



# Aurizon Network FY2021 Capital Expenditure Claim

Prepared by Aurizon Network  
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## 1. Introduction

Aurizon Network Pty Ltd (**Aurizon Network**) welcomes the opportunity to submit to the Queensland Competition Authority (**QCA**) its capital expenditure claim (**Capex Claim**) for the Financial Year ending 30 June 2021 (**FY21**). This submission provides evidence to support the QCA's prudence and efficiency assessment of the FY21 Capex Claim and the subsequent inclusion of Aurizon Network's capital expenditure into the Regulatory Asset Base (**RAB**).

Aurizon Network notes that the FY21 Capex Claim is the first to be submitted under the collaborative provisions of the QCA approved Draft Amending Access Undertaking (**DAAU**) to the 2017 Access Undertaking (**UT5**). It should be noted that Aurizon Network's inaugural FY21 Renewals Strategy and Budget (**approved RSB**) for all Coal Systems in the Central Queensland Coal Network (**CQCN**) was approved by the Rail Industry Group (**RIG**) on 14 February 2020. Throughout the course of FY21, Aurizon Network has sought wherever reasonably possible to deliver asset replacement and renewals activity in each Coal System in a manner that is consistent with the approved RSB.

The FY21 Capex Claim is comprised of three parts:

- **Part A - Asset Replacement and Renewal Expenditure claim (Renewals Capex Claim)**, \$241.3m including Interest During Construction (**IDC**), which:
  - i. demonstrates the extent to which Aurizon Network's capital expenditure and scope of work is consistent with the approved RSB for each Coal System; and
  - ii. in accordance with Clause 7A.11.6 (b)(iv)(B), Aurizon Network seeks QCA approval of additional costs where the Renewals Capex Claim departs from the approved RSB for each Coal System.
- **Part B – Advanced Planning and Scheduling (APS) Capex Claim**, \$60.0m including IDC, which relates to the delivery of Aurizon Network's APS system. APS is an asset renewal project that has replaced Aurizon Network's legacy planning and scheduling systems and manual processes with a modern, highly technical, integrated planning and scheduling platform.
- **Part C – Starlee Passing Loop Expansion Project** (\$9.4m including IDC). The Starlee Passing Loop Expansion Project (**Starlee Expansion**) was constructed to expand the capacity of the Bauhinia branch line to accommodate access rights being sought by Meteor Downs South (**MDS**).

Aurizon Network has split this FY21 Capital Claim into three parts to allow the QCA to assess them independently due to their unique nature and the separate obligations under UT5. Specifically, the APS project commenced prior to UT5 (and the relevant provisions of Clause 7A.11) being approved and the Starlee Expansion is not a renewal project. Consequently, Aurizon Network seeks QCA approval of:

- Part A in accordance with Clause 7A.11.6 (b); and
- Parts B and C in accordance with Clause 2.2 of Schedule E of UT5.

Capitalised terms in this submission have the meaning given in UT5, unless otherwise defined.

## 2. Investment Expenditure Framework

### 2.1 Aurizon's Enterprise Investment Framework

As detailed in the FY20 Capital Claim<sup>1</sup>, Aurizon Network adheres to the Aurizon Enterprise Investment Framework (**Framework**). In addition to that Framework, Aurizon Network has its own internal governance requirements which ensures the appropriate review and approvals from Network Finance, Network Operations, Network Assets and ultimately the Network Group Executive. The overall Framework is a rigorous process undertaken prior to the commitment of capital investments. The purpose of the Framework is to facilitate sound investment decisions and to ensure that:

- Investments have a high degree of success;
- Investment decisions are made on a consistent basis;
- Capital is optimised; and
- Learnings from past investments are recorded and taken into consideration as part of Aurizon Network's commitment to continuous improvement.

The Framework is informed by the requirements of UT5 and promote the prudence and efficiency of scope, standard and cost for capital expenditure. To inform and assist the internal governance process, Aurizon Network received pre-approval for its proposed FY21 asset replacement and renewal capital expenditure via the process outlined within Clause 7A.11.3 of UT5.

Appendix A contains additional information relating to the Framework, including an overview of the Capital Investment Stage Gate Framework that Aurizon Network utilises for its capital projects (**Stage Gate Process**).

To ensure the appropriate level of governance, routine sustaining capital investments which meet the feasibility stage objectives proceed straight to the feasibility stage gate. An Investment Approval Request (**IAR**) will be provided to the relevant members of the Network Leadership Team (**NLT**) and ultimately the Aurizon Investment Committee (**AIC**) for review and endorsement. Sustaining capital investments that are not classified as routine, still follow the Stage Gate Process.

#### 2.1.1 Project Discipline Types

Typically, IAR's contain projects that relate to three general project categories (**Discipline Types**). Table 1 provides an overview of these Discipline Types.

**Table 1 Capital Project Discipline Types**

Discipline Type	Characteristics	Approval Process
<b>Sustaining</b> - Includes projects which relate to the renewal or replacement of infrastructure assets within specified disciplines.	<ul style="list-style-type: none"><li>• Strategically aligned</li><li>• Routine/cyclical</li><li>• Typically, non-discretionary i.e. to comply with safety, regulatory standards</li><li>• Necessary to maintain existing operations and returns of the business</li></ul>	Streamlined Stage Gate Process
<b>Growth (i.e. Expansion Projects)</b> - Includes projects that add capacity to	<ul style="list-style-type: none"><li>• Strategically aligned</li><li>• Increase network capacity</li></ul>	Stage Gate Process

<sup>1</sup> <https://www.qca.org.au/wp-content/uploads/2020/09/ancapital-expeniture-report-201920.pdf>

Discipline Type	Characteristics	Approval Process
the existing network through expansion or augmentation.	<ul style="list-style-type: none"> <li>Typically, medium to long lead time to execute and complete (&gt; 12 months)</li> </ul>	
<b>Transformation</b> - Includes projects which do not fall within the Sustaining or Growth categories, and which often involve projects to improve operational efficiency and environmental or sustainability programs.	<ul style="list-style-type: none"> <li>Strategically aligned</li> <li>Typically drive incremental returns and/or productivity improvement</li> <li>Typically, medium to long lead time to execute and complete (&gt; 12 months)</li> </ul>	Stage Gate Process

## 2.2 UT5 Requirements

This submission is structured to delineate between RSB and non-RSB capital expenditure. This is due to there being two criteria within UT5 that the QCA must have regard to when assessing and approving the capital expenditure costs. Specifically, the UT5 criteria is as follows:

### **For Part A of this Capex Claim:**

The QCA must determine the extent to which the FY21 Renewals Capex Claim **is consistent with** the FY21 approved RSB for each Coal System in line with Clause 7A.11.6 (b). To the extent that the FY21 Renewals Capex Claim for a Coal System **is consistent with** the applicable approved RSB, the relevant End Users are deemed to support the relevant elements of the Renewals Capex Claim. Accordingly, the QCA will approve the Renewals Capex Claim.

### **Where Part A departs from the approved RSB and for Parts B and C of this FY21 Capex Claim:**

Clause 2.2(a) of Schedule E of UT5 requires that 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 the *Queensland Competition Authority Act 1997* (Qld), namely “the use of a coal system for providing transportation by rail”.

In determining the prudence and efficiency of capital expenditure, the QCA must have regard to the following three matters outlined in Clause 2.2 of Schedule E of UT5:

SCOPE	STANDARD	COST
<ul style="list-style-type: none"> <li>Scope 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>Standard of works, including whether the standard could be expected to deliver the requirements for that project without it being overdesigned 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>Costs 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 assess, in accordance with Clause 2.2(b) of Schedule E of UT5, whether the capital expenditure is prudent and efficient and in doing so, must 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).

This submission provides the QCA with the details of capital expenditure that Aurizon Network considers should be included in the RAB in accordance with Clause 2.2 of Schedule E of UT5, refer to section 5. Clause 2.2 of Schedule E of UT5 outlines in detail what the QCA must have regard to when determining the prudence and efficiency of scope, standard and cost.

## 2.3 Delineating Between Capital and Operating Expenditure

For the purposes of delineating between capital and operating expenditure, the criteria applied by Aurizon Network to define costs as capital expenditure is generally in accordance with the Australian Accounting Standard AASB 116 Property, Plant and Equipment.

Those costs which have been categorised as capital expenditure for work commissioned in FY21 are contained within this submission for inclusion in the RAB. For the purpose of this submission, commissioned assets refer to assets that have been installed and were ready for use on or before 30 June 2021.

Clause 1.3(a)(ii) of Schedule E of UT5 allows Aurizon Network to claim the costs of commissioned assets during the year within the annual Capex Claim. The approved RSB, however, is presented on the basis of total renewal spend expected to be incurred during the year. Aurizon Network has included additional information within this submission to reconcile the total costs that have been incurred during the year with the costs that have been included in the Capex Claim (i.e. commissioned assets) for subsequent inclusion in the RAB.

## 2.4 Interest During Construction (IDC)

Aurizon Network's approach to calculating IDC is consistent with the methodology that has been approved by the QCA since 2010.

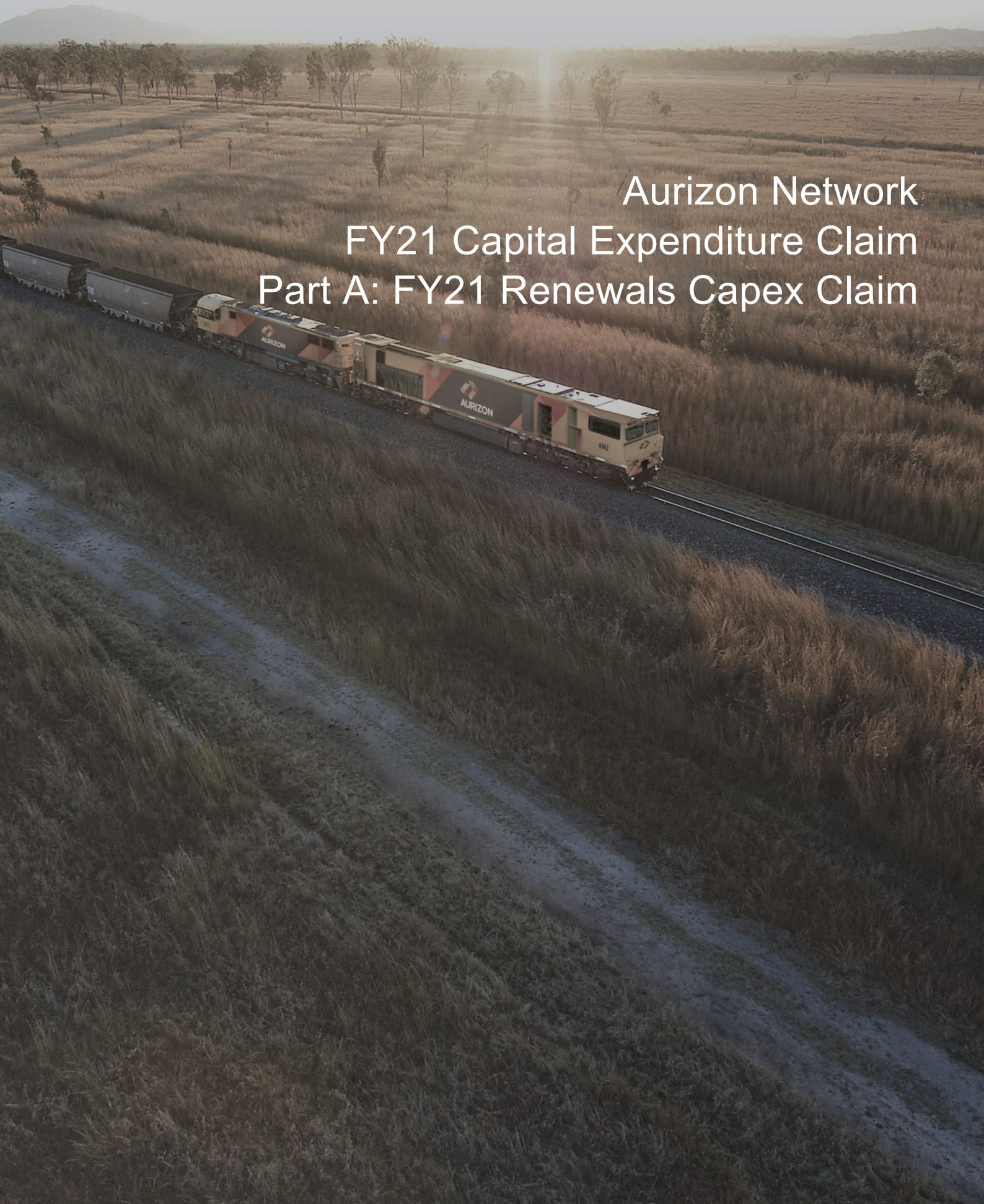
The regulatory model assumes that all capital expenditure is included in the RAB in the middle of the relevant financial year. IDC is therefore calculated up to and including the mid-point of the year in which the project was commissioned. For capital expenditure commissioned in FY21, the mid-point is 31 December 2020.

IDC is calculated using an S-curve methodology, whereby monthly cash flow values are multiplied by the applicable interest rate. The monthly cash flows for each project are extracted from Aurizon Network's financial accounting system (**SAP**). The applicable interest rate is the weighted average cost of capital (**WACC**) for the relevant year within the regulatory period.

Aurizon Network notes that the Report Date did not trigger during FY21 which ultimately means that Aurizon Network's WACC for the year remains at 5.9%. For the avoidance of doubt, Aurizon Network has applied the WACC of 5.9% for all IDC calculations within the FY21 Capex Claim.



Aurizon Network  
FY21 Capital Expenditure Claim  
Part A: FY21 Renewals Capex Claim



### 3. Introduction

Aurizon Network is the accredited Rail Infrastructure Manager (**RIM**) of the CQCN, the largest open-access coal rail network in Australia and one of the country's most complex rail freight networks. The CQCN is comprised of over 2,670 kilometres of heavy haul railway track, linking more than forty mines to five coal export terminals across four major Coal Systems and the Goonyella to Abbot Point Expansion (**GAPE**).

The approval of UT5 in the form agreed with customers, provided a unique opportunity for Aurizon Network and its Customers to adopt a new approach to working together; one that promotes greater collaboration and creates mutually beneficial outcomes. A key aspect of the new arrangements is the opportunity to enable greater customer involvement in the development and assessment of Aurizon Network's RSB on an annual basis for each Coal System.

On 14 February 2020, the Chair of the RIG advised Aurizon Network that "a Special Majority of End Users for each of the Moura, Blackwater, Goonyella and Newlands/GAPE Coal Systems have approved" the RSB for each Coal System for the Financial Year ending 30 June 2021.

Aurizon Network has sought to implement the FY21 approved RSB for each Coal System and has delivered the renewals program in a manner that has had regard to the UT5 Maintenance Objectives in terms of:

- Seeking to ensure that Committed Capacity is delivered;
- Appropriately balancing cost, reliability and performance of the Rail Infrastructure; and
- Coordinating outages with other Supply Chain Participants wherever reasonably possible with a view to maximising throughput.

In doing so, Aurizon Network notes that cost and scope variances do exist for some items, however appropriate justification for these is provided for within this submission and supporting documentation.

#### 3.1 Renewals Capex Claim

Aurizon Network submits for QCA approval, its Renewals Capex Claim for FY21. This Renewals Capex Claim details the:

- expenditure incurred;
- scope of works undertaken; and
- procurement strategy and methodology used.<sup>2</sup>

During FY21, Aurizon Network commissioned renewal capital projects representing a total investment of **\$238.7m** excluding IDC (**\$241.3m including IDC**) encompassing **35** projects across the CQCN, some of which were commenced prior to the commencement of the financial year. Actual costs incurred during the year was \$239.3m, which is \$27.3m lower than the approved RSB. A breakdown for each Coal System is outlined in Table 2.

**Table 2 FY21 Renewal Capex Claim by Coal System**

Coal System	Approved RSB (\$m)	Capex Incurred (\$m)	Variance (\$m)	Commissioned Capex Claimed excluding IDC (\$m)
Blackwater	116.1	106.4	9.7	108.0
Goonyella	113.5	101.2	12.3	103.5

<sup>2</sup> Clause 7A.11.6 (a) of UT5



Coal System	Approved RSB (\$m)	Capex Incurred (\$m)	Variance (\$m)	Commissioned Capex Claimed excluding IDC (\$m)
Moura	15.5	12.0	3.5	7.1
Newlands / GAPE	21.5	19.7	1.8	20.1
<b>Total CQCEN</b>	<b>266.6</b>	<b>239.3</b>	<b>27.3</b>	<b>238.7</b>

Aurizon Network's FY21 asset renewals program has sought to deliver the planned scope as per the approved RSB (\$266.6m) in an environment impacted by the global pandemic (**COVID-19**). The actual incurred costs for the FY21 asset renewals program is on aggregate, \$27.3m lower than the approved RSB's across the entire CQCEN. This reduction can be attributed to the deferral of a number of scope items from FY21 to FY22 due to a combination of factors such as; COVID-19, wet weather and supplier issues. Further information relating to these matters is provided in section 5 below.

The impact of COVID-19 created significant uncertainty in the ability to mobilise both internal and external resources, particularly for those not located in the geographical area of the CQCEN. In some instances, the supply chain for materials also experienced constraints. Some examples of the impacts to specific programs are outlined below.

The FY21 Control Systems and Structures renewals programs were impacted by COVID-19 with the attempt to complete works that were cancelled at the end of FY20. The FY21 Structures renewals program was largely able to recover however some culvert renewal sites will now be delivered in FY22. The Control Systems program has seen a number of scope items originally planned in FY21 added to the scope scheduled for completion in FY22.

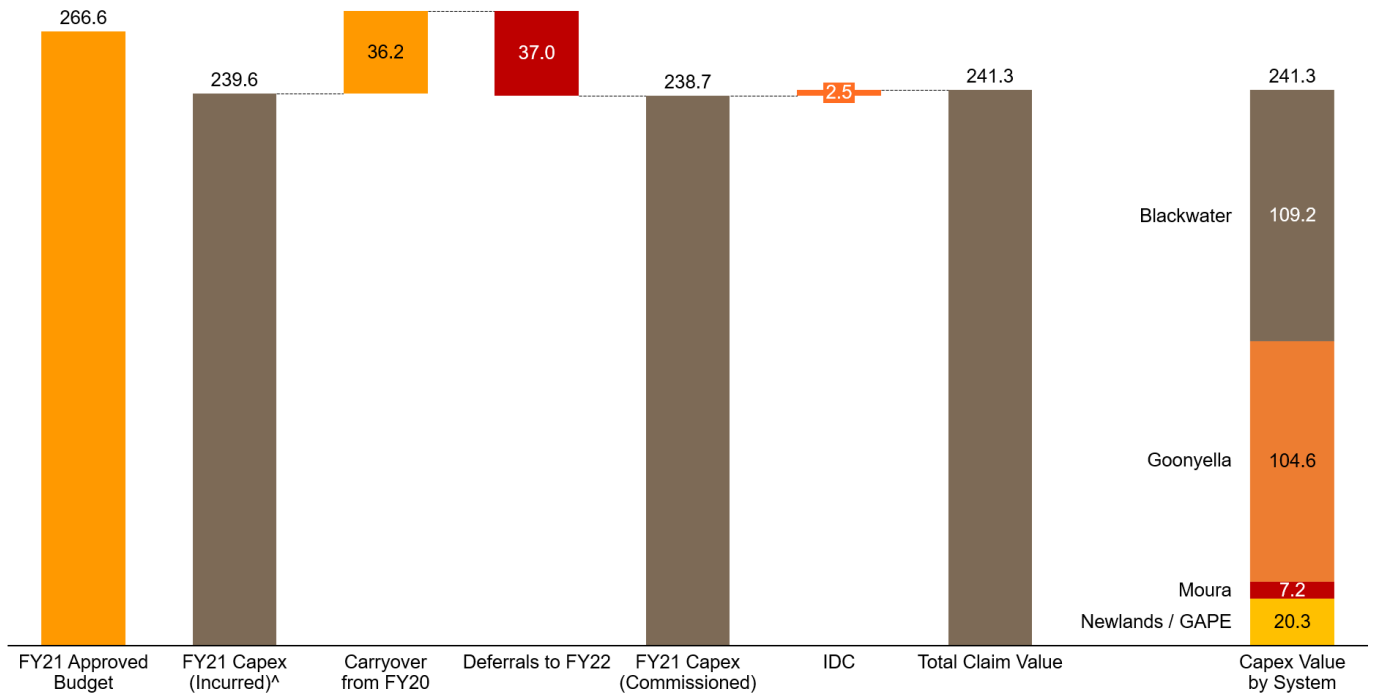
During the year, Aurizon Network has also sought to ensure that Committed Capacity is delivered. In some instances, this has seen scope rescheduled where the risk of overrunning a planned possession was deemed too high. One such example was the train detection and signalling works in Aroona – Duaringa that were rescheduled from May (FY21) to July (FY22).

In spite of the challenges, there were a number of successes in the year. Aurizon Network's engineering, planning and delivery teams worked closely with 3rd party contractors to deliver the optical fibre renewals at a significantly reduced cost and in a compressed timeframe. The Track Upgrade program also delivered more scope than initially planned, at a lower cost primarily as a result of the identification of internal planning opportunities which improved utilisation and mobilisation costs.

**Error! Reference source not found.** visually demonstrates the outcomes between the FY21 approved RSB and the FY21 capex incurred including a break-down of total claimed costs for each Coal System. Approximately 90% of the approved RSB has been accomplished (\$266.6m approved versus \$239.3 incurred), despite COVID-19 and other challenges.

Additional commentary for each Coal System's actual performance against the approved RSB can be found in section 5.

**Figure 1 FY21 Renewals Program**



*^Please note that the FY21 Capex (Incurred) value presented in Figure 1 differs slightly from the value presented in Table 2 above due to rounding.*

## 4. Assessment of the Renewals Capex Claim

### 4.1 QCA to assess consistency against approved RSB's

In accordance with Clause 7A.11.6(b), the QCA must determine the extent to which the FY21 Renewals Capex Claim is consistent with the FY21 approved RSB for each Coal System.<sup>3</sup> To the extent that the FY21 Renewals Capex Claim for a Coal System:

- **is consistent with** the applicable approved RSB, the relevant End Users are deemed to support the relevant elements of the Renewals Capex Claim. Accordingly, the QCA will approve the Renewals Capex Claim.<sup>4</sup>
- **departs from** the applicable approved RSB, the QCA will determine whether those additional costs specified in the Renewals Capex Claim are prudent and efficient. Aurizon Network notes that the QCA must approve the additional costs in a Renewals Capex Claim, to the extent those additional costs specified in the Renewal Capex Claim are prudent and efficient.<sup>5</sup>

Aurizon Network notes that the QCA will assess the prudence and efficiency and subsequent approval of renewal capital expenditure that departs from the approved RSB in accordance with Clause 2.2 of Schedule E of UT5.

Aurizon Network has sought to clearly identify the Asset Renewal Activities that depart from the approved RSB in section 5 below.

