

Commercial-in-Confidence

Notice of Advice

Attention	Amar Doshi	File No.	NoA-2_Final_v0
Company	Queensland Competition Authority	Date	02-Oct-2019
CC	chris.peart@qca.org.au	Total Page	14
Project Name	Engineering Assessment of Aurizon Network's FY17/18 Capital Expenditure Claim Review	Project No.	60591968_NoA-2
AECOM Ref	60591968_Var#2	Client Ref	1387050_Ref#4190
From	Susheel Prabhakar		
Service	Review of Aurizon Network's Submission to QCA's Draft Decision		
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On 23 May 2019, AECOM submitted our 'Engineering Assessment of Aurizon Network's FY17/18 Capital Expenditure Claim Report' (the 'Assessment Report'), and the QCA invited submissions on the report from interested parties. In the Assessment Report, we recommended that the QCA not approve a total of \$2.08m, pertaining to four (4) of the 27 projects sampled and reviewed for which we completely or partially rejected the cost claim.

Aurizon Network made a submission in response to the Assessment Report. AECOM responded to the submission where Aurizon Network had made reference to aspects of the Assessment Report through a Notice of Advice to the QCA dated 24 July 2019 after review of Aurizon Network's submission and provided additional information. In the Notice of Advice, AECOM revised the recommended deductions from four (4) projects totalling \$2.08m to three (3) projects totalling \$1.67m.

The QCA provided its draft decision on FY17/18 Capital Expenditure Claim to Aurizon Network on 15 August 2019. On 12 September 2019, Aurizon Network responded to the QCA's draft decision whereby Aurizon Network sought to clarify its view that the capital expenditure claim of \$1.44m associated with project IV.00154, the FY17 Autotransformer Renewal Project, should be approved by the QCA for inclusion into the RAB and provided new information on the issues raised previously.

This Notice of Advice has been prepared at the request of the QCA after review of the additional information and clarifications as provided by Aurizon Network in response to QCA's draft decision. This notice briefly discusses our initial and revised¹ findings, and the new information provided by Aurizon Network, and then provides our final findings and conclusions as summarised in Table 1.

Table 1 Summary of Deductions Related to Issues Identified in the Assessment Report

Projects	Issue Element	Total Project Claim	Initial Deductions	Initial Legend	Revised Deductions	Revised Legend	Final Deductions	Final Legend
IV.00154	Standard	\$1.44m	\$1.44M	X	\$1.44m	X	-	✓
IV.00321	Cost	\$6.75m	\$0.31M	X	-	✓	-	✓
IV.00323	Scope	\$23.45m	\$0.15M	X	\$0.06m	X	\$0.06m	X
IV.00343	Cost	\$5.42m	\$0.18M	X	\$0.18m	X	\$0.18m	X
Total	All	\$37.06m	\$2.08M		\$1.67m		\$0.24m	

¹ Initial and revised findings/assessment relate to the findings in the Assessment Report dated 23 May 2019 and the Notice of Advice dated 24 July 2019 respectively.

1.0 IV.00154 FY17 Autotransformer Renewal Project

Project Overview

Autotransformers balance the voltages of the contact wire and secondary contact wire to the rail, as well as the current between both phases. Out of service autotransformers pose a risk that other autotransformer faults will lead to failure of the overhead system.

This project addresses the replacement of eight autotransformers on the Blackwater and Goonyella systems as they are nearing the end of their working lifecycle. It forms part of a 5-year program to replace all autotransformers at these systems. The project uses current specification 14MVA autotransformers to maintain the integrity of the overhead power distribution system and reduce Aurizon Network's exposure to reportable environmental incidents.

1.1 Background - Initial and Revised Assessments²

IV.00154 - FY17 Autotransformer Renewal Project	Review Summary	Scope	✓	Capital Expenditure Claim	\$1.44M
		Standard	✗	Impact of findings on Claim	\$1.44M
		Cost	✓	Total accepted	\$0.00M

Scope (Initial and Revised Assessments)

Based on the condition assessments sighted and the prioritisation process to identify those autotransformers requiring replacement, the project is considered prudent and efficient in scope, supported by a medium level of documentation quality.

Standard (Initial Assessment)

This project is not considered prudent in standard due to the lack of justification for not addressing fire and explosion risk at the autotransformer sites. This is supported by a low level of documentation quality. It is recommended that the project is rejected from the FY17/18 claim in its entirety. It is recommended that a risk assessment is undertaken by Aurizon Network for each autotransformer site to determine the requirements for fire and explosion risk protection.

