Aurizon Network 2015 Flood Infrastructure Claim Review

Queensland Competition Authority

Cost Review of Aurizon Network's 2015 Flood Infrastructure Claim

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Executive Summary

On 20 February 2015, category 5 Cyclone Marcia crossed the Queensland coast North of Rockhampton and tracked South over Aurizon Network PTY Ltd.'s (Aurizon Network)'s Blackwater and Moura rail systems causing damage to these systems. The majority of damage occurred within the Moura system. Aurizon Network has claimed Force Majeure (i.e. that the cause of the damage was outside its control and hence the costs for the repair should be treated as being outside its normal business operations) for both the Blackwater and Moura systems on 19 February 2015, and at that time mobilised significant resources to inspect and restore the damaged sections of the rail corridor.

Aurizon Network is seeking Queensland Competition Authority's (QCA) approval for a variation to the Moura System reference tariffs to recover its track incremental maintenance costs arising from this event. In late November 2015, Aurizon Network submitted its finalised Review Event Submission. In this document, Aurizon Network stated that it is seeking to recover incremental maintenance costs[1] of $4,237,120 (after applying an escalation of 4.66% to actual costs incurred (the pre-escalated cost being $4,048,455), but not capital costs arising from the flood damage rectification works. We understand that Aurizon Network intends to recover its capital costs arising from the flood repairs through its next undertaking review.

Jacobs (we/us) was engaged in January 2016 by the QCA to review the prudency of scope, standard and cost being incremented maintenance costs of the works undertaken by Aurizon Network forming their claim for recovery of additional costs. Over the course of February and through to June, following requests for information and clarifications from us, Aurizon Network provided information to enable us to undertake our review.

In our review, we have split the repair works into two separate packages. The first package MSL-1 covers only one site and it differs from the other repair works due to it relating to replacement and reinstatement of signalling cabinets.

The second package comprises three sample sites that involved (in total) the reinstatement of 300 m of plain line track, formation repair, a turnout and panel removal and recovery of two signal boxes. Of these sites (MSL-61, MSL-66 and MSL-69, MSL-61 is unique in that this section of track suffered a complete washout of the embankment alongside Bells Creek. The works at MSL-61 incorporated the re-instatement of track alignment, maintenance access road and major embankment works with retraining of Bells Creek adjacent to the site. However, the embankment works do not form part of Aurizon Network's claim as these works are considered by Aurizon Network to be capital expenditure as a new asset was created. As such, our review assesses the incremental expenditure only.

These three track wash out sample sites are a reasonable representation of the remainder of the sites requiring flood damage repair expenditure by Aurizon Network and hence we are confident that our conclusions on prudency can be extrapolated to the remaining sites using a weighted extrapolation method based on a confidence level.

Aurizon Network's explanation of incremental costs were costs captured that are not already part of the maintenance cost estimates (maintenance allowance) submitted with Aurizon Network's 2014DAU nor were they included in the Maximum Allowable Revenue submitted as part of the transitional Reference Tariffs for FY2016. Aurizon Network specified that the costs that form the flood damage repair claim:

- Can be specifically attributed to Aurizon Network's response (inspection) to the 2015 Flood Review Event in the CQCR used for the purpose of coal-carrying services;
- Exclude all capital expenditure (Capex) associated with Aurizon Network's response to the 2015 Flood Review Event (which will be submitted as part of the ex-post capital expenditure claim);

[1] Aurizon Network uses the term maintenance costs to differentiate certain costs from capital costs. Maintenance costs may be considered as a proxy for operating costs. Aurizon Network differentiates between maintenance costs and capital expenditure costs on quantum not type of expenditure. For example if during a track repair 20 sleepers required to be replaced, this is considered a maintenance cost. However, if 21 or more sleepers require to be replaced, this is considered a capital cost. The document that Aurizon Network uses to define these quantum for various cost categories is not definitive and still in draft form. As such, there is a lack of absolute definition of which costs should be treated as maintenance costs and which capital costs. Incremental maintenance costs is the term used by Aurizon Network to define maintenance costs that are beyond 'business as usual' operating costs such as, in this case, costs related to flood repairs.

- Relate only to incremental costs, such as overtime and not ordinary labour within Aurizon Network; and
- Excludes any costs which would be claimable under Aurizon Network's Insurance Program

Using the above explanation, firstly we focused on assessing what the capital expenditure items were to ensure they were being excluded from this claim. We then reviewed the costs of the response work required to inspect the flood damage and assess the extent of the recovery work. The third part of the assessment involved evaluating the overtime as being 'not ordinary labour' by reviewing the repair and recovery tasks and assessing what was deemed as 'ordinary or business as usual' as opposed to incremental costs arising from the flooding and ensuring these tasks and costs had been included in Aurizon Network's claim. In order to do this we reviewed plans, designs, photographic evidence of the recovery stage and the completed works all provided by Aurizon Network. The review covered track and civil infrastructure (including rail structure, access roads, formation works, drainage etc.).

All relevant aspects of the existing rail corridor damaged by the flood were covered and any new assets required (considered capital cost expenditure) were excluded. This is consistent with Aurizon Network's explanation that their claim is for incremental maintenance costs only. We have adopted a benchmarking process of assessing the tasks required to complete the recovery and used market tested unit costs to develop our own recovery cost per site. These costs were then compared with the Aurizon Network claim to test the prudency of the recovery works and to help identify whether the claimed costs may be considered incremental maintenance costs or not and whether they form part of this claim.

We have used our engineering judgement together with recent project experience to assess the construction method, level of quality adopted and the standards used for the recovery works of the four sample sites. Where we have been unable to ascertain prudency of standards with certainty, due to lack of evidence or information, we have assumed Aurizon Network standards have been adopted and met to complete the works.

Our summary of prudency of scope, standard and cost for the flood damage rectification work that we have reviewed is summarised below in Table 1:

Table 1 : Summary of prudency of scope, standard and cost for rectification work reviewed

Expenditure Item	Prudency Item			Recommended Recoverable Cost
	Scope	Standard	Cost	AUD 2015
MSL-1 Signalling cabinet reinstatement, Mt Rainbow	🟢	🟢	🔴	93,934
MSL-61 Embankment and track washout along Bells Creek Mt Rainbow - Dumgree	🟡	🟢	🟢	477,585
MSL-66 Ballast scour and track wash out Earlsfield - Dakenba	🟡	🟡	🔴	223,536
MSL-69 Track wash out Earlsfield - Dakenba	🟡	🟡	🟢	182,032

Key: Green = Prudent, Amber = Partially Prudent, Red = Not Prudent

Our summary of the reasons for the determination of prudency for each of the sampled rectification work items is provided in Table 2 to Table 5 below:

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Table 2 : MSL-1 Signalling cabinet reinstatement

Prudency item	Jacobs' conclusions and comments	Prudency traffic light
Prudency of scope	The scope adopted by Aurizon Network was prudent on the evidence presented for each signal box restoration site.	
Prudency of standard	We have determined reinstatement to full Aurizon Network standards specifications for optimised operation and minimal future maintenance.	
Prudency of cost Are Aurizon Network cost within + 30% of our bench mark costs?	Aurizon Network's costs are in excess of plus 30% of our benchmark costs for this sample site as such we consider Aurizon Network's costs not to be prudent. From our analysis we consider the prudent substantiated cost for this work activity to be $93,934	

Table 3 : MSL-61 Embankment and track washout along Bells Creek: Mt Rainbow – Dumgree

Prudency item	Jacobs conclusions and comments	Prudency traffic light
Prudency of scope	On the evidence provided the scope adopted by Aurizon Network was prudent to the need of the restoration project and has prolonged and enhanced the life of the asset. The scope adopted was efficiently chosen, planned and executed. Due to insufficient data on the existing rail corridor it is not possible to determine definitively whether the embankment before the flood contributed to the flood event and what the remaining life of the asset was.	
Prudency of standard	There is sufficient evidence provided of the recovery works to complete the re-instatement of the rail corridor complying with Aurizon Network's standards to determine that the standard of works is prudent. Also that the asset (embankment flood protection) has been enhanced resulting in increased asset functionality and betterment flood protection as would be undertaken by an efficient operator.	
Prudency of cost Aurizon Network cost within + 30% of our bench mark costs?	Aurizon Network's costs are in excess of plus 30% of our benchmark costs for this sample site as such we consider Aurizon Network's costs not to be prudent. From our analysis we consider the prudent substantiated cost for this work activity to be $477,585.	

Table 4 : MSL-66 Ballast scour and track wash out: Mt Rainbow - Dumgree

Prudency item	Comment	Determination
Prudency of scope	The scope adopted by Aurizon Network was only partially prudent on the evidence presented for each restoration site. There is insufficient evidence to ascertain the projected life of the asset without knowledge of the formation depths and materials both before the flood and after rectification works .As such we are unable to state that the scope does not include betterment beyond what an informed and efficient operation would have implemented.	
Prudency of standard	We have determined reinstatement to full Aurizon Network's standards specifications for optimised operation and minimal future maintenance based on our knowledge of Aurizon Network's operations as opposed to direct evidence for this work site.	
Prudency of cost Are Aurizon Network costs within + 30% of our bench mark costs?	Aurizon Network's costs are in excess of plus 30% of our benchmark costs for this sample site as such we consider Aurizon Network's costs not to be prudent. From our analysis we consider the prudent substantiated cost for this work activity to be $223,536	

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Table 5 : MSL-69 Track wash out: Earslfield – Dakenba

Prudency item	Comment	Determination
Prudency of scope	The scope adopted by Aurizon Network was only partially prudent on the evidence presented for each restoration site. There is insufficient evidence to ascertain the projected life of the asset without knowledge of the formation depths and materials before the flood and after recovery works were completed. As such we are unable to state consistently that the scope does not include betterment beyond what an informed and efficient operation would have implemented.	
Prudency of standard	We have determined reinstatement to full Aurizon Network's standards specifications for optimised operation and minimal future maintenance based on our knowledge of Aurizon Network's operations as opposed to direct evidence for this work site.	
Prudency of cost Aurizon Network cost within + 30% of our bench mark costs?	Aurizon Network's costs are less than plus 30% of our benchmark costs for this sample site as such we consider Aurizon Network's costs to be prudent. From our analysis we consider the prudent substantiated cost for this work activity to be $182,032.	

We have extrapolated our findings from MSL-1, MSL-66 and MSL-69 to the remainder of the un-sampled expenditure given that the remaining sites all required almost identical work activities. The only difference between the sites is the quantum of materials and labour. We have applied the following formulae to extrapolate the costs:

$$EPC = TUC \times (SWPP \times ECF + (1 - ECF))$$

Where:

EPC = Extrapolated prudent cost

TUC = Total un-sampled cost

SWPP = Sample works prudency percentage (i.e. percentage of sampled works found to be prudent)

ECF = Extrapolation confidence factor

For the sampled work items MSL-1, MSL-66 and MSL-69 we found one out of three of the sampled work items to be prudent on cost. As such our SCPP is equal to 33.33%. However, we note that one of the sampled sites, MSL-66 is only 40% greater than our benchmark cost and for works site MSL-1, we have only been able to identify supporting documentation to justify $93,934 of costs out of $191,648. We have therefore applied an ECF of 25% to the extrapolation. We have set out our findings of prudency of cost on all of the incremental maintenance expenditure claimed in Table 6 below (June 2015 dollar terms).

Table 6 : Overall conclusions of prudency of costs for 2015 flood damage expenditure claims by Aurizon Network

Cost item – work site	Aurizon Network Incremental Maintenance Cost Claim including Asset Maintenance costs	JACOBS order of magnitude benchmark costs (Plus/minus 30%)	Absolute difference (Aurizon Network - Jacobs)	Percentage difference (Aurizon Network- Jacobs) / Jacobs	Jacobs Recommended Prudent Cost
MSL1	$191,648	$93,934	$97,714	104%*	$93,934
MSL-61	$477,585	$561,224	-$83,640	-15%	$477,585
MSL66	$301,306	$223,536	$77,770	35%	$223,536
MSL69	$182,032	$251,741	-$69,709	-28%	$182,032
Remaining track wash out claim	$2,895,884	$2,413,213	$482,672		$2,413,213
Totals	**$4,048,455**	**$3,543,648**	**$504,807**		**$3,390,300**

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Glossary

Abbreviation, Acronyms and Terminology	Description / Definition
Aurizon Network	Aurizon Network Pty Ltd.
BOM	Bureau of Meteorology
Capex	Capital expenditure
CETS	Civil Engineering Track Standards
CRB	Client Requirement Brief
DERM	Department of Environment and Resource Management
GPS	Global Positioning System
LOC	Signal Location Cabin
Opex	Operational maintenance expenditure
QCA	Queensland Competition Authority
RFI	Request for Information

Limitations

This report has been prepared based on information provided by Aurizon Network in respect of the damage caused to the Moura Railway system as a result of the flood event arising from tropical cyclone Marcia in February 2015. Additional information has been sourced from divisions of the Queensland Government including the Bureau of Meteorology and the Department of Natural Resources and Mines

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1. Introduction

The Queensland Competition Authority (QCA) appointed Jacobs Group (Australia) PTY Ltd (we/us) to undertake a cost review of the remediation work undertaken by Aurizon Network PTY Ltd (Aurizon Network) in respect of the flood damage to the Moura Coal system railway line arising from a category 5 Cyclone (Cyclone Marcia) which crossed the state of Queensland on the 20th of February 2015.

The purpose of the commission is to provide the QCA with independent specialist advice on the prudency of scope, standard and cost (being incremental maintenance costs only of the works and not capital expenditure) of works to address the flood-related damage to the below-rail infrastructure owned by Aurizon Network. The scope of our work comprises the following, to:

a) conduct reasonable assurance procedures on a sample of projects from the claim to check whether the costs are substantiated

b) complete a desktop review of any written, photographic or filmed evidence provided by Aurizon Network to document the damage;

c) respond to issues raised by stakeholders in their submissions to the QCA; and

d) provide a written summary report describing the damage and giving an estimate of incremental maintenance costs incurred as a direct result of the flood rectification work, drawing on benchmarks and the consultant's knowledge of similar projects. This report will also critique any cost estimates provided by Aurizon Network, if they are available.

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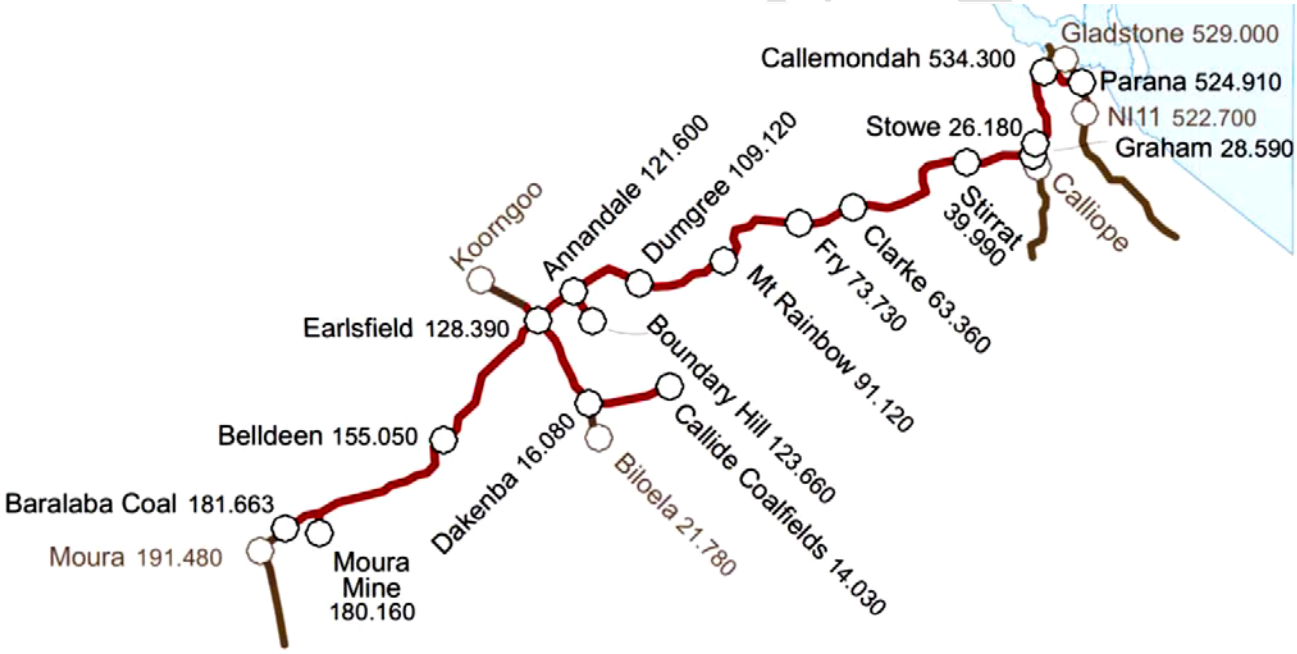
2. Description

In this section we describe, briefly, the rail network sections affected and the weather event that resulted in flooding.

2.1 The Moura coal rail system

The Aurizon Network Moura system is located in Central Queensland between the latitudes 23º50' S and 24º54' S and longitudes 149º58' E and 151º15' E. The system services the Dawson and Callide Valleys and is predominantly used to transport coal from the mines to the Coal export terminals at Gladstone. The system comprises of approximately 235 km of single track railway with eleven passing loops totalling a further 22 km. In the year 2012/13 the system carried approximately 10.8 million tonnes of coal.

Figure 2.1 : Moura coal rail system



The Moura railway line runs adjacent to a major water course, Bells Creek, for a significant section of the line. Bell's Creek converges on the rail corridor at approximately 93.35 km where the railway crosses the creek. The creek then runs in close proximity to the railway for the following 20 km, crossing it at around 101 km (rail kilometres) and again at 106 km. There are approximately five locations where the creek comes to within 50 m of the railway alignment. The flooding of this creek as a result of the rainfall associated with tropical cyclone Marcia was the primary cause of damage to the rail system infrastructure.

A schematic plan of the Moura system is provided in Appendix A.

2.2 February 2015 flood event

The rainfall and subsequent flooding arising from tropical cyclone Marcia's crossing the Queensland coast was of short duration but significant for catchments extending from the Dawson, Don and Dee Rivers in the Fitzroy River Catchment to the Upper Brisbane River. The majority of the rain was recorded between 9 am Thursday 19 February and midday Saturday 20 February 2015.