### 4.2 Consistency or Variations to the approved RSB

Clause 1.3(a)(ii) of Schedule E of UT5 allows Aurizon Network to submit the costs of assets that were *commissioned* during the year to the QCA for approval within the annual Capex Claim. Aurizon Network has included additional information to clearly outline the capital expenditure that has been *incurred* during the year versus what it is seeking to claim (commissioned assets) and include in the RAB.

Aurizon Network has provided a comparison of actual cost and scope delivered against the approved RSB for each Coal System. This information is presented in section 5 of this submission and is aligned to the information voluntarily provided to the RIG in Quarterly Reports.

To further demonstrate consistency, or outline where Aurizon Network has not been consistent with the approved RSB, Aurizon Network has prepared End of Year Financial Status Reports (**EOFY Reports**), for the 10 categories of asset renewal activities identified in the approved RSB. These EOFY Reports articulate the extent to which scope and cost is consistent with the approved RSB for each system, where Aurizon Network has departed from the approved RSB and supporting commentary or evidence to justify that the variations are indeed prudent and efficient.

The 10 categories of asset renewal activities are: Track Renewal, Ballast Undercutting, Bridge Ballast, Turnouts, Formation, Level Crossings, Structures, Corridor Assets, Control Systems and Electrical (which includes both Over Headline Equipment (**OHLE**) and Power systems).

In addition, works associated with the Network Asset Management System (**NAMS**) Next project, were undertaken this year. The system is now referred to as OneSAP. Capital expenditure associated with this project has been

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<sup>3</sup> Clause 7A.11.6 (b) (i) of UT5

<sup>4</sup> Clause 7A.11.6 (b) (iii) of UT5

<sup>5</sup> Clause 7A.11.6 (b) (iv) of UT5

included within Part A of this submission for approval and subsequent inclusion into the RAB. As this is a system wide renewal project, relevant commentary is provided here but is applicable to all Coal Systems.

OneSAP aims to improve data quality by replacing a legacy manual asset management process with an interrelated system that provides a digital representation of the asset life cycle. OneSAP is currently used for maintenance activities with the progressive transition of asset replacement and renewal activities into the system commencing in FY21. The OneSAP project was split into two stages with key deliverables adding functionality to the existing NAMS system. Stage 1 of this work was undertaken in FY21 and saw the installation of system enhancements including:

- Standardisation of the use of OneSAP across all maintenance and linear renewal tasks (i.e. Ballast, Track and Rail) improving the transparency of scope and costs against individual assets;
- All maintenance and linear renewal scope is now within a centralised system, meaning all scope and activities are captured against an individual asset, providing a complete view of activities against that asset. This provides opportunities to improve planning and alignment of other works in common locations; and
- Clearer visibility of completed tasks against plan via standardised reporting, resulting in improved transparency and insights, ultimately enabling effective asset management and investment decisions.

Aurizon Network is currently focussing on embedding OneSAP within its business processes and promoting consistency of inputs.

### 4.3 Prudency and efficiency of capital expenditure that departs from the Approved RSB

As per Clause 7A.11.6(b)(iv), to the extent that a Renewals Capex Claim for an individual Coal System departs from the applicable approved RSB, the QCA's review is limited to assessing whether the departed costs specified in the Renewals Capex Claim are prudent and efficient. The QCA must approve the additional costs in a Renewals Capex Claim, to the extent those additional costs specified in the Renewal Capex Claim are prudent and efficient. The QCA will assess the departed capital expenditure against Clause 2.2 of Schedule E of UT5.

Aurizon Network has sought to identify, for each individual Coal System, capital expenditure that has departed from the approved RSB within this submission.

#### 4.3.1 Prudency and Efficiency

Aurizon Network has prepared comprehensive documentation to support the QCA's assessment of prudency and efficiency of the scope, standard and cost for the capital expenditure which departs from the approved RSB. This documentation is outlined in Table 3 below and can be provided to the QCA on request.

**Table 3 Supporting documents accompanying this submission**

Document	Scope	Standard	Cost
FY21 Renewals Strategy & Budget	✓	✓	✓
End of Financial Year (EOFY) Status Reports	✓	✓	✓
Capital Expenditure Workbook			✓
Quarterly Reports FY21 Q1-Q4	✓		✓
OneSAP (NAMS Next) Project Completion Report	✓	✓	✓
OneSAP (NAMS Next) Investment Approval Request	✓	✓	✓

Further information can be provided to the QCA and/or their consultant if required, via a formal Request for Information (RFI) process.

## 5. Costs Incurred, Costs Claimed and Scope Achieved

The following section summarises Aurizon Network's asset replacement and renewals performance for the year.

### Costs Incurred

Costs incurred refer to costs that Aurizon Network has incurred when capital expenditure works have been undertaken throughout the year. For clarity, incurred costs are the key measure for determining consistency with the approved RSB for each Coal System. It should be noted that costs incurred may not exactly align to the costs claimed within this submission. Clause 1.3(a)(ii) of Schedule E of UT5 requires that Aurizon Network claim costs associated with commissioned assets.

### Costs Claimed

Costs claimed refer to costs that Aurizon Network is claiming within this submission. Claimed costs relate to assets that have been commissioned.

### Scope achieved

Scope achieved refers to scope undertaken through the year and is reflective of the costs incurred and costs claimed.

In accordance with Clause 7A.11.6(a)(i)-(iii) of UT5, Aurizon Network has provided a summary of costs incurred and scope achieved in the Blackwater, Goonyella, Moura, Newlands system and GAPE outlining where Aurizon Network has remained consistent or departed from the approved RSB.

Please note that the tables within section 5 of this submission are formatted differently from the tables presented in the FY21 approved RSB as presentation of information within this submission is better aligned to how Aurizon Network's internal processes and systems records the scope and costs that have been delivered. Tables within this submission represent a similar presentation of information to tables within the quarterly reports developed during consultation with and provided to Customers throughout the year. For example, the FY21 approved RSB reported kilometres of sleepers in track upgrade, whereas actual scope delivered is typically recorded as the quantity (number) of sleepers installed. Aurizon Network has sought to address this by including additional information within the FY22 RSB. Aurizon Network will seek to ensure better alignment when presenting the FY22 Capex Claim information against the FY22 RSB.

Aurizon Network has also included waterfall graphs in Appendix B to assist with the comparison of actual incurred asset renewals expenditure to the value of commissioned assets for each program that is included within this submission.

Aurizon Network's performance against the approved RSB has been assessed using the following criteria:

#### Consistent

- Cost are in line with or below the approved RSB; and or
- Approved scope was delivered, equal to or more.
- Aurizon Network considers that this scope and expenditure is consistent with the approved RSB for this Coal System. As per Clause 7A.11.6 (b)(iii) to the extent that the Renewals Capex Claim for a Year is consistent with the applicable approved RSB, the relevant End Users are deemed to support the relevant elements of the Renewals Capex Claim; and the QCA will approve the Renewals Capex Claim.

#### Departed

- Costs are higher than the approved RSB; and or
- Scope was not delivered in line with the approved RSB.
- As per Clause 7A.11.6 (b)(iv) to the extent that a Renewals Capex Claim for a Year departs from the applicable approved RSB, the QCA will determine whether those additional costs specified in the Renewals Capex Claim are prudent and efficient. The QCA must approve the additional costs in a Renewals Capex Claim, to the extent those additional costs specified in the Renewal Capex Claim are prudent and efficient, in line with Clause 2.2 of Schedule E of UT5.

Please note:

- the totals presented in the tables below may not add due to rounding; and
- A variance in brackets represents an underspend against the approved RSB. A variance not in brackets represents an overspend.

Throughout the year, Aurizon Network has communicated changes and variations with the approved RSB to the RIG through the provision of Quarterly Reports. All items and variations within the tables below have been communicated to the RIG.

## 5.1 Blackwater System

### 5.1.1 Cost Incurred and Scope Achieved for the year

Please refer to Table 4 for details of the costs incurred and scope achieved for each item, within the Blackwater system.

**Table 4 Blackwater System Costs Incurred & Scope achieved for the year**

Item	Note	Cost (\$m)			Scope (Qty)		
		Costs Incurred for the Year	Full Year Approved RSB	Variance	Scope achieved for the Year	Full Year Approved Scope	Variance
<b>Civil Assets</b>							
<b>Track Upgrade</b>		<b>28.2</b>	<b>29.6</b>	<b>(1.4)</b>			
- Track Upgrade		7.6	7.4		5.4	5.5	<b>(0.1)</b>
- Rail		13.6	14.8		37.5	35.3	<b>2.2</b>
- Sleeper		7.0	7.4		8.5	8.0	<b>0.5</b>
<b>Ballast Undercutting:</b>	<b>1</b>	<b>29.8</b>	<b>32.2</b>	<b>(2.4)</b>			
- Mainline		27.7	29.9		62.5	67.9	<b>(5.4)</b>
- Turnout		2.1	2.3		18	19	<b>(1)</b>
<b>Bridge Ballast</b>		<b>3.7</b>	<b>4.0</b>	<b>(0.3)</b>	1	1	--
<b>Turnouts</b>	<b>2</b>	<b>5.3</b>	<b>7.5</b>	<b>(2.2)</b>			
- Major Renewals		3.8	4.6		3	4	<b>(1)</b>
- Component Renewals		1.5	2.9				
<b>Formation Renewal</b>	<b>3</b>	<b>4.2</b>	<b>2.3</b>	<b>1.9</b>	2.2	0.8	<b>1.4</b>
<b>Level Crossing Renewal:</b>		<b>1.9</b>	<b>2.9</b>	<b>(1.0)</b>			
- Major Renewal		1.8	2.4		3	3	--
- Other Renewals		0.1	0.5				
<b>Structures:</b>	<b>4</b>	<b>14.2</b>	<b>11.2</b>	<b>3.0</b>			
- Culverts		13.7	9.1		25	24	<b>1</b>
- Bridges		--	0.2		--	1	<b>(1)</b>
- Other		0.5	1.9				
<b>Corridor Assets</b>		<b>1.7</b>	<b>1.6</b>	<b>0.1</b>			
<b>Control Systems Assets</b>							
<b>Safeworking System</b>	<b>5</b>	<b>13.6</b>	<b>19.1</b>	<b>(5.5)</b>			
- Train Detection		6.1	5.6		4	4	--
- Interlocking		3.6	3.3		2	5	<b>(3)</b>
- Asset Protection		0.3	0.6		1	4	<b>(3)</b>
<b>Train Control System</b>		<b>0.7</b>	<b>0.9</b>	<b>(0.2)</b>	9	14	<b>(5)</b>
<b>Telecommunication Assets</b>		<b>0.3</b>	<b>5.0</b>	<b>(4.7)</b>	10	38	<b>(28)</b>
<b>Transmission and Data Network</b>		<b>2.1</b>	<b>3.0</b>	<b>(0.9)</b>	29	57	<b>(28)</b>



	Cost (\$m)			Scope (Qty)		
Power Resilience	0.1	0.2	(0.1)	2	1	1
Other Control Systems	0.4	0.5	(0.1)	0	3	(3)
<b>Electrical Traction Assets</b>						
Overhead Line Equipment	1.0	1.3	(0.3)			
Power Systems	2.0	2.7	(0.7)			
<b>Transformation</b>						
OneSAP	0.8	1.7	(0.9)			
<b>Total</b>	<b>106.4</b>	<b>116.1</b>	<b>(9.7)</b>			

### Variation Commentary:

#### 1. Ballast Undercutting:

During FY21, Aurizon Network delivered a total of 62.5km (92%) of mainline ballast undercutting in the Blackwater system; representing a variance of 5.4km (8%) in comparison to the approved RSB (67.5km). This variance is driven by a scope shortfall of 4km between Westwood to Windah (6km long). The full scope of work in this location was unable to be completed due to the signalling configuration, which would not allow single line running (i.e. where one road is closed and the other remains open to rail traffic). As a consequence, scope could not be completed without a full closure, which Aurizon Network assessed as having the potential to materially disrupt Coal Services. Aurizon Network made the decision to defer this work until it could be completed in a way that would minimise disruption. Furthermore, approximately 1km of scope was unable to be completed from Parnabal to Walton as a result of higher coal contamination levels within the ballast, therefore reducing the amount of ballast that could be reused.

#### 2. Turnouts:

The turnout renewal at Archer has been deferred to FY22 due to insufficient access hours (48hrs) being available to complete the scope. The original scope identified in FY20 did not require a full formation renewal. A full formation renewal was discovered after geo-technical investigations, however as there was no adequate closure time to complete works in FY21 the works have been rescheduled to FY22. This was included in the FY22 RSB that was approved by Blackwater End Users.

#### 3. Formation Renewal:

The actual delivered scope exceeds the annual approved scope, this is attributable to the completion of additional fix-on-fail works, which given their nature, were not planned as part of the original FY21 strategy and budget.

#### 4. Structures:

The spend and scope on culvert renewals was impacted by a number of factors, including:

- When the contractor mobilised to perform the culvert tunnel lining renewals between Aroona and Duaringa they noticed a substantial amount of deflection when under rail traffic, which meant the job could not be completed without a track closure. Furthermore, the work had to be then split across multiple closures to provide sufficient time to complete the task, this has resulted in an increase in construction costs of approximately \$0.5m due to multiple mobilisations and resulted in delays to the scheduled completion of this activity. The work is now forecast to be completed in FY22, with an additional spend of \$1.4m expected to be incurred to complete the necessary works at this site.
- Additional costs of approximately \$0.25m were incurred on a culvert replacement between Midgee and Archer. The works required the replacement of a large culvert under 1 track only, which is built up against a 2nd culvert under the adjacent track. Furthermore, the foundations of a mast supporting the overhead power lines was in close proximity to culvert. The budgeted cost underestimated the complexity of the construction associated with replacing this culvert.

- Aurizon Network completed 25 culvert renewals in FY21 against a budget of 24. This was attributable to culvert renewals and Cured in Place Pipe (**CIPP**) scope that was deferred from FY20 into FY21 as a result of COVID-19 related procurement delays. The spend relating to these FY20 scope items was approximately \$0.3m.
- Bridge scope in the approved RSB related to the application of shotcrete to the wingwall of a bridge. On assessment of this site, these works were deprioritised to attend more critical scope. As a result, this activity did not take place in FY21, resulting in no spend or scope in this category.

## 5. Control Systems:

- Train Detection - Four train detection renewals were completed in FY21, which aligns with the approved RSB. Two of the completed activities (at Edungalba and Wallaroo) related to works that were delayed from FY20. It should be noted that two renewals (at Aroona and Duaringa) that were originally budgeted for completion in FY21 will now be commissioned in FY22. The installation at these sites had been completed in FY21, however the final commissioning was delayed to July 2021 (i.e. beginning of FY22) to reduce the risk of the closure over-running and therefore minimising any potential disruption to Coal Services.
- Interlocking - Actual interlocking scope delivered is reflective of commissioned sites only. The original budgeted scope quantity also included design milestones. The 2 interlockings that were commissioned in FY21 are at Bajool and Wallaroo. Design and preliminary work were completed for Raglan, Marmor, Callemondah and Archer.
- Asset Protection - Remote monitoring equipment at Callemondah and Train Alarms at Ensham and Rolleston were not completed in FY21 due to the availability of external resources for design works coupled with extended delivery time frames on long-lead time materials. This is now planned for completion in FY22.
- Telecommunications - a section of optical fibre renewal (26km) near Aroona and Duaringa was not completed as a result of delays to other scope and external contractor constraints. Approximately 20km of the shortfall has now been installed with the remainder to be completed in August 2021 (FY22). Aurizon Network has a limited number of suitably qualified external suppliers available to complete cabling and associated works. As a result, these suppliers are used extensively across the entire asset renewal program and for third party works. The completion of the cabling works on the Aroona Duaringa train detection and the Marmor interlocking sites were prioritised over the optic fibre works due to the number and availability of resources across a range of control system disciplines. In addition, train detection requires a closure for works to be completed, however the optic fibre works can be done outside of a closure and as such the train detection was prioritised making efficient use of the possession.
- Transmission and Data Network - further design work is taking place on the Tetra Digital Radio network to ensure the solutions are both technically sound and cost effective. The design team have identified that in some circumstances, realignment of the antennae is sufficient to improve the signal strength, which is more cost effective than erecting new masts and installing additional base stations. This however resulted in the completion dates for some areas moving into FY22. As a temporary solution, mobile equipment has been mobilised to sites with known black spots to ensure safe operation of the network.
- Transmission and Data Network - renewals scope was also heavily impacted by the lengthy lead times with supplies coming from overseas due to COVID-19 and the limited availability of design details and suitably qualified construction resources. The external contractors who have the required skillset and are qualified to work on the Network are limited. The limited available resources meant the completion of the digital radio strengthening works were prioritised to minimise safety issues on the Network.

### 5.1.2 Cost Incurred versus Claimed Amount

In line with Clause 1.3(a)(ii) of Schedule E of UT5, please refer to Table 5 below for details of the costs incurred for the year versus the claimed amount for the Blackwater System.

**Table 5 Blackwater System Costs Incurred versus Claimed Amount**

Item	Total Costs Incurred for the Year (\$m)	Claimed Expenditure (\$m)	IDC (\$m)	Total Claimed Amount including IDC (\$m)
Track Upgrade	28.2	29.2	0.2	29.4
Ballast Undercutting	29.8	30.1	0.1	30.3
Bridge Ballast	3.7	3.7	0.0	3.7
Turnouts	5.3	6.8	0.2	7.0
Formation Renewal	4.2	4.2	0.0	4.2
Level Crossing Renewal	1.9	2.2	0.0	2.2
Structures	14.2	14.5	0.2	14.7
Corridor Assets	1.7	1.4	0.0	1.4
Control Systems Assets	13.6	10.8	0.3	11.2
Overhead Line Equipment	1.0	1.7	0.1	1.7
Power Systems	2.0	2.0	0.1	2.0
OneSAP	0.8	1.4	0.0	1.4
<b>Total</b>	<b>106.4</b>	<b>108.0</b>	<b>1.2</b>	<b>109.2</b>

## 5.2 Goonyella System

### 5.2.1 Cost Incurred and Scope Achieved for the Year

Please refer to Table 6 for details of the costs incurred and scope achieved within the Goonyella system.

**Table 6 Goonyella System Costs Incurred & Scope achieved for the Year**

Item	Note	Cost (\$m)			Scope (Qty)		
		Costs Incurred for the Year	Full Year Approved RSB	Variance	Scope achieved for the Year	Full Year Approved Scope	Variance
<b>Civil Assets</b>							
<b>Track Upgrade</b>		<b>28.4</b>	<b>29.2</b>	<b>(0.8)</b>			
- Track Upgrade		14.5	14.9		10.9	11.0	<b>(0.1)</b>
- Rail	1	9.7	10.3		28.7	24.4	<b>4.3</b>
- Sleeper		4.2	4.0		4.6	4.5	<b>0.1</b>
<b>Ballast Undercutting:</b>		<b>31.7</b>	<b>32.0</b>	<b>(0.3)</b>			
- Mainline		28.6	29.2		64.1	66.3	<b>(2.2)</b>
- Turnout		3.1	2.8		24	23	<b>1</b>
<b>Bridge Ballast</b>		<b>1.9</b>	<b>2.2</b>	<b>(0.3)</b>	0.5	0.6	<b>(0.1)</b>
<b>Turnouts</b>	2	<b>6.5</b>	<b>6.0</b>	<b>0.5</b>			
- Major Renewals		3.3	1.4		2	2	--
- Component Renewals		3.2	4.6				
<b>Formation Renewal</b>	3	<b>2.9</b>	<b>4.8</b>	<b>(1.9)</b>	1.5	1.7	<b>(0.2)</b>
<b>Level Crossing Renewal:</b>		<b>1.3</b>	<b>1.0</b>	<b>0.3</b>			
- Major Renewal		0.9	0.8		1	1	--
- Other Renewals		0.4	0.2				
<b>Structures:</b>	4	<b>5.1</b>	<b>6.3</b>	<b>(1.2)</b>			
- Culverts		3.3	3.1		12	11	<b>1</b>
- Bridges		1.6	2.2		1	1	--
- Other		0.2	1.0				
<b>Corridor Assets</b>		<b>0.8</b>	<b>1.3</b>	<b>(0.5)</b>			
<b>Control Systems Assets</b>							
<b>Safeworking System</b>	5	<b>15.0</b>	<b>21.1</b>	<b>(6.1)</b>			
- Train Detection		1.8	0.7		1	1	--
- Interlocking		0.4	0.5		0	1	<b>(1)</b>
- Asset Protection		1.7	1.0		3	5	<b>(2)</b>
<b>Train Control System</b>		<b>0.7</b>	<b>1.0</b>	<b>(0.3)</b>	0	14	<b>(14)</b>
<b>Telecommunication Assets</b>		<b>5.2</b>	<b>11.2</b>	<b>(6.0)</b>	111	87	<b>24</b>
<b>Transmission and Data Network</b>		<b>1.2</b>	<b>1.9</b>	<b>(0.7)</b>	28	46	<b>(18)</b>
<b>Power Resilience</b>		<b>4.0</b>	<b>4.8</b>	<b>(0.8)</b>	6	8	<b>(2)</b>
<b>Other Control Systems</b>							
<b>Electrical Traction Assets</b>							

	Cost (\$m)			Scope (Qty)
Overhead Line Equipment	3.7	4.2	(0.5)	
Power Systems	3.1	3.6	(0.5)	
Transformation				
OneSAP	0.8	1.8	(1.0)	
<b>Total</b>	<b>101.2</b>	<b>113.5</b>	<b>(12.3)</b>	

### Variation Commentary:

#### 1. Rail:

Accelerated rail wear near Peak Downs and Jilalan was higher than what was assumed in the FY21 approved RSB. This subsequently led to an increase in the required rail renewal scope. This accelerated rail wear was identified through the Rail Inspection Vehicle (**RIV**) and field inspections. Cost savings achieved YTD allowed the cost of completing the additional scope to be incurred without exceeding the approved budget. Aurizon Network was able to complete this additional scope without taking any additional access.

#### 2. Turnouts:

Full year spend for major turnout renewal works is greater than the budget due to site preparation works taking place for the renewal of turnout 12C at Broadlea, which will be completed in July 2021 (FY22). The additional expenditure was also partially attributable to the site-specific complexities at Hatfield relating to the alignment of the overhead wires, which required the entire head span to be replaced.

#### 3. Formation:

Formation renewals were less than the approved budget for Goonyella primarily due to lower fix-on-fail requirements than budgeted.

#### 4. Structures:

Bridge Renewal at Cooper Creek was delivered at a lower cost than anticipated within the budget. Due to COVID-19 procurement delays, the completion of some culverts originally within the FY20 program were rescheduled to FY21, and a portion of FY21 culverts were rescheduled for FY22. Overall, this resulted in one additional culvert being completed in FY21.