Standard (Revised Assessment)

AECOM is still unable to confirm that this project meets all relevant standards. The issues raised are of such fundamental nature that we are unable to separate the effects of non-compliance, if there is, from the overall project. It is therefore, recommended that the project is rejected from the FY17/18 claim in its entirety based on medium level of documentation. The provision of appropriate documentation would have a bearing on our assessment. It is recommended that Aurizon Network provides:

- 1. Electrical RPEQ signed off drawings for each individual site, showing the modification to the earth grid, following the new bund installations, and the connection of the rebar into the earth grid and evidence to support correct installation has been achieved.**
- 2. Documentary evidence to support that the protection systems such as lightning surge arrestors, lightning rods and transformer mechanical protection fault locators have been installed and tested in accordance with relevant standards.**

Cost (Initial and Revised Assessments)

The project is considered prudent and efficient in cost, informed by a medium level of documentation quality.

² Initial and revised findings/assessments relate to the findings in the Assessment Report dated 23 May 2019 and the Notice of Advice dated 24 July 2019 respectively.

1.2 Issues Raised in AECOM's Initial and Revised Assessments³ Related to Standard

The risk assessment carried out in 2013 (for feeder stations) and the 2017 autotransformer risk assessment report did not adequately address the requirements of the 2016 update of AS2067 for autotransformer sites. As such, the documentation provided by Aurizon Network which references these documents is not sufficient justification as for not addressing fire and explosion risk at the autotransformer sites.

AECOM recommended that a risk assessment is undertaken by Aurizon Network for each autotransformer site to determine the current requirements for fire and explosion risk protection. The following three items were further discussed in Aurizon Network's submission and are important in relation to determining the prudence of standard:

Item 1 (Earth Grid)

The Assessment Report stated that, *'It is noted that no design drawings have been provided for the connection of the bund to the earth grid, and Aurizon Network has advised that these do not exist. A design drawing for the bunds has been provided which is signed off by a structural RPEQ, however this does not show the connection to the earth grid. Photos and drawings of the fences' connection to the earth grid have been provided.'*

Item 2 (Surge Protection)

Section 4.2.6, Item 2(a), Lightning arrestor of the Assessment Report stated that, *'The 2017 report is silent on whether the risk control of a lightning arrestor is applicable to the Autotransformer. There is not enough information to determine if lightning arrestors are installed at the Autotransformer sites. If not, then this risk control cannot be claimed, and this needs to be reflected in the risk assessment and may have an impact on the overall risk profile.'*

Item 3 (Protection Systems)

The risk assessments carried out for each site identify a hazard of catastrophic AT fault, resulting in explosion and intense fire with the following controls of primary track feeder protection and secondary protection functions (e.g. fault locator). Section 4.2.6, Item 2(b), Mechanical Trip Signals' of the Assessment Report, stated that, *'There is not enough information to demonstrate proven reliability of the Fault Locators to be an effective risk control to avoid ignition of an explosion. In a separate capital funding request labelled 'CFR Traction Fault Locator Renewals' dated (19 September 2014), fault locators have previously been proven to be unreliable to provide exact fault location and to relay the Autotransformer Mechanical Trip Signals back to the Feeder Station for fast clearing of the supply feeding the autotransformer fault.'*

1.3 New Information Provided by Aurizon Network since the Assessment Report

Item 1 (Earth Grid)

- a) No new information was provided by Aurizon Network in its submission to the QCA in response to the Assessment Report in relation to the lack of design drawings for the connection of the bund to the earth grid.
- b) In response to QCA's draft decision, Aurizon Network did not satisfy the first request of providing electrical RPEQ drawings of the bund wall earth bonding, however, provided new information showing details of a proposal to retro-fit a new bonding cable to connect the bund wall reinforcement to the existing earth grid at each site as described in Figure 1.

Item 2 (Surge Protection)

- a) In its submission in response to the Assessment Report, Aurizon Network provided a new report titled, 'Trackside Autotransformer Fire Wall Assessment', dated June 2019 to provide justification for not including the AS2067:2016 recommendation of installing fire walls at each of the autotransformer sites. As part of the study, Aurizon Network re-assessed the risks associated with fire and explosion at trackside autotransformer stations and conducted individual risk assessments for each site.

³ Initial and revised findings/assessment relate to the findings in the Assessment Report dated 23 May 2019 and the Notice of Advice dated 24 July 2019 respectively.