Over northeast Queensland, the most intense rainfall was recorded over the Don and Dee Rivers and Callide Creek in the Fitzroy River catchment as tropical cyclone Marcia moved through the area, with falls of up to 300 mm recorded in a 6–8 hour period on the afternoon and evening of 20 February 2015.

Flooding above the major flood level occurred in the following basins:

- Don and Dee Rivers and Callide Creek in the Fitzroy River catchment
- Burnett River and Three Moon Creek in the Burnett River catchment
- Mary River, Six Mile Creek and Tinana Creek in the Mary River catchment.

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Figure 2.2 : Track of Marcia as a tropical low (L) and tropical cyclone 15–22 February 2015

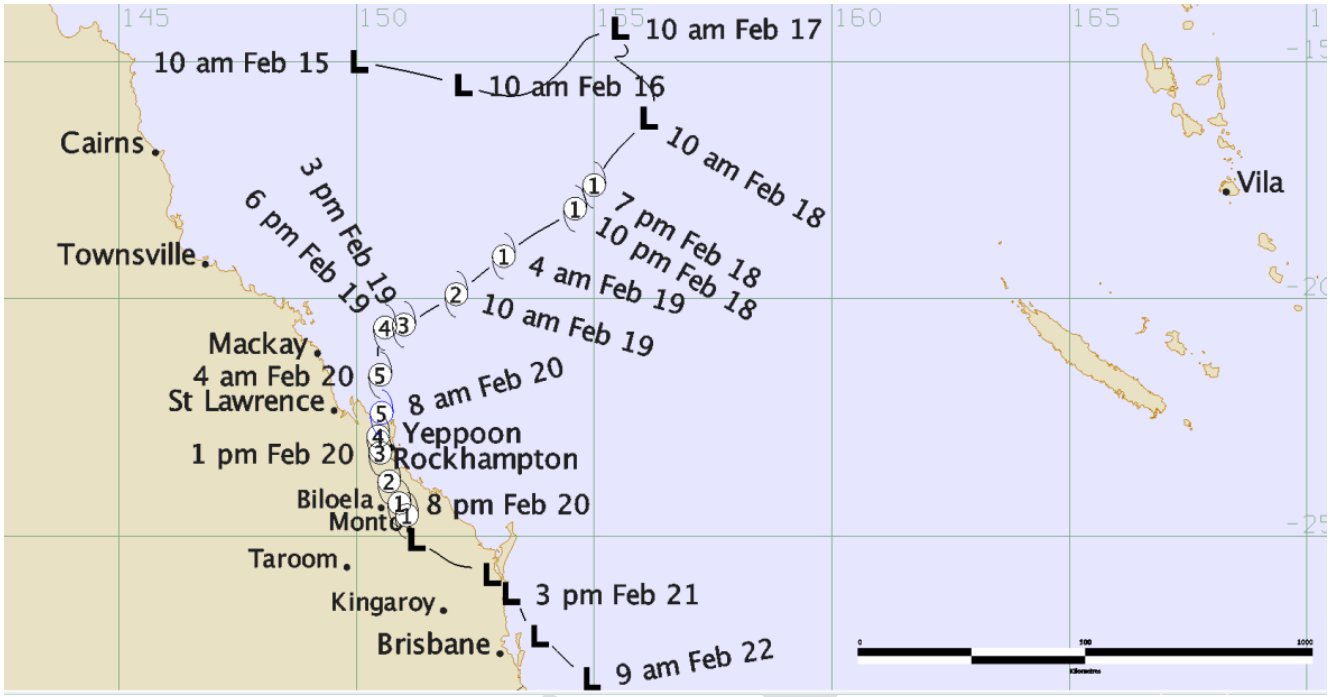
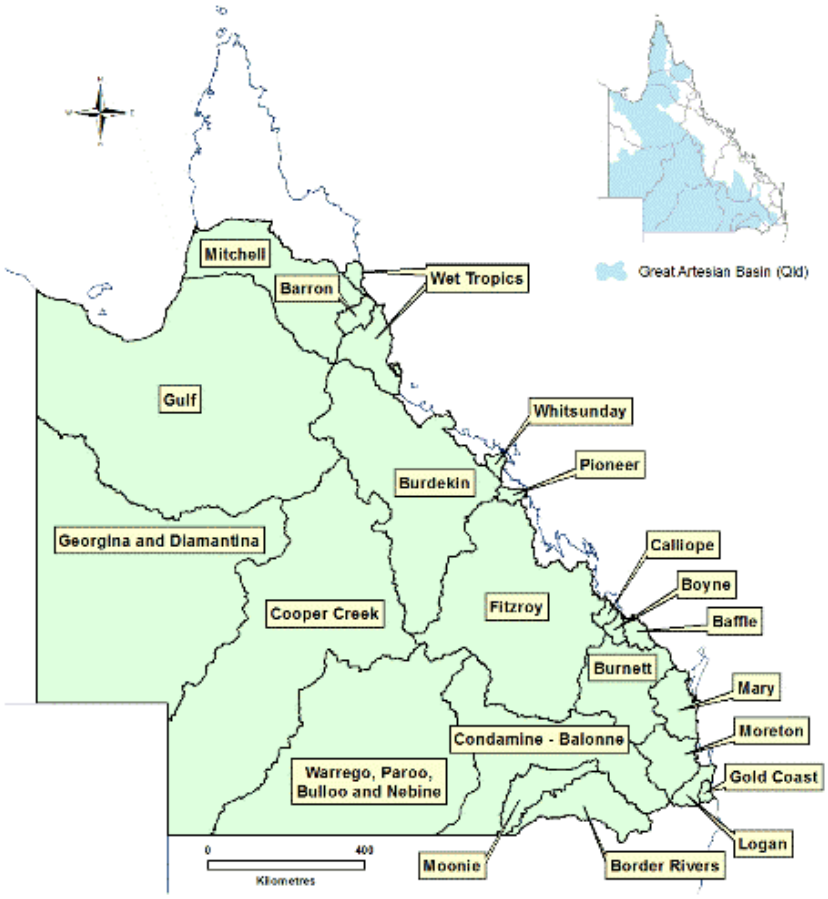


Figure 2.3 : Queensland rainfall catchment areas



The Moura railway system lies within the Calliope and Fitzroy catchment areas (see Appendix C) and the rainfall that occurred during the TC Marcia flood event is best represented by the monitoring stations at Castlehope and Callide Dam Inflow. The recorded rainfall for these two locations is provided in Table 2.1 below.

Table 2.1 : Queensland rain fall totals in catchment areas

Station Name	24 hour rainfall (mm) to 9 am February 2015			Total (mm)
	19	20	21	
Calliope				
Castlehope TM*	16	40	65	122
Dawson				
Callide Dam Inflow TM*	1	18	198	217

2.3 Work sites

Forty eight individual work sites have been identified by Aurizon Network as locations where flood damage work has been carried out and details of these have been provided to us in Spreadsheet[2] format, an extract of which is provided in Table 2.2 in the following pages. We understand that Aurizon Network's 2015 Flood damage claim relates to all 48 sites but this review has assessed a sample of sites that represent 28% of the total incremental maintenance costs for all the works. These sample sites are highlighted in green in Table 2.2. By agreement with the QCA and Aurizon Network, we identified four sample sites that are representation of all the sites impacted by the flood. We have assessed prudency of scope, standard and cost (incremental maintenance) for the four sample sites. We are confident, given the representative nature of the sites with respect to all the sites impacted that our findings and conclusions for these four sites can be extrapolated to the remaining sites.

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[2] Spreadsheet titled 'Moura Flood Repair' received by email from Aurizon Network on 01/02/2016 – See Appendix A

Table 2.2 : Worksites affected by flood damage

Ref.	Aurizon Network MSL No.	Location	Start Chainage (Km)	Finish Chainage (Km)	Length (Meters)	Description of Damage	Description of Repair works
1	MSL-1	Mt Rainbow	89.65	89.65	0	Major damage to 2x signal boxes	2 LOC boxes washed out of position to be reinstated.
2	MSL -10	Graham - Stirrat	33	34	1000	Scouring under boundary fence	Site inspection only. No rectification/construction work by PD
3	MSL-19	Stirrat - Clarke	59.876	59.888	12	track formation and ballast washout	Formation repair by placing new materials to rebuild track sub structure, place new ballast & reinstate existing track
4	MSL-20	Stirrat - Clarke	59.9	59.98	80	track formation and ballast washout	Major washout - track panel to be removed, formation repair, ballast, flood rock, reinstate track, resurfacing.
5	MSL-22	Stirrat - Clarke	60.9	60.98	80	track formation and ballast washout	Major washout - track panel to be removed, formation repair, ballast, flood rock, reinstate track, resurfacing.
6	MSL-24	Stirrat - Clarke	61.21	61.22	10	Major washout	Major washout - track panel to be removed, formation repair, ballast, flood rock, reinstate track, resurfacing.
7	MSL-25	Stirrat - Clarke	61.22	61.33	110	Major ballast scour	Major washout - track panel to be removed, formation repair, ballast, flood rock, reinstate track, resurfacing.
8	MSL-26	Stirrat - Clarke	61.375	61.394	19	Major washout	Major washout - track panel to be removed, formation repair, ballast, flood rock, reinstate track, resurfacing.
9	MSL-33	Clarke - Fry	72.6	92	19400	Access road scoured	Inspection of site only by TCC. No work conducted.

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Ref.	Aurizon Network MSL No.	Location	Start Chainage (Km)	Finish Chainage (Km)	Length (Meters)	Description of Damage	Description of Repair works
10	MSL-34	Clarke - Fry	72.6	92	19400	Access road scoured	Inspection of site only by TCC. No work conducted.
11	MSL-35	Clarke - Fry	72.85			Scour under fence PH58	Inspection of site only by TCC. No work conducted.
12	MSL-37	Clarke - Fry	72.85			Scour under fence	Inspection of site only by TCC. No work conducted.
13	MSL-43	Fry - Mt Rainbow	82.2			Slip onto access road	Inspection of site only by TCC. No work conducted.
14	MSL-45	Fry - Mt Rainbow	83.8			Access road scour	Inspection of site only by TCC. No work conducted.
15	MSL-47	Fry - Mt Rainbow	89.55	89.65	100	Major washout	Major washout - track panel to be removed, turnout removed (rodding support) formation repair, ballast, flood rock, reinstate track, resurfacing. See MSL-1 for LOC box work.
16	MSL-48	Fry - Mt Rainbow	89.65	89.9	250	Major ballast scour	Major washout; rodding removal support, ballast, flood rock, resurfacing. See MSL-1 for LOC box work.
17	MSL-49	Fry - Mt Rainbow	89.99	90.1	110	Washout in cross drain	Washout in cross drain. Ballast Replacement, cess drainage reconstruction, rail re-stressing
18	MSL-53	Fry - Mt Rainbow	90	90.08	80	Major ballast scour	Track panel reinstatement and re-stressing

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Ref.	Aurizon Network MSL No.	Location	Start Chainage (Km)	Finish Chainage (Km)	Length (Meters)	Description of Damage	Description of Repair works
19	MSL-61	Mt Rainbow - Dumgree	100.3	100.5	200	Embankment washout along Bells Creek	Embankment stabilisation design and track alignment design. Temporary access way (via 3rd party land) created to traverse waterway (Creek) and temporary water course diversion. New rock wall and embankment rebuild. New ballast for track install at temporary alignment for interim solution. Final solution requires tack reinstated as before following completion embankment rebuild.
20	MSL-62	Mt Rainbow - Dumgree	106	106.07	70		At 106 km rock causeway install
21	MSL-63	Earlsfield - Belldeen	132.3	132.345	45	Washout over culvert and sides PH45/41	Approx. 60 m (Track removal - consider stabilised sand around culvert to get compaction)
22	MSL-64	Earlsfield - Belldeen	133.04	133.14	100	Ballast washout - approx. 120m - Track removal	reinstatement of track and ballast
23	MSL-65	Dakenba - Callide	4.098	4.117	19	Dawson highway - Up side of road. Formation & Ballast washed away	Formation repair by placing new materials to rebuild track sub structure, place new ballast & reinstate existing track
24	MSL-66	Earlsfield - Dakenba	8.7	8.9	200	Ballast Scour	Remove Track - repair formation
25	MSL-67	Earlsfield - Dakenba	12.01	12.02	10	Washout	Remove track - repair formation
26	MSL-68	Earlsfield - Dakenba	14.1	14.15	50	Washout	Remove track - repair formation
27	MSL-69	Earlsfield - Dakenba	15.05	15.15	100	No. 12 points washed out as ballast (Earlsfield end)	Formation repair, turnout and panel removal required - rodding assistance required
28	MSL-70	Dumgree	108.818	109.04	222	70 Sleepers timbers damaged	Replace 70 timbers sleepers with concrete
29	MSL-71	Stirrat	40.05	40.2	150	71 Sleepers timbers damaged	Replace 71 timbers sleepers with concrete

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Ref.	Aurizon Network MSL No.	Location	Start Chainage (Km)	Finish Chainage (Km)	Length (Meters)	Description of Damage	Description of Repair works
30	MSL-72	Belldeen - Moura Jct	163.7	163.7	0	Scouring around centre pile	same as location as MSL 73. Listed as 2 separate works as one in on pier and other on abutment of the bridge
31	MSL-73	Belldeen - Moura Jct	163.7	163.7	0	Scouring around abonnement	same as location as MSL 72. Listed as 2 separate works as one in on pier and other on abutment of the bridge
32	MSL-75	Moura Mine	180.745	180.76	15	Scoured access road	Inspection of site only by TCC. No work conducted.
33	MSL-133	Earslfield	128.09	130.36	2270	Major Damage to 2x Signal Boxes	2 LOC boxes washed out of position to be reinstated.
34	MSL-135	Mt Rainbow - Dumgree	99.35	99.45	100	Significant scour	Batter protection required
35	MSL-136	Stirrat-Clarke	48.49	48.49	0	Culvert - Debris on fence, scouring at outlet	Clear debris, add scour protection
36	MSL-137	Stirrat-Clarke	57.76	57.76	0	Bridge - Debris between girders, scouring of abutment	Clear debris, add scour protection
37	MSL-138	Stirrat-Clarke	59.91	59.91	0	Culvert - Scour at inlet under pipes & embankments, debris on outlet fence	Clear debris, add scour protection
38	MSL-139	Stirrat-Clarke	60.82	60.82	0	Culvert - Broken headwall at inlet, reo exposed	Fix headwall
39	MSL-143	Fry-Mt Rainbow	75.14	75.14	0	Culvert - erosion of embankment around culvert, debris on fence	Clear debris, add scour protection
40	MSL-144	Fry-Mt Rainbow	89.11	89.11	0	Culvert - scouring of apron and surroundings at outlet	Add scour protection
41	MSL-145	Mt Rainbow-Dumgree	89.866	89.866	0	Erosion of cutting, scouring next to access road	Add scour protection.
42	MSL-146	Mt Rainbow-Dumgree	94.51	94.51	0	Culvert - Scouring under apron outlet, broken apron outlet, debris on inlet fence	Clear debris, add scour protection
43	MSL-147	Dumgree	110.33	110.33	0	Culvert - minor scouring at outlet	Add scour protection

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Ref.	Aurizon Network MSL No.	Location	Start Chainage (Km)	Finish Chainage (Km)	Length (Meters)	Description of Damage	Description of Repair works
44	MSL-148	Dumgree-Annandale	114.95	114.95	0	Culvert - scour at outlet, debris on fence	Clear debris, add scour protection
45	MSL-149	Belldeen	161.05	161.05	0	Culvert - scouring around apron outlet, fence at outlet fallen, debris in inlet fence, slight scouring at inlet	Clear debris, add scour protection
46	MSL-167	Fry - Mt Rainbow	89.56	89.56	0	Scouring of culvert outlet	Scouring of culvert outlet
47	MSL-168	Mt Rainbow - Dumgree	93.37	93.37	0	Scouring at the bridge end and embankment	Scouring at the bridge end and embankment
48	MSL -171	Stirrat - Clarke	62.23	62.23	0	Scour under fence	washed out rock to fill in hole where water is ponding and scours within the private property

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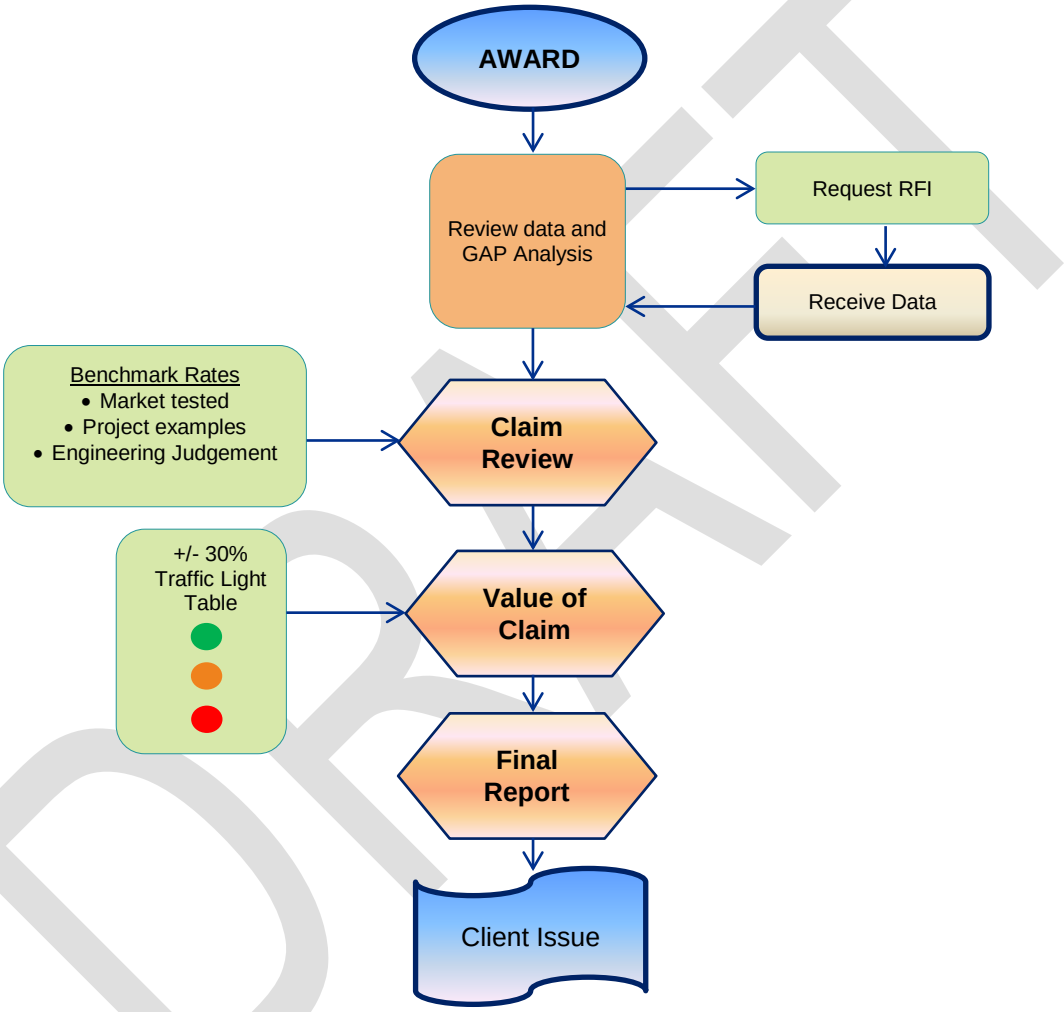
3. Method

On award we reviewed the data available and completed a gap analysis. We then submitted RFIs to the Aurizon Network to collect information for the development of our review. We collated tried and tested benchmark rates and used these to produce costs for the flood repairs of each site. These projected costs were then compared with the Aurizon Network claim and a Level 4 (order of magnitude) +/-30% cost comparison traffic light table was completed for each package to evaluate the prudence of costs.