#### 5. Control Systems:

- Costs for Train Detection renewals were greater than budget due to increased complexity identified during detailed site designs and site walkouts which required an increase in cabling works to link the Frauscher axle counters to the location cases.
- Interlocking – the scope outlined in the approved RSB related to design works for the single interlocking upgrade at Balook. It should be noted that Aurizon Network is seeking to complete a broader interlocking renewal program in the Goonyella System, which will see works completed at multiple locations. Rather than complete designs for the Balook site in isolation, the decision was made to change the design approach such that it promotes the effective delivery of the broader interlocking program of works. Aurizon Network incurred expenditure during the year while progressing designs of the broader interlocking program. Nevertheless, scope completed has been reported as 0, because the design works to date have not yet resulted in commissioned assets.
- Asset Protection – Of the actual scope quantity of 3 completed in FY21, 2 of these related to scope from FY20 (Blair Athol weigh systems and Lake Vermont Alarm renewals). The delays in completing works in these locations were driven by resourcing constraints on design and construction labour. Resources with the required skillset are in short supply and work across a number of programmes. The 3rd scope item completed was the renewal of the Oakey Creek weigh system. The remaining FY21 scope items have been rescheduled into FY22. Asset Protection scope is a combination of larger items, such as the weighers and smaller items such as the

alarms. The FY20 works completed in FY21, and a focus on delivering the larger scope items, are the key drivers of the actual scope quantities being below forecast with the spend being greater than budget.

- Train Control – scope variation is attributable to a transposition error in the RSB in which the total CQCN scope quantity (14) was applied to each Coal System. Actual spend incurred on the work performed to date is reported in the above table, however, the task was not commissioned by the end of the year, therefore the actual scope is reported as 0.
- Telecommunications - the delivery of the optical fibre program achieved savings as a result of design and delivery teams developing a more cost-effective installation methodology. This was utilised on certain sections and involves directly burying the cables in the ground on the adjacent side of the track, therefore avoiding disturbing existing cables and services. Soil conditions also allowed for a more rapid installation.
- Power resilience – the program experienced delays with the completion of the Uninterrupted Power Supply (UPS) hut installation at Pragueland, Yukan, Hatfield, Black Mountain and Wandoo due to issues encountered in the scoping design and building of the new huts. The original UPS huts delivered to various sites were found to not meet requirements and the required design standards. This was the result of COVID-19 restrictions preventing factory acceptance inspections. The resulting delays in the delivery and commissioning of the UPS huts were further exacerbated by COVID-19 equipment supply impacts. As a result, five sites originally planned for FY21 have been rescheduled for FY22. For clarity, the approved RSB for FY21 provided for works at 8 sites. During the year, Aurizon Network completed 3 sites that were delayed from FY20 and 3 sites that were planned for FY21. This results in the scope variation of 2 sites as presented in Table 6 above.

## 5.2.2 Cost Incurred versus Claimed Amount

In line with Clause 1.3(a)(ii) of Schedule E of UT5, please refer to Table 7 for details of the costs incurred for the Year versus the claimed amount for the Goonyella System.

**Table 7 Goonyella System Costs Incurred versus Claimed Amount**

Item	Total Costs Incurred for the Year (\$m)	Claimed Expenditure (\$m)	IDC (\$m)	Total Claimed Amount including IDC (\$m)
Track Upgrade	28.4	28.6	0.1	28.7
Ballast Undercutting	31.7	31.9	0.1	32.0
Bridge Ballast	1.9	1.9	0.0	1.9
Turnouts	6.5	5.9	0.1	6.0
Formation Renewal	2.9	4.0	0.0	4.0
Level Crossing Renewal	1.3	1.2	0.0	1.3
Structures	5.1	5.8	0.0	5.9
Corridor Assets	0.8	0.8	0.0	0.8
Control Systems Assets	15.0	15.0	0.3	15.3
Overhead Line Equipment	3.7	3.1	0.1	3.2
Power Systems	3.1	3.9	0.1	4.0
OneSAP	0.8	1.5	0.0	1.5
<b>Total</b>	<b>101.2</b>	<b>103.5</b>	<b>1.0</b>	<b>104.6</b>

## 5.3 Moura System

### 5.3.1 Cost Incurred and Scope Achieved for the Year

Please refer to Table 8 for details of the costs incurred and scope achieved within the Moura system.

**Table 8 Moura System Costs Incurred & Scope achieved for the Year**

Item	Note	Cost (\$m)			Scope (Qty)		
		Costs Incurred for the Year	Full Year Approved RSB	Variance	Scope achieved for the Year	Full Year Approved Scope	Variance
<b>Civil Assets</b>							
<b>Track Upgrade</b>		<b>3.1</b>	<b>3.3</b>	<b>(0.2)</b>			
- Track Upgrade		2.7	2.7		2.0	2.0	--
- Rail		0.4	0.6		1.5	1.5	--
- Sleeper							
<b>Ballast Undercutting:</b>		<b>0.2</b>	<b>0.1</b>	<b>0.1</b>			
- Mainline		0.1	--				
- Turnout		0.1	0.1		1	1	--
<b>Bridge Ballast</b>		<b>0.9</b>	<b>1.0</b>	<b>(0.1)</b>	0.2	0.3	<b>(0.0)</b>
<b>Turnouts</b>	1	<b>1.7</b>	<b>2.8</b>	<b>(1.1)</b>			
- Major Renewals		1.5	2.5		0	1	<b>(1)</b>
- Component Renewals		0.2	0.3				
<b>Formation Renewal</b>		<b>2.0</b>	<b>1.8</b>	<b>0.2</b>	0.9	0.6	<b>0.3</b>
<b>Level Crossing Renewal:</b>	2	<b>0.4</b>	<b>1.3</b>	<b>(0.9)</b>			
- Major Renewal		0.4	0.8		1	1	--
- Other Renewals		0.0	0.5				
<b>Structures:</b>	3	<b>1.3</b>	<b>2.4</b>	<b>(1.1)</b>			
- Culverts		1.0	2.1		2	6	<b>(4)</b>
- Bridges							
- Other		0.3	0.3				
<b>Corridor Assets</b>		<b>0.1</b>	<b>0.1</b>	<b>--</b>			
<b>Control Systems Assets</b>							
<b>Safeworking System</b>	4	<b>2.2</b>	<b>2.5</b>	<b>(0.3)</b>			
- Train Detection							
- Interlocking							
- Asset Protection		0.9	0.9		0	2	<b>(2)</b>
<b>Train Control System</b>		<b>0.2</b>	<b>0.2</b>	<b>--</b>	0	14	<b>(14)</b>
<b>Telecommunication Assets</b>							
<b>Transmission and Data Network</b>		<b>0.5</b>	<b>0.7</b>	<b>(0.2)</b>	3	40	<b>(37)</b>
<b>Power Resilience</b>		<b>0.6</b>	<b>0.6</b>	<b>--</b>	5	3	<b>2</b>

	Cost (\$m)			Scope (Qty)		
Other Control Systems	0.0	0.1	(0.1)	2	2	--
Electrical Traction Assets						
Transformation						
OneSAP	0.1	0.2	(0.1)			
<b>Total</b>	<b>12.0</b>	<b>15.5</b>	<b>(3.5)</b>			

### Variation Commentary:

#### 1. Turnouts:

During the year, procurement delays resulted in the turnout materials being unavailable for the planned possession to perform the renewal at Gladstone. However, as the track access was still available, work crews performed preparatory works including work on the electrical overheads, signalling equipment and civil works. This will reduce the risk of completing the works outside the planned possession when access is next available to finalise the renewal.

#### 2. Level Crossings:

Aurizon Network underspent against the approved budget for level crossings with fewer reactive component renewals required in comparison to the approved RSB.

#### 3. Structures:

Due to an increase in contractor safety incidents, a safety pause was instigated by Aurizon Network. This resulted in a change in process whereby all contractors working within the rail corridor must be either supervised by an appropriately qualified Aurizon Network employee or must be certified to work without supervision. To obtain certification, contractors were required to be audited.

This safety requirement delayed the completion of tunnel lining and CIPP scope, which has now been forecast to be executed in FY22. As the contractor performing these works is based in Victoria, Aurizon Network is continuing to monitor the COVID travel restrictions.

#### 4. Control Systems:

- Asset Protection - Actual costs were incurred progressing work on the renewal of the weigh system at Graham however the scope was incomplete at year end due to the cancellation of the March 21 closure as a result of bad weather. As a consequence, scope completed is reported as 0.
- Train Control – The Train Control scope variation is attributable to a transposition error in the FY21 approved RSB in which the total CQCN scope quantity (14) was applied to each Coal System. Actual costs were incurred progressing work, however the scope was incomplete at year end, therefore scope completed is reported as 0.
- Transmission and Data Network - further design work is taking place on the Tetra Digital Radio network to ensure the solution is optimised. The design team have identified that in some circumstances, realignment of the antennae is sufficient to improve the signal strength, which is more cost effective than erecting new masts and installing additional base stations. As a result, the completion of some areas has been deferred to FY22. As a temporary solution, mobile equipment has been mobilised to sites with known black spots to ensure safe operation of the network. The budgeted scope for Transmission and Data Network was also reported incorrectly (the workings within the FY21 RSB counted scope items from different asset classes).
- Power Resilience - Five sites (x2 Mt Rainbow, x1 Belldreen, x1 Annandale and x1 Dungree) were completed against an approved scope of three, with 2 sites previously scheduled for FY20 being completed. One site (Earlsfield) originally planned for delivery in FY21 has been delayed due to the delivery of an alternator being impacted by long lead times on materials as a result of COVID-19.



### 5.3.2 Cost Incurred versus Claimed Amount

In line with Clause 1.3(a)(ii) of Schedule E of UT5, please refer to Table 9 below for details of the costs incurred for the Year versus the claimed amount for the Moura System.

**Table 9 Moura System Costs Incurred versus Claimed Amount**

Item	Total Costs Incurred for the Year (\$m)	Claimed Expenditure (\$m)	IDC (\$m)	Total Claimed Amount including IDC (\$m)
Track Upgrade	3.1	2.3	0.0	2.4
Ballast Undercutting	0.2	0.2	0.0	0.2
Bridge Ballast	0.9	0.4	0.0	0.4
Turnouts	1.7	0.2	0.0	0.2
Formation Renewal	2.0	1.5	0.0	1.5
Level Crossing Renewal:	0.4	0.0	0.0	0.0
Structures	1.3	0.8	0.0	0.8
Corridor Assets	0.1	0.1	0.0	0.1
Control Systems Assets	2.2	1.4	0.1	1.4
Overhead Line Equipment	0.0	0.0	0.0	0.0
Power Systems	0.0	0.0	0.0	0.0
OneSAP	0.1	0.2	0.0	0.2
<b>Total</b>	<b>12.0</b>	<b>7.1</b>	<b>0.1</b>	<b>7.2</b>

## 5.4 Newlands System and Goonyella Abbot Point Expansion Project (GAPE)

### 5.4.1 Cost Incurred and Scope Achieved for the Year

Please refer to Table 10 for details of the costs incurred and scope achieved within the Newlands System and GAPE.

The FY21 RSB did not separate the Newlands System and GAPE, and as such, Table 10 and Table 12 below present a combined asset replacement and renewals performance.

Please note that asset replacement and renewal expenditure on infrastructure constructed as part of the GAPE project is separately identified in Table 11 below.

**Table 10 Combined Newlands System and GAPE Costs Incurred & Scope achieved for the Year**

Item	Note	Cost (\$m)			Scope (Qty)		
		Costs Incurred for the Year	Full Year Approved RSB	Variance	Scope achieved for the Year	Full Year Approved Scope	Variance
<b>Civil Assets</b>							
<b>Track Upgrade</b>	1	<b>8.2</b>	<b>10.2</b>	<b>(2.0)</b>			
- Track Upgrade		5.5	6.7		4.8	4.9	(0.1)
- Rail		2.3	3.2		6.6	7.6	(1.0)
- Sleeper		0.4	0.3		0.4	0.3	0.1
<b>Ballast Undercutting:</b>	2	<b>3.3</b>	<b>2.8</b>	<b>0.5</b>			
- Mainline		3.1	2.5		6.6	5.8	0.8
- Turnout		0.2	0.3		2	2	--
<b>Bridge Ballast</b>		<b>0.3</b>	<b>0.3</b>	<b>--</b>	0.1	0.1	--
<b>Turnouts</b>		<b>0.7</b>	<b>0.8</b>	<b>(0.1)</b>			
- Major Renewals							
- Component Renewals		0.7	0.8				
<b>Formation Renewal</b>		<b>1.5</b>	<b>1.6</b>	<b>(0.1)</b>	0.6	0.6	--
<b>Level Crossing Renewal:</b>		<b>--</b>	<b>--</b>	<b>--</b>			
- Major Renewal							
- Other Renewals		0.0	0.0	--			
<b>Structures:</b>	3	<b>3.9</b>	<b>3.0</b>	<b>0.9</b>			
- Culverts		3.7	2.3		5	5	--
- Bridges		0.0	0.0		0	0	--
- Other		0.2	0.7				
<b>Corridor Assets</b>		<b>0.2</b>	<b>0.3</b>	<b>(0.1)</b>			
<b>Control Systems Assets</b>	4	<b>1.4</b>	<b>2.0</b>	<b>(0.6)</b>			
<b>Safeworking System</b>		<b>0.3</b>	<b>0.7</b>	<b>(0.4)</b>			
- Train Detection							
- Interlocking							
- Asset Protection		0.3	0.7		3	3	--
<b>Train Control System</b>		<b>0.2</b>	<b>0.3</b>	<b>(0.1)</b>	0	14	(14)

	Cost (\$m)			Scope (Qty)		
Telecommunication Assets			0			
Transmission and Data Network	0.4	0.7	(0.3)	5	9	(5)
Power Resilience	0.5	0.3	0.2	4	4	--
Other Control Systems						
Electrical Traction Assets						
Transformation						
OneSAP	0.2	0.5	(0.3)			
<b>Total</b>	<b>19.7</b>	<b>21.5</b>	<b>(1.8)</b>			

### Variation Commentary:

#### 1. Track Upgrade:

Cost efficiencies were achieved for Track Upgrade works as Aurizon Network was able to take advantage of an integrated possession with longer closure hours that was required for Structure Renewals. This extended closure allowed for a greater amount of work to be completed during daylight hours, therefore requiring fewer resources and resulting in an underspend relative to the approved RSB.

#### 2. Ballast Undercutting:

Aurizon Network utilised the existing closure footprint to complete additional scope from Kaili to Abbot Point. Condition monitoring showed that fouling in the area had deteriorated ballast condition in that section and therefore the additional scope was required. The undercutting machine was already in this section performing existing planned scope and therefore the additional scope was able to be completed with minimal cost impact.

#### 3. Structures:

The Structures Renewal Program in the Newlands System saw an increase in costs of \$0.9m primarily due to works which were rolled over from FY20 as a result of COVID-19 procurement delays. Specifically, the following locations:

- Newlands Durroburra to Pring bridge deck replacement; and
- Newlands Sonoma to Birralee tunnel line.

#### 4. Control Systems:

- The Train Control scope variation is attributable to a transposition error in the FY21 approved RSB in which the total CQCN scope quantity (14) was applied to each Coal System. Actual costs were incurred progressing work, however the scope was incomplete at year end, therefore scope completed is reported as 0.
- Asset Protection - weigh system renewals at McNaughton and Newlands were completed below budget as a result of the following:
  - Aurizon Network was able to coordinate the installation of both the McNaughton and Newlands weigh systems, such that they were delivered in the same possession. This resulted in a reduction in mobilisation costs associated with completing the works; and
  - Aurizon Network realised cost savings by securing competitive pricing arrangements with the contractor selected to deliver the McNaughton weigh systems.
- Transmission and Data Network - the delivery of Radome covers was delayed due to the limited availability of suitably qualified resources to complete the required design and construction. The external contractors who have the required skillset and are qualified to work on the Network are limited, which meant that the completion of the digital radio strengthening works were prioritised to minimise safety issues on the Network.

### 5.4.2 Separately identifying asset replacement and renewal expenditure constructed at GAPE

Aurizon Network has separately identified the asset replacement and renewal expenditure associated with Rail Infrastructure that was constructed as part of the Goonyella Abbot Point Expansion Project (**GAPE**). This includes asset replacement and renewal expenditure incurred:

- between North Goonyella Junction and Newlands Mine Junction (the GAPE Link); and
- on common-user Rail Infrastructure geographically located in the Newlands system but constructed as part of the GAPE project (i.e. the Newlands System Enhancements).

Examples of the asset replacement and renewal works on the GAPE Link include:

- turnout replacement at Leichardt Range;
- ballast undercutting at various locations including the passing loops at Leichardt Range, Suttor Creek and Eaglefield Creek; and
- minor control systems replacement at Leichardt Range.

Examples of the asset replacement and renewal works on the Newlands System Enhancements include:

- rail renewals on the Briaba Deviation down road;
- ballast undercutting in various locations, including the Abbott Point Balloon, the Durroburra – Kaili section and passing loops at Buckley, Aberdeen and Cockool; and
- Turnout replacements at Almoola, Briaba and Durroburra – Kaili.

A breakdown of this expenditure by activity is provided below:

**Table 11 FY21 Asset Replacement and Renewals Expenditure – GAPE**

Activity	Value (\$m)
Rail	2.37
Ballast Undercutting	2.06
Turnouts	0.21
Control Systems	0.01
<b>Total</b>	<b>4.65</b>

### 5.4.3 Cost Incurred versus Claimed Amount

In line with Clause 1.3(a)(ii) of Schedule E of UT5, please refer to Table 12 below for details of the costs incurred for the Year versus the claimed amount for the Newlands System and GAPE.

**Table 12 Combined Newlands/GAPE System Costs Incurred versus Claimed Amount**

Item	Total Costs Incurred for the Year (\$m)	Claimed Expenditure (\$m)	IDC (\$m)	Total Claimed Amount including IDC (\$m)
Track Upgrade	8.2	8.0	0.0	8.1
Ballast Undercutting	3.3	3.3	0.0	3.3
Bridge Ballast	0.3	0.1	0.0	0.1
Turnouts	0.7	0.2	0.0	0.2
Formation Renewal	1.5	1.2	0.0	1.2
Level Crossing Renewal	-	0.0	0.0	0.0
Structures	3.9	3.8	0.0	3.9

Item	Total Costs Incurred for the Year (\$m)	Claimed Expenditure (\$m)	IDC (\$m)	Total Claimed Amount including IDC (\$m)
Corridor Assets	0.2	0.3	0.0	0.3
Control Systems Assets	1.4	2.8	0.1	2.8
Overhead Line Equipment	-	0.0	0.0	0.0
Power Systems	-	0.0	0.0	0.0
OneSAP	0.2	0.4	0.0	0.4
<b>Total</b>	<b>19.7</b>	<b>20.1</b>	<b>0.2</b>	<b>20.3</b>

## 6. Procurement Strategy and Inventory

In completing asset replacement and renewals work for FY21, Aurizon Network has procured resources in an effective and efficient manner; an outcome that was supported through the execution of the procurement strategy and methodology outlined within the Approved MRSB for FY21. This approach saw Aurizon Network seek to maximise utilisation of its internal delivery teams and augment these internal resources with suitably qualified contractor staff and plant where additional resources were required to complete identified scope.

When engaging external resources, Aurizon Network utilised, wherever reasonably possible, a series of engineering and technical service contractor panels, established through its Enterprise Procurement group. These include asset-specific service panels, skilled labour hire, plant hire and plant transportation services. Where scope required a specific skill set or if the required plant was not held within the Aurizon Network group, Aurizon Network sought to engage pre-qualified contractors to perform work either under direct supervision or if approved, as principal contractor for short periods. Aurizon Network applies an assurance program and a performance-based governance framework for external contractors to ensure they meet the required business and safety processes and policies.

As detailed in the commentary within this submission, COVID-19 continues to have an impact on some items within the FY21 asset replacement and renewal program. Where appropriate, Aurizon Network has sought to manage the ongoing impact and challenges associated by COVID-19 (e.g. supply constraints or longer than usual lead-times) by bringing forward orders, or placing additional orders of items such as rail.

## 7. Capital Expenditure for inclusion into the RAB by System

This submission provides the QCA with the details of capital expenditure that Aurizon Network considers should be included in the RAB in accordance with Clause 2.2 of Schedule E of UT5. Details for each Coal System are contained within the following tables:

### 7.1 Blackwater System

**Table 13 Blackwater System - Claimed Expenditure including IDC (\$m)**

Project Number	Project Name	RIG Category	Claimed Expenditure (\$m)
IV.00049	Radio System Replacement	Control Systems	0.02
IV.00426	Rail Renewal Program Package 2	Track Upgrade	0.08
IV.00447	Structures Renewal Package 2	Structures	5.02
IV.00448	Structures Renewal Package 3	Structures	9.64
IV.00450	Bridge Ballast Renewal Package 2	Bridge Ballast	0.07
IV.00451	Bridge Ballast Renewal Package 3	Bridge Ballast	3.60
IV.00453	Formation Renewal Package 2	Formation	0.01
IV.00454	Formation Renewal Package 3	Formation	4.21
IV.00455	Control Systems Renewal Package 1	Control Systems	1.14
IV.00456	Control Systems Renewal Package 2	Control Systems	5.57
IV.00457	Control Systems Renewal Package 3	Control Systems	2.66
IV.00459	Level Crossing Renewal Package 2	Level Crossings	0.08
IV.00460	Level Crossing Renewal Package 3	Level Crossings	2.17
IV.00462	Turnout Renewal Package 2	Turnouts	5.41
IV.00463	Turnout Renewal Package 3	Turnouts	1.63
IV.00464	Access Points Package 2	Corridor Assets	0.44
IV.00468	Access Roads Package 2	Corridor Assets	0.21
IV.00472	Corridor Security Package 3	Corridor Assets	0.27
IV.00474	Sleeper Renewal Package 2	Track Upgrade	2.24
IV.00477	Track Renewal Package 2	Track Upgrade	0.22
IV.00478	Track Renewal Package 3	Track Upgrade	26.83
IV.00503	Power Systems Renewal Package 1	Electrical Power Systems	0.39
IV.00504	Power Systems Renewal Package 2	Electrical Power Systems	0.23
IV.00505	Power Systems Renewal Package 3	Electrical Power Systems	1.43
IV.00507	Electrical Overhead Renewal Package 2	Electrical OHLE	0.98
IV.00508	Electrical Overhead Renewal Package 3	Electrical OHLE	0.76
IV.00605	FY20 Ballast Renewal Program	Ballast Undercutting	0.24
IV.00644	FY21 Ballast Renewal Programme	Ballast Undercutting	30.01
IV.00661	OneSAP	NAMS Next	1.40

Project Number	Project Name	RIG Category	Claimed Expenditure (\$m)
IV.00678	Optical Fibre Renewal	Control Systems	0.12
IV.00690	Ground Penetrating Radar	Corridor Assets	0.47
IV.00693	Interlocking Renewal - NCL	Control Systems	1.66
<b>Total</b>			<b>109.21</b>

