.00262	Power Resilience FY17	2,004,360	-31,321
<b>OTHER</b>			
A.02628	COAL SYSTEM: COAL LOSS MANAGEMENT	4,015,001	125,187
<b>TOTAL</b>		<b>\$979,344,951</b>	<b>\$36,052,741</b>

**Table 11 – Post-Commissioning Expenditure**

## Other Supporting Information

Additional information for individual projects listed in *Appendix A: Capital Expenditure Project List* is available on request during the review of this submission.

## Conclusion

Aurizon Network is seeking the QCA's approval to include FY18 Capital Expenditure in the RAB, in accordance with clause 2 of Schedule E of UT4. This report provides the QCA with details of that capital expenditure which amounts to **\$211,188,417** excluding IDC (**\$1,579,729**), for a total of **\$212,768,146** including IDC.

## Appendix A: Capital Expenditure Project List

Project Number	Project Name	Project Type	Project Discipline	Asset Type	System	Claimable Expenditure (pre-escalation)
<b>MATERIAL PROJECTS</b>						
IV.00049	Radio System Replacement	Capital Renewal	Systems	Network Controls	System Wide	23,351,894
IV.00323	Track Upgrade FY18	Capital Renewal	CIVIL	Track	System Wide	23,449,382
IV.00322	Rail Renewal FY18	Capital Renewal	CIVIL	Rail	System Wide	21,468,545
IV.00329	Structures Renewal FY18	Capital Renewal	CIVIL	Structures	System Wide	15,054,900
IV.00344	Formation Renewal FY18	Capital Renewal	CIVIL	Formation / Ballast	System Wide	12,236,291
IV.00364	Turnout Renewal FY18	Capital Renewal	CIVIL	Turnouts	System Wide	11,500,392
A.04599	Havilah Culverts Upgrade	Growth	Expansion	Structures	Newlands	8,719,163
IV.00346	Package 1 FY18 Control Systems Renewal	Capital Renewal	Systems	Network Controls	System Wide	8,223,807
IV.00347	Package 2 FY18 Control Systems Renewal	Capital Renewal	Systems	Network Controls	System Wide	8,035,389
IV.00334	Bridge Ballast Renewal Program FY18	Capital Renewal	CIVIL	Formation / Ballast	System Wide	7,272,262
IV.00321	Sleeper Renewal Program FY18	Capital Renewal	CIVIL	Sleepers	System Wide	6,747,175
<b>Sub total</b>						<b>\$146,059,200</b>

Project Number	Project Name	Project Type	Project Discipline	Asset Type	System	Claimable Expenditure (pre-escalation)
<b>NON-MATERIAL PROJECTS</b>						
IV.00343	Level Crossings Renewal Program FY18	Capital Renewal	CIVIL	Level Crossings	System Wide	5,421,998
IV.00360	Network Asset Mgt System Tranche 2	Capital Renewal	Systems	Operational Systems	System Wide	5,311,528
IV.00145	Track Upgrade FY17	Capital Renewal	CIVIL	Track	System Wide	5,145,878
IV.00437	Callide Infrastructure Upgrade	Other	CIVIL	Track	TBC	5,151,241
IV.00399	2017 Cyclone Debbie Rectification	Capital Renewal	CIVIL	Various	System Wide	4,441,745
OP.00161	FY18 Minerva Renewals	Capital Renewal	CIVIL	Sleepers	Blackwater	3,813,799
IV.00177	Structures Renewal FY17	Capital Renewal	CIVIL	Structures	System Wide	3,618,047
IV.00384	OH Equipment Renewal FY18	Capital Renewal	Electrical	Distribution Network	System Wide	3,461,614
IV.00270	Ethernet to Corner SCADA Upgrade FY17	Capital Renewal	Systems	Network Controls	System Wide	3,022,135
IV.00146	Sleeper Renewal FY17	Capital Renewal	CIVIL	Sleepers	System Wide	2,843,381
IV.00168	Turnout Renewal FY17	Capital Renewal	CIVIL	Turnouts	System Wide	2,685,243
IV.00294	Goonyella Supersite FY17	Capital Renewal	Systems	Network Controls	Goonyella	2,147,879
IV.00144	Rail Renewal FY17	Capital Renewal	CIVIL	Rail	System Wide	2,064,204
IV.00004	Traction Fault Locator Renewal	Capital Renewal	Electrical	Distribution Network	System Wide	1,985,507
IV.00283	Traction SCADA System	Capital Renewal	Systems	Network Controls	System Wide	2,078,916
IV.00266	Transmission Renewal FY17	Capital Renewal	Systems	Network Controls	System Wide	1,926,012
IV.00261	Telecommunications Infrastructure Renewa	Capital Renewal	Systems	Telecommunication	System Wide	1,875,684
IV.00154	FY17 Autotransformer Renewal Project	Capital Renewal	Electrical	Power Systems	System Wide	1,437,366
IV.00170	Bridge Ballast Renewals FY17	Capital Renewal	CIVIL	Formation / Ballast	System Wide	1,284,390
IV.00375	Corridor Security & Fencing FY18	Capital Renewal	Corridor	Corridor Access	System Wide	769,726
IV.00032	FY16 Turnout Renewal Program	Capital Renewal	CIVIL	Turnouts	System Wide	717,377
A.01731	WIRP1: DINGO TO BLUFF DUPLICATION	Growth	CIVIL	Track	Blackwater	550,225
IV.00184	Network Capacity Model	Capital Renewal	Systems	Network Controls	System Wide	521,256
IV.00169	Formation Renewal FY17	Capital Renewal	CIVIL	Formation / Ballast	System Wide	459,984
IV.00040	Train Detection Renewal Program	Capital Renewal	Systems	Network Controls	Goonyella	360,580
IV.00316	Access Points Renewal Program	Capital Renewal	Corridor	Corridor Access	System Wide	308,344