Aurizon Network's response, detailed in the 'Trackside Autotransformer Fire Wall Assessment' report, states, '*Aurizon Network's specification, 'SAF/SPC/5175/ELE/NET High Voltage Electric Traction System Construction and Commissioning clearly states that surge arrestors are installed at all trackside AT sites'* at specific locations detailed in the report.

- b) In response to QCA's draft decision, Aurizon Network has provided new information in the form of typical photos and site-specific as-built drawings showing that surge arrestors have been installed at Balook and Epala/Ambrose sites as claimed in their 2019 Autotransformer site-specific risk assessments as an existing control to minimise risk exposure. However, initially the drawings for Tryphinia site at chainage CH 125.706 were provided instead of Dingo site at chainage CH 140.896. Aurizon Network provided the correct drawing for Dingo site during the recent clarification meeting held on 26 September 2019 showing the surge diverter and the lightning rod.

Item 3 (Protection Systems)

- a) The Trackside Autotransformer Fire Wall Assessment report provided by Aurizon Network with its submission in response to the Assessment Report, states, '*The ability of the Traction Fault Locators to relay mechanical trip signals to traction substations is seen as a backup protection function. The protection system is designed so that any severe internal AT fault would be detected by the primary track feeder protection relays. If the primary protection failed to operate, the Fault Locator would serve as this backup to arrest the source of ignition of a fire by tripping the relevant circuit breakers.*

Furthermore, it should be noted that the telecommunications system that this protection runs on, is a highly available carrier-grade PDH system. Such systems have long been used for tele-protection purposes and adhere to IEC 60834 requirements. On this basis Aurizon Network is justified in claiming that the Fault Locators provide a valid backup risk control for fire at trackside AT sites.'

- b) Subsequently in response to QCA's draft decision, Aurizon Network also provided new information in the form of site-specific Inspection Test Plans (ITPs) showing that existing (unreliable) Fault Locators have been replaced with upgraded ones, installed and tested at each site as claimed in their 2019 Autotransformer site-specific risk assessments as an existing control to minimise risk exposure.

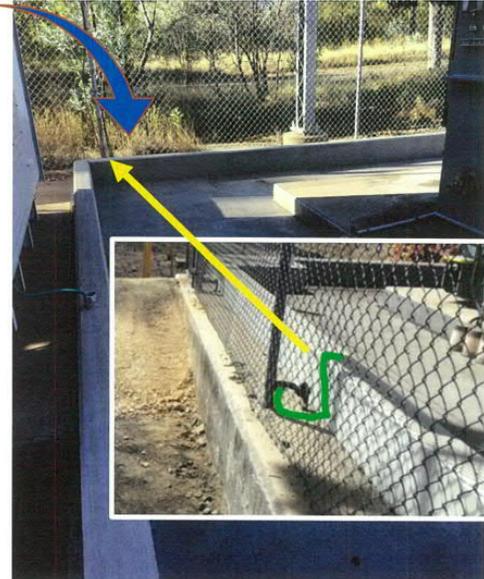
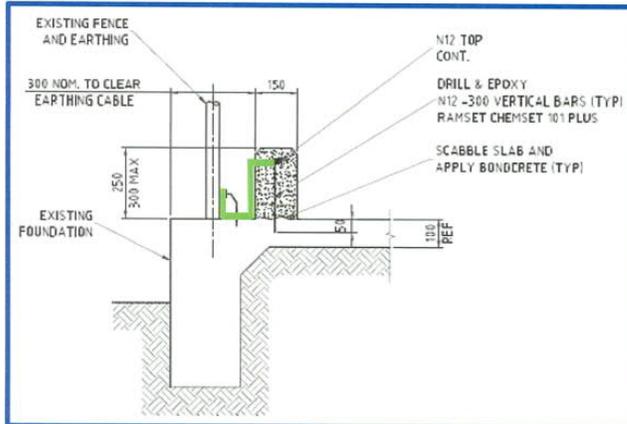
1.4 AECOM's Review of New Information since the Assessment Report

Item 1 (Earth Grid)