## 7.2 Goonyella System

**Table 14 Goonyella System - Claimed Expenditure including IDC (\$m)**

Project Number	Project Name	RIG Category	Claimed Expenditure (\$m)
IV.00049	Radio System Replacement	Control Systems	0.04
IV.00426	Rail Renewal Program Package 2	Track Upgrade	0.26
IV.00447	Structures Renewal Package 2	Structures	1.02
IV.00448	Structures Renewal Package 3	Structures	4.84
IV.00451	Bridge Ballast Renewal Package 3	Bridge Ballast	1.89
IV.00453	Formation Renewal Package 2	Formation	0.05
IV.00454	Formation Renewal Package 3	Formation	3.96
IV.00455	Control Systems Renewal Package 1	Control Systems	0.08
IV.00456	Control Systems Renewal Package 2	Control Systems	4.91
IV.00457	Control Systems Renewal Package 3	Control Systems	6.50
IV.00459	Level Crossing Renewal Package 2	Level Crossings	0.00
IV.00460	Level Crossing Renewal Package 3	Level Crossings	1.25
IV.00462	Turnout Renewal Package 2	Turnouts	2.09
IV.00463	Turnout Renewal Package 3	Turnouts	3.96
IV.00468	Access Roads Package 2	Corridor Assets	0.02
IV.00469	Access Roads Package 3	Corridor Assets	0.11
IV.00474	Sleeper Renewal Package 2	Track Upgrade	0.12
IV.00477	Track Renewal Package 2	Track Upgrade	0.10
IV.00478	Track Renewal Package 3	Track Upgrade	28.21
IV.00503	Power Systems Renewal Package 1	Electrical Power Systems	0.32
IV.00504	Power Systems Renewal Package 2	Electrical Power Systems	1.32
IV.00505	Power Systems Renewal Package 3	Electrical Power Systems	2.40
IV.00507	Electrical Overhead Renewal Package 2	Electrical OHLE	2.11
IV.00508	Electrical Overhead Renewal Package 3	Electrical OHLE	1.11
IV.00605	FY20 Ballast Renewal Program	Ballast Undercutting	0.26
IV.00606	Rail Lubrication FY20	Corridor Assets	0.15
IV.00644	FY21 Ballast Renewal Programme	Ballast Undercutting	31.76
IV.00661	OneSAP	NAMS Next	1.50
IV.00678	Optical Fibre Renewal	Control Systems	3.74



Project Number	Project Name	RIG Category	Claimed Expenditure (\$m)
IV.00690	Ground Penetrating Radar	Corridor Assets	0.50
<b>Total</b>			<b>104.57</b>

## 7.3 Moura System

**Table 15 Moura System - Claimed Expenditure including IDC (\$m)**

Project Number	Project Name	RIG Category	Claimed Expenditure (\$m)
IV.00447	Structures Renewal Package 2	Structures	0.83
IV.00451	Bridge Ballast Renewal Package 3	Bridge Ballast	0.41
IV.00453	Formation Renewal Package 2	Formation	0.01
IV.00454	Formation Renewal Package 3	Formation	1.51
IV.00455	Control Systems Renewal Package 1	Control Systems	0.66
IV.00456	Control Systems Renewal Package 2	Control Systems	0.40
IV.00457	Control Systems Renewal Package 3	Control Systems	0.36
IV.00459	Level Crossing Renewal Package 2	Level Crossings	0.00
IV.00460	Level Crossing Renewal Package 3	Level Crossings	0.00
IV.00462	Turnout Renewal Package 2	Turnouts	-0.00
IV.00463	Turnout Renewal Package 3	Turnouts	0.17
IV.00477	Track Renewal Package 2	Track Upgrade	0.10
IV.00478	Track Renewal Package 3	Track Upgrade	2.25
IV.00644	FY21 Ballast Renewal Programme	Ballast Undercutting	0.22
IV.00661	OneSAP	NAMS Next	0.17
IV.00690	Ground Penetrating Radar	Corridor Assets	0.06
<b>Total</b>			<b>7.17</b>

## 7.4 Newlands System and GAPE

**Table 16 Newlands System and GAPE - Claimed Expenditure including IDC (\$m)**

Project Number	Project Name	RIG Category	Claimed Expenditure (\$m)
IV.00049	Radio System Replacement	Control Systems	\$0.20
IV.00447	Structures Renewal Package 2	Structures	\$0.61
IV.00448	Structures Renewal Package 3	Structures	\$3.24
IV.00451	Bridge Ballast Renewal Package 3	Bridge Ballast	\$0.15
IV.00453	Formation Renewal Package 2	Formation	\$0.19
IV.00454	Formation Renewal Package 3	Formation	\$1.04
IV.00455	Control Systems Renewal Package 1	Control Systems	-\$0.03
IV.00456	Control Systems Renewal Package 2	Control Systems	\$1.00

Project Number	Project Name	RIG Category	Claimed Expenditure (\$m)
IV.00457	Control Systems Renewal Package 3	Control Systems	\$1.66
IV.00462	Turnout Renewal Package 2	Turnouts	\$0.03
IV.00463	Turnout Renewal Package 3	Turnouts	\$0.18
IV.00478	Track Renewal Package 3	Track Upgrade	\$8.06
IV.00606	Rail Lubrication FY20	Corridor Assets	\$0.13
IV.00644	FY21 Ballast Renewal Programme	Ballast Undercutting	\$3.30
IV.00661	OneSAP	NAMS Next	\$0.42
IV.00690	Ground Penetrating Radar	Corridor Assets	\$0.14
<b>Total</b>			<b>\$20.32</b>

# Appendix A: Aurizon’s Enterprise Investment Framework

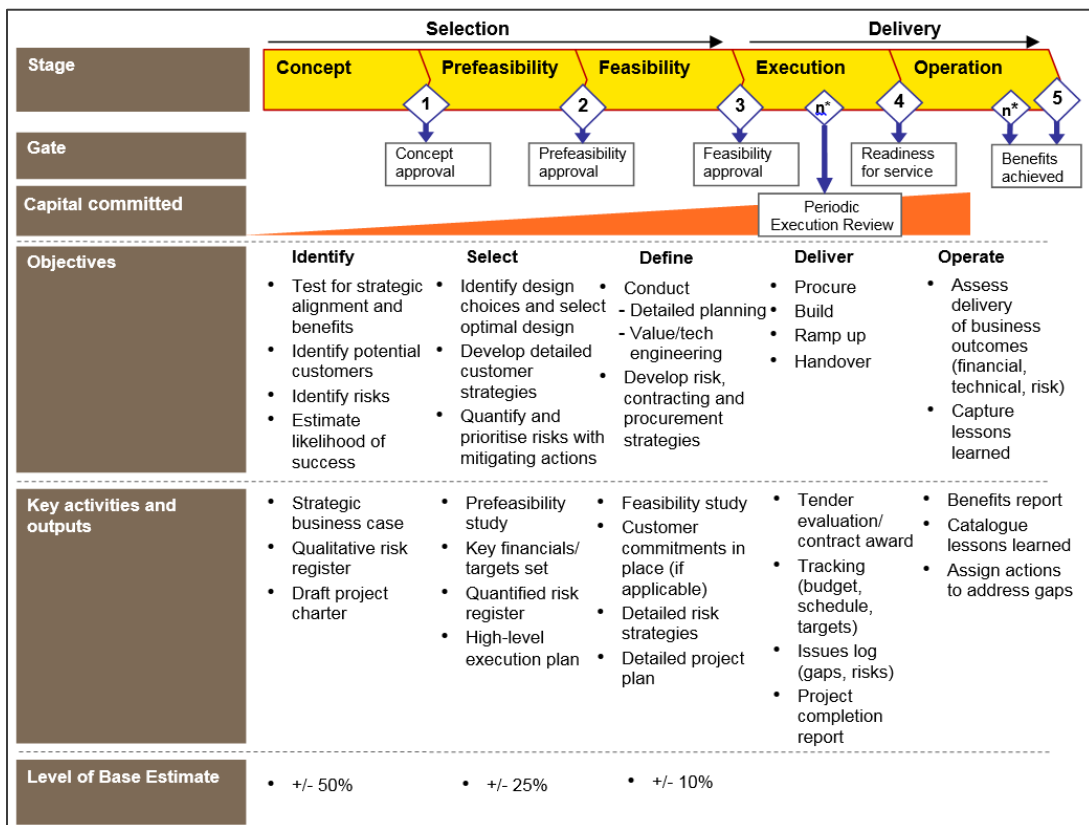
Whilst Aurizon Network received pre-approval for capital expenditure via the RSB process, outlined within Clause 7A.11.3, Aurizon Network also adheres to an internal approval process via the Aurizon Enterprise Framework (**Framework**). The Framework is a rigorous approval process prior to the commitment of capital investments. The purpose of the Framework is to facilitate sound investment decisions and to ensure that:

- Investments have a high degree of success;
- Investment decisions are made on a consistent basis;
- Capital is optimised; and
- Learnings from past investments are recorded and taken into consideration as part of Aurizon Network’s commitment to continuous improvement.

The Framework is informed by the requirements of UT5 by promoting prudence and efficiency of scope, standard and cost for capital expenditure. Figure 2 **Capital Investment Stage Gates** provides an overview of the capital investment stage gates that Aurizon Network utilises for its capital projects.

The structure of Aurizon Network’s Framework provides a robust methodology for assessing the potential scope of projects presented for investment approvals and ensures the costs which are then committed to the projects are viable. This framework aids in the delivery of sufficient supporting evidence to determine the prudence and efficiency of the capital expenditure in accordance with Clause 2.2 of Schedule E of UT5.

**Figure 2 Capital Investment Stage Gates**



## Sustaining Program Approval

A program is a collection of capital investment projects managed in a coordinated way in order to optimise the achievement of the program’s objectives and provide benefits not available from managing the projects individually.

Where an investment project forms part of a larger program, the program of work for all the underlying projects is submitted together to:

- enable review and approval at the appropriate holistic level, rather than in separate pieces;
- create scale benefits; and
- allow investment optimisation to occur prior to external commitments being made.

## Multi-Year Sustaining Project / Program Approval

Certain sustaining capital projects/programs benefit from better supply chain management, logistic planning and efficiency in execution when scoped as a multi-year project/program. An example would be the autotransformer renewal program (power systems) whereby a better rate may be negotiated with suppliers with the provision of a long-term order. For each year of the project/program, updated forecasts of cashflows are provided and submitted annually for approval in line with the Framework.

## 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 in accordance with Clause 3 of Schedule E of UT5. Aurizon Network's Asset Maintenance and Sustaining Renewal Policy (**Policy**) was provided to the QCA as part of its UT5 investigation, which ultimately resulted in an approved Capital Indicator. The Policy clearly documents defined assumptions that sit behind plans for managing assets throughout the CQCN.

Aurizon Network's asset management documentation, including Condition Assessments and Prioritisation Models, further support the prudence and efficiency of the FY21 capital expenditure in accordance with Clauses 2.2(b)(i)(D), 2.2(b)(ii)(D) and 2.2(b)(iii)(D) of Schedule E of UT5, 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 UT5. 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 relevant Australian Standard(s) and Aurizon Network's technical knowledge and experience. Any additional or non-standard requirements are outlined in project documentation such as Project Management Plans.

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 Certifications, Practical Completion Certificates and photographs of completed works.

Further, these documents support Aurizon Network in 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 UT5. In relation to this requirement, Aurizon Network has a fully integrated Safety, Health and Environment Reporting 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 UT5.

## Appendix B: Incurred Renewal Expenditure vs Commissioned Asset Graphs

Aurizon Network has included the following waterfall graphs to assist with the comparison of actual incurred Asset Renewals Expenditure to the value of commissioned assets for each program that is included within this submission.

Please note that the following graphs reflect the expenditure that Aurizon Network has incurred while delivering the FY21 Asset Replacement and Renewals program. While incurred expenditure provides an appropriate comparison against the approved RSB, in some circumstances this may differ from the amounts Aurizon Network is seeking QCA approval of through this Capex Claim (which reflects commissioned assets). Aurizon Network has sought to separately identify incurred versus claimed costs for comparison. Please note that variances between incurred and claimed expenditure can exist where incurred expenditure is awaiting an administrative process (e.g. receipt of a final invoice) before the asset in question can be commissioned and subsequently transferred to Aurizon Network's Fixed Asset Register (**FAR**).

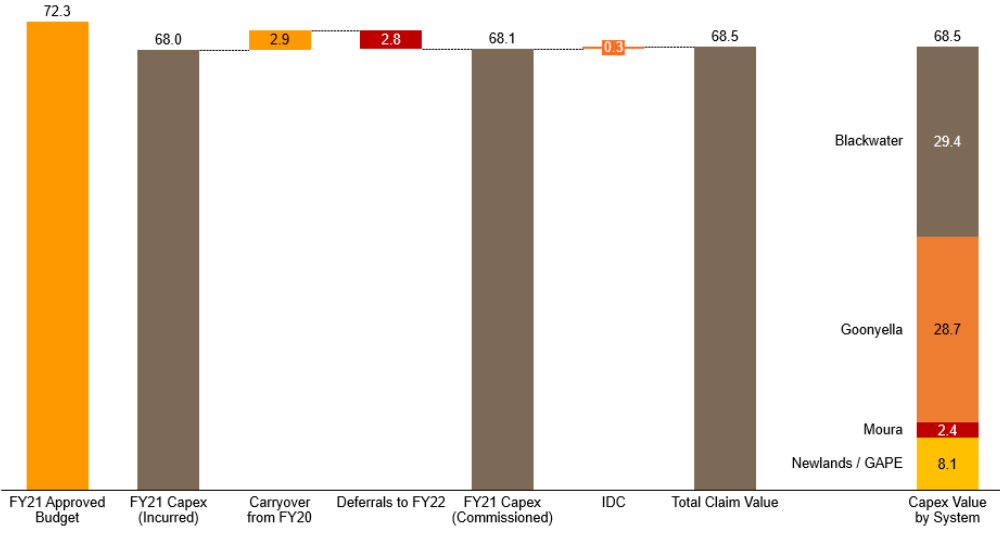
The waterfall graphs illustrate for each Item identified in the RSB, the following:

- FY21 Capex (Incurred) \$m
- Carryover from FY20 \$m
- Deferrals to FY22 \$m
- FY21 Capex (Commissioned Asset) \$m
- IDC \$m
- Total Claim Value \$m
- Capex Value by Coal System \$m

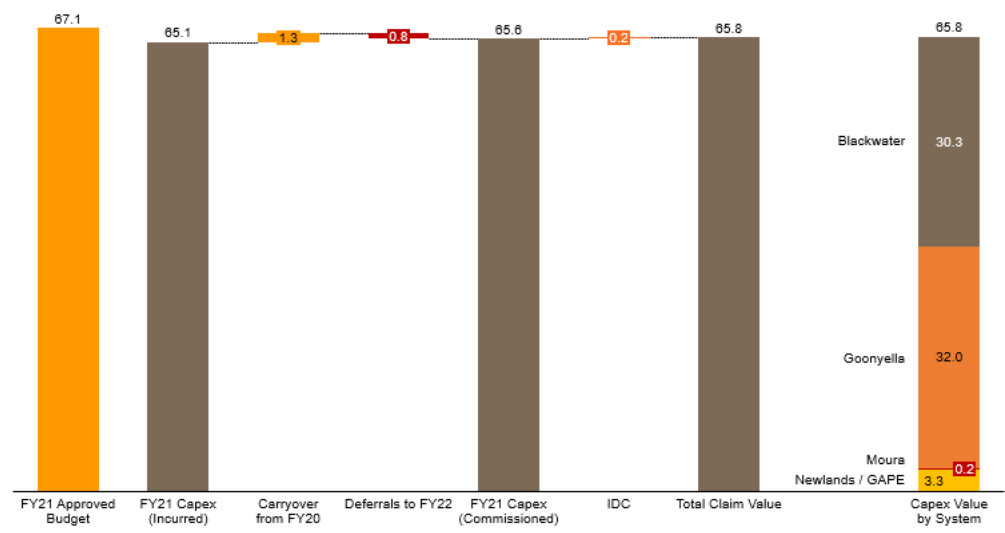
The waterfall graphs illustrate for each Item identified in the RSB, the following:

Aurizon Network notes that it still has some limitations in the ability to provide each of these categories at an individual system level and is working to improve its processes to provide a greater level of transparency as part of future reporting.

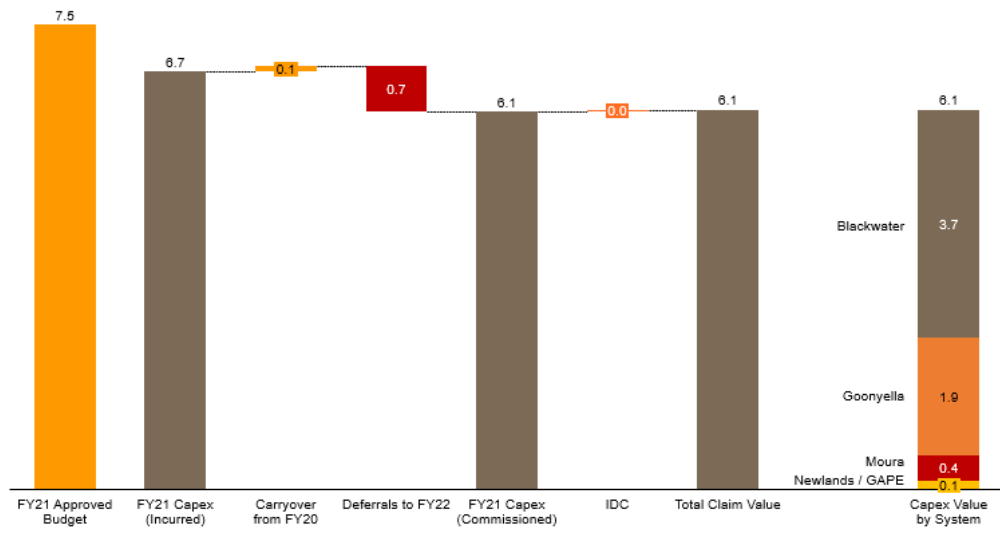
**Figure 3 FY21 Track Upgrade**



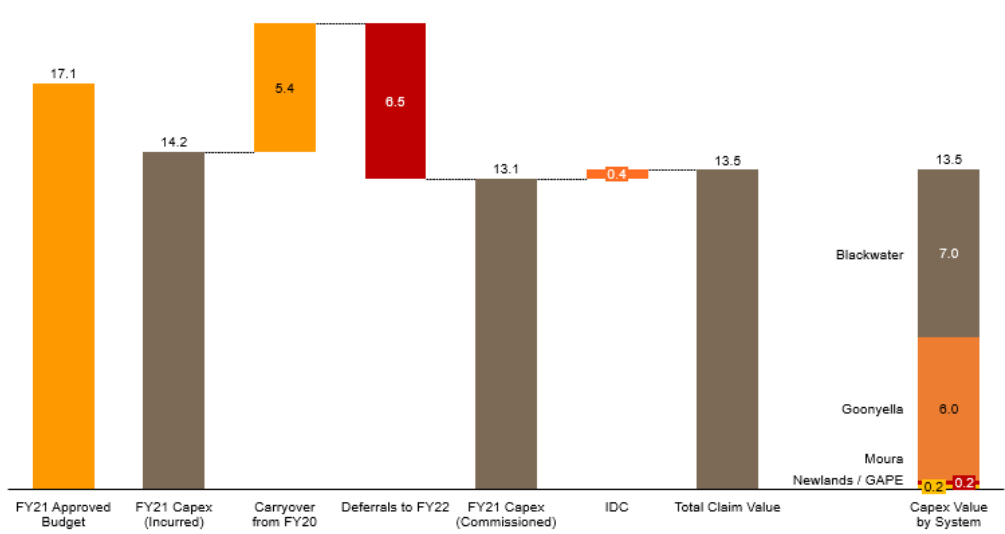
**Figure 4 FY21 Ballast Undercutting**



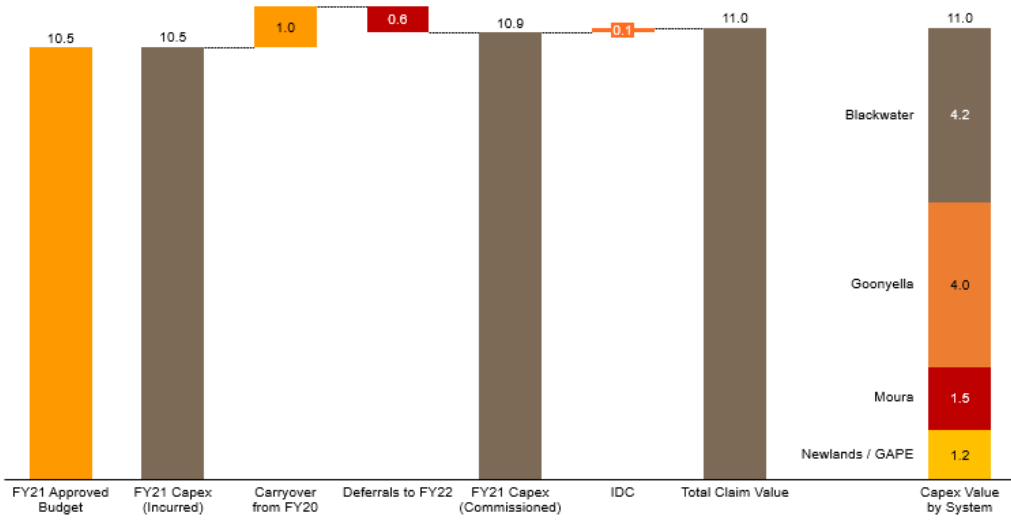
**Figure 5 FY21 Bridge Ballast**



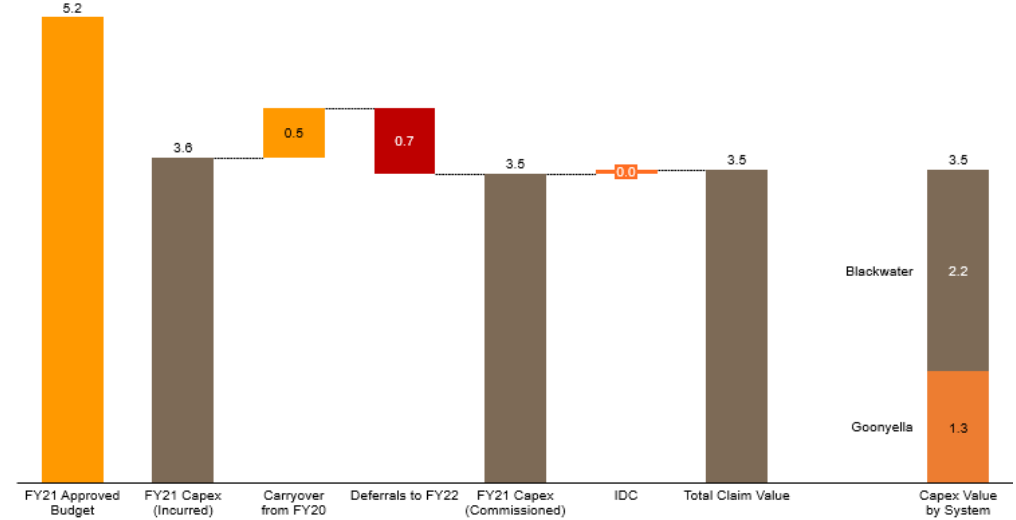
**Figure 6 FY21 Turnouts**



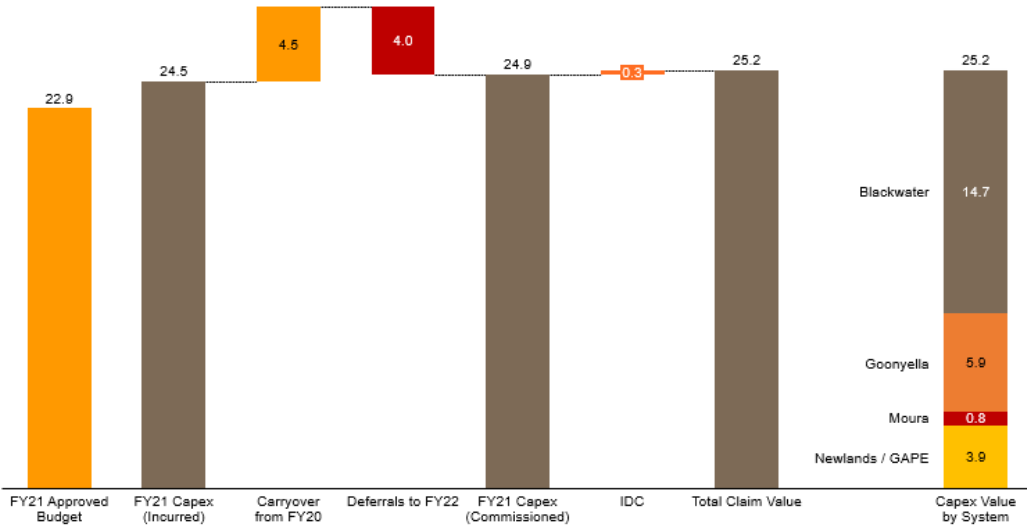
**Figure 7 FY21 Formation Renewal**



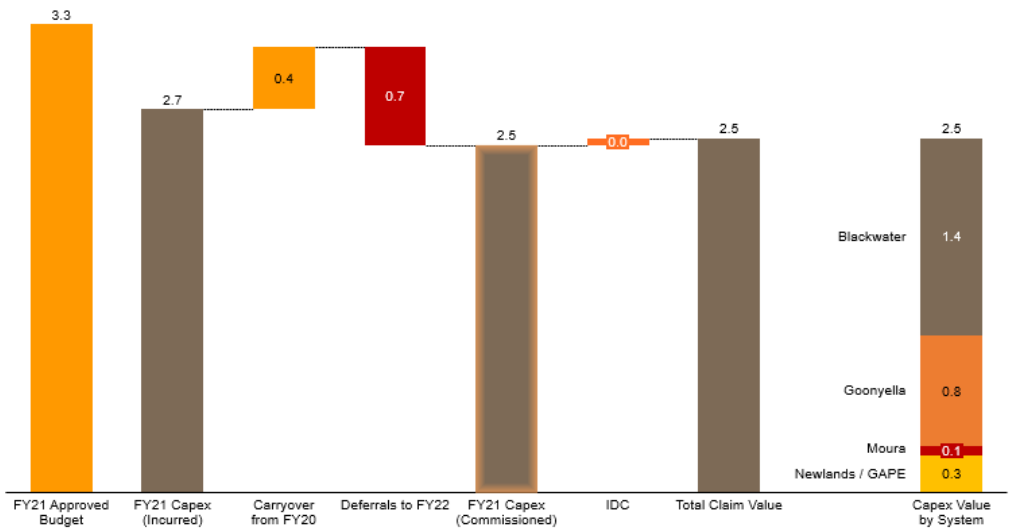
**Figure 8 FY21 Level Crossing Renewal**