A.04313	Gauge Face Lubrication Asset Renewal	Capital Renewal	CIVIL	Track	System Wide	276,873
IV.00271	UTC and DTC Upgrade Program	Capital Renewal	Systems	Signalling Equipment	System Wide	264,528
IV.00267	Asset Protection Equipment Replacement	Capital Renewal	Systems	Signalling Equipment	System Wide	238,851
IV.00171	Level Crossings FY17	Capital Renewal	CIVIL	Level Crossings	System Wide	214,462
A.02976	WIRP1: North Coast Line	Growth	CIVIL	Track	Blackwater	159,332
IV.00005	Blackwater Supersite	Capital Renewal	Systems	Network Controls	Blackwater	153,288
A.02628	COAL SYSTEM: COAL LOSS MANAGEMENT	Other	Corridor	Environmental	System Wide	125,187
IV.00046	Interlocking Renewal Program	Capital Renewal	Systems	Signalling Equipment	System Wide	92,267
IV.00359	FY16 Goonyella Flood	Capital Renewal	CIVIL	Various	Goonyella	86,001
A.03735	WIRP1: Bauhinia NORTH Upgrade	Growth	CIVIL	Track	Blackwater	64,434
A.03686	WIRP1: MOURA SYSTEM UPGRADE	Growth	CIVIL	Track	Moura	30,112
A.04357	NR Gladstone Yard Retaining Wall Upgrade	Capital Renewal	CIVIL	Structures	Blackwater	22,842
A.01552	WIRP1: WIGGINS BALLOON LOOP	Growth	CIVIL	Track	Blackwater	22,465
IV.00260	CQ Access Roads FY17	Capital Renewal	Corridor	Corridor Access	System Wide	14,561
IV.00025	NR Track Upgrade Program FY16	Capital Renewal	CIVIL	Track	System Wide	4,491
IV.00257	Minerva Renewals	Capital Renewal	CIVIL	Sleepers	Blackwater	1,107
IV.00056	Diagnostic Computer Renewal	Capital Renewal	Systems	Signalling Equipment	System Wide	-105
A.01631	WIRP1: ROCKLANDS TO STANWELL DUPLICATION	Growth	CIVIL	Track	Blackwater	-2,342
IV.00024	NR Vital Disabling Release	Capital Renewal	Systems	Network Controls	System Wide	-2,585
A.04321	Central Coal UPS Upgrade Project	Capital Renewal	Systems	Operational Systems	System Wide	-9,291
IV.00262	Power Resilience FY17	Capital Renewal	Electrical	Power Systems	Blackwater	-31,321
IV.00343	Level Crossings Renewal Program FY18	Capital Renewal	CIVIL	Level Crossings	System Wide	5,421,998
IV.00360	Network Asset Mgt System Tranche 2	Capital Renewal	Systems	Operational Systems	System Wide	5,311,528
IV.00145	Track Upgrade FY17	Capital Renewal	CIVIL	Track	System Wide	5,145,878

**Sub total \$65,129,218**

**TOTAL \$211,188,417**