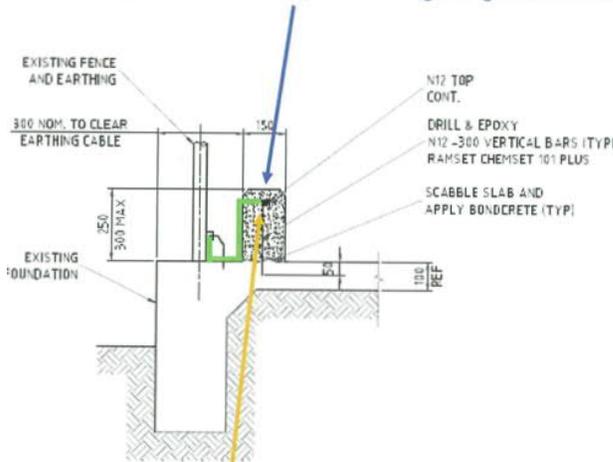
Electrical RPEQ signed off drawings for each site, showing the modification to the earth grid, following the new bund installations, and the connection of the rebar into the earth grid have not been sighted. However, in response to QCA's draft decision, new information showing details of a proposal to retrofit a new bonding cable to connect the bund wall reinforcement to the existing earth grid at each site was provided by Aurizon Network. This proposal, as described in Figure 1, is considered acceptable, as the likelihood of injury to personnel (between now and the time of the rectification) from touch potential is very low and therefore satisfies requirements of AS2067:2016. Aurizon Network in response to QCA draft decision state, that, '*Aurizon Network intends to complete the connection of the steel reinforcing within the new oil containment bunds to the existing earth grid (estimated at \$10k per site) in a future year and intend to include these associate costs within a future Capex Claim. Aurizon Network will include the earthing for all future renewal sites into the forward-looking autotransformer renewal program'*. We consider this additional cost to retro-fit as not being efficient because the cost for this task, if it was done as part of the upgrade activities, would have been minimal.

Additionally, photographs sited showed that after the upgrade, the gates at these sites open outwards which would mean that the earth grid should have been extended to ensure that there are no excessive step and touch potentials when the gate is in the open position. No design drawings were made available until the meeting held on 26 September 2019, where Aurizon Network explained that original earth grid design incorporated requirements for outward opening gates even though the gates were installed to open inwards. Due to the installation of the bund-walls it was no longer possible to have the gates open inwards due to space constraints and the gates are now installed to open outwards. This however, did not need any modifications to the earth grid as the original earth grid was installed to cater for outward opening gates in the first place as shown in Figure 2.

Install a suitable Earth Conductor between Bund Wall reinforcing and site Earth Grid.



Cut/chase top of bund wall and expose horizontal N12 reinforcing bar. Clean bar and weld earthing bond to reinforcing bar. Lug earth conductor end and bolt to flat earthing strap. Flat earthing strap to be Hilti fitted for low, safe profile on outside face of bund wall and across existing slab. Bond earth strap to the existing earth grid at the enclosure fence.



Earth Rods & Accessories

4 Protection & Earthing

Earthing Bond
For Commercial Earthing Installations

The earthing bond system provides an earth connection welded to the steel reinforcement, thus offering a virtually indestructible, stable and low resistance path to earth soil. Please enquire about other sizes available.

Part Number	Description
D-C75	Bonding Cable: 75mm ² 1 sec Short Current Rating: 5kA Weldable Lug Dia: 12mm Terminal Thread: M10 Thread Depth: 20mm Cable Length: 3m
D-C95	Bonding Cable: 95mm ² 1 sec Short Current Rating: 5kA Lug Dia: 16mm Terminal Thread: M10 Thread Depth: 20mm Cable Length: 3m
D-C120	Bonding Cable: 120mm ² 1 sec Short Current Rating: 10kA Lug Dia: 20mm Terminal Thread: M10 Thread Depth: 20mm Cable Length: 3m