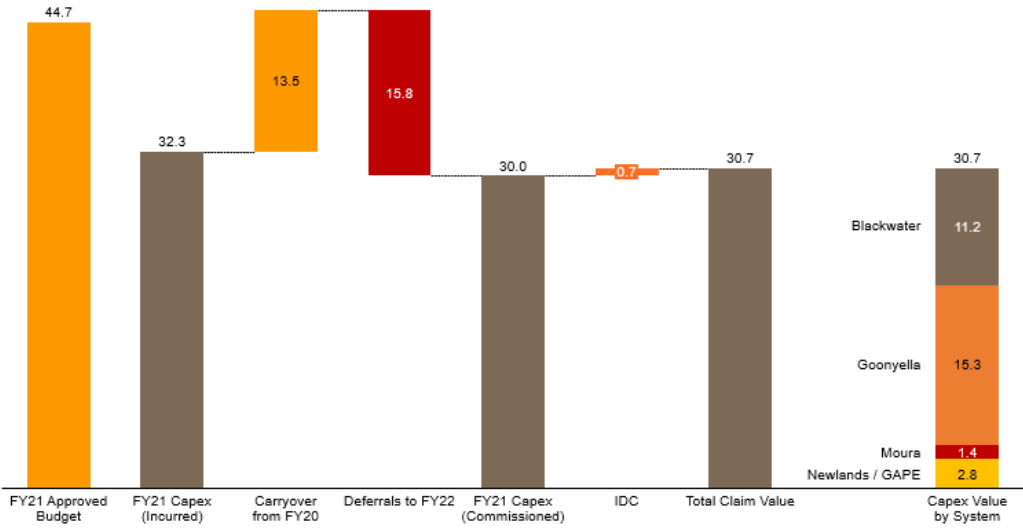
**Figure 9 FY21 Structures**



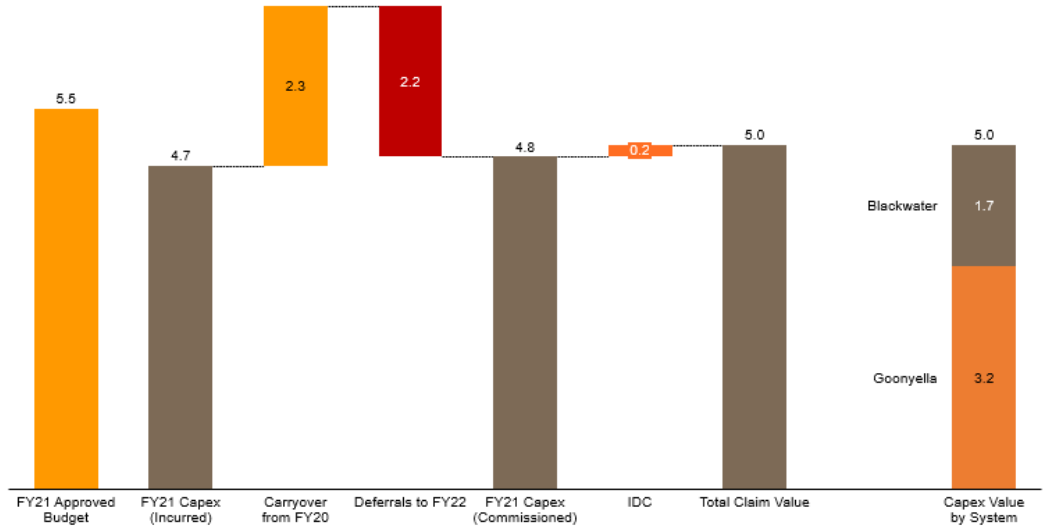
**Figure 10 FY21 Corridor Assets**



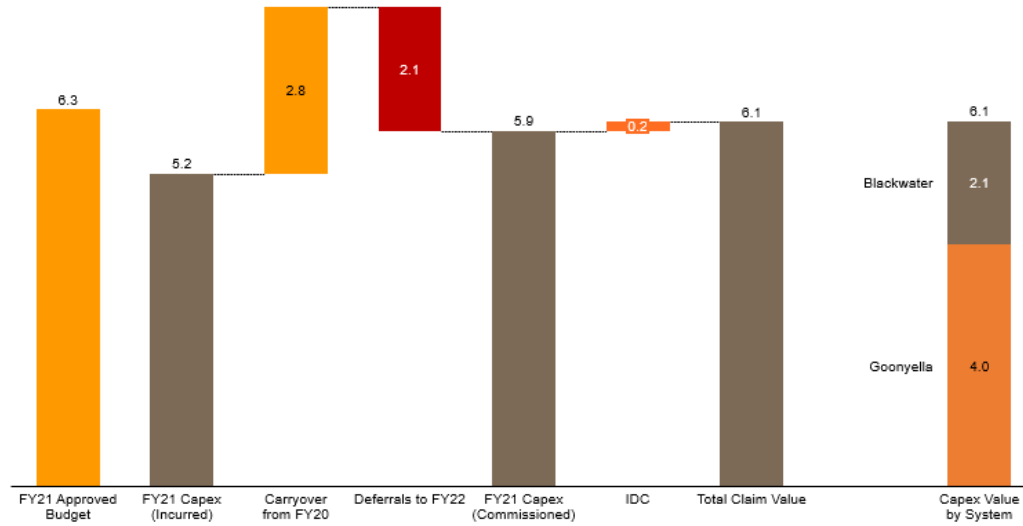
**Figure 11 FY21 Control Systems**



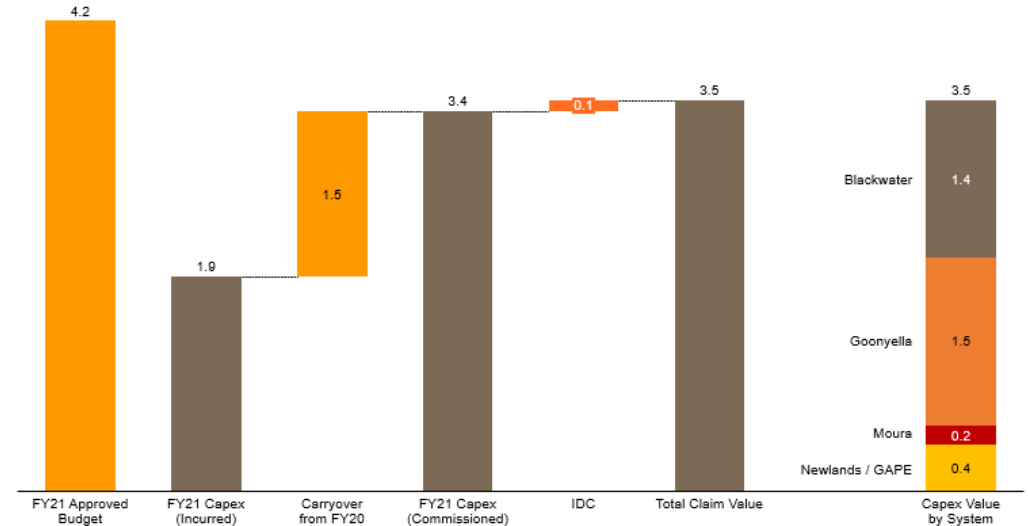
**Figure 12 FY21 Electrical Overhead Line Equipment**



**Figure 13 FY21 Electrical Power Systems**



**Figure 14 FY21 OneSAP**

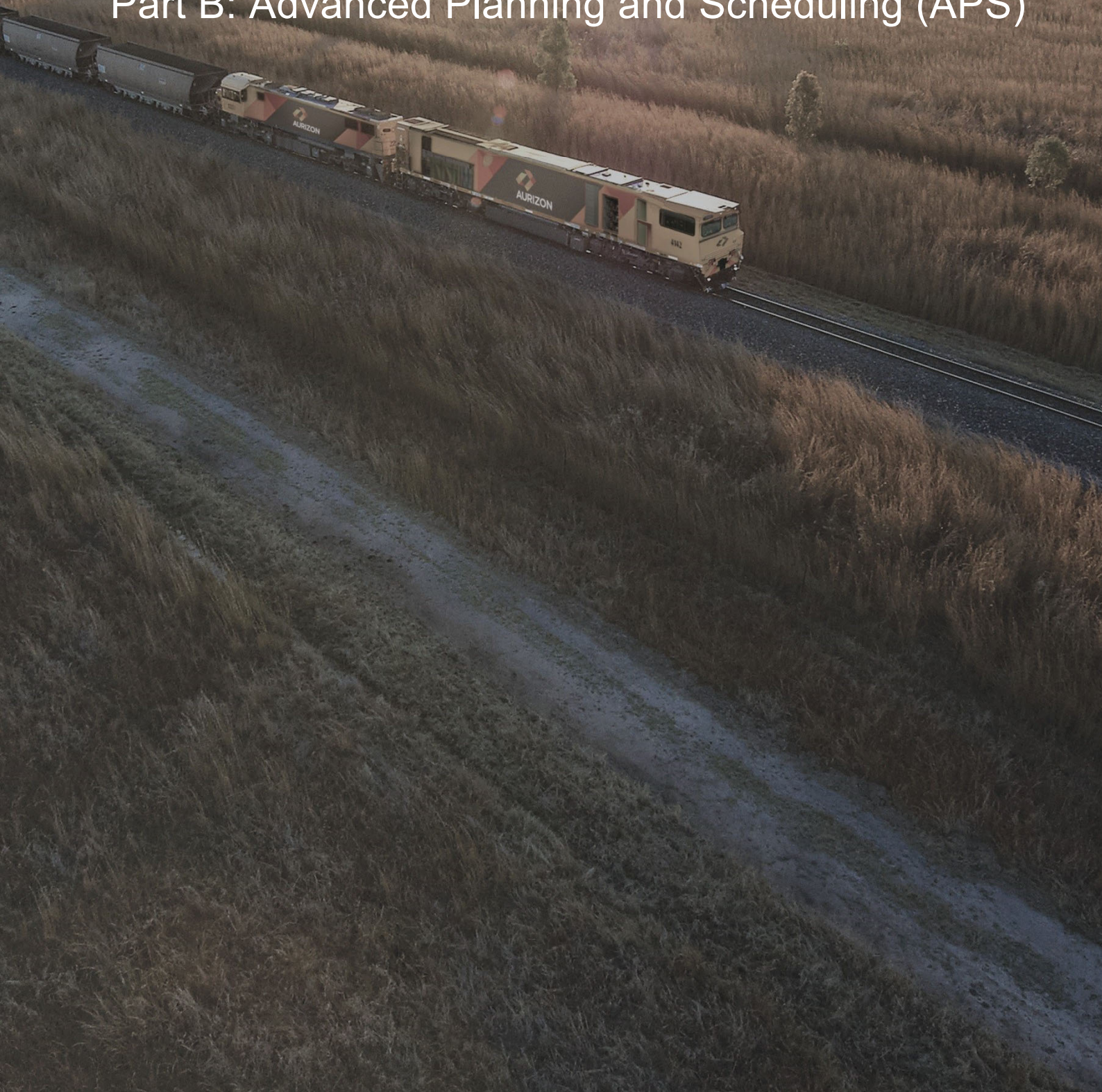




## Appendix C: Supporting Documentation



Aurizon Network  
FY21 Capital Expenditure Claim  
Part B: Advanced Planning and Scheduling (APS)



## 8. Executive Summary

Aurizon Network Pty Ltd (**Aurizon Network**) is seeking QCA approval of capital expenditure totalling \$60.0m related to the design, development and implementation of the Advanced Planning and Scheduling (**APS**) system and the associated enhancements to Aurizon Network's reporting capability.

APS is an asset renewal project that has replaced Aurizon Network's legacy planning and scheduling systems and manual processes with a modern, integrated planning and scheduling platform.

APS enables Aurizon Network to support its current and future traffic management task which has become increasingly complex due to a variety of factors including:

- growth in coal volumes and Train Services;
- an increased number of mine and port combinations, including Cross System Train Services;
- an increased number of Train Operators; and
- the additional maintenance and renewal activity required to support the increased coal volumes.

Aurizon Network's legacy planning and scheduling approach was highly reliant on discrete systems, a multitude of excel spreadsheets, knowledge held by individuals and manual processes, including train schedules that were hand drawn with pencil and paper.

These legacy systems and processes were inherited from Queensland Rail (**QR**). Furthermore, the systems used in planning and scheduling were not integrated with one another. This meant that Aurizon Network's planners, schedulers and Day of Operations controllers did not have a single source of consistent, up-to-date information regarding the useable capacity on mainline and branch lines, demand from Customers, schedule variability, network impacts (e.g. speed restrictions), supply chain outages and asset activity. These aging tools and manual processes did not provide the integrated decision support systems necessary to manage and operate a growing and more complex Central Queensland Coal Network (**CQCN**).

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**APS has improved the sophistication and accuracy of Aurizon Network's planning and scheduling processes.**

**The integrated nature of the solution ensures that Aurizon Network's planning, scheduling and Day of Operations teams have access to timely and up-to-date information.**

**Aurizon Network uses this improved visibility to develop robust train schedules that maximise opportunities to fulfill Customer demand and to enable improved operational outcomes for the CQCN.**

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The APS project required the design and development of a bespoke solution with the capability to effectively manage large volumes of complex supply chain information. APS was not available as an "off the shelf" solution that could be applied directly to the CQCN. The project involved (but was not limited to) the design and development of:

- **operational models and business logic**, including the development of algorithms that systemise the knowledge and experience of Aurizon Network personnel, the regulatory requirements and streamline manual practices where possible;
- **operational datasets** which contain a complete rail plan for a period of time, including topology and all planning inputs and outputs covering all planning horizons including all information relevant to:

- capacity planning, including topology, asset activities (renewals and maintenance programs), contracts and service templates;
- demand planning and scheduling, including train schedules, train orders, train activities and the Day of Operations feedback loop;
- **knowledge bases**, including:
  - the Live Knowledge Base which holds the ‘real-world’ data and planning inputs; and
  - Scenario Knowledge Bases, which allow ‘what if’ scenarios to be tested and refined (such as aligning asset activity in the shadow of other works) prior to accepting it into the live environment,<sup>6</sup>
- **integration** with other Aurizon Network systems and those of other Supply Chain Participants. The preservation of data interfaces and ecosystems is important for those reliant on Aurizon Network data; and
- enhanced **reporting** solutions for internal and external purposes using the Power BI and HANA platforms.

The integrated nature of the APS system provides Aurizon Network, End Users and other stakeholders with:

- a **more complete planning and scheduling assessment across the full train cycle**, allowing Aurizon Network to better understand network cross system and branch line impacts. This provides opportunities to preserve Committed Capacity when planning asset activity wherever reasonably possible;
- **improved planning and scheduling outcomes** through the dynamic application of network constraints (such as speed restrictions) in all planning horizons, and through visibility of actual train running in the Day of Operations which informs the next day’s schedule. This functionality improves Aurizon Network’s ability to plan for known constraints and to resolve scheduling conflicts prior to the Daily Train Plan being provided to Network Control for execution on the Day of Operations; and
- **improved visibility of operational performance** through enhanced ‘near real-time’ reporting capability with data refreshed at 30-minute intervals. This enhanced reporting is also made available to other Supply Chain Participants, who have the opportunity to use this information to better coordinate activities or align resources at their respective interfaces.

While it is recognised that the benefits of complex information and communications technology (ICT) projects may take time to fully realise, results to date illustrate that the project improvements are enabling performance benefits in line with target KPIs. This includes on time performance, schedule adherence, and velocity, as outlined in the interim benefit realisation assessment summarised at section 10.

APS was a complex project that was developed over a period of time that spanned three (3) successive Access Undertakings (UT3 to UT5) and the solution had to adapt to meet Aurizon Network’s changing obligations. In managing the project over this time, Aurizon Network implemented procurement and governance procedures and processes that were robust, useable and adequate for an ICT project of this scale and complexity, and which have been independently reviewed by Ernst and Young (EY).<sup>7</sup>

This submission, and supporting documentation, demonstrates that the APS investment meets the requirements for prudent and efficient investments to provide the declared service as set out in the 2017 Access Undertaking (UT5). The APS Capex Claim therefore should be approved for inclusion in the Regulatory Asset Base (RAB).

## 8.1 Form of submission

This Part B submission is structured as follows:

- **Section 2** provides an overview of APS, which is a key part of a project known as “Project Pluto”;
- **Section 10** provides context for the investment in the project and an overview of the expected project benefits;
- **Section 11** demonstrates how the project satisfies the key criteria necessary for the QCA to assess capital expenditure as prudent and efficient; and
- **Section 12** outlines key documentation that can be provided to the QCA in support of the APS Capex Claim.

<sup>6</sup> Aurizon Network (2020), Project Pluto, Solution Architecture Design (SAD) – APS Release 4, 16 June, Page 27-28.

<sup>7</sup> EY (2021), Project Pluto APS solution procurement and governance independent assessment, May

## 9. Overview and Functionality

Part B of this FY21 Capex Claim submission seeks QCA approval of capital expenditure related to the APS system and the associated reporting improvements. APS was delivered as part of Project Pluto, a multi-faceted information and communications technology (ICT) project that was initiated in October 2012 to replace Aurizon Network’s legacy planning and scheduling systems and processes. Project Pluto also delivered the Movement Planner system along with an improved reporting solution. The QCA approved the capital expenditure associated with Movement Planner as part of the FY2016 and FY2017 capital expenditure claims and it has been included in the RAB.

### 9.1 Project Overview

Project Pluto was initiated to improve planning, scheduling and Day of Operations outcomes for the CQCN in a demand environment with strong growth expectations.

Aurizon Network’s legacy systems were highly reliant on discrete systems, a multitude of spreadsheets, knowledge held by individuals and manual processes.<sup>8</sup> As a consequence, these systems had limited capability to sustainably support the Queensland coal industry’s expected growth path.

The key objective of Project Pluto was to replace these legacy systems and manual processes with a modern solution capable of handling large volumes of complex supply chain information. Project Pluto would achieve this through the design, development, and implementation of key systems, being Movement Planner, APS, and the associated reporting systems.

#### 9.1.1 Project Timeline

Project Pluto commenced in 2012 and was a complex ICT project that required bespoke design, development and implementation. An overview of the key project milestones and the events that took place during the delivery of the project is set out below:

Figure 15 Project Pluto Milestones

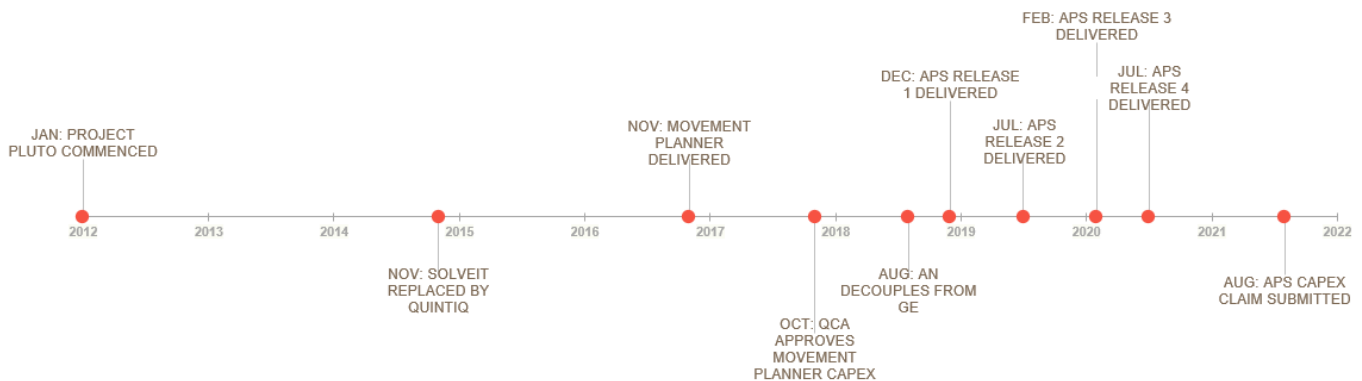


Table 17 Key factors relevant to the development and delivery of APS

Time	Description of Event
2012 – Project Pluto Commenced.	Aurizon Network conducted a competitive 2-stage procurement process to appoint vendors to deliver the project. This commenced via a Request for Information (RFI) to identify potential bidders. A formal Request for Proposal (RFP) was then provided to 5 identified vendors.