Figure 3.1 : Flow chart of method used by us to evaluate flood expenditure claims



3.1 Prudency of scope

Based on the information available, we concluded at the commencement of our assignment that the occurrence of tropical cyclone Marcia and subsequent flood event is not in doubt, but the extent of the damage which occurred needed to be established. We made an evaluation of severity of the damage and the works involved to restore the rail corridor.

It was also our intention to take into account any other contributory factors, such as the state of the asset prior to the flood which could have exacerbated the level of damage that occurred. However, by the time of writing this report, we have not received any information in terms of the general condition of the sites prior to the flood. If the asset was already life expired, then an argument may be made that its replacement falls under the remit of maintenance. Conversely had the asset been in good condition then the full costs to replace these

materials should be considered in our cost benchmarks. However, and in spite of lack of information on pre-flood condition we have assumed that the condition track, ballast, embankment and other affected infrastructure condition prior to the flooding was good. This assumption is based on our knowledge of the maintenance processes and standards employed by Aurizon Network.

Our review has concentrated on an assessment of completed flood recovery re-construction works only. Our review of the restoration works includes an assessment whether the most efficient option has been selected for the expenditure item. That is, we have assessed the option selection against a criterion of what a knowledgeable and efficient rail network operator would have selected, taking a holistic view to its asset base, as preferred option on a lifecycle cost basis.

In making this assessment, four options were considered:

- Option 1 – Minimal works to restore the line to operation service
- Option 2 – Reinstatement to full Aurizon Network standard specifications for optimised operation and minimal future maintenance.
- Option 3 – Asset betterment to protect the asset in future flood events
- Option 4 – Asset enhancement resulting in the increasing of the assets functionality.

Due to the period of time which has elapsed between the flood event and the submission of the flood claim, it was not practicable to visit any of the sites to assess the extent of the flood damage or the extent of the remediation works. We have therefore relied upon data provided by Aurizon Network to evaluate the extent of the damage and the quantum of the repair work. This data comprised:

- Photographs of the flood damage
- Inspection reports in respect of the condition of the assets before the flood event
- Engineering drawings and sketches showing the extent of the damage and the means of reinstatement.
- Detailed breakdown of track renewals and earthworks costs from non-flood related renewals works carried out on the Moura line in a similar time period
- Information on the procurement and sourcing of repair materials
- Works Completion Certificates.

3.2 Prudency of standard

In the absence of any detailed reconstruction information, we have assumed that Aurizon Network (and its contractors) reinstated all railway infrastructure to Aurizon Network's technical specifications which are based on the following standards:

1. Civil Engineering Track Standards (CETS), QR Ltd, 2010
2. Civil Engineering Structures Standards (CESS), QR Ltd, 2010.

The Aurizon Network '*Moura Systems Information Pack'* describes the rail system as '*generally 60kg/m rail with concrete sleepers*' and suitable for axle loads of up to 26.5 tonnes. We have therefore assessed reinstatement work on the basis of a track composition compatible with these requirements, namely:

- 60 kg Rail
- 26.5 tal sleepers

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- 300 mm of ballast below the base of the sleeper.

Assuming a standard ballast profile, this depth of ballast equates to a volume of 1.3 m^3 per linear meter of track.

We have used Aurizon Network's standard drawing AUR-S-999-2100 for earthwork and formation reconstruction projections.

3.3 Prudency of costs

For each of the worksites, an estimate of major quantities has been compiled. These have been costed on a Level 4 (order of magnitude estimate (± 30%)) basis using the unit rates tabulated in Table 3.1 of section 3.3.2. The resulting figures have then been compared to those provided by Aurizon Network in the spreadsheet contained within Appendix B.

3.3.1 Development of our cost estimate

We have drawn on recent rail project work, our in-house database of costs for rail infrastructure, published information and our engineering knowledge to develop unit rates for linear km of track and infrastructure and or volumes of material (e.g. ballast). These unit rates are set out in Table 3.1 below. We have then applied these unit rates to the estimates of linear track and infrastructure and or volume of materials employed in the flood recovery works, drawing on information provided by Aurizon Network, including sizing from photographs and drawings to develop replacement expenditure benchmarks.

3.3.2 Unit Rates

The unit rates shown in are typical for railway works undertaken in Queensland for the year 2015 and have been used to evaluate the costings submitted by Aurizon Network. The unit rates below do not make allowance for arduous working that are likely to have existed at the time. In order to compensate for management activities, emergency services rendered, or various flood related activities and to allow for the order of magnitude precision of the cost estimates, a plus/minus of 30% will be attributed to the final benchmark cost for each site.

Table 3.1 : Unit rates used in our cost benchmark estimates

Item	Sub Category	Type	Size	Unit Cost ($)
Culverts	Concrete	RCBC	Large (>4m2)	500,000
			Med (3-4m2)	250,000
			Small (<3m2)	50,000
		RCP	Large (>4m2)	500,000
			Med (3-4m2)	250,000
			Small (<3m2)	50,000
	Steel	CMP	Large (>4m2)	300,000
			Med (3-4m2)	150,000
			Small (<3m2)	20,000
		Armco	Large (>4m2)	300,000
			Med (3-4m2)	150,000
			Small (<3m^2)	20,000

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Item	Sub Category	Type	Size	Unit Cost ($)
Earthworks	Site clearance		m2	5
	Excavate & disposal off-site	Clean	m3	45
	Excavate & disposal off-site	Contaminated	m3	195
	Embankments (structural fill)		m3	112
	Capping layer (formation)		m3	144
Ballast	*Cost and installation included in track below.	Single track, 300 mm below the sleeper	Cubic metres	60
Fencing	Four wire		Linear meter	50
	Chain link		Linear meter	100
	Security		Linear meter	200
Drainage	Trackside		Linear meter	400
Sleepers	Timber	Sleepers at 650 mm spacing	Each	
	Steel	Sleepers at 650 mm spacing	Each	60
	Concrete	Sleepers at 650 mm spacing	Each	149
Rail (including transportation and installation of Ballast, rail, rail components, Guard rails etc.)	60 kg/m		Linear meter	712
Guard Rails			Linear meter	300
Turnouts	1:7, 60 kg/m	Turnout (Greenfield)	Each	200,000
	1:7, 60 kg/m	Turnout (possession)	Each	230,000
	1:7, 60 kg/m	Crossover (Greenfield)	Each	420,000
	1:7, 60 kg/m	Crossover (Possession)	Each	450,000
Catch point			Each	60,000
Turnout Operations	Hand lever		Each	8,000
	Trailable		Each	8,000
	Machine		Each	15,000
Track Sluing	In possession		Linear meter	350
Ballasted plain line track			Linear meter	850
Track Mounted Equipment	Wheel Impact Detector		Each	200,000

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Item	Sub Category	Type	Size	Unit Cost ($)
	Hot Bearing Detector		Each	400,000
	Dragging Equipment Detector		Each	400,000
	Rail flange lubricators		Each	20,000
	Weighbridges		Each	5,000

3.4 Traffic light table

We have employed a traffic light system to indicate, visually, our conclusions on prudency of scope, standard and expenditure. The following table describes how we have applied this system:

Table 3.2 : Prudency evaluation traffic light system

Prudency of scope	Was the scope adopted by Aurizon Network prudent to the need of the project and remaining life of the asset? Was the scope adopted the most efficient one selected for the expenditure item and in keeping with the scope that would be adopted by a knowledgeable and efficient rail network operator taking into account the circumstances at the time?	
Prudency of standard	Were the Standards adopted by Aurizon Network prudent to the need of the project and remaining life of the asset? Were the standards adopted the most efficient ones selected for the expenditure items?	
Prudency of cost Plus / Minus 30% to allow for emergency costs	Are Aurizon Network's costs within plus 30% of our benchmark costs	

Key: Green = Prudent; Amber = Partially Prudent; Red = Not Prudent

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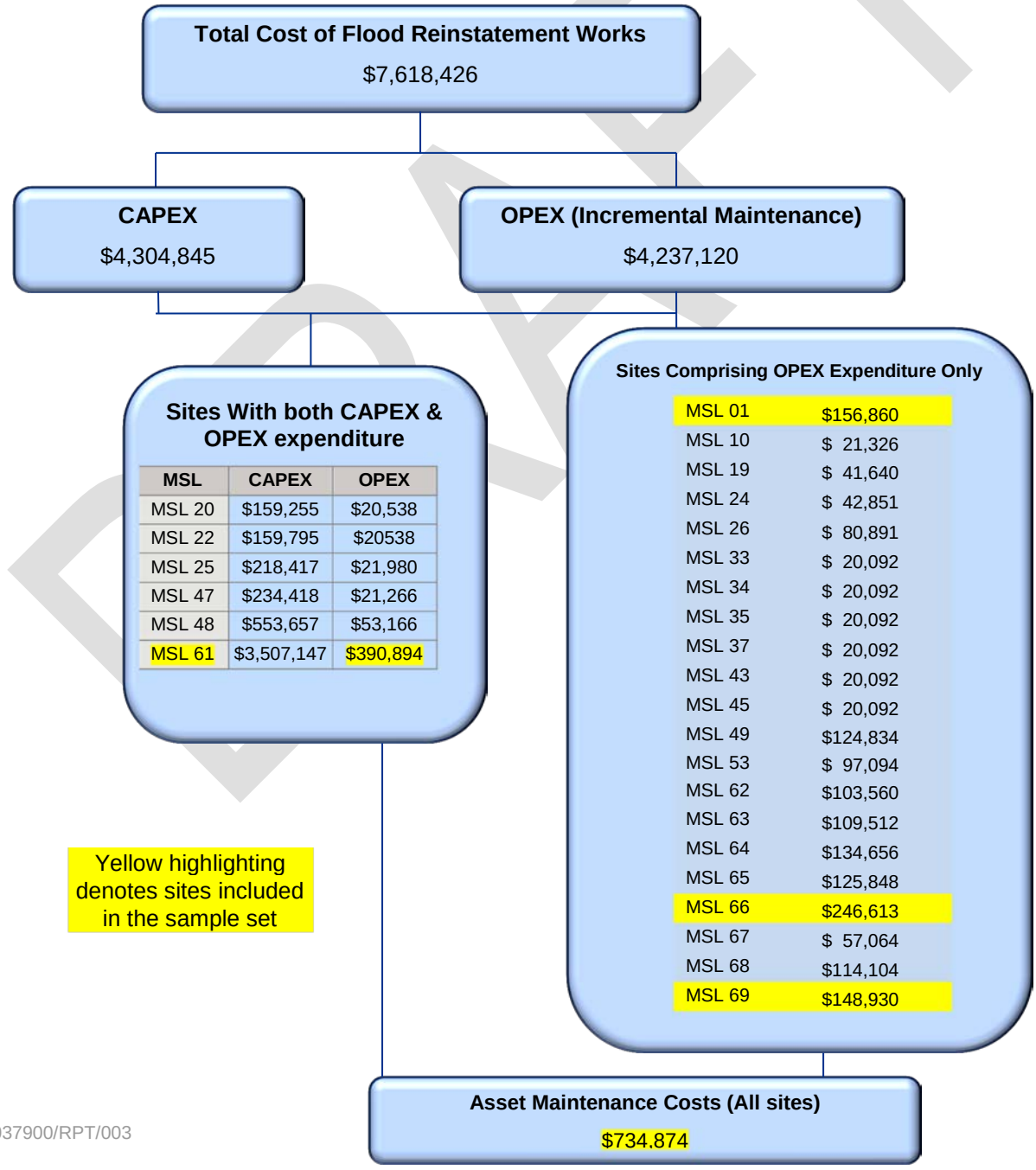
4. Claim review

Expenditure incurred rectifying damage caused directly by the 2015 flood that would not otherwise have been incurred as a part of 'business as usual' and with respect to capex (capital expenditure) , had not been planned to be expended in the current undertaking period and hence will form part of a capex submission (UT4/5). Figure 4.1 below presents Aurizon Network's total claim split between capex and opex (operational maintenance expenditure). As explained above the capex is not part of this submission. The incremental opex, being the incremental operational maintenance expenditure, is shown in Figure 4.1 and highlighted in yellow the four sample sites MSL1, 61, 66 & 69.

MSL61 site falls under the capex and incremental opex headings, due to the nature of work required. This results in the capex being excluded in order to obtain the Incremental Maintenance (IM) cost which Aurizon Network is claiming. The Asset Maintenance costs are also included which cover all 48 sites and this cost is described in Section 6.

Figure 4.1 : Division of capex and incremental opex (incremental maintenance costs)



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5. Incremental maintenance costs and sample selection

In Aurizon Network's 'Review Event Submission'[3] to the QCA, Aurizon Network stated that it is seeking approval from the QCA for a variation to the Moura System reference tariffs to recover its incremental maintenance costs resulting from the Cyclone Marcia event in the sum of $4,237,120 after escalation of 4.66% has been applied by Aurizon Network to bring the costs to June 2015 money terms. The sum prior to escalation is $4,048,455. All of our assessment has been undertaken on pre-escalation costs.

The spreadsheet[4] initially provided by Aurizon Network indicated a total value of works undertaken as being $7,618,426. We queried this discrepancy in totals with Aurizon Network[5] who responded[6] to advise that the spreadsheet presented the total cost of the flood reinstatement works including both capex and opex; however, only incremental maintenance opex is being claimed which is consistent with the figure shown in the submission submitted to the QCA. The capital relating to Bells creek, Stirrat-Clarke and Mount Rainbow-Fry are not included in the incremental opex and therefore not part of the claim. These will form part of the ex-post capex claim process. Aurizon Network also advised that the labour figure claimed relates to Overtime labour and external labour only.

In order to review the incremental maintenance costs of the four sample sites which would be a representation of all the sites which total (after escalation) the claim of $4,237,120, we split the sites into two packages. Package 1 would be site MSL61 which is unique in nature in comparison to Package 2 which would include a representative sample of the remaining sites which are almost identical in type of work undertaken and which had similar flood impacts to many of the other sites.

By agreement with both the QCA and Aurizon Network we have undertaken an assessment of prudency on four sample work sites. The activities at all work sites other than MSL-61 are almost identical in nature. We therefore selected MSL-61 as being a work site that needed to be assessed independent of the other sites. For the remaining sites it was agreed that a review of the three work site having the largest allocation of incremental maintenance costs would be sufficient and, given the similarity between these sites and the remaining sites, it would be possible to extrapolate the findings from these sites confidently to the remaining sites. We therefore selected work sites MSL-1, MSL-66 and MSL-69 as the final three sample sites. In total, the sampled work sites represent some 28 % of the total incremental maintenance cost claim. We have set out Aurizon Network's incremental maintenance claim for each of the sample sites in Table 5.1 below:

Table 5.1 : Sample sites and incremental maintenance expenditure claim

Work Site Reference	Work Site Descriptor	Incremental Maintenance Cost including Asset Maintenance cost Claim
MSL-1	Signalling cabinet reinstatement, Mt Rainbow	$191,648
MSL-61	Embankment and track washout along Bells Creek, Mt Rainbow - Dumgree	$477,585
MSL-66	Ballast scour and track wash out, Earlsfield - Dakenba	$301,306
MSL-69	Track wash out Earlsfield - Dakenba	$182,032

[3] Aurizon Network Access Undertaking (2010): Review Event Submission – Central Queensland Flooding 2015 dated 30 November 2015
[4] Spreadsheet titled 'Moura Flood Repair' received by email from Michelle De Saram on 01/02/2016 – See Appendix A
[5] Email from M Lipscombe (Jacobs) to Michelle De Saram (Aurizon Network) dated 2nd February, 2016
[6] Email from Michelle De Saram to M Lipscombe dated 2nd February, 2016

5.1 Package 1: MSL61. Bells Creek embankment washout and reinstatement of track formation (including emergency temporary track works)

A breakdown of site MSL61 total is shown in Table 5.2[7]. The costs highlighted in green are the incremental maintenance costs and asset maintenance costs being reviewed in this claim. All other costs, including capital expenditure costs are excluded.

Table 5.2 : Aurizon Network's flood damage claim Bells Creek section of track

MSL-61	Mt Rainbow - Dumgree		Flood Claim Total	Incremental Maintenance Costs	Asset Maintenance cost
	Track	Labour & Plant	$334,661	$264,255	
	Ballast	Ballast	$58,895	$58,895	
	Track	Material	$89,675	$35,034	
	Formation	Labour & Plant	$1,167,058		
	Formation	Material	$1,304,407		
	Design - External	Labour	$215,748		
	Design - Internal	Labour	$4,021		
	Design Management	Labour	$154,530		
	Construction Management	Labour	$94,393		
	Management	Labour	$16,016		
	Land Acquisition & Access	Labour	$4,552	$4,552	
	Land Acquisition & Access	Compensation	$42,314	$42,314	
	Cultural Heritage	Labour	$20,877	$20,877	
	MSL 61 Total		**$3,507,147**	$390,893	$86,691

We have reviewed and assessed the incremental maintenance costs, including the associated asset maintenance costs that Aurizon Network has separated as being discrete to certain elements of its maintenance costs. Land Acquisition, Access and Cultural Heritage are also included in this claim as they would not have been affected otherwise in 'normal' daily operations. The track labour and plant , ballast and material required to complete the recovery works are reviewed further in Section 6.1 to assess whether they fall outside the boundaries of business as usual' activities and have been considered as costs only flood damage incurred from the 2015 cyclone.

5.2 Package 2 – MSL1, 66 & 69

Three other sample sites reviewed for this submission which together with MSL61 represent 28% of total incremental maintenance costs and which are considered, together, as a representation of all the works include-

5.2.1 MSL– 1; Mount Rainbow – signal cabinet reinstatement

At Mount Rainbow there was a major damage to two signal boxes. Following inspection works and isolation of all electrical works Aurizon Network assessed that two LOC boxes were washed out of position and all works within to be tested and either repaired or reinstated as new. We have assumed all works for MSL1 are to be included as incremental maintenance costs. Aurizon Network's claim for this work activity is shown below in Table 5.3.

[7] Spreadsheet titled 'Moura Flood Repair' received by email from Michelle De Saram on 01/02/2016 – See Appendix A

Table 5.3 : MSL1 Aurizon Network's expenditure for the flood damage repair costs as submitted to us

MSL-1 Mt Rainbow	Asset Type	Cost Description	Incremental Maintenance Costs	Asset Maintenance costs
	Signalling	Labour & Plant	$ 113,565	
	Signalling	Material	$ 27,279	
	Management	Labour	$ 16,016	
	MSL 1 Total		**$ 156,860**	**$34,788**

5.2.2 MSL-66 Earlsfield - Dakenba - ballast washout

As shown in the photographs in Appendix D, the flood removed a large portion of the ballast for a length of approximately 200 m. The claim below is for the incremental opex works to re-instate the track to its former state. The incremental maintenance and asset maintenance costs claimed are as shown in Table 5.4

Table 5.4 : MSL66 Aurizon Network's expenditure for the flood damage repair costs as submitted to us

MSL-66 Earlsfield - Dakenba	Asset Type	Cost Description	Incremental Maintenance Costs	Asset Maintenance Costs
	Track	Labour & Plant	$161,634	
	Ballast	Ballast	$6,298	
	Formation	Labour & Plant	$30,485	
	Formation	Material	$28,819	
	Construction Management	Labour	$3,360	
	Management	Labour	$16,016	
	MSL 66 Total		**$246,613**	**$54,693**

5.2.3 MSL-69 Earlsfield - Dakenba – ballast washout

No. 12 Turnout point, ballast washout (Earlsfield end). Formation repair, turnout and panel removal required - rodding assistance required. As shown in the photographs in appendix D. The flood removed track ballast for a length of approximately 50 m. The claim below is for the opex works to re-instate the track to its former state. The incremental maintenance and asset maintenance costs claimed are as shown in Table 5.5.

Table 5.5 : MSL69 Aurizon Network's expenditure for the flood damage repair costs as submitted to us

MSL-69 Earlsfield - Dakenba	Asset Type	Cost Description	Incremental Maintenance Costs	Asset Maintenance Costs
	Track	Labour & Plant	$ 80,817	
	Ballast	Ballast	$3,149	
	Formation	Labour & Plant	$31,238	
	Formation	Material	$14,410	
	Construction Management	Labour	$3,360	
	Management	Labour	$16,016	
	MSL 69 Total		**$148,990**	**$33,042**

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6. Asset Maintenance costs

A significant portion of Aurizon Network's claim, totalling $734,874, comprises of a group of costs that has been classed under the heading of 'Asset Maintenance'. The costs are not directly attributable to a single location and have been verbally described as costs arising from the initial response and inspection works and incremental maintenance costs arising from those initial recovery works, however the posting date of these costs range from the 19th of February to the 10th of August 2015 which appears to cover the period of the implementation works.

Although to a large extent, receipts have been made available to substantiate these costs, limited, or for some items, no detailed information was provided in respect of the application or relevance of the items. These costs are summarised in the table below.

Table 6.1 : Aurizon Network Asset Maintenance cost claim

Category	Value
Accommodation domestic	$14,557
Activity usage labour	$190,902
Activity usage machine hours	$94,862
Airfares domestic	$300
Ballast	$26,488
Bottled water	$101
Contractors	$49,622
General hardware materials	$1,823
Hire charges - plant & machinery	$263,195
Minor canteen purchases	$526
Stationery	$9
Tools & equipment	$2,693
Trade services	$4,480
Travel expenses - general domestic	$85,315
Total	**$734,874**

Whist a number of these categories are those which would be expected to be associated with the initial inspection and evaluation phase following a significant climate event, others are not and without further explanation and evidence cannot be considered proven in the this case, the following explains our findings for each task and assumptions garnered when assessing their validation to be included as part of the claim or not:

Table 6.2 : Asset Maintenance costs

Category	Jacobs Estimation Costs	Comment
Activity usage labour	$ 190,902	The information provided regarding the type the work covered in this category is classed as overtime work coupled with an employee name, describing the work as planning, supervision and maintenance. Overall there are 1632 hours documented as overtime. This would result in an average OVT rate of $117 @ 34hours per site spread over the 48 sites for maintenance and inspection. This seems a reasonable amount for each site and is to be considered within the claim under asset maintenance.

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Activity usage machine hours	$ 94,862	The Information provided for this category covers various tasks that require plant machinery or maintenance equipment hire. These tasks are listed as thermit welding, ballast regulator machinery, resurfacing trucks, tampers, excavators and loaders (which at times appear in the photographic evidence provided). Using an average cost over 21 sites (where track formation works were required to be removed and replaced) results in an average cost of $4517 per site for machinery hire hours. This seems a reasonable amount per site if the machinery was used for maintenance. Furthermore Approximately $62,000 is logged for Tamper usage which works out to an average of $7000 an hour. With Tampers required for finalising track reinstatement construction, it is reasonable to quantify the requirement of this cost. The remaining $32,000 to cover excavation, welding etc. spread over the 21 sites results in an average of $1,523 for machinery hire at each site. With a total of 67 machinery hire (minus 8 hours tamper hire) the average amount of machinery hire is 3hours per site, resulting in an average hourly hire rate of $507. This seems a reasonable amount for each site and is to be considered within the claim under asset maintenance.
Ballast	$ 26,488	Ballast is generally included within each individual site. It is not clear from the information provided why additional ballast is required. In our experience and in discussion with Aurizon Network we have made the assumption that each flood recovery site will have lost ballast from beneath the track and ballast shoulders that would not have normally be lost through 'normal' operations. This asset maintenance cost is a nominal amount for each site (approx. $500 per site) to cover the cost of topping up ballast within the limits of the site.
Contractors	$ 49,622	No detail has been provided as to the work undertaken by the contractors within this category and therefore it is not possible to validate its inclusion in the claim.
Hire charges - plant & machinery	$ 263,195 $104,806 to be included (See table 6.4)	It has not been made clear how Plant & Machinery hire changes relate to the initial inspection phase. The purchase order text associated with the majority of the listing within this category relates to fencing, access roads and general repairs. Without any further information we have made the assumption that specific repairs that fall into the category of maintenance work that wouldn't have been required had their not been a flood, are to be included. However any other work that is listed as general flood repair is to be excluded as it cannot be substantiated. *Specific Maintenance costs machinery hire to be included for fencing, access road, welds, drainage = $104,806.68 (See table 6.4)
Total	**$ 417,058**	**Considered reasonable and prudent**

In addition to the items listed above, which are considered as a prudent cost based on the evidence currently provided by Aurizon Network, the costs below are also associated with the 'initial response and inspection works.

Table 6.3 : Additional asset management costs and our assessment

Category	Value	Comment
Accommodation domestic	$14,557	The accommodation cost seems reasonable, assuming at least one Inspector/engineer per site (maximum 2 nights per site). Average accommodation per night pp = $152.
Airfares domestic	$300	We consider the claim for 'Airfares Domestic' to be low for work of this nature. However, we consider the 'Travel Expenses – General Domestic' to be high and un-substantiated in that insufficient detail has been provided as to its relevance. We therefore considered that the combined figure is reasonable for work of this nature and extent. In further discussion with Aurizon Network, this cost covers helicopter usage for fly-over inspection photography. Thus these costs are to be included.
Travel expenses - general domestic	$85,315	
Total	**$100,172**	**Considered reasonable.**

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Table 6.4 : Substantiated Hire charge Plant and machinery costs

Hire Charges - Plant & Machinery	AUD
Fencing Repairs Cyclone Marcia FEB2015	22,368.00
Q15-0087: TC Marcia Repair Access Road @	10,808.61
Q15-0188: Repair Welds @ Moura FLOOD	5,935.79
Inv.#QRS15-00184: Drainage Repairs @ MSL	3,450.68
Inv.#QRS15-00087: TC Marcia Access Rd @	18,211.10
Fencing Repairs Cyclone Marcia FEB2015	306.25
Fencing Repairs Cyclone Marcia FEB2015	611.25
Fencing Repairs Cyclone Marcia FEB2015	1,072.50
Fencing Repairs Cyclone Marcia FEB2015	1,368.13
Fencing Repairs Cyclone Marcia FEB2015	1,368.12
Fencing Repairs Cyclone Marcia FEB2015	1,072.50
Fencing Repairs Cyclone Marcia FEB2015	611.25
Fencing Repairs Cyclone Marcia FEB2015	306.25
Fencing Repairs Cyclone Marcia FEB2015	1,368.13
Fencing Repairs Cyclone Marcia FEB2015	1,072.50
Fencing Repairs Cyclone Marcia FEB2015	611.25
Fencing Repairs Cyclone Marcia FEB2015	306.25
Fencing Repairs Cyclone Marcia FEB2015	1,368.12
Fencing Repairs Cyclone Marcia FEB2015	1,072.50
Fencing Repairs Cyclone Marcia FEB2015	611.25
Fencing Repairs Cyclone Marcia FEB2015	600.00
Fencing Repairs Cyclone Marcia FEB2015	306.25
Inv.# INV-009: Railway Access TC Marcia	30,000.00
Total	**104,806.68**

6.1 Asset Maintenance cost summary

Aurizon Network has separated out certain incremental maintenance costs as Asset Maintenance costs and these need to be added to the incremental maintenance costs to produce an incremental maintenance and asset maintenance total.

We have done this by:

- Reviewing separately the Asset Maintenance costs and stripping out items for which no substantiation has been provided i.e. contractor costs of circa $50k, certain plant hire costs all as we set out in Table 6.2 above
- Assigning the remaining costs on a pro-rata basis by a ratio of the value of incremental maintenance costs to the total incremental maintenance costs for each work site.

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The total Asset Maintenance cost claimed by Aurizon Network together with our assessment of prudent Asset Maintenance cost is shown below in Table 6.5. Table 6.6 shows Aurizon Network's Incremental Maintenance claim for the sample work sites together with an Asset Maintenance cost allocation per sample work site assigned by us on a pro-rata basis with respect to Incremental Maintenance cost for a particular site relative to Aurizon Network's overall Incremental Maintenance claim. Our pro rata allocation of the sum $517,230 (our assessment of prudent Asset Maintenance costs) by sample work site is show Table 6.6. We assess Aurizon Network's claimed Incremental Maintenance and Asset Maintenance cost total for prudency of cost for each work site sample in Sections 6.2 to 6.3.

Table 6.5 : Overall Asset Maintenance costs substantiated by Jacobs' estimations

Asset Types	Aurizon Network Claim	Jacobs estimation costs	Difference (Aurizon Network-Jacobs)
Asset Maintenance Total	$734,874	$517,230	$217,644

Table 6.6 : Aurizon Network's Incremental Maintenance Claim for sample work sites together with Aurizon Network's Asset Maintenance costs pro-rated across sample work sites

MSL Reference	Cost Description	Incremental Maintenance Costs $ (June 2015)	Asset Maintenance Cost $ (June 2015)	Incremental Maintenance Costs including Asset Maintenance Costs $ (June 2015)
MSL-1	Labour & Plant	113,565		
	Material	27,279		
	Labour	16,016		
	Asset Maintenance Pro-rata allocation		34,788	
MSL-1 total		**156,860**		**191,648**
MSL-61	Labour & Plant	264,255		
	Ballast	58,895		
	Labour	4,552		
	Compensation	42,314		
	Labour	20,877		
	Asset Maintenance Pro-rata allocation		86,691	
MSL-61 total		**390,894**		**477,585**
MSL-66				
	Labour & Plant	161,634		
	Ballast	6,298		
	Labour & Plant	30,485		
	Material	28,819		
	Labour	3,360		
	Labour	16,016		
	Asset Maintenance Pro-rata allocation		54,693	
MSL-66 total		**246,613**		**301,306**

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MSL Reference	Cost Description	Incremental Maintenance Costs $ (June 2015)	Asset Maintenance Cost $ (June 2015)	Incremental Maintenance Costs including Asset Maintenance Costs $ (June 2015)
MSL -69				
	Labour & Plant	80,817		
	Ballast	3,149		
	Labour & Plant	31,238		
	Material	14,410		
	Labour	3,360		
	Labour	16,016		
	Asset Maintenance Pro-rata allocation		33,042	
MSL-69 total		**148,990**		**182,032**
Total costs reviewed		**943,357**	**209,214**	**1,152,571**

Table 6.7 : Jacobs assessed prudent Asset Maintenance costs per sample work site

MSL Reference (Work Site Sample)	Pro rata allocation of Jacobs prudent assessment of Asset Maintenance costs by work site sample $ (June 2015)
MSL-1	24,485
MSL-61	61,016
MSL-66	38,495
MSL-69	23,256

6.2 Package 1 - MSL61 - Major embankment washout - Mount Rainbow to Dumgee (Bells Creek)

In this section we set out our assessment of prudency of scope, standard and cost for the Mount Rainbow to Dumgee (Bells Creek) section of track flood expenditure claim.

6.2.1 Description

The path of tropical cyclone Marcia crossed over the Moura rail corridor Line near Mount Rainbow, 45 kilometres north of Biloela. The cyclone caused significant damage to the rail embankment adjacent to Bells Creek between 100.3 km to 100.5 km chainage. The rail maintenance access road was washed away in sections along the rail corridor. The creek embankment was eroded away to such an extent the rail line was closed until Aurizon Network could fortify and reinstate the embankment.

Due to the time it would take to re-establish the rail embankment adjacent to the creek, Aurizon Network excavated a cutting on the opposite side of the corridor to construct rail formation to allow a temporary slue of the rail alignment. This temporary measure allowed trains to operate through the site, albeit under a temporary speed restriction whilst reconstruction continued on the embankment.

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Once the maintenance access road and embankment were completed, the rail was slued back to its original mounted position. Photographic evidence of these construction stages can be viewed in Appendix D. Aurizon Network has not included the embankment works in this claim as this is related to capital expenditure and will be dealt separately. Only the incremental maintenance costs have been included in this claim.

6.2.2 Prudency of scope

Following a flood that closes the rail corridor upon inspection, Aurizon Network's response is to re-instate the rail corridor as quickly as possible. However, due to the severity of the embankment washout at the MSL 61 site, it became a greater challenge, in comparison to the other sites within this claim, to render the corridor operational again as before. Accessibility to this site for crew and plant machinery was of particular issue and an engineering consultant was employed to deliver the engineering design due to the complexities involved in re-establishing the embankment.

Aurizon Network's fast track solution to opening the corridor again for safe passage of coal trains, was to provide a temporary track alignment adjacent to the existing position. This would involve constructing a temporary track formation and slewing the track away from the creek and thus ensuring trains could run while the embankment was re-constructed offline. Hence, although the works were initially completed as an emergency, once temporary works were employed, it is of our opinion that the works were planned accordingly and from the evidence provided the most efficient re-design and construction options were chosen (Option 4).

The completed reconstruction of the corridor, access road and apparent extension to the width of the rail corridor through this section, in comparison to how the rail corridor looked post flood, has been completed to the betterment for the future. We consider that there will be reduced maintenance regime, better protection from flooding, enhanced design life to the asset and improved accessibility for maintenance and monitoring.

However, we consider that these enhancement works go beyond what would be undertaken by an efficient operator and as such include betterment works. As such, we consider that the scope of works is only partially prudent.

6.2.3 Prudency of standard

Aurizon Network has provided some evidence displaying the reconstruction stages and a few photographs of the final state of the corridor on completion. The information shows the re-build of the embankment (not part of this claim), re-establishment of the track formation, temporary works and the rail access maintenance road. The new 4 m (Type 1) rail access maintenance road running through the corridor is now protected by flood rock placed at the edge of the embankment. We have assumed that the design shown in the drawings provided (Appendix F) were as constructed and as built. We have assumed the all Aurizon Network's standards were adhered to and the unit costs reflect this in our benchmark costs.

We therefore conclude that the standard of construction is prudent.

6.2.4 Prudency of cost

We have employed our benchmark unit costs together with our assessment of the quantity of infrastructure items repaired or replaced to develop benchmark order of magnitude cost estimates of the works. Where Aurizon Network's costs are within +30% of our cost estimate, i.e. within the upper band of estimating tolerance taking into account the precision of our estimate, we have concluded that Aurizon Network's costs are prudent. Where Aurizon Network's costs exceed our benchmark estimate, we conclude that our costs are the costs that would have been incurred by a knowledgeable and efficient rail network operator.