<sup>8</sup> Aurizon Network (2012), Mini Board Green Paper, Investment Framework Feasibility Capital Approval, 27 September, Page 1

Time	Description of Event
	<p>The RFP process resulted in the appointment of GE Transport Systems Pty Ltd (<b>GE</b>) as principal contractor with SolveIT as GE's subcontractor. In October 2012, Aurizon entered into an IT Services Agreement with GE for delivery of an 'Advanced Planning and Execution' (<b>APEX</b>) system. APEX consisted of GE's movement planner software solution, integrated with a planning and scheduling software solution (<b>APS</b>) developed by GE's subcontractor, initially SolveIT and then Quintiq Pty Ltd (<b>Quintiq</b>).</p>
<p>2013-2014 – Replacement of sub-contractor</p>	<p>As noted in section 8 above, the APEX solution required all aspects of Aurizon Network's capacity, planning, scheduling and operational data, business logic and scenario functionality to be designed and developed into an integrated solution. Due to the scale, complexity and bespoke nature of the APS solution, GE's subcontractor (SolveIT) struggled to meet their delivery milestones and quality outcomes.</p> <p>This resulted in schedule slippage and subsequently, the contract with SolveIT was terminated. GE approached the market for a replacement for SolveIT and in November 2014, Quintiq replaced SolveIT as GE's subcontractor for the project.</p> <p><i>Note: Quintiq was acquired by Dassault Systèmes in 2014 and rebranded to DELMIA Quintiq (DS).</i></p>
<p>November 2016 – Movement Planner was delivered</p>	<p>Movement Planner was delivered in November 2016. Capital expenditure associated with Movement Planner (\$17.5m including IDC) was approved by the QCA for inclusion in the RAB as part of the FY2016 and FY2017 capital expenditure claims.</p>
<p>November 2017 and April 2018 – Decoupling from GE</p>	<p>Aurizon went through the process of 'decoupling' the provision of APS from the IT Services Agreement with GE so as to allow Aurizon to deal directly with DS and take a more direct role in managing the delivery and technical risks associated with the project. These risk were driven by the scale, complexity and bespoke nature of the APS solution, which have been summarised above.</p> <p>Aurizon Network sought to manage these risks by entering into an alternative contract structure with the vendors. Decoupling would see:</p> <ul style="list-style-type: none"> <li>responsibility for the management, governance and solution integration of APS transferred from GE to Aurizon Network; and</li> <li>the delivery model for APS transferred from GE to Quintiq. In June 2018 Aurizon, GE and Quintiq signed relevant contracts to give effect to the decoupling. In the process of decoupling, Aurizon Network set up the appropriate internal governance through the Pluto Program Board to manage Quintiq with a prime purpose of driving the project forward to deliver the outcomes and benefits as set out in the approved business case.<sup>9</sup></li> </ul>
<p>May 2018 – scope changes to accommodate UT5 requirements</p>	<p>In May 2018, scope changes identified as a result of business process changes associated with Aurizon Network's Draft Amending Access Undertaking to UT5 (<b>UT5 DAAU</b>) and the prioritisation of necessary system enhancements identified during testing.</p>
<p>November 2018 - APS Release 1 was delivered</p>	<p>Release 1 related to the management of asset activity and outages across the CQCN and provided the foundation for reporting via Power BI.</p>
<p>August 2019 - APS Release 2 was delivered</p>	<p>Release 2 saw the transition of pathing and train planning and scheduling functions into APS and the introduction of new Power BI reports.</p>
<p>December 2019 – QCA approval of the UT5 Draft Amending Access Undertaking</p>	<p>The UT5 DAAU was approved by the QCA on 19 December 2019.</p> <p>The UT5 DAAU drove a significant change to Aurizon Network's regulatory environment including the content of network performance reports for customers. As a result, Aurizon Network was required to develop new business practices through APS, including the requirement to preserve Capacity on main and branch lines.</p>
<p>February 2020 - APS Release 3 was delivered</p>	<p>Release 3 saw the introduction of refinements and functionality enhancements, including the delivery of new capacity modelling in the form of "Useable Capacity" and the dynamic application of network constraints such as speed restrictions.</p>

<sup>9</sup> EY (2021), Page 32

Time	Description of Event
July 2020 – APS Release 4 was delivered	The final release of APS included the introduction of the new “Estimate/Actual” schedule.

## 9.2 Project Functionality

### 9.2.1 Movement Planner

Movement Planner was implemented in 2016 and replaced Aurizon Network’s manual paper-based train diagrams with a real-time electronic train graph and automated conflict detection for use on the Day of Operations.

The scope, standard and cost of Movement Planner was deemed prudent and efficient and all capital expenditure associated with this element of Project Pluto (a total value of c.\$17.5m) was approved by the QCA for inclusion in the RAB in FY2016 and FY2017.

References to Movement Planner within this submission are provided for reference and completeness only. Aurizon Network is not seeking QCA approval of costs relating to Movement Planner within this FY21 Capex Claim submission.

### 9.2.2 Advanced Planning and Scheduling (APS)

APS is a modern planning and scheduling platform that improves Aurizon Network’s planning, scheduling and operational decision support capabilities.

APS provides a single source of information for all relevant planning teams and provides access to consistent and timely information across each stage of the planning and scheduling process. This not only supports better quality decision making but has improved Aurizon Network’s ability to deliver more comprehensive and operationally robust Train Plans. APS achieves this through the following functionality:

- a near real-time view of the CQCN and known constraints, allowing for more sophisticated and accurate planning outcomes. This provides Aurizon Network’s planners with more timely and complete information which can be used to better coordinate Customer demand and asset activity in the CQCN;
- a more complete planning and scheduling assessment across the full train cycle, allowing planners to better understand network cross system and branch line impacts and provides opportunities to preserve Committed Capacity when planning asset activity wherever reasonably possible;
- functionality that dynamically applies network constraints (such as speed restrictions) to future schedules, which provides the opportunity to resolve scheduling conflicts prior to the Daily Train Plan being provided to Network Control for execution in the Day of Operations; and
- improved near real-time<sup>10</sup> network performance reporting, which also provides greater transparency to other Supply Chain Participants thereby giving them the opportunity to align their own maintenance and rail plans.

APS is utilised by all relevant teams throughout each stage of Aurizon Network’s planning and scheduling processes including:

- informing the development of the Maintenance and Renewal Strategy and Budget and access implications for each Coal System;
- informing the development of the monthly Master Train Plan;
- development of the weekly Intermediate Train Plan;
- development of 96-hour schedule (as outlined in the System Rules); and
- development and handover of the Daily Train Plan to Network Control.

<sup>10</sup> Data refreshed at 30-minute intervals.

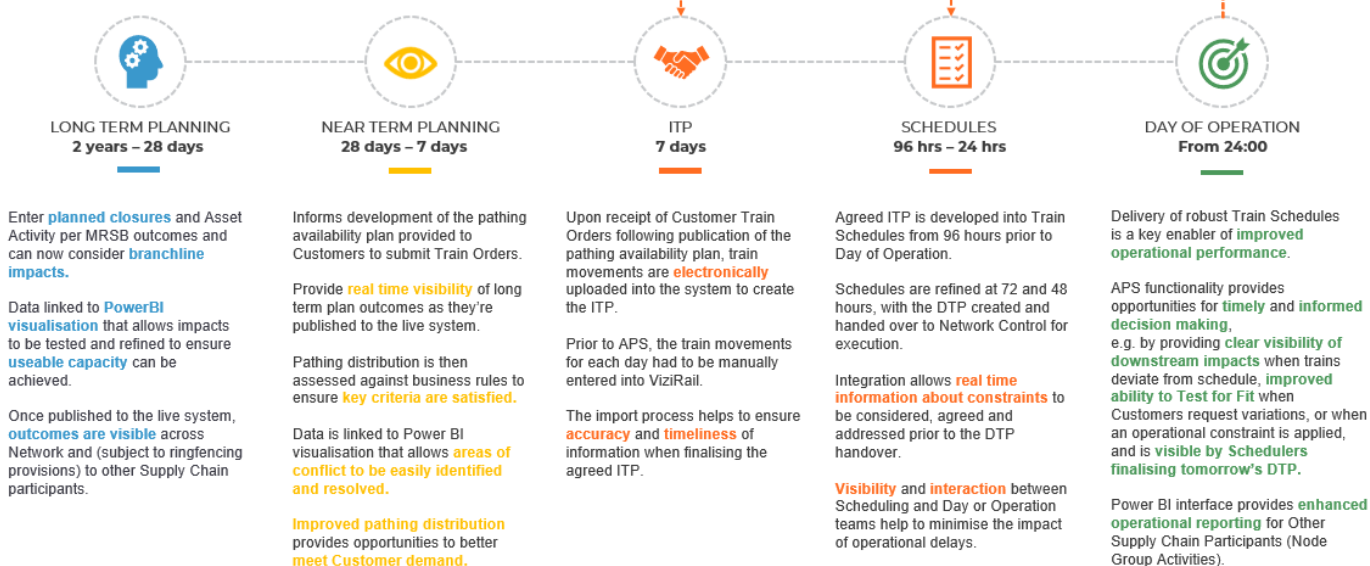
Some of the key benefits that have been realised by the planning and scheduling teams as a result of APS are outlined in Figure 16 below.

Figure 16 Benefits of APS

## APS | Visibility & Feedback Loop

APS is used across all planning, scheduling and Day of Operations horizons. Teams have access to and visibility of consistent and timely information across each stage of the process. This provides opportunities to better coordinate Customer demand and asset activity and to identify any potential areas of concern earlier in the process. This ultimately enables the development of robust train schedules for execution.

### HOW APS IS USED:



As indicated in Table 17 above, APS functionality was delivered in 4 releases. A high-level overview of the key functionality delivered at each major release is provided in Figure 17.

Figure 17 Overview of functionality in each APS Release



Further detail of the functionality delivered at each stage is provided in Table 18 below. It should be noted that this is only a summary of key functionality. In delivering Project Pluto, approximately 1,000 individual business requirements were implemented. The complete list of the user requirements and functionality is outlined in the Requirements Traceability Matrix, which can be supplied to the QCA on request.



**Table 18 Overview of APS Releases**

Release	Functionality Delivered
APS Release 1	<p>In late 2018, Project Pluto delivered the first commissioning of APS together with the foundation for the Power BI reporting solution via the self-service portal. Release 1 brought together management of all asset activities and outages across CQCN, along with supplying an update to the GE Movement Planner gateway. All three systems (i.e. APS, Movement Planner and Power BI), along with the SAP Network Asset Maintenance System were integrated into the solution.</p> <p>Following this release, the Pluto Program Board requested the Program Manager to set up a charter and chair monthly meetings with Railway Operators (the Technical Working Group) in order to work collaboratively and assist them with the numerous changes which would be delivered in subsequent releases. The forum proved to be a valuable way of communicating the many changes delivered in the following tranches and determining ways in which Aurizon Network could work constructively with Railway Operators for the smooth adoption of APS.</p>
APS Release 2	<p>In mid-2019, planning and scheduling functions were transferred from Aurizon Network’s disparate and aging systems into APS. This included the delivery of the key functionality such as the Electronic Train Graph and Node Group Activity Forms, timetables for a variety of traffic, functionality to manage train stowage location and train stowage plans, user interface enhancements, and access agreements and contract data which is essential for determining key measures such as usable capacity.</p> <p>Some functionality, such as the automatic application of speed restrictions, was developed but not immediately implemented and the existing manual process was initially retained. This approach was part of a considered project change management strategy that sought to set system-use fundamentals prior to introducing more significant changes for both internal and external stakeholders.</p> <p>Power BI reporting enhancements were also included in this release to reflect the increased functionality provided by APS.</p>
APS Release 3	<p>A further release occurred in February 2020, which among other things, included enhancements and alterations to address lessons observed from the network planners following their use of the previous releases. Given the scale and complexity of the capacity, planning, scheduling and operational data, business logic and scenario functionality that was required to be incorporated, receiving feedback from those who will ultimately use the system was a key aspect of the design, development and delivery of the APS solution.</p> <p>This release saw functionality implemented in the live environment, including conflict detection – a key tool which helps to identify potential scheduling constraints ahead of the Day of Operations, validation of section run times, and enhancements to the Electronic Train Graph and Power BI reporting.</p> <p>Following engagement with Railway Operators through monthly working groups, the functionality developed as part of Release 2 to support the dynamic application of speed restrictions went live. This improved the accuracy of estimated times of arrival through the network based on either planned or unplanned issues for scheduled and running trains.</p>
APS Release 4	<p>Delivered in July 2020, the final scheduled functionality release delivered further enhancements on the earlier releases of Pluto and:</p> <ul style="list-style-type: none"> <li>• provided a visual display in the Electronic Train Graph of each day’s Agreed Daily Train Plan along with a second representation of the Actual Running Plan (with revised future estimates) based on near real-time updates of activity throughout the CQCN;</li> <li>• included functionality to consider branch lines impacts (which was not previously possible);</li> <li>• provided an automatic application of additional run-time to trains that are re-routed through crossovers, ensuring a more accurate schedule;</li> <li>• included an electronic weekly ordering (Journey Order Import or JOI) process with operators which allows an initial draft train plan to be developed via automation.</li> <li>• improved mine and port slot availability reporting, to consider events and availability of adjoining infrastructure to the CQCN and replace the legacy non-integrated system which relied on the manual re-keying of data.</li> <li>• Provides Day of Operations feedback to the schedulers for preparation of a more accurate 24-hour schedule for the following day. APS is now the primary planning and scheduling tool utilised by Aurizon Network</li> </ul>

### 9.2.3 Improved Reporting

The fundamental objective of delivering improved reporting in line with each APS release was to improve transparency and provide access to information sourced from APS to Customers.

Project Pluto has improved visibility and access to operational, scheduling, tactical and strategic planning information with the transition of monthly static reports to a modern self-service portal. This portal is accessible by Aurizon Network, Railway Operators, Customers and port operators. The reports and portal capability use the Aurizon Group's Enterprise reporting architecture including SAP HANA and Microsoft Power BI and is refreshed regularly to promote timely access to information.

This has improved Aurizon Network's ability to provide additional network performance information (e.g. branch line capacity), as required in Part 10.8 of UT5.

The Power BI reporting provides a clear visual representation of data sourced from APS. This is then used at key stages of the planning process (e.g. asset activity and maintenance) to confirm whether Aurizon Network still has the capability to deliver an appropriate level of useable Capacity and pathing distribution to meet its obligations to Customers. Where this cannot be achieved, it is highlighted within the Power BI reporting, providing an opportunity for the planner to investigate the activity causing the discrepancy. Upon investigation, the discrepancy can either be rectified, or retained, with the latter being subject to receipt of appropriate internal approvals.

## 10. Rationale for Project Pluto

### 10.1 Rationale for the investment

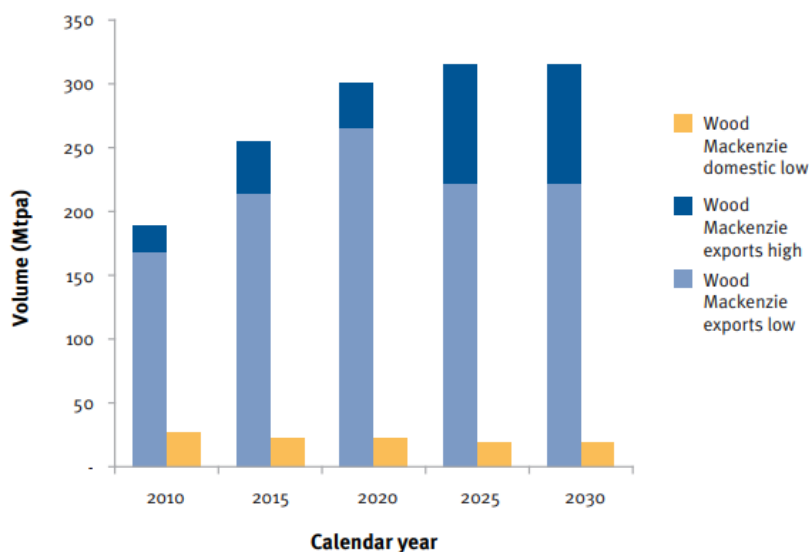
Aurizon Network's legacy planning and scheduling approach relied heavily on discrete systems, spreadsheets, knowledge of individuals and manual processes.<sup>11</sup> Aurizon Network's Investment Approval Request (IAR) for Project Pluto outlined that the:

*"Uplift in services across multiple systems is becoming increasingly difficult to plan and schedule and the risk of day of operations losses increases as number of services increases. If the Network business does not respond to this challenge and replace its current systems then there is a risk that it will be unable to fulfil its contractual obligations under the Access Undertaking."<sup>12</sup>*

The need for a modern planning and scheduling system was reinforced by the requirement to accommodate the strong growth expectations of the Queensland coal industry that prevailed at the time of the investment.

These expectations were supported by the Queensland Government's Department of Infrastructure and Planning, which in 2010 published CoalPlan 2030 (CoalPlan). CoalPlan examined the potential growth path for Queensland's coal industry out to 2030 and the infrastructure that may be required to support the growth and increasing interoperability between Coal Systems. CoalPlan noted that total Queensland coal exports (up to 2014) were expected to peak at between 240 and 340 mtpa.<sup>13</sup>

**Figure 18 Queensland exports and production forecast – thermal and metallurgical coal**



Source: Department of Infrastructure and Planning (2010), Figure 19

Note: Wood Mackenzie's forecasts were baselined against the ABARE view of growth in export supply from Australia in early 2010, for both metallurgical and thermal coal exports over the 2009-2014 period.

Aurizon Network identified that such significant demand growth would result in increased operational complexity, as a result of:

- growth in volumes and train services;

<sup>11</sup> Aurizon Network (2012), Mini Board Green Paper, Investment Framework Feasibility Capital Approval, 27 September, Page 1.

<sup>12</sup> Aurizon Network (2012), pg. 8

<sup>13</sup> Department of Infrastructure and Planning (2010), CoalPlan 2030 – Laying the foundations of a future, 12 November, Page 22.

- an increasing number of mine to port combinations to plan, schedule and manage;
- necessary infrastructure expansion and configuration changes requiring additional train planning and operational management activities;
- greater complexity in facilitating track access for planned construction, asset renewal and maintenance work while maintaining useable capacity;
- an increasing volume of cross system traffic;
- coal producers seeking to contract directly with Network for Track Access; and
- coal producers contemplating the introduction of their own haulage operations.<sup>14</sup>

Without the capability to efficiently manage large volumes of complex Supply Chain information, Aurizon Network could not sustainably manage the expected increase in demand to efficiently fulfill its contractual obligations to Customers.

As such, Project Pluto was initiated on 24 January 2012 to replace Aurizon Network's legacy systems and processes with a modern equivalent that was capable of improving planning and scheduling outcomes in an environment characterised by increasing operational complexity and expectations of increasing Customer demand.

## 10.2 Expected Project Benefits

Project Pluto has helped to deliver operational benefits for the CQCN by improving Aurizon Network's planning and scheduling processes resulting in better, more robust train schedules for Day of Operations execution.

APS has helped to facilitate higher quality planning outcomes by improving both planning and scheduling accuracy and Aurizon Network's ability to analyse and improve system performance.

### 10.2.1 Planning and scheduling accuracy:

APS helps to improve scheduling accuracy and allows changes to asset condition and network constraints (for e.g. speed restrictions) to be dynamically reflected in future train schedules. This improved, early visibility of network constraints provides an opportunity to reduce disruption in the Day of Operations where:

- Aurizon Network can adjust short term schedules to reduce the likelihood of cancellations due to missed connections; or where
- Other Supply Chain Participants (i.e. mines, ports and operators) have the ability to adjust their own plans / resources in response.

### 10.2.2 Aurizon Network's analytical capability:

APS functionality improves Aurizon Network's capability to:

- identify constraints which may impact useable Capacity or pathing distribution. Identification of such constraints early the planning process allows appropriate action to be taken, thereby facilitating delivery of effective plans for asset activity that help to achieve the Maintenance Objectives.
- perform capability assessments at key interface points, e.g. ports/mines/loadouts and branch line impacts. This allows asset activity to be aligned in a way that seeks to deliver committed capacity.

Figure 19 below provides an illustrative example of how the combination of APS and Power BI reporting allows pathing conflicts to be easily identified and effectively managed.

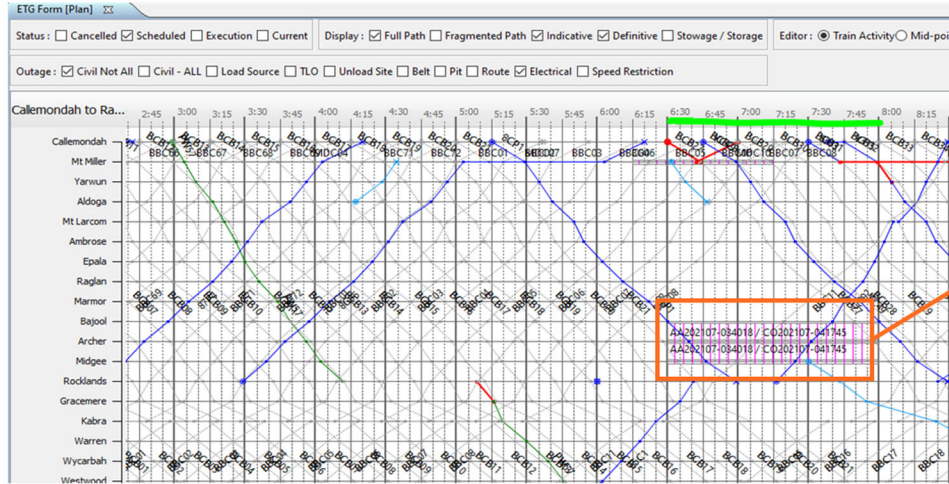
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<sup>14</sup> Ibid.