6.2.4.1 Our estimate of required expenditure

Our compiled estimate of major quantities is set out below. These major quantities estimate have been priced using the unit rates set out in Table 3.1 in section 3.3.2. The measurements were taken from the evidence provided in particular the Aurizon Network design drawings which provided us with exact chainage, width, length and depth of areas of reinstatement. The vertical and horizontal reinstatement was provided from

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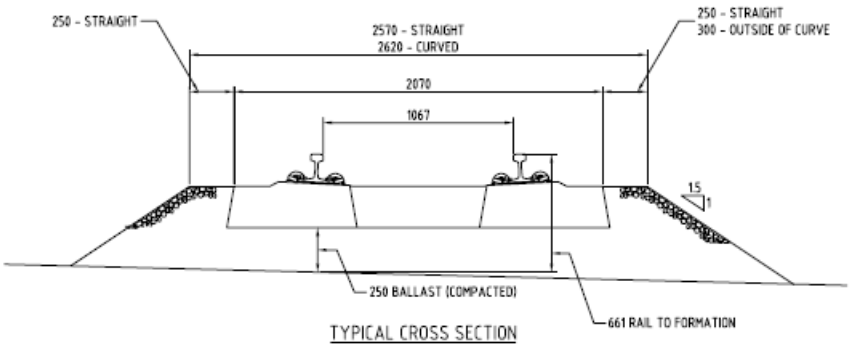
100.214 km to 100.527 km (313 m). Areas outside of these limits have not been considered for this claim. The width of the reinstatement includes temporary track alignment (track slue to the temporary position to allow trains to run during the embankment recovery works), re-instatement of the formation under the original track position and new access road (total width of 12 m). Where it has not been possible to measure accurately Aurizon Network standards and drawings (for example AUR-S-9999-2100) have been used. Ballast has been calculated on the amount required based on the evidence provided and has been calculated separately thus the cost projected is excluded from unit costs that already include the ballast cost. Our benchmark cost estimate for the Bells Creek track section flood repair works are explained below.

No formation works were completed for the temporary track alignment, ballast and top surface removal only, with ballast placed on top.

6.2.5 MSL 61 - Ballast estimate

Ballast expenditure of $58,895 we have assumed covers only the cost to ballast the emergency works track alignment slued into the temporary position. The photography provided shows the temporary slue over 200 m of track. Using the drawings in Appendix F the track Slue limits were from 100.527 km to 100.214 km, 313 m in length. Using Aurizon Network Standards for typical cross sections of plain line track (see diagram below) we assumed a ballast width up to maximum 4,000 mm for 300 mm depth.



Using network standard of $60 per cubic metre of ballast material:

4,000 mm (standard ballast width including shoulders) x 274 m (314 m total slue – rounded down to 274 m to allow for nominal 20 m transition ramps) x $60 unit rate = $65,750. The total amount being claimed for ballast material at Bells Creek of $58,895 is prudent cost and to standard and scope.

Table 6.8 : MSL61 - Ballast cost estimation

Asset Types	Aurizon Network Claim	Jacobs Incremental Maintenance estimation Costs	Difference (Aurizon Network-Jacobs)
Ballast	$58,895	$65,760	-$6,895

6.2.6 MSL 61 - Labour and Plant estimate

The incremental costs for the Bells Creek recovery works include all works required aside from 'business as usual' works. The slewing of the track to its temporary position to allow for trains to operate during the emergency works and re-instatement of the embankment certainly falls within this remit. Using rates from Table 3.1 we have compiled a review to assess the prudency of cost against these temporary works shown below:

Table 6.9 : MSL61 - Labour and Plant cost estimation

Asset Types	Aurizon Network Claim	Jacobs Incremental Maintenance estimation Costs	Difference (Aurizon Network-Jacobs)
Track labour (installation and transport)	$229,221	$195,088	
Site Clearance		$8,220	
Site Clearance clean material (excavate and disposal) m^3		$36,990	
Site Clearance – contaminated material m^3		$10,686	
Capping Layer (formation) m^3	$35,034	N/A	
Track Slewing		$95,900	
Track Total	**$264,255**	**$346,884**	**-$82,629**

Our assessment prudent labour, plant and ballast totals as compared to Aurizon Network's claim for MSL61 incremental maintenance costs are shown in Table 6.10.

Table 6.10 : MSL61 - Estimation totals

Asset Types	Aurizon Network Claim	Jacobs Incremental Maintenance estimation Costs	Difference (Aurizon Network-Jacobs)
Ballast	$58,895	$65,760	-$6,895
Track Total	$264,255	$346,884	-$82,629
Overall Total	**$323,150**	**$412,644**	**-$89,524**

6.2.7 Value of claim by Aurizon Network

The cost of the flood damage rectification 'incremental maintenance' work undertaken and claimed by Aurizon Network for the Bells Creek section of track together with our benchmark costs is set out in Table 6.11 below.

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Table 6.11 : MSL61 - Aurizon Network and Jacobs Incremental Maintenance cost claim comparison table

MSL-61	Mt Rainbow - Dumgree	Cost item	Aurizon Network Incremental Maintenance Costs $ (June 2015)	Jacobs Incremental Maintenance Costs $ (June 2015)	Difference (Aurizon Network-Jacobs) $ (June 2015)
	Track	Labour & Plant	229,221	346,884	- 117,663
	Ballast	Ballast	58,895	65,760	- 6,865
	Track	Material	35,034	$0	+ 35,034
	Formation	Labour & Plant			
	Formation	Material			
	Design - External	Labour			
	Design - Internal	Labour			
	Design Management	Labour			
	Construction Management	Labour			
	Management	Labour			
	Land Acquisition & Access	Labour	4,552	4,552	0
	Land Acquisition & Access	Compensation	42,314	42,314	0
	Cultural Heritage	Labour	20,877	20,877	0
	Asset maintenance	Various	86,691	80,837	+ 5,854
	MSL 61 Total		**$477,585**	**$561,224**	**-$83,640**

Our cost estimations for the temporary works required at Bells Creek demonstrate the Aurizon Network cost claims to be prudent. However, whether contaminated material would have been cleared from the site has not been substantiated. Due to the nature of the emergency works we would assume that this item was not completed and the temporary works completed used contaminated formation due to the limited time the temporary alignment was in use. All other works would be recovered and used for the capital expenditure and have been omitted from this table.

6.2.8 Comparison of claimed expenditure and benchmark costs

We set out a comparison of Aurizon Network's claim and our cost estimate for the Bells Creek section of track flood repair works in Table 6.12 below:

Table 6.12 : Comparison between Aurizon Networks claim and our benchmark estimates – Bells Creek track section

Cost item	Aurizon Network expenditure claim assessed by Jacobs	JACOBS benchmark costs	Absolute difference (Aurizon Network-Jacobs)	Percentage difference (Aurizon Network - Jacobs)/Jacobs
MMSL 61	**$477,585**	**$561,224**	**-$83,640**	**-15%**

Given that the costs claimed by Aurizon Network for this track section are within +30% of our cost estimate, we consider that the Aurizon Network costs for the track washout sections repair to be prudent.

6.2.9 Conclusions

Our conclusions on from our assessment of prudency of scope, standard and cost are set out in Table 6.13 below:

Table 6.13 : Bells Creek track section flood damage expenditure prudency conclusions

Prudency item	Jacobs conclusions and comments	Prudency traffic light
Prudency of scope	On the evidence provided the scope adopted by Aurizon Network was prudent to the need of the restoration project and has prolonged and enhanced the life of the asset. The scope adopted was efficiently chosen, planned and executed. Due to insufficient data of existing rail corridor it is not possible to determine definitively whether the embankment before the flood contributed to the flood event and what the remaining life of the asset was.	
Prudency of standard	There is sufficient evidence provided of the recovery works to complete the re-instatement of the rail corridor complying with Aurizon Network's standards to determine that the standard of works is prudent. Also that the asset (embankment flood protection) has been enhanced resulting in increased asset functionality and betterment flood protection as would be undertaken by an efficient operator.	
Prudency of cost Aurizon Network cost within + 30% of our bench mark costs?	Aurizon Network's costs are in excess of plus 30% of our benchmark costs for this sample site as such we consider Aurizon Network's costs not to be prudent. From our analysis we consider the prudent substantiated cost for this work activity to be $477,585.	

6.3 Sample sites MSL66 & 69 - Major Ballast washout and MSL1 - Signalling cabinet reinstatement.

For the Package 2 section, we set out our assessment of prudency of scope, standard and cost for the three sample sites which include signalling cabinet reinstatement and two track formation and ballast washout sites. Due to the smaller claims compared to that of MSL61, we have combined these sites into one expenditure item to avoid unnecessary duplication consistent with the approach taken by Aurizon Network.

6.3.1 Description

These sample sites are a representation of all the other sites as they are very similar in nature, being identified as sites on the Moura network where a major washout and ballast scour occurred or where electrical systems need reinstating.

6.3.2 Prudency of scope

The main scope of works for MSL66 & MSL69 (ballast washout sites) was to re-establish the track formation works, fill with ballast and re-instate the track. Due to volume and size of the washouts Aurizon Network has classified some of the works as capital expenditure which has not been included in this claim. The photographs in Appendix D provide some evidence of the extent of the flood damage and the works required to re-instate the rail corridor. Photographic evidence for MSL1 also clearly shows the impact the flood had on two existing signalling cabinets and the works completed to reinstate these systems as soon as possible.

These sites were rectified very quickly and so the question has to be addressed as to whether they have been restored to safe design standards. No evidence was provided of how these sites looked before the flood, so again we only have information presented to us post-flood. We are unable to ascertain what the remaining life of the asset was before the flood occurred.

Hence the assessment has been completed on the merits of evidence provided post flood, during re-construction and the completion of the asset. Similarly to MSL61 when assessing the restoration works we have assumed that the design and re-construction have chosen preferred options on a lifecycle cost basis. No design

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drawings were provided to us for package 2 sites so we have made assumptions using the photographs provided to compile measurements for the cost analysis. We therefore conclude that the scope of works is only partially prudent.

6.3.3 Prudency of standard

From our review of the documentation provided, particularly photographic evidence it seems to that the depth of formation MSL66 and MSL69 have been restored to standard for 26t axle loads. The depths used are considered to comply with Aurizon Network's earthworks formation works standards and requirements. However, without as built drawings we cannot ascertain, definitively, whether or not the sites were restored to standard. As such we conclude that the standard of construction is only partially prudent.

6.3.4 Prudency of cost

We have employed our benchmark unit costs together with our assessment of the quantity of infrastructure items repaired or replaced to develop benchmark order of magnitude cost estimates of the works. Where Aurizon Network's costs are within +30% of our cost estimate, i.e. within the upper band of estimating tolerance taking into account the precision of our estimate, we have concluded that Aurizon Network's costs are prudent. Where Aurizon Network's costs exceed our benchmark estimate, we conclude that our costs are the costs that would have been incurred by a knowledgeable and efficient rail network operator.

6.3.5 Value of claim by Aurizon Network and our estimate of required expenditure

The cost of the flood damage rectification work undertaken and claimed by Aurizon Network for the track wash out sections of track is set out in Sections 6.3.6 to 6.3.8 for the sample sites MSL1, MSL66 & MSL69. Our estimate have been priced using the unit rates set out in Table 3.1 in Section 3.3.2 and are in June 2015 terms. We took per unit measures from the evidence provided in particular design drawings which provided us with exact chainage, width, length and depth of areas of reinstatement.

6.3.6 MSL1 – reinstatement of signalling cabinets

Photographs and evidence of work completed are shown in Appendix D. Without a unit cost for signalling work for comparison and without Aurizon Network providing a cost breakdown for these works we have assumed using the evidence and the tasks involved that the materials costed ($27,279) are to be included (covering new axle counter heads, trackside unit, electro-hydraulic pump unit and 3 x detectors). Our benchmark cost estimates for the track MSL1 Signalling cabinet reinstatement flood repair works are provided in Table 6.14.

Table 6.14 : Comparison of Aurizon Network's cost claim and our cost estimates for the MSL-1 site flood damage repairs

Asset Types	Rate ($) & quantity	Aurizon Network Claim	Jacobs Incremental Maintenance estimation Costs	Difference (Aurizon Network-Jacobs)
Track labour and plant (installation and transport)	$250 (signalling RSD engineer) x 32h (projected hours from Moura Flood recovery baseline)	$113,565	$8,000	$105,565
Site Clearance	5 m^2		$100	-$100
Site Clearance clean material (excavate and disposal) m^3	45 m^3		$900	-$900
Trackside Drainage	$400 linear m		$8,000	-$9,000
Material		$27,279	$27,279	$0
Management	64 h reasonable for management and design work	$16,016	$16,016	$0
Asset maintenance	Various	$34,788	$34,439	$2,349
Total		**$191,648**	**$93,934**	**$97,714**

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The difference between Aurizon Network's claim and our benchmark costs taking into account the level of substantiation of Aurizon Network's costs is +$97,714. Aurizon Network has provided insufficient evidence to substantiate the worked completed for a large part of the claimed costs. Without Aurizon Network providing a cost breakdown of the tasks shown in Appendix F the above costs have been completed on what information we had. The works were completed within two days on site and these costs have been accounted for. We assume the costs missing for this work are costs incurred for re-design and works completed off-site.

Drawing on our early analysis of prudency of scope and standards, our summary assessment of prudency of the works for site MSL-1 is provided below in Table 6.15 below.

Table 6.15 : Summary assessment of prudency of scope, standards and costs for works site MSL-1: Signalling Cabinet Reinstatement

Prudency item	Comment	Determination
Prudency of scope	The scope adopted by Aurizon Network was prudent on the evidence presented for each signal box restoration site.	
Prudency of standard	We have determined reinstatement to full Aurizon Network standards specifications for optimised operation and minimal future maintenance.	
Prudency of cost Are Aurizon Network cost within + 30% of our bench mark costs?	Aurizon Network's costs are in excess of plus 30% of our benchmark costs for this sample site as such we consider Aurizon Network's costs not to be prudent. From our analysis we consider the prudent substantiated cost for this work activity to be $93,934	

6.3.7 MSL-66 – Ballast washout

Using the evidence of tasks and site limits stated in Aurizon Network's Clients Requirements Brief shown in Appendix F the following cost estimates were completed for the MSL66 site.

Table 6.16 : Comparison of Aurizon Network's cost claim and our cost estimates for the MSL-66 flood damage repairs

Asset Types	Rate ($) & quantity	Aurizon Network Claim	Jacobs Incremental Maintenance estimation Costs	Difference (Aurizon Network-Jacobs)
Track labour (installation and transport)	712 linear m	$161,634	$71,200	$90,434
Site Clearance	5 m^2		$6,000	-$6,000
Site Clearance clean material (excavate and disposal) m^3	45 m^3		$9,180	-$9,180
Site Clearance – contaminated material m^3	195 m^3		$39,780	-$39,780
Management		$16,016		$16,016
Construction Management		$3,360		$3,360
Track Slewing	$350 linear m		$11,900	
Track labour Total		$181,011	$138,060	-$42,951
Capping Layer (formation) m^3	144 m^3	$59,304	$29,376	
Ballast	60m^3	$6,298	$5,100	
Asset management		$54,693	$51,000	$3,693
Grand total		$301,306	$223,536	**$77,770**

Our benchmark costs for the total for MSL66 are lower than those claimed by Aurizon Network's claimed costs are greater than +30% of our benchmark costs and we therefore conclude that the Aurizon Network's costs as

claimed are not prudent for this site. The main difference between the details provided seems to be the length of the site that needed reinstating. Although the site has been listed as 200 m length, the formation works completed were for approximately 34 m in length according to the evidence provided in Aurizon Network's Client requirements brief and this seems consistent with the photographic evidence (See Appendix D& F). Although there was debris, ballast reinstatement and track stressing required beyond this 200 m length, the large portion of the track, labour and plant machinery would be centred on the excavation and reinstatement of the formation works. Drawing on our early analysis of prudency of scope and standards, our summary assessment of prudency of the works for site MSL-66 is provided below in Table 6.17

Table 6.17 : Summary assessment of prudency of scope, standards and costs for works site MSL-66: Ballast scour and track wash out: Mt Rainbow - Dumgree

Prudency item	Comment	Determination
Prudency of scope	The scope adopted by Aurizon Network was only partially prudent on the evidence presented for each restoration site. There is insufficient evidence to ascertain the projected life of the asset without knowledge of the formation depths and materials before the flood and after recovery works were completed. As such we are unable to state consistently that the scope does not include betterment beyond what an informed and efficient operation would have implemented.	
Prudency of standard	We have determined reinstatement to full Aurizon Network's standards specifications for optimised operation and minimal future maintenance based on our knowledge of Aurizon Network's operations as opposed to direct evidence for this work site.	
Prudency of cost Are Aurizon Network costs within + 30% of our bench mark costs?	Aurizon Network's costs are in excess of plus 30% of our benchmark costs for this sample site as such we consider Aurizon Network's costs not to be prudent. From our analysis we consider the prudent substantiated cost for this work activity to be $223,536	

6.3.8 MSL69 – Ballast washout

Using the evidence of tasks and site limits stated in Aurizon Network's Clients Requirements Brief shown in Appendix F the following cost estimates were completed for the MSL69 site.

Table 6.18 : Comparison of Aurizon Network's cost claim and our cost estimates for the MSL69 flood damage repairs

Asset Types	Rate ($) & quantity	Aurizon Network Claim	Jacobs Incremental Maintenance estimation Costs	Difference (Aurizon Network-Jacobs)
Track labour (installation and transport)	712 linear m	$80,817	$39,160	$41,657
Site Clearance	5 m^2		$1,000	-$1,000
Site Clearance clean material (excavate and disposal) m^3	45 m^3		$14,850	-$14,850
Site Clearance – contaminated material m^3	195 m^3		$64,350	-$64,350
Management		$16,016		$16,016
Construction Management		$3,360		$3,360
Track Slewing	350 linear m		$50,750	-$50,750
Track Total		$100,193	$170,110	
Capping Layer (formation) m^3	144 m^3	$45,648	$47,520	-$1,872
Ballast	60 m^3	$3,149	$3,300	-$151
Asset Maintenance		$33,042	$30,811	$2,231
Grand total		**$182,032**	**$251,741**	**-$69,709**

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In comparison to the incremental cost estimates found for MSL66, Aurizon Network's cost claim for MSL69 is relatively low when assessing and taking into account the tasks and work completed using the same benchmark costs. Although the site was deemed to be 100 m in length only 55 m was formation work requiring extensive excavation and the use of plant machinery (according to the Aurizon Network reinstatement brief). However, Points 12 Turnout was reinstated at and beyond the toe of the turnout and through the nose with formation and track slewing for both straight and trailing alignment. Thus the length of track overall was more than the site works initially indicated. Appendix F details the tasks and lengths involved and using the benchmark costs we have estimated that the incremental maintenance costs claimed are below our benchmark comparison by 28%.

Drawing on our early analysis of prudency of scope and standards, our summary assessment of prudency of the works for site MSL-69 is provided below in Table 6.20 below.

Table 6.19 : Summary assessment of prudency of scope, standards and costs for works site MSL-69: Track washout: Earslfield – Dakenba

Prudency item	Comment	Determination
Prudency of scope	The scope adopted by Aurizon Network was only partially prudent on the evidence presented for each restoration site. There is insufficient evidence to ascertain the projected life of the asset without knowledge of the formation depths and materials before the flood and after recovery works were completed. As such we are unable to state consistently that the scope does not include betterment beyond what an informed and efficient operation would have implemented.	
Prudency of standard	We have determined reinstatement to full Aurizon Network's standards specifications for optimised operation and minimal future maintenance based on our knowledge of Aurizon Network's operations as opposed to direct evidence for this work site.	
Prudency of cost Aurizon Network cost within + 30% of our bench mark costs?	Aurizon Network's costs less than plus 30% of our benchmark costs for this sample site as such we consider Aurizon Network's costs to be prudent. From our analysis we consider the prudent substantiated cost for this work activity to be $182,032.	

6.3.9 Comparison of claimed expenditure and benchmark costs

We set out in Table 6.20 below a comparison of Aurizon Network's claimed flood damage expenditure costs with our cost estimates for all of the sites.

Table 6.20 : Comparison of Aurizon Network flood damage expenditure claim and our cost estimates

Cost item	Aurizon Network Incremental Maintenance Cost Claim including Asset Maintenance costs	Jacobs order of magnitude benchmark costs	Absolute difference (Aurizon Network - Jacobs)	Percentage difference (Aurizon Network-Jacobs)/Jacobs
MSL1	$191,648	$93,934	$97,714	104%*
MSL66	$301,306	$223,536	$77,770	35%
MSL69	$182,032	$251,741	-$69,709	-28%
Totals	**$674,986**	**$569,211**	**$105,775**	**19%**

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Whilst when taken as a whole, our sample of flood wash out sites reveals that Aurizon Network's total costs for these sites are within +30% of our order of magnitude benchmark costs, we consider it important to assess overall prudency based on the number of sites found to be prudent rather than on the basis of the aggregate costs. We consider this because of the significant variability in substantiating documentation for the different sites. It is therefore necessary to extrapolate our findings for these three sites across the remainder of the track wash out sites.

6.3.10 Extrapolation of findings for sample track wash out section sites to remain track wash out sections

We have extrapolated our findings from MSL-1, MSL-66 and MSL-69 to the remainder of the un-sampled expenditure given that the remaining sites all required almost identical work activities. The only difference between the sites being the quantum of materials and labour. We have applied the following formulae to extrapolate the costs:

$$EPC = TUC \times (SWPP \times ECF + (1 - ECF))$$

Where:

EPC = Extrapolated prudent cost

TUC = Total un-sampled cost

SWPP = Sample works prudency percentage (i.e. percentage of sampled works found to be prudent)

ECF = Extrapolation confidence factor

For the sampled work items MSL-1, MSL-66 and MSL-69 we found one out of three of the sampled work items to be prudent on cost. As such our SCPP is equal to 33.33%. However, we note that one of the sampled sites, MSL-66 is only 35% greater than our benchmark cost and for works site MSL-1 we have only been able to identify supporting documentation to justify $97,714 of the costs out of $191,648. We have therefore applied an ECF of 25% to the extrapolation. Our finding of prudency of cost for the remaining claim based on this extrapolation approach is set out below:

Table 6.21 : Extrapolation of our findings for the track wash out work site sample to the remainder of Aurizon Network claim for track wash out sections

Cost item – work site	Aurizon Network Incremental Maintenance Cost Claim including Asset Maintenance costs	Jacobs Extrapolated Benchmark cost (Plus/minus 30%)	Absolute difference (Aurizon Network - Jacobs)	Percentage difference (Aurizon Network-Jacobs) / Jacobs	Jacobs Recommended Prudent Cost
Remaining track wash out claim	$2,895,884	$2,413,213	$482,672	20%	$2,413,213

6.4 Overall Incremental Maintenance and Asset Maintenance total claim assessment

Our overall conclusions of prudency of cost for the 2015 flood damage expenditure claim, taking into account our extrapolation of our findings for MSL-1, MSL-66 and MSL-69 are provided in Table 6.22 below.

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Table 6.22 : Overall conclusions of prudency of costs for 2015 flood damage expenditure claims by Aurizon Network

Cost item – work site	Aurizon Network Incremental Maintenance Cost Claim including Asset Maintenance costs	Jacobs order of magnitude benchmark costs (Plus/minus 30%)	Absolute difference (Aurizon Network - Jacobs)	Percentage difference (Aurizon Network-Jacobs) / Jacobs	Jacobs Recommended Prudent Cost
MSL-61	$477,585	$561,224	-$83,640	-15%	$477,585
MSL1	$191,648	$93,934	$97,714	104%*	$93,934
MSL66	$301,306	$223,536	$77,770	35%	$223,536
MSL69	$182,032	$251,741	-$69,709	-28%	$182,032
Remaining track wash out claim	$2,895,884	$2,413,213	$482,672		$2,413,213
Totals	**$4,048,455**	**$3,543,648**	**$504,807**		**$3,390,300**

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7. Comments on stakeholder response

7.1 Anglo American Coal Australia

Anglo American Coal Australia (Anglo American) has made a submission[8] to the Queensland Competition Authority (QCA) in relation to Aurizon Network's application to an increase in the Moura System Reference tariffs as a result of the Flood Event 2015.

We summarise Anglo American's submission below:

a) **there is insufficient information, granularity or transparency contained in Aurizon Network's Flood Review** Event Submission 2015 for Anglo American or the QCA to determine whether the costs said to have been incurred were prudent and efficient;

b) **the high cost and proportions of both external labour costs and plant/equipment hire costs**. In particular, Anglo American is concerned that this may be an indication that maintenance activities which would ordinarily be undertaken by Aurizon Network, as part of its operation and maintenance of, in this case, the Moura System have been outsourced or transferred to Aurizon Operations which is clearly inefficient. Further, that there is little (or no) oversight as to the terms and conditions upon which Aurizon Operations contracts with Aurizon Network in respect of the maintenance of the below rail infrastructure is of particular concern. For example, it is not clear whether profit is being made by Aurizon Operations in carrying out such activities which are properly categorised as being access related maintenance;

c) the escalation calculation is inappropriate and acts to escalate payments already made, creating windfall revenue for Aurizon Network;

d) given total costs claimed on the Moura System are said to exceed $8,000,000 and that the works are all asset reinstatement or future flood immunity related, it is submitted that capitalising all of these costs into the RAB is appropriate.

7.1.1 Our comments

The following sets out our opinion on the stakeholder comments of Anglo American set out above:

a) **Agreed.**

b) **Agreed in part.**

c) **Not us**

d) **Not us**

In respect of first two items listed above, it is believed that Aurizon Network has not demonstrated with sufficient clarity the expenditure claimed in their application to the QCA. They have neither confirmed the extent or form of the works undertaken and they have also provided limited supporting information in respect of the costs incurred. Without providing evidence of the condition of the assets before the flood, made it challenging to ascertain the scope of prudency in terms of whether the recovery works will provide betterment from future flooding. Signed Reports, Design or As-Built drawings for the completed recovery works would have supported the tasks performed and provide a measure for prudency of standards used. However, no drawings or reports were provided for some of the sites (package 2) with only invoices and limited number of photographs as evidence. It was not possible to be definitive in terms of proving efficiency, standards adopted, quantities or materials used without this supporting evidence. Design drawings for the MSL61 site were provided and these were beneficial in supporting the recovery works in terms of calculating volumes and site extents.

We consider that items c) & d) above fall outside the scope of this report. We consider that items a) & b) have been addressed by the content of this document.

[8] Submission to the Queensland Competition Authority: Flood event 2015 dated December 2015

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7.2 Cockatoo Coal Limited

Cockatoo Coal Limited (Cockatoo) has made a submission[9] to the Queensland Competition Authority (QCA) in relation to Aurizon Network's application to an increase in the Moura System Reference tariffs as a result of the Flood Event 2015.

We summarise Cockatoo's submission below:

Cockatoo requests that, as per similar flood events submitted to the QCA, all reasonable steps continue to be undertaken by the regulator to independently assess the prudency of costs so as to ensure that:

1) the claims truly represent incremental costs;
2) labour costs included within the claim are those associated with overtime hours and not those attributable to ordinary effort; and
3) any costs attributable to employees or contractors are not attributable to reallocation from other tasks within the CQCN.

7.2.1 Our Comments

The following sets out our opinion on the stakeholder comments of Cockatoo

1) We consider that the QCA has fulfilled its obligation by appointing an independent consultant (Jacobs) to review the costs and ascertain whether the costs reasonably represent incremental costs and don't include costs for business as usual maintenance and or betterment beyond what a knowledgeable and efficient operator would undertake. We confirm that we have undertaken this assessment and made recommendations based on our findings of such. In the main, any reduction in recommended cost recovery has been as a result of insufficient information provided by Aurizon Network to substantiate their claim in full. We have, however, also made adjustments where we consider that the work represented 'business as usual' maintenance and or where we consider the rectification resulted in betterment beyond the criteria set out above in this paragraph.
2) We confirm our understanding from discussions with Aurizon Network and our review of the information provided that the labour costs represent overtime working only and not, those that are already covered under the current undertaking as 'ordinary effort'. We have also recognised that, as a result of the urgent need to repair the track, there may also be some other non-flood important maintenance work that was delayed as a result of the flood rectification works and that there may be an element of overtime payment to undertake 'catch up' works.
3) We confirm from our review, and for those cost items that we consider prudent, that there are no costs attributable to employees or contractors that we have determined as being prudent that have been reallocated from other tasks within Aurizon Network and hence which should be allocated to these other tasks rather than the flood repair expenditure. We have satisfied ourselves on this matter by determining the level of effort required to undertake the rectification works and by developing benchmark costs for such based on or database of costs for such activities.

[9] Submission to the Queensland Competition Authority: Flood event 2015 dated December 2015

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8. Summary and conclusions

We used our engineering judgement and recent project experience of a similar nature to assess the construction method, level of quality adopted and the standards used for the recovery works of the 6 sites identified. Where we have been unable to ascertain due to lack of evidence or information we have assumed Aurizon Network standards have been adopted and met to complete the works.

Our summary table of our prudency of cost evaluation is provided below in Table 8.1:

Table 8.1 : Overall conclusions of prudency of costs for 2015 flood damage expenditure claims by Aurizon Network

Cost item – work site	Aurizon Network Incremental Maintenance Cost Claim including Asset Maintenance costs	Jacobs order of magnitude benchmark costs (Plus/minus 30%)	Absolute difference (Aurizon Network - Jacobs)	Percentage difference (Aurizon Network- Jacobs) / Jacobs	Jacobs Recommended Prudent Cost
MSL1	$191,648	$93,934	$97,714	104%*	$93,934
MSL-61	$477,585	$561,224	-$83,640	-15%	$477,585
MSL66	$301,306	$223,536	$77,770	35%	$223,536
MSL69	$182,032	$251,741	-$69,709	-28%	$182,032
Remaining track wash out claim	$2,895,884	$2,413,213	$482,672		$2,413,213
Totals	**$4,048,455**	**$3,543,648**	**$504,807**		**$3,390,300**

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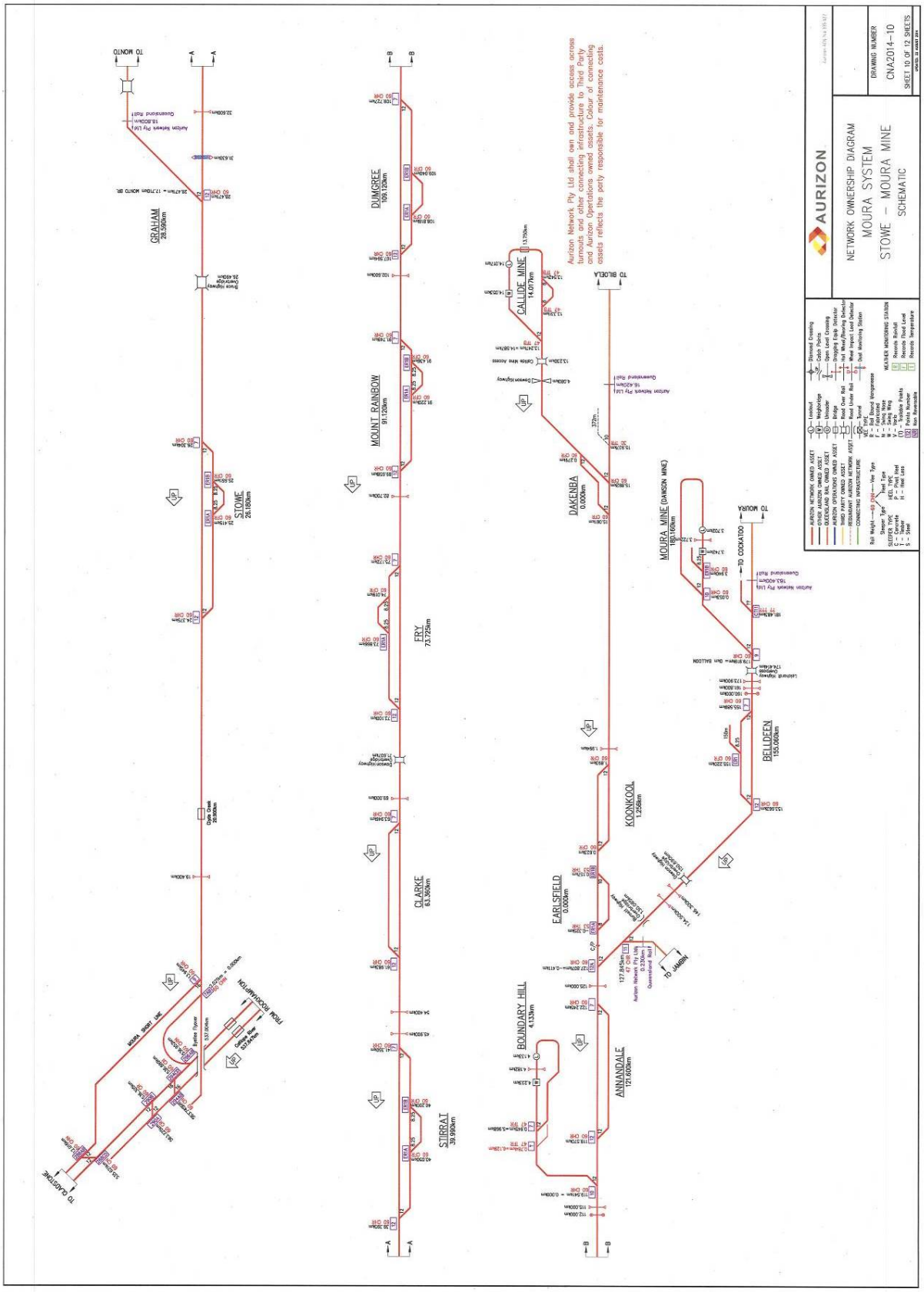
Appendix A. Aurizon Network's Moura System line diagram



Appendix B. Aurizon Network summary spreadsheet ‘Moura Flood Damage’ dated Sep-15

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PROJECT: Moura Flood Repair

MONTH: Sep-15

MSL Reference	Area	Km From	Km To	Distance in m	Road	Damage	Repair Scope	Asset type	Cost Description	Flood Claim $ (June 2015)
MSL-1	Mt Rainbow	89.65	89.65	0	main	Major damage to 2x signal boxes	2 LOC boxes washed out of position to be reinstated.	Signalling	Labour & Plant	113,565
								Signalling	Material	27,279
								Management	Labour	16,016
								MSL 1 Total		156,860
MSL -10	Graham - Stirrat	33	34	1000	main	Scouring under boundary fence	Site inspection only. No rectification/construction work by PD	Culvert - Scour	Labour & Plant	5,310
								Management	Labour	16,016
								MSL 10 Total		21,326
MSL-19	Stirrat - Clarke	59.876	59.888	12	main	track formation and ballast washout	Formation repair by placing new materials to rebuild track sub structure, place new ballast & reinstate existing track	Track	Labour & Plant	8,390
								Ballast	Ballast	2,398
								Formation	Labour & Plant	6,189
								Formation	Material	3,070
								Construction Management	Labour	5,576
								Management	Labour	16,016
								MSL 19 Total		41,640

MSL Reference	Area	Km From	Km To	Distance in m	Road	Damage	Repair Scope	Asset type	Cost Description	Flood Claim $ (June 2015)
MSL-20	Stirrat - Clarke	59.9	59.98	80	main	track formation and ballast washout	Major washout - track panel to be removed, formation repair, ballast, flood rock, reinstate track, resurfacing.	Track	Labour & Plant	55,933
								Ballast	Ballast	15,986
								Formation	Labour & Plant	41,260
								Formation	Material	20,469
								Construction Management	Labour	5,576
								Management	Labour	16,016
								Land Acquisition & Access	Labour	4,552
								Land Acquisition & Access	Compensation	0
								MSL 20 Total		159,793
MSL-22	Stirrat - Clarke	60.9	60.98	80	main	track formation and ballast washout	Major washout - track panel to be removed, formation repair, ballast, flood rock, reinstate track, resurfacing.	Track	Labour & Plant	55,933
								Ballast	Ballast	15,986
								Formation	Labour & Plant	41,263
								Formation	Material	20,469
								Construction Management	Labour	5,576
								Management	Labour	16,016
								Land Acquisition & Access	Labour	4,552

MSL Reference	Area	Km From	Km To	Distance in m	Road	Damage	Repair Scope	Asset type	Cost Description	Flood Claim $ (June 2015)
								Land Acquisition & Access	Compensation	0
								MSL 22 Total		159,795
MSL-24	Stirrat - Clarke	61.21	61.22	10	main	Major washout	Major washout - track panel to be removed, formation repair, ballast, flood rock, reinstate track, resurfacing.	Track	Labour & Plant	6,992
								Ballast	Ballast	1,998
								Formation	Labour & Plant	5,158
								Formation	Material	2,559
								Construction Management	Labour	5,576
								Management	Labour	16,016
								Land Acquisition & Access	Labour	4,552
								Land Acquisition & Access	Compensation	0
								MSL 24 Total		42,851
MSL-25	Stirrat - Clarke	61.22	61.33	110	main	Major ballast scour	Major washout - track panel to be removed, formation repair, ballast, flood rock, reinstate track, resurfacing.	Track	Labour & Plant	76,908
								Ballast	Ballast	21,980
								Track	Material	13,054
								Formation	Labour & Plant	56,737
								Formation	Material	28,145