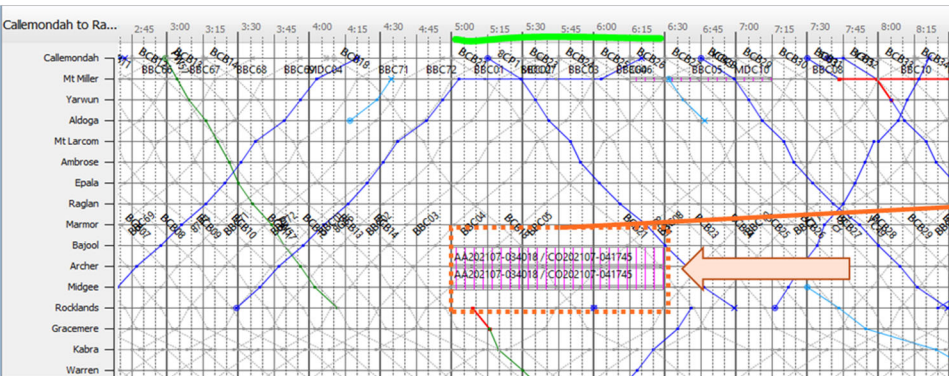
Figure 19 APS and Power BI help to facilitate effective pathing distribution outcomes

Leg Date	Empty				Loaded				Total				Path Breaches	
	NA %	Breaches	Compliance %	Vacant Paths	NA %	Breaches	Compliance %	Vacant Paths	NA %	Breaches	Compliance %	Vacant Paths	Path Dt	Path ID
20/09/2021	60.42%		100.00%	58	63.89%		100.00%	46	61.90%		100.00%	10	21/09/2021	BBC20
21/09/2021	83.33%		100.00%	80	79.17%	1	98.61%	57	81.55%	1	99.40%	13	22/09/2021	BBC14
22/09/2021	94.79%	2	97.92%	91	93.06%	1	98.61%	67	94.05%	3	98.21%	15	22/09/2021	BC825
23/09/2021	100.00%		100.00%	96	100.00%		100.00%	72	100.00%		100.00%	16	22/09/2021	BC826
24/09/2021	100.00%		100.00%	96	100.00%		100.00%	72	100.00%		100.00%	16		

Data sourced from APS and presented in the Pathing Power BI report allows Aurizon Network planners to easily identify 3 Paths on 22 September that require investigation.



A review of the electronic train graph indicates that an asset activity planned between 0630-0800 conflicts with two (2) MTP trains (represented by the dark blue lines).



APS assists Aurizon Network planners to visually identify space between trains.

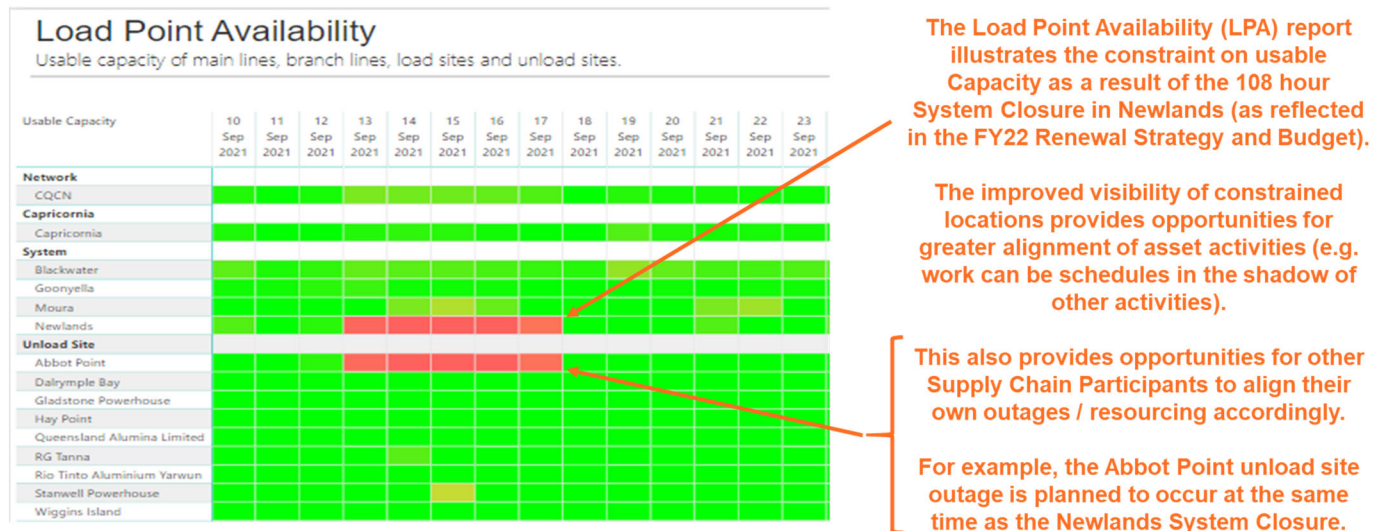
In this example, the asset activity is then moved to start at 0500-0630, thereby deconflicting the paths.

Leg Date	Empty				Loaded				Total				Path Breaches	
	NA %	Breaches	Compliance %	Vacant Paths	NA %	Breaches	Compliance %	Vacant Paths	NA %	Breaches	Compliance %	Vacant Paths	Path Dt	Path ID
20/09/2021	60.42%		100.00%	58	63.89%		100.00%	46	61.90%		100.00%	10	21/09/2021	BBC20
21/09/2021	83.33%		100.00%	80	79.17%	1	98.61%	57	81.55%	1	99.40%	13		
22/09/2021	93.75%		100.00%	90	93.06%		100.00%	67	93.45%		100.00%	13		
23/09/2021	100.00%		100.00%	96	100.00%		100.00%	72	100.00%		100.00%	16		
24/09/2021	100.00%		100.00%	96	100.00%		100.00%	72	100.00%		100.00%	16		

A review of the Pathing Power BI report validates that the conflict has been resolved.

Figure 20 below provides an illustrative example of the 'Load Point Availability' report, which provides Aurizon Network and Other Supply Chain Participants with near real time visibility of the dates and locations where Usable Capacity may be constrained. Such visibility provides opportunities to promote greater alignment of activities across the supply chain.

Figure 20 Example of Load Point Availability report



The combination of the above ultimately create opportunities to increase throughput. Advanced Planning and Scheduling technology has enabled Aurizon Network to preserve capacity for train movements by ensuring that maintenance activity is optimally planned and resourced. These modernised planning and scheduling techniques have resulted in an increased number of revenue train cycles.

Improved accuracy in scheduling provides the foundation for pursuing further operational improvements, including:

- reduction in Day of Operations cancellations;
- increased cycle velocity with reduced cross system delays and dwells; and
- improved on-time arrival at key locations, thereby improving tonnage throughput, through disciplined train operations.

### 10.2.3 Interim benefits realisation analysis shows positive performance

Aurizon Network’s Project Completion Report for the project includes an interim benefits realisation analysis against relevant Key Performance Indicators (KPIs).

While it is not uncommon for the benefits of ICT projects to take time to fully realise (indeed the Australian Energy Regulator’s Non-Network ICT Capex Assessment Review noted that the benefits of an ICT project may not become apparent until several years after the investment<sup>15</sup>), results to date illustrate that Project Pluto has either achieved, or is on track to achieving, the relevant project targets. A summary of the interim results is provided in Table 19 below.

Table 19 Interim performance against project targets

KPI	Target	CQCN (FY19)	CQCN (FY20)	CQCN (FY21)	Blackwater	Goonyella	Moura	Newlands
On Time Port Arrivals	43.02%	19.48%	31.21%	42.38%	48.3%	33.3%	51.5%	48.2%
Network Velocity	24.25 kph	23.09	23.29	22.98	25.8	20.5	16.6	24.4

<sup>15</sup> AER (2019), Non-network ICT capex assessment approach, November, Pg. 25. Aurizon Network notes that UT5 does not contain specific guidelines relating to ICT projects like APS, nor has the QCA issued other guidance papers on the matter, hence Aurizon Network having regard to the Australian Energy Regulator’s (AER) Non-Network ICT Capex Assessment Review (AER Guidelines).

KPI	Target	CQCN (FY19)	CQCN (FY20)	CQCN (FY21)	Blackwater	Goonyella	Moura	Newlands
Schedule Adherence	39 to 100%	19 to 77%	31 to 83%	42 to 96%	48 to 98%	33 to 94%	51 to 97%	48 to 96%
On Time Mine Arrivals	+ 0.3%	39.8%	47.6%	56.8%	61.4%	54.1%	61.6%	52.4%

Orange results indicate that while the target KPI has not yet been met, the relevant measure has improved since implementation of Pluto.

In interpreting these results, it can be seen that the KPIs relating to schedule adherence and on time performance show the most significant improvement, due to the high correlation with the development of achievable rail schedules and operation to plan.

In contrast, Network velocity is subject to a range of other exogenous factors, including the performance of other Supply Chain Participants. As a consequence, it may take longer for such targets to be met as these KPIs are dependent on the ability of other Supply Chain Participants to also improve their own processes and operational capability in response to the planning and scheduling improvements.

It should be noted that APS has helped to facilitate the maturation of a number of Aurizon Network's business processes and practices, including the introduction of more advanced algorithms with which to model capacity. In some instances, such changes have meant that KPI's identified at the commencement of the project are no longer measurable, as comparable data is no longer recorded. Aurizon Network has provided a description of these KPI's in Table 20 below.

**Table 20 Original project KPI's that are no longer comparable**

KPI	Description
Daily Supply Chain Capacity	Data is not comparable - The basis upon which capacity was calculated in 2012 is significantly different to the current model used to determine usable capacity. Presentation of useable capacity outcomes would not provide a meaningful comparison to the original project target.
Theoretical Rail Network Capacity	Measure no longer relevant - While Aurizon Network has achieved this KPI, measures of <i>theoretical</i> capacity are no longer seen as a valuable measure of project benefits, with the focus shifting to <i>useable</i> capacity.
Payload Improvement	Data is not comparable – The measure set at the beginning of the project was intended to measure improvements driven by Aurizon Network. Non-Network factors (e.g. increased consist length) have also contributed to payload improvement over time making it difficult to isolate and report on the benefits driven by the project.  This KPI was subsequently replaced by the 'On Time Mine Arrivals' KPI, which has seen improvement across all Coal Systems.
Day of Operations Cancellations	Data is not comparable – Performance against the original target is skewed by a change in business process that saw operator changes to a service's mine/port combination in the Day of Operations recorded as a cancellation (plus addition) rather than as a diversion.

Further information in relation to the above is included within the Project Completion Report.

It should be noted that at the time of drafting this submission, the Independent Expert (IE) has not published its Initial Capacity Assessment Report (ICAR). The ICAR will, among other things, assess Deliverable Network Capacity and whether an Existing Capacity Deficit exists in a Coal System. The resulting consultation between Aurizon Network, End Users, Customers, Access Holders and Train Operators may determine that the most effective and efficient way of addressing the Existing Capacity Deficit is for Aurizon Network to make changes to the operational and maintenance practices for Rail Infrastructure in a relevant Coal System.

It's likely that the outcomes of the ICAR process would also have impacted the ongoing comparability and relevance of the KPI's identified in Table 20.

## 11. Prudence and Efficiency of APS Capital Expenditure

Clause 2.2(a) of Schedule E to UT5 requires that the QCA must approve including capital expenditure 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 the *Queensland Competition Authority Act 1997* (Qld). The APS investment meets these requirements and the APS Capex Claim should be approved for inclusion in the RAB.

In this section, Aurizon Network outlines how APS satisfies the key criteria that the QCA must have regard to when determining whether to approve capital expenditure for inclusion in the RAB.

### 11.1 Scope of Works

Aurizon Network's legacy planning and scheduling systems (including the NOPP<sup>16</sup>) were discrete and highly reliant on a multitude of excel spreadsheets, knowledge held by individuals, and manual processes<sup>17</sup> including train schedules that were hand drawn with pencil and paper. These aging tools and processes did not provide the integrated decision support systems that are necessary to manage and operate a growing and more complex CQCN<sup>18</sup>.

The scope of the larger program of works under Project Pluto was informed by a detailed comparative analysis between Aurizon Network's legacy systems, commercial "off the shelf" software and through benchmarking studies with Class 1 Railroads in North America. This analysis identified that Aurizon Network's legacy systems provided limited capability to effectively manage large volumes of complex supply chain information. The scope of the project would also require functionality to address limitations and deficiencies in Aurizon Network's legacy systems, including:

- lack of standardisation and systems integration limited Aurizon Network's ability to develop optimal planning and scheduling outcomes and had the potential to compromise data integrity and consistency across the planning, scheduling and operational horizons;
- the inability to dynamically apply the impact of track condition (e.g. speed restrictions) to train schedules; and
- lack of integration between the existing time vs. distance train graphs used in maintenance planning, access planning and train performance to facilitate on-time performance or flexibility in rescheduling and re-routing to accommodate additional services or recovery.

This meant that Aurizon Network's planners, schedulers and Day of Operations controllers did not have a single source of consistent, up-to-date information regarding the useable capacity on mainline and branch lines, demand from Customers, schedule variability, network impacts (e.g. speed restrictions), supply chain outages and asset activity. In the context of the coal export growth expectations prevailing at the time, Aurizon Network required a modern equivalent to replace or upgrade its aging planning, scheduling and operational decision support capabilities.

In order to improve planning and scheduling outcomes in the CQCN, Aurizon Network would require a bespoke, integrated solution that would capture all business logic, topology and operational datasets relating to the management of capacity, planning, scheduling and operating the CQCN. This included (but was not limited to) the design and development of:

- **operational models and business logic**, including the development of algorithms that systemise the knowledge and experience of Aurizon Network personnel and streamline manual practices where possible;

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<sup>16</sup> Network Operations Path Planner was a custom-built application that contained some planning information, i.e. master data assumptions but no business logic or capability to dynamically consider 'real-time' constraints.

<sup>17</sup> Aurizon Network (2012), Mini Board Green Paper, Investment Framework Feasibility Capital Approval, 27 September, Page 1

<sup>18</sup> Aurizon Network (2016), Additional Funds / Change of Scope Approval Request, October, Page 2



- **operational datasets** which may contain a complete rail plan for a period of time, including topology and all planning inputs and outputs covering all planning horizons including all information relevant to:
  - capacity planning, including topology, asset activities (renewals and maintenance programs), contracts and service templates;
  - demand planning and scheduling, including train schedules, train orders, train activities and the Day of Operations feedback loop;
- **knowledge bases**, including:
  - the Live Knowledge Base which holds the ‘real-world’ data and planning inputs; and
  - Scenario Knowledge Bases, which allow ‘what if’ scenarios to be tested and refined (such as aligning asset activity in the shadow of other works) prior to accepting it into the live environment,<sup>19</sup>
- **integration** with other Aurizon Network systems and those of other Supply Chain Participants. The preservation of data interfaces and ecosystems is important for those reliant on Aurizon Network data; and
- enhanced **reporting** solution for internal and external purposes using the Power BI and HANA platforms.

### 11.1.1 Defining Project Pluto deliverables

The scope of the project was limited to the processes, systems and resources that Aurizon Network required to plan and schedule CQCN rail traffic from approximately 2 years ahead of Day of Operations. Baseline scope development was informed by the benchmarking exercised with Class 1 Railroads and interviews with operational teams to determine requirements. Further scope changes were made following User Acceptance Testing and use in a live environment.

The technical solution of Project Pluto, in which APS is included, provides forecasting, planning and scheduling functionality. This functionality utilises statistical algorithms to determine useable capacity across the CQCN (including branch lines) considering both Network and Supply Chain constraints. The solution enables greater accuracy of train schedules that can be updated dynamically as conditions change, thereby supporting the maturation of Aurizon Network’s business processes.

This complex business solution also depended on the alignment of technology delivered through Aurizon Network’s IT platforms and the related business processes that rely on those platforms. Functional requirements are outlined within the Project Pluto ‘request for proposal (**RFP**) process with solutioning workshops held to identify gaps.<sup>20</sup>

A System Requirements Specification (**SRS**) was prepared during the early Requirements Definition Stage for Project Pluto to create the scope and a Requirements Traceability Matrix (**RTM**) was established to maintain a consolidated list of all business requirements associated with Project Pluto.

The baseline scope for each of the projects within Project Pluto’s overall program is outlined within the relevant confidential vendor contracts, the Project Initiation Documents (**PID**), together with the RTM. The scope is further detailed within vendor contractual agreements within Release Plans, as the scope was confirmed with the vendor at the beginning of each release.

As the project proceeded, requirements were changed, updated and removed in some circumstances as necessary in a project of this scale and complexity. The baseline scope, detailed scope agreed to in vendor contracts, and all scope changes have all been approved under the appropriate delegations of authority within Aurizon Network.

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<sup>19</sup> Aurizon Network (2020), Project Pluto, Solution Architecture Design (SAD) – APS Release 4, 16 June, Page 27-28.

<sup>20</sup> Aurizon Network (2012), Page 26

In the context of APS, the final agreed scope (at a high level) includes:

**Table 21 Scope of the APS Program**

Inclusions
Quintiq APS (Planning and Scheduling Rail Module) in 4 releases
Reporting and analytics in 4 releases accessible via a web portal
Change management and training to implement the above
Integration with other existing systems including: <ul style="list-style-type: none"> <li>• NAMS / SAP</li> <li>• ViziRail</li> <li>• Movement Planner</li> <li>• SAP HANA</li> </ul>
Decommissioning of legacy systems: <ul style="list-style-type: none"> <li>• NOPP</li> <li>• Reports in CDW which source data from APS/MP</li> </ul>

### 11.1.2 Change Management Process

APS was developed over a period of time that spanned three (3) successive Access Undertakings (UT3 to UT5). During this period, the APS solution had to adapt to meet the evolving needs of Customers and Aurizon Network's changing obligations as reflected in each successive Access Undertaking.

In order to effectively manage this change:

- a Change Control Process and Procedure was documented and used to govern and manage variations to agreed project deliverables; and
- a standardised template Change Request form was made available to detail the rationale, options available, and the impact of the proposed change.

The change request process was administered by the Pluto Program Management Office, with all requests recorded in a change register. Depending on the degree of impact, change requests required Program Board and/or Steering Committee approval.

An independent review of the procurement and governance processes for the project noted that the documented procedures and processes appear robust, useable and adequate for an ICT project of this size and nature.<sup>21</sup>

## 11.2 Standard of Works

The standard of work for APS is considered prudent and efficient and has enabled Aurizon Network to improve its planning, scheduling, and operational decision support capabilities.

The standard of works and solution design of Project Pluto (and subsequently APS) is detailed in the following documents:

**Table 22 Project Pluto design documents**

Document Name	Description
Solution Architecture Design	The Solution Architecture Design (SAD) drives the technical design of the solution. It describes the infrastructure, network, application and interface components and

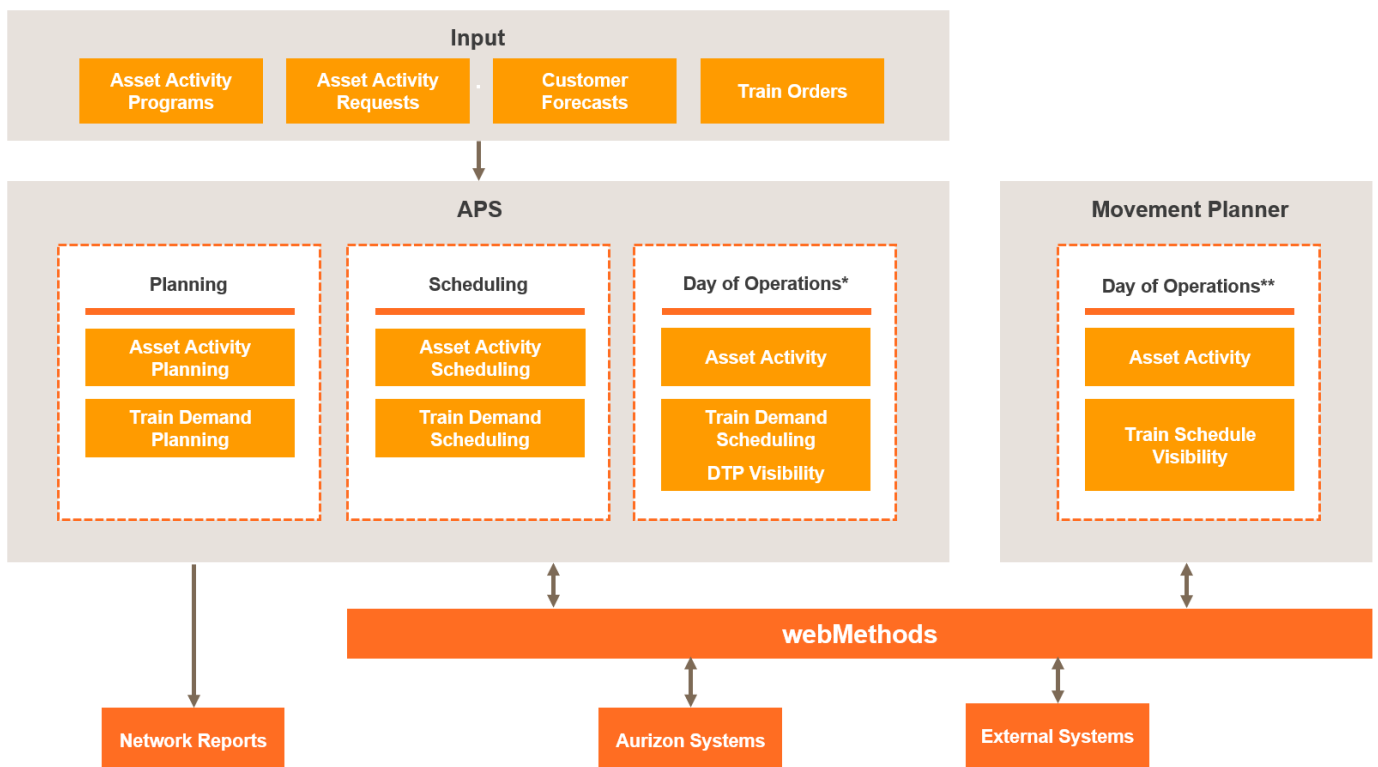
<sup>21</sup> EY (2021)

Document Name	Description
	explains how the solution will interface with Aurizon Network's internal and external systems.
Interface Control Document	The Interface Control Document (ICD) contains Detailed Interface Specifications for the new message types and the integration protocols they use. The ICD describes the message format and content whereas the SAD describes where the interface is connected to, the scenarios where it will be used, and any rules required.
Infrastructure Architecture Design	The Infrastructure Architecture Design (IAD) describes the server and database infrastructure required to host APS.
Quintiq Integration Document	Quintiq Integration Document (QID) describes the technical APS application integration. It describes how APS consumes/produces the interfaces described in the ICD.
Quintiq Architecture Design	Quintiq Architecture Design (QAD) document describes which Quintiq application and integration components are used to implement the solution and captures the initial component configuration. This document informs the IAD.
Quintiq Business Analysis	The Quintiq Business Analysis (QBA) document describes the APS functional solution. The QBA is the product of the analysis phase in which Aurizon Network's planning problem is translated into a planning solution and design specification used by the software developers to build the software.

Collectively, these documents describe, the physical and logical design of the solution and the data messages that are to be shared between APS and other connected systems, for example SAP.

The high-level design for the Project Pluto solution is provided in Figure 21.

**Figure 21 Design of Project Pluto Solution**



\* For clarity, APS **does not** provide Aurizon Network with the ability to control, modify and/or manage the running and operation of live trains.

\*\* Movement Planner saw the implementation of a real-time electronic train graph to replace Aurizon Network's manual paper-based train diagrams and provided automated conflict detection and resolution.

## Project Pluto was part of Aurizon Network’s Technical Strategy

Project Pluto was also featured in Aurizon Network’s Technical Strategy. Published in 2016, the Technical Strategy outlines Aurizon Network’s roadmap for delivering improved productivity and efficiency in the CQCN. The strategy recognised the potential for Project Pluto to deliver operational improvements; noting that the delivery of reliable and accurate plans and schedules helps to improve the utilisation of above and below rail resources by reducing unplanned dwells and delays.<sup>22</sup>

## 11.3 Project Costs

As part of its assessment of APS capital expenditure the QCA must have regard to whether the costs of the project are prudent and efficient, having regard to the scope and standard of work undertaken.

It is Aurizon Network’s submission that the costs incurred by Aurizon Network to design, develop and implement the APS project were prudent and efficient relative to the scale, nature and complexity of the project.

### 11.3.1 APS Capital Expenditure

Aurizon Network is seeking QCA approval to include \$60.0m of APS capital expenditure (including IDC) into the RAB. This consists of:

- Capital Expenditure of \$53.3m; plus
- IDC of \$11.4m; less
- Adjustments of (\$4.7m), costs that Aurizon Network proposes to exclude from the APS Capex Claim (please refer to section 11.3.4 below).

This section 11.3 provides further information about each of the above matters.

### 11.3.2 Capital Expenditure

Aurizon Network uses SAP as its accounting and reporting platform for capital projects from initial funding through to budget allocation and project delivery. Aurizon Network’s APS Capex Claim reflects capital expenditure incurred for Project Pluto (project number A.03980) since February 2012.

As outlined in Table 23 below, the total approved budget for Project Pluto (Movement Planner, APS, and the associated reporting improvements) was \$74.6m. It should be noted that increases to the initial budget were driven by necessary scope changes and in order to accommodate the evolving regulatory landscape. All funding approvals were conducted in accordance with Aurizon Network’s established governance processes.

**Table 23 Project budget approvals**

Time	Description of Event
2012 – Project Pluto Commenced. Initial funding approval.	In September 2012, \$32.3m of capital funding was internally approved for Project Pluto via Aurizon Network’s Capital Expenditure Feasibility IAR.
2016 – Additional project funding approved	In October 2016, an additional \$35.7m was internally approved for Project Pluto. The additional funding was required to facilitate the scope of work required to complete APS, Movement Planner, Power BI with the associated level business integration required by Aurizon Network.
November 2016 – Movement Planner was delivered	Movement Planner was delivered in November 2016. Capital expenditure of \$15.9m (or \$17.5m including IDC) associated with Movement Planner was approved by the QCA for inclusion in the RAB as part of the FY2016 and FY2017 capital expenditure claims.

<sup>22</sup> Aurizon Network (2016), Network Technical Strategy, Page. 28.

Time	Description of Event
May 2018 - scope changes to accommodate UT5 requirements	In May 2018, \$6.6m was internally approved for Project Pluto. The additional funding was required for scope changes related to the introduction of business process changes associated with UT5 and the prioritisation of system enhancements identified during testing.

Aurizon Network has provided (in Table 24 below) a comparison of actual expenditure vs the budget for Project Pluto overall. Aurizon Network has then illustrated the composition of the APS Capex by these Cost Types in Table 24 below.

**Table 24 Project Pluto – Overall Cost Performance and composition of APS Capex (excluding IDC)**

Project Pluto - Cost Type	Internal Budget (\$m)	Cost Incurred (\$m)	Variance (\$m)
Prefeasibility Costs	0.6	0.6	
Labour	25.2	27.9	
Implementation Services	33.1	32.8	
Infrastructure Costs (e.g. hardware)	1.6	2.0	
Travel, Expenses and Consumables	1.6	1.7	
Software Costs	8.2	8.0	
Contingency**	4.3	**	
Less Movement Planner Support Costs~	(3.7)	(3.7)	
Less QCA-approved Movement Planner <sup>23</sup>	(15.9)	(15.9)	
<b>APS Capex (\$m) – Excluding IDC</b>	<b>55.0</b>	<b>53.3<sup>^</sup></b>	<b>(1.7)</b>

~ Movement Planner Support Costs transferred from Project Pluto to be managed as a standalone project.

<sup>^</sup> Please note that this amount is then adjusted to remove costs associated with functionality that was required for non-coal traffic and internal labour costs that were already funded through the regulatory operating cost allowances. Please refer to section 11.3.4 for further information.

\*\* Please note that some contingency funding was used and is incorporated within the 'Costs Incurred' for each Cost Type.

### 11.3.3 Interest During Construction (IDC)

Aurizon Network's approach to calculating IDC is consistent with the methodology that has been approved by the QCA since 2010. The regulatory model assumes that all capital expenditure is included in the RAB in the middle of the relevant financial year. IDC is therefore calculated up to and including the mid-point of the year in which the project was commissioned. IDC is calculated using an S-curve methodology, whereby monthly cash flow values are multiplied by the applicable interest rate. The monthly cash flows for each project are extracted from Aurizon Network's financial accounting system (SAP). The applicable interest rate is the weighted average cost of capital (**WACC**) for the relevant year within the regulatory period.

<sup>23</sup> Reflects Movement Planner capital expenditure approved in FY2016 and FY2017. Excludes Interest During Construction.

### 11.3.4 Adjustments to the APS Capex Claim

Aurizon Network proposes to exclude approximately \$4.7m from this APS Capex Claim. These costs relate to the following matters:

- APS Capex incurred to maintain compatibility for timetabled (non-coal) traffic;
- An IDC reduction proposed by Aurizon Network in recognition of the delays in the delivery of the APS solution; and
- deduction of internal labour costs that Aurizon Network considers would already have been funded through the regulatory operating cost allowances.

Aurizon Network has outlined the rationale for the exclusion of these costs within Table 25 below. Aurizon Network confirms that it will not seek recovery of these amounts as part of a future capex claim.

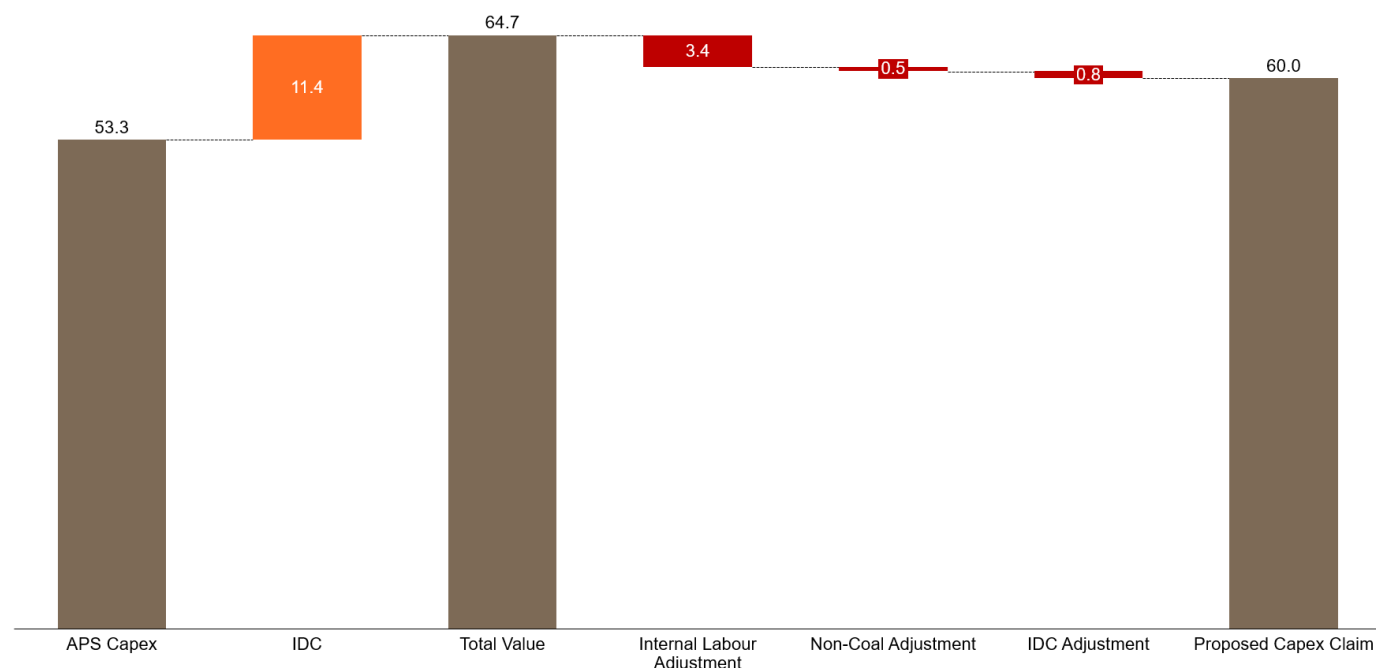
**Table 25 Aurizon Network’s voluntary APS Capex exclusions**

Exclusions	Rationale for Exclusion	Value (\$m)
Non-Coal Adjustment	<p>APS allows Aurizon Network to dynamically plan and schedule CQCN traffic. Queensland Rail (QR) operates timetabled traffic whose schedules are not updated dynamically.</p> <p>Aurizon Network has identified \$0.5m of APS capex which relates to development costs that were incurred to maintain compatibility with QR’s scheduling interfaces and desired operating practices for non-coal train services.</p> <p>Given these costs are not related to coal services and would have been avoided in the absence of non-coal services, Aurizon Network has removed these costs from this APS Capex Claim.</p>	0.5
Interest Adjustment	<p>During a 6-month period (Nov 2017 - Apr 2018) Aurizon Network decoupled from GE and appointed Dassault Systemes as Principal Contractor to deliver APS. During this time, the project was delayed.</p> <p>In light of this, Aurizon Network is proposing to reduce its overall IDC calculations for APS capital expenditure. In practice, this means that Aurizon Network’s APS capital expenditure will not accrue any interest during this 6-month period.</p> <p>This has the effect of reducing the FY21 APS Capex Claim by \$0.8m.</p>	0.8
Internal Labour Adjustment	<p>Aurizon Network notes that during the course of the project, Aurizon Network personnel and subject matter experts participated in the development and implementation of APS. In recognition of the fact that the ordinary labour costs of some of these personnel were partially, or fully funded through the regulated operating cost allowances, Aurizon Network proposes to exclude the ordinary labour costs of these employees from the APS Capex Claim.</p> <p>This has the effect of reducing the FY21 APS Capex Claim by \$3.4m.</p>	3.4
<b>TOTAL EXCLUSIONS (\$m)</b>		<b>4.7</b>

### 11.3.5 Overall value of the APS Capex Claim

The composition of the APS Capex Claim is illustrated in Figure 22 below.

Figure 22 Proposed FY21 APS Capex Claim (\$m)



### 11.3.6 Procurement Process

As an internally approved capital investment, Project Pluto has been governed by the Aurizon Investment Framework, following its principles and processes.

Project Pluto involved three (3) separate procurement processes over the life of the project. A description of each is outlined in Table 26.

Table 26 Description of Procurement Process

#	Procurement Process	Description
1	Selection of GE and SolveIT	Relates to the selection and appointment of the vendor (GE and SolveIT) at the commencement of Project Pluto. Procurement was conducted through a competitive 2-stage procurement process involving and initial RFI, followed by a formal RFP.
2	Replacement of SolveIT with Quintiq	<p>GE's subcontractor (SolveIT) was unable to provide the services and software solution that was required to develop a bespoke solution that could effectively manage complex capacity, planning, scheduling and operational data, business logic and scenario functionality.</p> <p>GE approached the market through an RFP process for a replacement for SolveIT and in November 2014, SolveIT was replaced by Quintiq as the subcontractor for APS.</p>
3	Decoupling from GE and contracting directly with DS for the delivery of APS	<p>This process was enacted to ensure continued progress on the project following delivery challenges with GE driven by the technical complexities of the APS solution (as mentioned above). Decoupling from GE saw:</p> <ul style="list-style-type: none"> <li>responsibility for management, governance and solution integration transferred to Aurizon so as to allow Aurizon to deal directly with DS; and</li> <li>the delivery model for APS transferred from GE to Dassault Systemes Australia Pty Ltd (<b>DS</b>) (by this time DS's parent company had acquired Quintiq).</li> </ul>

### 11.3.7 Independent review of procurement and governance processes

Aurizon Network engaged Ernst and Young (EY) to undertake an independent assessment of the procurement and governance processes relating to APS.

The scope of EY’s engagement was to consider whether:

1. the project governance and delivery of the procurement process adopted by Aurizon Network for the APS project was appropriate given the scale and complexity of the project; and
2. the approach and implementation of project governance by Aurizon Network was appropriate given the scale and complexity of the project.

Aurizon Network has summarised EY’s recommendations below. A copy of the full EY report is appended to this submission.

#### EY Report Outcomes

Despite the challenges faced during the delivery of the project, EY’s independent assessment report concluded that both the procurement and project governance processes were generally acceptable for a project of this size and complexity.

#### Procurement Process

EY assessed the three (3) key procurement processes, being:

**Table 27 EY findings relating to APS Procurement Processes**

Procurement Process	Findings	Conclusion
Selection of GE and SolveIT	<ul style="list-style-type: none"> <li>• The process, evaluation framework, criteria, documentation and contracting was appropriate</li> <li>• While a specific software warranty period was not included in the contract, it did include warranties that the software product would be fit for the stated purpose.</li> </ul>	Process was appropriate for a project of this size and complexity.
Replacement of SolveIT with Quintiq	<ul style="list-style-type: none"> <li>• The process was led by GE who was required to replace its subcontractor.</li> <li>• The RFP documentation used for GE’s selection of SolveIT’s replacement appears to be less specific than would be expected given the context; including the design work that had been completed at that time and that GE was replacing a subcontractor who was unable to deliver the solution due, in part, to underestimating the complexity of the task.</li> <li>• The RFP documentation did not address the potential for misalignment with Aurizon Network’s changing regulatory requirements.</li> </ul> <p>EY notes that Aurizon Network could not have anticipated all changes to the regulatory framework over the project period.</p>	Process was generally acceptable
Decoupling from GE and contracting directly with Quintiq for the delivery of APS	<ul style="list-style-type: none"> <li>• Aurizon Network did not undertake a formal RFP process for the selection of Quintiq as its Principal Contractor. Aurizon Network’s experience and understanding of Quintiq’s capability was justified in approval documentation.</li> </ul>	Process was appropriate for a project of this size and complexity.



## Project Governance

Table 28 EY findings relating to APS Project Governance

Project Governance	Key Findings	Conclusion
Business and User Requirements	<ul style="list-style-type: none"> <li>The Requirements Traceability Matrix (<b>RTM</b>) which maps the requirements through the project phases is incomplete and did not reflect what was implemented as part of the APS final solution.</li> <li><i>NB: AN notes that the RTM has now been updated and completed as part of the project close activities.</i></li> <li>The EY report notes that regulatory changes from UT4 to UT5 led to the misalignment of some APS deliverables, but that these regulatory changes were not foreseeable at the time of contracting.</li> </ul>	Process was generally acceptable
Risk management processes adopted throughout the project	<ul style="list-style-type: none"> <li>While 'key risks' were escalated to SteerCo, risk was not a standing agenda item. EY state it would have been appropriate for SteerCo to have regard to identified project risk, not just the 'key risks'; and</li> <li>The APS design phase was unusually long (6 years) but EY acknowledges the complexities, regulatory and vendor changes that contributed to this.</li> </ul>	Process was generally acceptable
Overall project governance	<ul style="list-style-type: none"> <li>The project governance pre-decoupling from GE was defined in governance forum charters and the contract with GE. The project governance post-decoupling of GE was updated and defined in revised governance forum charters and the separate contracts with GE and Quintiq.</li> <li>A gap in governance meetings between November 2017 and June 2018 coinciding with the decoupling of GE. EY note that it was unclear how decisions were made/endorsed/approved during this period. Once the decoupling was completed, project governance was updated to reflect the decoupled model and Aurizon Network created a Program Board to control the Project.</li> </ul>	Process was generally acceptable

## 11.4 Prudency and Efficiency

On the basis of the information outlined above and supported by the information made available to the QCA, Aurizon Network:

- submits that the costs incurred by Aurizon Network in the APS Capex Claim to design, develop and implement the APS project were prudent and efficient; and
- requests that the QCA approves including the APS Capex Claim into the RAB in accordance with clause 2.2(a) of Schedule E to UT5.

## 12. Supporting Documentation

Aurizon Network can provide the following documentation to the QCA in support of the FY21 APS Capex Claim.

**Table 29 Project Documentation**

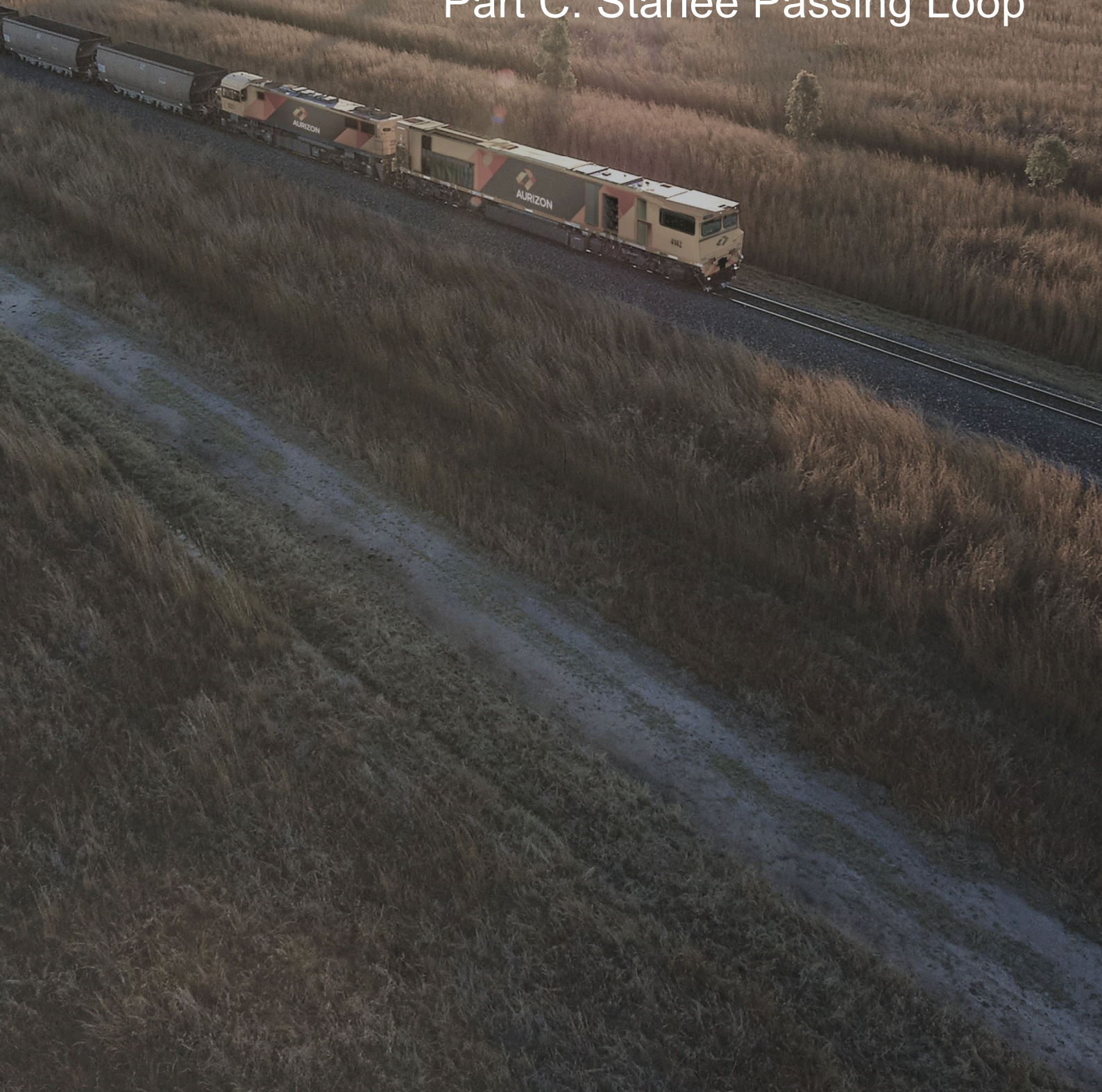
Document Name	Description
Project Completion Report	Provides detailed information for key matters relating to the delivery of Project Pluto including budget, timeframe and scope performance, and an interim benefits realisation analysis.
Capital Expenditure workbook	Provides details of capital expenditure incurred over the life of the project and supporting IDC calculations
Requirements Traceability Matrix	Provides a consolidated list of all business requirements (i.e. scope / functionality) and the implementation status of each.
EY Report – Project Pluto APS Solution Procurement and Governance Independent Assessment	Provides an independent review of the project governance and procurement of the APS component of Project Pluto.

Other documentation relevant to the QCA's assessment can be provided upon request.

# Appendix A: EY Report – Project Pluto APS Solution Procurement and Governance Independent Assessment



# Aurizon Network FY21 Capital Expenditure Claim Part C: Starlee Passing Loop



## 13. Starlee Expansion

Part C of this FY21 Capex Claim submission seeks QCA approval of capital expenditure associated with the construction of the Starlee Passing Loop, a small growth project on the Bauhinia Branch line. This project was valued at \$9.4m including IDC.

The assessment of the Starlee Passing Loop (**Starlee Expansion**) costs are separate to the renewal expenditure outlined within the approved RSB and should be reviewed against the criteria within Schedule E of UT5.

The Starlee Expansion was constructed to expand the capacity of the Bauhinia branch line to accommodate access rights being sought by Meteor Downs South (**MDS**). Following consultation with Expansion Stakeholders, Aurizon Network could not reach a consensus. Subsequently, the Starlee Expansion was treated as an Endorsed Expansion as defined within UT5 with the applicable reference tariff to be submitted via a Draft Amending Access Undertaking (**DAAU**).

On 6 August 2020, Aurizon Network notified the QCA of the MDS Draft Amending Access Undertaking (**MDS Tariff DAAU**). On 17 December 2020 the QCA approved the MDS Tariff DAAU and Sojitz Coal Mining (**Sojitz**) entered into an Access Agreement with Aurizon Network.

The Starlee Expansion on the Bauhinia branch line was completed in FY21 and provides a prudent and efficient option to meet the required volumes. As such Aurizon Network submits costs of \$9.4m, including IDC, associated with the expenditure incurred.

below details the total capital expenditure for the project, IDC and the total amount claimed within this submission.

**Table 30 Expansion Project – Capex Claim**

Project	Capital Expenditure Claimed (\$m)	IDC (\$m)	Total Claim Amount including IDC (\$m)
IV.00672 Bauhinia Branch Line Expansion (Starlee)	9.0	0.4	9.4

Aurizon Network has sought to demonstrate prudence and efficiency in line with Clause 2.2 of Schedule E of UT5 by providing the following supporting documentation as part of this submission.

**Table 31 Expansion Project - Supporting Documentation**

Document	Scope	Standard	Cost
Investment Approval Request	✓	✓	✓
Project Completion Report	✓	✓	✓

Aurizon Network considers the Starlee Expansion to be prudent and efficient and seeks the QCAs approval for inclusion into the RAB.

For clarity, and consistent with the MDS Tariff DAAU, capital expenditure associated with the connecting infrastructure for the MDS rail infrastructure is not included within the amounts outlined above. If required, Aurizon Network will work with the QCA to support its assessment of any Private Infrastructure Costs (PIC) claimed as per clause 6.3.2(a) of UT5.