MSL Reference	Area	Km From	Km To	Distance in m	Road	Damage	Repair Scope	Asset type	Cost Description	Flood Claim $ (June 2015)
								Construction Management	Labour	5,576
								Management	Labour	16,016
								MSL 25 Total		218,417
MSL-26	Stirrat - Clarke	61.375	61.394	19	main	Major washout	Major washout - track panel to be removed, formation repair, ballast, flood rock, reinstate track, resurfacing.	Track	Labour & Plant	13,284
								Ballast	Ballast	3,797
								Track	Material	23,005
								Formation	Labour & Plant	9,800
								Formation	Material	4,861
								Construction Management	Labour	5,576
								Management	Labour	16,016
								Land Acquisition & Access	Labour	4,552
								Land Acquisition & Access	Compensation	0
								MSL 26 Total		80,891
MSL-33	Clarke - Fry	72.6	92	19400		Access road scoured	Inspection of site only by TCC. No work conducted.	Culvert - Scour	Labour & Plant	4,076
								Management	Labour	16,016
								MSL 33 Total		20,092
MSL-34	Clarke - Fry	72.6	92	19400		Access road	Inspection of site only by TCC. No work	Culvert - Scour	Labour & Plant	4,076

MSL Reference	Area	Km From	Km To	Distance in m	Road	Damage	Repair Scope	Asset type	Cost Description	Flood Claim $ (June 2015)
						scoured	conducted.	Management	Labour	16,016
								MSL 34 Total		20,092
MSL-35	Clarke - Fry	72.85				Scour under fence PH58	Inspection of site only by TCC. No work conducted.	Culvert - Scour	Labour & Plant	4,076
								Management	Labour	16,016
								MSL 35 Total		20,092
MSL-37	Clarke - Fry	72.85				Scour under fence	Inspection of site only by TCC. No work conducted.	Culvert - Scour	Labour & Plant	4,076
								Management	Labour	16,016
								MSL 37 Total		20,092
MSL-43	Fry - Mt Rainbow	82.2				Slip onto access road	Inspection of site only by TCC. No work conducted.	Culvert - Scour	Labour & Plant	4,076
								Management	Labour	16,016
								MSL 43 Total		20,092
MSL-45	Fry - Mt Rainbow	83.8				Access road scour	Inspection of site only by TCC. No work conducted.	Culvert - Scour	Labour & Plant	4,076
								Management	Labour	16,016
								MSL 45 Total		20,092
MSL-47	Fry - Mt Rainbow	89.55	89.65	100	main	Major washout	Major washout - track panel to be removed, turnout removed (rodding support) formation repair, ballast, flood rock, reinstate track, resurfacing. See MSL-1 for LOC box work.	Track	Labour & Plant	114,394
								Ballast	Ballast	21,266
								Formation	Labour & Plant	51,579
								Formation	Material	25,587

MSL Reference	Area	Km From	Km To	Distance in m	Road	Damage	Repair Scope	Asset type	Cost Description	Flood Claim $ (June 2015)
								Construction Management	Labour	5,576
								Management	Labour	16,016
								MSL 47 Total		234,418
MSL-48	Fry - Mt Rainbow	89.65	89.9	250	main	Major ballast scour	Major washout; rodding removal support, ballast, flood rock, resurfacing. See MSL-1 for LOC box work.	Track	Labour & Plant	285,985
								Ballast	Ballast	53,166
								Formation	Labour & Plant	128,947
								Formation	Material	63,966
								Construction Management	Labour	5,576
								Management	Labour	16,016
								MSL 48 Total		553,657
MSL-49	Fry - Mt Rainbow	89.99	90.1	110	main	Washout in cross drain	Washout in cross drain. Ballast Replacement, cess drainage reconstruction, rail restressing	Track	Labour & Plant	12,378
								Ballast	Ballast	5,982
								Formation	Labour & Plant	56,737
								Formation	Material	28,145
								Construction Management	Labour	5,576
								Management	Labour	16,016
								MSL 49 Total		124,834

MSL Reference	Area	Km From	Km To	Distance in m	Road	Damage	Repair Scope	Asset type	Cost Description	Flood Claim $ (June 2015)
MSL-53	Fry - Mt Rainbow	90	90.08	80	main	Major ballast scour	track panel reinstatement and restressing	Track	Labour & Plant	9,284
								Ballast	Ballast	4,486
								Formation	Labour & Plant	41,263
								Formation	Material	20,469
								Construction Management	Labour	5,576
								Management	Labour	16,016
								MSL 53 Total		97,094
MSL-61	Mt Rainbow - Dumgree	100.3	100.5	200	main	Embankment washout along Bells Creek	Embankment stabilisation design and track alignment design. Temporary access way (via 3rd party land) created to traverse waterway (Creek) and temporary water course diversion. New rock wall and embankment rebuild. New ballast for track install at temporary alignment for interim solution. Final solution required tack reinstated as before following completion embankment rebuild.	Track	Labour & Plant	334,661
								Ballast	Ballast	58,895
								Track	Material	89,675
								Formation	Labour & Plant	1,167,058
								Formation	Material	1,304,407
								Design - External	Labour	215,748
								Design - Internal	Labour	4,021
								Design Management	Labour	154,530
								Construction Management	Labour	94,393
								Management	Labour	16,016
								Land Acquisition & Access	Labour	4,552

MSL Reference	Area	Km From	Km To	Distance in m	Road	Damage	Repair Scope	Asset type	Cost Description	Flood Claim $ (June 2015)
								Land Acquisition & Access	Compensation	42,314
								Cultural Heritage	Labour	20,877
								MSL 61 Total		3,507,147
MSL-62	Mt Rainbow - Dumgre	106	106.07	70	main		At 106km rock causeway install	Culvert - Scour	Labour & Plant	83,175
								Culvert - Scour	Material	1,009
								Construction Management	Labour	3,360
								Management	Labour	16,016
								MSL 62 Total		103,560
MSL-63	Earlsfield - Belldeen	132.3	132.345	45	main	Washout over culvert and sides PH45/41	Approx. 60m (Track removal - consider stabilised sand around culvert to get compaction)	Track	Labour & Plant	24,922
								Track	Material	12,534
								Formation	Labour & Plant	44,034
								Formation	Material	8,646
								Construction Management	Labour	3,360
								Management	Labour	16,016
								MSL 63 Total		109,512
MSL-64	Earlsfield - Belldeen	133.04	133.14	100	main	Ballast washout - approx. 120m - Track removal	reinstatement of track and ballast	Track	Labour & Plant	49,844

MSL Reference	Area	Km From	Km To	Distance in m	Road	Damage	Repair Scope	Asset type	Cost Description	Flood Claim $ (June 2015)
								Track	Material	22,552
								Formation	Labour & Plant	25,592
								Formation	Material	17,291
								Construction Management	Labour	3,360
								Management	Labour	16,016
								MSL 64 Total		134,656
MSL-65	Dakenba - Callide	4.098	4.117	19	main	Dawson highway - Up side of road. Formation & Ballast washed away	Formation repair by placing new materials to rebuild track sub structure, place new ballast & reinstate existing track	Track	Labour & Plant	40,032
								Ballast	Ballast	3,484
								Formation	Labour & Plant	60,217
								Formation	Material	2,738
								Construction Management	Labour	3,360
								Management	Labour	16,016
								MSL 65 Total		125,848
MSL-66	Earlsfield - Dakenba	8.7	8.9	200	main	Ballast Scour	Remove Track - repair formation	Track	Labour & Plant	161,634
								Ballast	Ballast	6,298
								Formation	Labour & Plant	30,485
								Formation	Material	28,819
								Construction Management	Labour	3,360
								Management	Labour	16,016

MSL Reference	Area	Km From	Km To	Distance in m	Road	Damage	Repair Scope	Asset type	Cost Description	Flood Claim $ (June 2015)
								MSL 66 Total		246,613
MSL-67	Earlsfield - Dakenba	12.01	12.02	10	main	Washout	Remove track - repair formation	Track	Labour & Plant	8,082
								Ballast	Ballast	315
								Formation	Labour & Plant	27,850
								Formation	Material	1,441
								Construction Management	Labour	3,360
								Management	Labour	16,016
								MSL 67 Total		57,064
MSL-68	Earlsfield - Dakenba	14.1	14.15	50	main	Washout	Remove track - repair formation	Track	Labour & Plant	40,409
								Ballast	Ballast	1,575
								Formation	Labour & Plant	45,539
								Formation	Material	7,205
								Construction Management	Labour	3,360
								Management	Labour	16,016
								MSL 68 Total		114,104
MSL-69	Earlsfield - Dakenba	15.05	15.15	100	main	No. 12 points washed out as ballast (Earlsfield end)	Formation repair, turnout and panel removal required - rodding assistance required	Track	Labour & Plant	80,817
								Ballast	Ballast	3,149
								Formation	Labour & Plant	31,238
								Formation	Material	14,410

MSL Reference	Area	Km From	Km To	Distance in m	Road	Damage	Repair Scope	Asset type	Cost Description	Flood Claim $ (June 2015)
								Construction Management	Labour	3,360
								Management	Labour	16,016
								MSL 69 Total		148,990
MSL-70	Dumgree	108.818	109.04	222	Bad Order Siding	70 Sleepers timbers damaged	Replace 70 timbers sleepers with concrete	Track	Labour & Plant	131,596
								Management	Labour	16,016
								MSL 70 Total		147,612
MSL-71	Stirrat	40.05	40.2	150	Bad Order Siding	71 Sleepers timbers damaged	Replace 71 timbers sleepers with concrete	Track	Labour & Plant	16,100
								Management	Labour	16,016
								MSL 71 Total		32,116
MSL-72	Belldeen - Moura Jct	163.7	163.7	0	main	Scouring around centre pile	Same location as MSL 73. Listed as 2 separate works as one in on pier and other on abutment of the bridge	Culvert - Scour	Labour & Plant	4,328
								Construction Management	Labour	3,360
								Management	Labour	16,016
								MSL 72 Total		23,705
MSL-73	Belldeen - Moura Jct	163.7	163.7	0	main	Scouring around abonnement	same as location as MSL 72. Listed as 2 separate works as one in on pier and other on abutment of the bridge	Culvert - Scour	Labour & Plant	4,328
								Construction Management	Labour	3,360
								Management	Labour	16,016
								MSL 73 Total		23,705

MSL Reference	Area	Km From	Km To	Distance in m	Road	Damage	Repair Scope	Asset type	Cost Description	Flood Claim $ (June 2015)
MSL-75	Moura Mine	180.745	180.76	15	main	Scoured access road	Inspection of site only by TCC. No work conducted.	Culvert - Scour	Labour & Plant	3,570
								Management	Labour	16,016
								MSL 75 Total		19,586
MSL-133	Earslfield	128.09	130.36	2270	main	Major Damage to 2x Signal Boxes	2 LOC boxes washed out of position to be reinstated.	Signalling	Labour & Plant	17,241
								Signalling	Material	5,121
								Management	Labour	16,016
								MSL 133 Total		38,378
MSL-135	Mt Rainbow - Dumgree	99.35	99.45	100	main	Significant scour	Batter protection required	Formation	Labour & Plant	0
								Formation	Material	0
								Design - External	Labour	37,024
								Design Management	Labour	19,826
								Construction Management	Labour	0
								Management	Labour	16,016
								Land Acquisition & Access	Labour	4,552
								Land Acquisition & Access	Compensation	0
								Cultural Heritage	Labour	20,877
								MSL 135 Total		98,296

MSL Reference	Area	Km From	Km To	Distance in m	Road	Damage	Repair Scope	Asset type	Cost Description	Flood Claim $ (June 2015)
MSL-136	Stirrat-Clarke	48.49	48.49	0	Main	Culvert - Debris on fence, scouring at outlet	Clear debris, add scour protection	Culvert - Scour	Labour & Plant	7,314
								Construction Management	Labour	5,576
								Management	Labour	16,016
								Land Acquisition & Access	Labour	4,552
								Land Acquisition & Access	Compensation	0
								MSL 136 Total		33,458
MSL-137	Stirrat-Clarke	57.76	57.76	0	Main	Bridge - Debris between girders, scouring of abutment	Clear debris, add scour protection	Culvert - Scour	Labour & Plant	6,257
								Construction Management	Labour	5,576
								Management	Labour	16,016
								MSL 137 Total		27,849
MSL-138	Stirrat-Clarke	59.91	59.91	0	Main	Culvert - Scour at inlet under pipes & embankments, debris on outlet fence	Clear debris, add scour protection	Culvert - Scour	Labour & Plant	4,231
								Construction Management	Labour	5,576
								Management	Labour	16,016
								MSL 138 Total		25,823
MSL-139	Stirrat-Clarke	60.82	60.82	0	Main	Culvert - Broken	Fix headwall	Culvert - Scour	Labour & Plant	14,862

MSL Reference	Area	Km From	Km To	Distance in m	Road	Damage	Repair Scope	Asset type	Cost Description	Flood Claim $ (June 2015)
						headwall at inlet, reo exposed		Construction Management	Labour	5,576
								Management	Labour	16,016
								MSL 139 Total		36,454
MSL-143	Fry-Mt Rainbow	75.14	75.14	0	Main	Culvert - erosion of embankment around culvert, debris on fence	Clear debris, add scour protection	Culvert - Scour	Labour & Plant	4,770
								Construction Management	Labour	5,576
								Management	Labour	16,016
								MSL 143 Total		26,362
MSL-144	Fry-Mt Rainbow	89.11	89.11	0	Main	Culvert - scouring of apron and surroundings at outlet	Add scour protection	Culvert - Scour	Labour & Plant	45,577
								Construction Management	Labour	5,576
								Management	Labour	16,016
								MSL 144 Total		67,169
MSL-145	Mt Rainbow-Dumgree	89.866	89.866	0	Main	Erosion of cutting, scouring next to access road	Add scour protection.	Culvert - Scour	Labour & Plant	27,171
								Construction Management	Labour	5,576
								Management	Labour	16,016

MSL Reference	Area	Km From	Km To	Distance in m	Road	Damage	Repair Scope	Asset type	Cost Description	Flood Claim $ (June 2015)
								MSL 145 Total		48,763
MSL-146	Mt Rainbow-Dumgree	94.51	94.51	0	Main	Culvert - Scouring under apron outlet, broken apron outlet, debris on inlet fence	Clear debris, add scour protection	Culvert - Scour	Labour & Plant	1,321
								Construction Management	Labour	5,576
								Management	Labour	16,016
								Land Acquisition & Access	Labour	4,552
								Land Acquisition & Access	Compensation	0
								MSL 146 Total		27,465
MSL-147	Dumgree	110.33	110.33	0	Main	Culvert - minor scouring at outlet	Add scour protection	Culvert - Scour	Labour & Plant	10,162
								Construction Management	Labour	3,360
								Management	Labour	16,016
								MSL 147 Total		29,538
MSL-148	Dumgree-Annandale	114.95	114.95	0	Main	Culvert - scour at outlet, debris on fence	Clear debris, add scour protection	Culvert - Scour	Labour & Plant	4,516
								Construction Management	Labour	3,360
								Management	Labour	16,016

MSL Reference	Area	Km From	Km To	Distance in m	Road	Damage	Repair Scope	Asset type	Cost Description	Flood Claim $ (June 2015)
								MSL 148 Total		23,893
MSL-149	Belldeen	161.05	161.05	0	Main	Culvert - scouring around apron outlet, fence at outlet fallen, debris in inlet fence, slight scouring at inlet	Clear debris, add scour protection	Culvert - Scour	Labour & Plant	4,893
								Construction Management	Labour	3,360
								Management	Labour	16,016
								MSL 149 Total		24,269
MSL-167	Fry - Mt Rainbow	89.56	89.56	0	Main	Scouring of culvert outlet	Scouring of culvert outlet	Culvert - Scour	Labour & Plant	106,040
								Construction Management	Labour	5,576
								Management	Labour	16,016
								MSL 167 Total		127,632
MSL-168	Mt Rainbow - Dumgree	93.37	93.37	0	Main	Scouring at the bridge end and embankment	Scouring at the bridge end and embankment	Culvert - Scour	Labour & Plant	119,727
								Construction Management	Labour	5,576
								Management	Labour	16,016
								MSL 168 Total		141,319
MSL -171	Stirrat - Clarke	62.23	62.23	0	Main	Scour under fence	washed out rock to fill in hole where water is ponding and scours within the private	Culvert - Scour	Labour & Plant	9,267

MSL Reference	Area	Km From	Km To	Distance in m	Road	Damage	Repair Scope	Asset type	Cost Description	Flood Claim $ (June 2015)
							property	Construction Management	Labour	5,576
								Management	Labour	16,016
								Land Acquisition & Access	Labour	4,552
								Land Acquisition & Access	Compensation	0
								MSL 171 Total		35,411
TOTAL PROJECT SPEND										**7,618,426**

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Appendix C. Rivers and catchment areas, Baffle, Boyne, Calliope and Kolan basins

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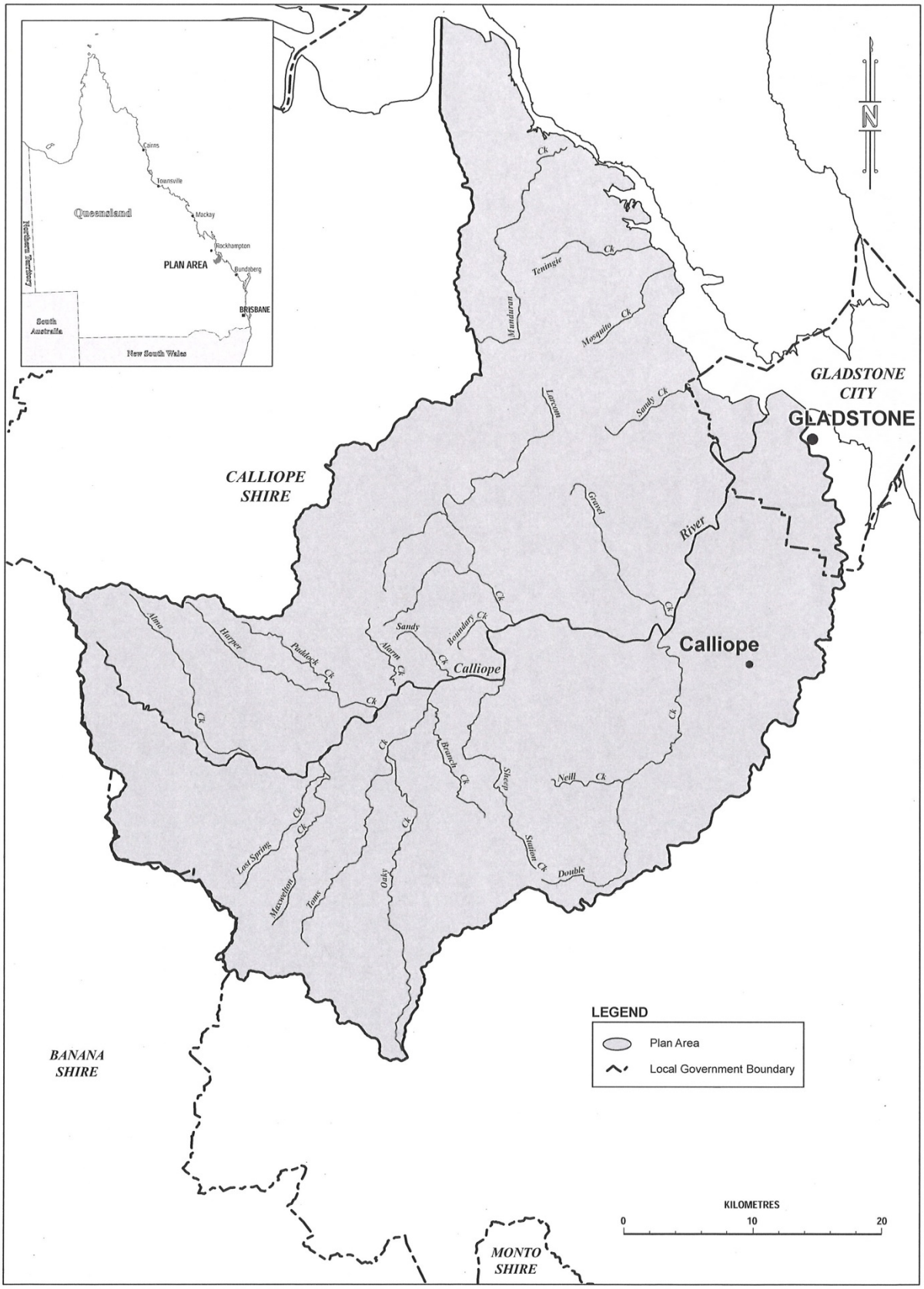
Figure C.1 : Baffle, Boyne, Calliope and Kolan Basins showing the Moura Railway System alignment

Figure C.2 : Fitzroy Catchment Area

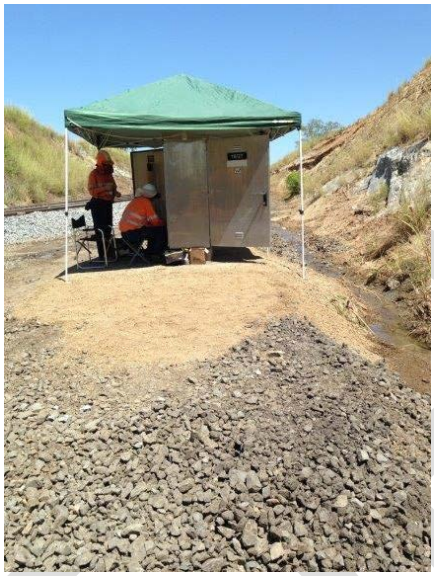
Figure C.3 : Calliope Catchment Area



Appendix D. Photographs of flood damage and reinstatement works

MSL1 – After the Flood, before re-instatement works


MSL1 - During the re-instatement




MSL1 - Completed Works


MSL66 – After the Flood, before re-instatement works




MSL66 – During re-instatement works. Removal and reinstatement of 200 m of rail, ballast and formation.





MSL66 – Completed works

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MSL69 – After the Flood, before re-instatement works




MSL69 – During re-instatement works






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MSL69 – Completed works shown at turnout in both directions

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Appendix E. Register of ‘Request for Information’ submissions

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JACOBS

RFI Register for Jacobs review of GAWB capex and opex

RFI	Brief Description of RFI	Date Issued	Issued By	Date Received	Closed Out?	Date Closed Out	Comment
0001	Site plan / Mapping showing extent of damage	5/02/2016	M. Lipscombe	Rec'd 18/03/16	Partial		Track structure and configuration drawing map NA 2014-10 showing chainage extents and a brief description of the damage for each work site affected by the Moura flood. No site plans received.
0002	Copies of the track inspection logs/reports for the weeks preceding the storm event	5/02/2016	M. Lipscombe		No		No photos of the asset pre-flood
0003	Copies of the most recent structure inspection reports for any structures included within the claim.	5/02/2016	M. Lipscombe		No		Indicated as received on the RFI summary list submitted by Aurizon Network, but no information provided.
0004	Copy of the latest route video (cab/train video)	5/02/2016	M. Lipscombe		No		Videos that were provided do not cover the work sites
0005	Site photographs and video detailing the damage that occurred	5/02/2016	M. Lipscombe	Rec'd 10/02/16	Partial		Photographs received of all work sites showing post flood, during construction and after recovery photos. No video of work sites received.

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RFI	Brief Description of RFI	Date Issued	Issued By	Date Received	Closed Out?	Date Closed Out	Comment
0006	Timeline for the works from commencement of storm event until completion of repair works. Timeline to indicate: • Storm event • Suspension of rail services, • Subsidence of flood waters to allow site inspection to take place • Commencement and duration of Inspection works • Appointment of repair team • Duration of works • Recommencement of rail services.	5/02/2016	M. Lipscombe		Partial		General timeline for the Moura flood of the Moura system received. Moura Flood Recovery Baseline received. This is an Integrated possession schedule. Detailing timelines of activities for each work site.
0007	Engineering drawings and sketches showing the extent of the damage and the means of reinstatement.	1/02/2016	M. Lipscombe		1 of 6 received.		Indicated as received on the RFI summary list submitted by Aurizon Network, but no information provided. MSL61 design drawings received only.
0008	Copy of Aurizon Network's flood recovery plan for the area	5/02/2016	M. Lipscombe		No		
0009	Breakdown of expenditure resulting from the flood repair works.	5/02/2016	M. Lipscombe		No		
0010	Detailed breakdown of track renewals and earthworks costs from non-flood related renewals works carried out on the Moura line in a similar time period (such as the Moura West upgrade works for the WICET project)	5/02/2016	M. Lipscombe		No		
0011	Information on the procurement and sourcing of repair materials.	5/02/2016	M. Lipscombe		Partial		Brief explanation provided post recovery

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RFI	Brief Description of RFI	Date Issued	Issued By	Date Received	Closed Out?	Date Closed Out	Comment
0012	Information on residual damage to the network not addressed by the reinstatement/repair works.	5/02/2016	M. Lipscombe		No		
0013	Implementation programme the reinstatement works	5/02/2016	M. Lipscombe		Partial		Standard Aurizon Network work safety 'Incident Management Procedure' received.
0014	Works Completion Certificates	1/02/2016	M. Lipscombe	10/02/16	Yes	10/02/16	Received
0015	Cost breakdown, material, contactor, labour, equipment for the flood repair work at each site	1/02/2016	S. Hinchliffe		Partial		Individual daily records, progress claims, invoices and receipts received for the relevant work sites and sites out of scope. Cost breakdown of each site not received.
0016	Procurement procedures	5/02/2016	M. Lipscombe		No		

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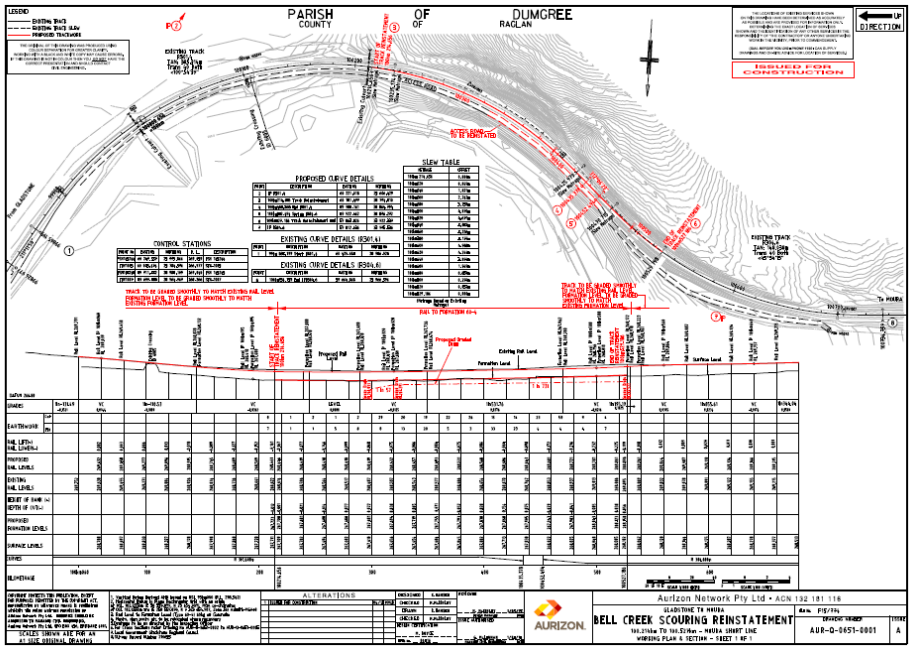
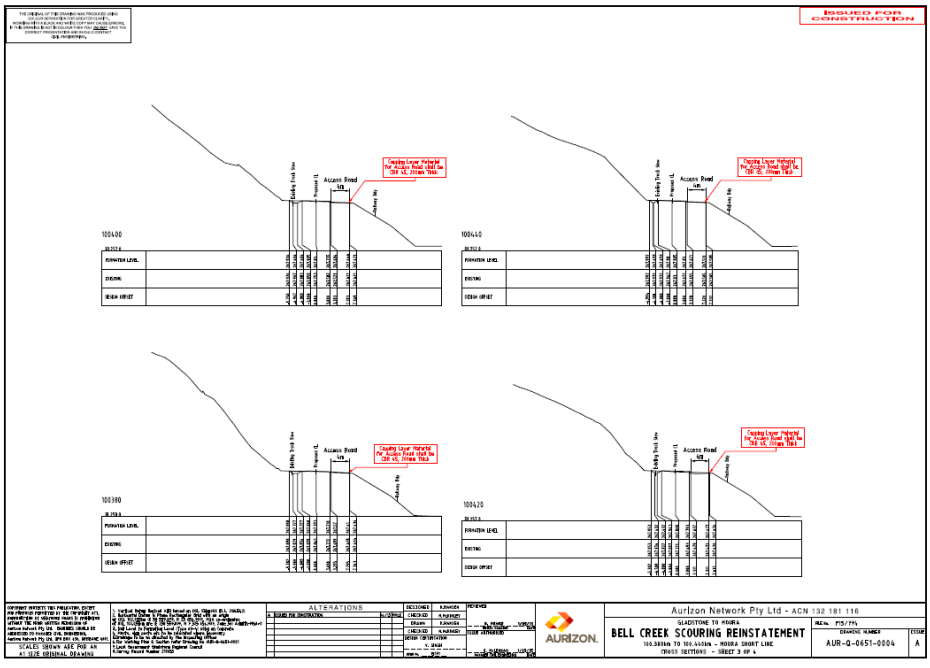
Appendix F. Reinstatement works information – engineering drawings and sketches

MSL 61

Track design drawings. Horizontal and vertical alignment and cross sections detailing earthworks design of re-construction





Other sites

MSL1 – works completed to re-instate two signalling cabinets.

Judge, David

From: Macpherson, David
Sent: Thursday, 5 March 2015 3:40 PM
To: Judge, David; Brown, Chris; DeCourcy, Troy; Ellingsen, Robert
Cc: Hollamby, Paul; Maynard, Blake
Subject: RE: MSL-1 CRB

David

- Initial Site Inspection. COMPLETED 02/03/2015.
- Isolate and secure Main Cables (3 off) to MR16/27 Loc Case A. COMPLETED 04/03/2015.
- Disconnect all cables terminated in MR16/27 Loc Cases A and B and all Trackside equipment controlled by these Locs. (Total of 25 Cables). COMPLETED 04/03/2015.
- Meggar test all disconnected Cables. COMPLETED 04/03/2015. (See NOTE 1).
- Remove Axle Counter Heads and Trackside Unit. COMPLETED by others. To be replaced due to inundation.
- Remove Electro-Hydraulic Pump Unit. COMPLETED 04/03/2015. To be replaced due to inundation.
- Remove 1 x HM4 Detector Box and 2 x HMX Detector Boxes fitted to Turnout. COMPLETED 04/03/2015. To be replaced due to inundation.
- Remove MR16/27 Loc Cases A and B and return to Rockhampton Depot. COMPLETED 04/03/2015. (See NOTE 2).
- Remove existing concrete foundations clear of cable ends. COMPLETED 04/03/2015.
- All disconnected cable ends secured above ground and highlighted to denote presence. COMPLETED 04/03/2015.
- Consult with S&TE re option of consolidating the 2 x existing SW Location Cases into 1 x SW Location Case. Requires relocation of the 4 x Track Relays and 1 x Track Feed Set currently in Case B into Case A. Design has been forwarded to S&TE (COMPLETED 04/03/2015) who will Check and Approve. (Consolidation into only one SW Loc will result in less space needing to be found to position the reinstalled Location Case once drainage works are completed.)
- Rockhampton Depot. Inspection of recovered 16/27 Loc Case A. Replace/Rewire/Recrimp/Relug as required. Modifications to install equipment removed from Case B.

AFTER DRAINAGE WORKS COMPLETED

- Install new SW Location Case foundation.
- Inspect all previously disconnected cables and reinstall into Location Case foundation. (Some may require extending dependant on damage or direction of Cable Route).
- Reterminate all cables in 16/27 Loc. (Total of 22).
- Meggar all Main Cables. (Total of 5).
- Function-test 16/27 Loc.
- Install new Axle Counter Heads and Trackside Unit. Reterminate and meggar cable. Set-up, test and certify Axle Counter Track Section. (1 off)
- Install new Electro-Hydraulic Pump Unit and 3 x Detectors on 12 Points. Reterminate and meggar cables. (Total of 4). Set-up and adjust mechanically and electrically. Test and certify operation of Points.
- Reinstall track leads (previously removed by others). Meggar cables. (Total of 5). Set-up, test and certify Track Circuits. (Total of 4).
- Meggar cable to Signals and Push Buttons. (Total of 7). Test and certify all Signal Aspects.
- Through-test all Functions to the SER.

NOTES. 1). Initial tests were carried out on 04/03/2015 on all cables terminated in 16/27 Loc Case A and B. Due to the movement of the foundations during the flood event, significant stresses would have been placed on a number of cables and cable slack usually left coiled and zip-tied in the base of the Locations had been pulled through the Entry Pipes. These tests indicated at least at that time, there was no physical breaks in any cables (Continuity ok). However, there is evidence that some cables do have damaged insulation as they display poor insulation resistance. All suspect cables are in the local cable route from the 16/27 Loc to MR18 Signal. Due to the extremely rocky conditions through this area, it is known that the cables are not at the full standard depth in some parts of this route.

1

MSL 66 – evidence of recovery work limits for formation, ballast, track works and inspections

Client Requirements Brief (CRB) Remediation Summary Sheet

Project / Site: MSL 66 Earlsfield-Dakenba MSL		
Start km	**End km**	**Works Required**
8.850	9.143	Debris removal
8.730 (2 bays)	8.732	Replace ballast
8.900 (2 bays)	8.902	Replace Ballast
8.769	8.850	Replace ballast
8.850	8.938	Ballast resurface
8.816	8.850	Formation reconstruction
8.816	8.850	Track slewing, welding and clipping
8.730	8.938	Resurface and stabilise track
8.730	8.938	Restress
8.730	8.938	Final Track Inspection

[insert more information here]

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MSL 69 – evidence of recovery work limits for formation, ballast, track works and inspections

Client Requirements Brief (CRB) Remediation Summary Sheet

Project / Site: MSL-69 Dakenba		
Start km	**End km**	**Works Required**
15.000	15.200	Remove debris
15.045	15.200	Track slewing, welding and clipping
15.045	15.100	Formation reconstruction
15.045	15.100	Replace ballast
15.000	15.200	Resurface and stabilise track
14.945	15.200	Restress
15.000	15.200	Final track inspection
15.000	15.200	General cleanup of site

[insert more information here]

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Appendix G. Correspondence arising during the preparation of this report

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Lipscombe, Mike

From: De Saram, Michelle <Michelle.DeSaram@aurizon.com.au>
Sent: Tuesday, 2 February 2016 2:43 PM
To: Lipscombe, Mike
Cc: Hinchliffe, Stephen
Subject: RE: RO37900 QCA review of 2015 flood damage repair costs - Jacobs RFIs - batch 1
Attachments: RINGFENCED_2015 Moura Flood Recovery Model_30.11.2015.xlsx; Flood Claim_Scope _updated_02.02.16.xlsx

Follow Up Flag: Follow up
Flag Status: Flagged

Hi Mike

Opex and Capex
The file I sent you is the total cost of flood works including capital and opex. However we are only claiming incremental opex as part of the flood claim which is consistent with our submission. The capital relating to Bells creek, Stirrat-Clarke and Mount Rainbow-Fry are not included in the incremental opex and therefore not part of the claim. These will form part of the ex-post capex claim process

I have updated the spreadsheet I sent yesterday with detailed steps on how we arrived at the incremental Opex, $4,048,455 (prior to escalation) . Then follow the flood model provided to the QCA (also attached) to see how we applied escalation to arrive at the $4,237,120. I'll email the password to the model shortly

The "Pass-through Summary" sheet in the model provided to the QCA is built from the Scope model two sheets

Labour
In the asset maintenance sheet-
Column E, row 260 to row 1881 relates to normal hours of labour $629,501 which has been excluded from the claim. The total of $ 734,874 is therefore inclusive of only of Overtime labour and external labour . See "Pass-through Summary" sheet model provided to QCA

Incremental capital and opex sheet –
All labour costs relate in incremental labour costs incurred as a result of the flood works . See "Pass-through Summary" sheet model provided to QCA

Please feel free to contact me if you have questions

Thanks
Michelle

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Michelle De Saram
Commercial Analyst
Network
Regulation and Policy
T 0730197199 / **M** 0430317604 / **F**