Figure 1 Proposed Bund Wall Replacement Earthing

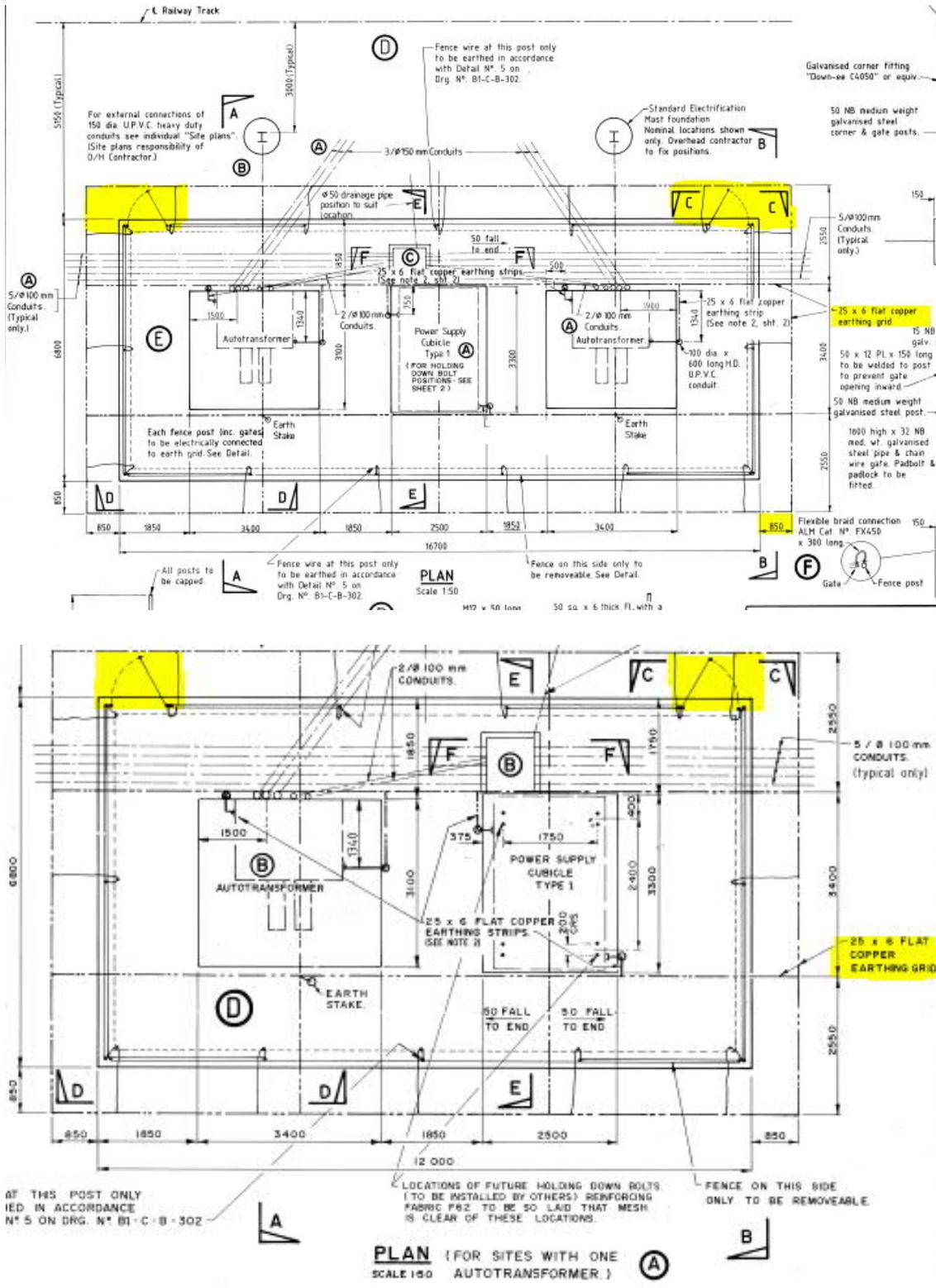


Figure 2 Excerpts of Typical Drawings Showing Earth Grid Suitability for Outward Opening Gates

After review of this information we conclude that step and touch potential issues due to outward opening gates is not material if the earth grid was in-fact installed to cater for outward opening gates during original construction as stated by Aurizon Network and shown on the design drawings and therefore the earth grid is in accordance with AS2067:2016.

Item 2 (Surge Protection)

The site-specific risk assessment dated 20 June 2019 provided by Aurizon Network in its submission generally addressed the seven key points raised in the Assessment Report with the exception of surge protection (this item) and transformer protection systems (next item).

In response to QCA's draft decision, Aurizon Network provided new information in the form of typical photos and site-specific as-built drawings showing that surge arrestors have been installed at each site as claimed in their 2019 Autotransformer site-specific risk assessments as an existing control to minimise risk exposure at the three sites, namely, Balook (Figure 3), Epala/Ambrose (Figure 4) and Dingo (Figure 5).

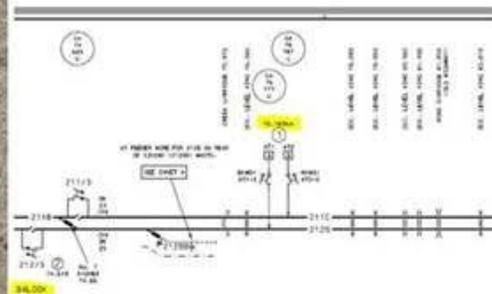
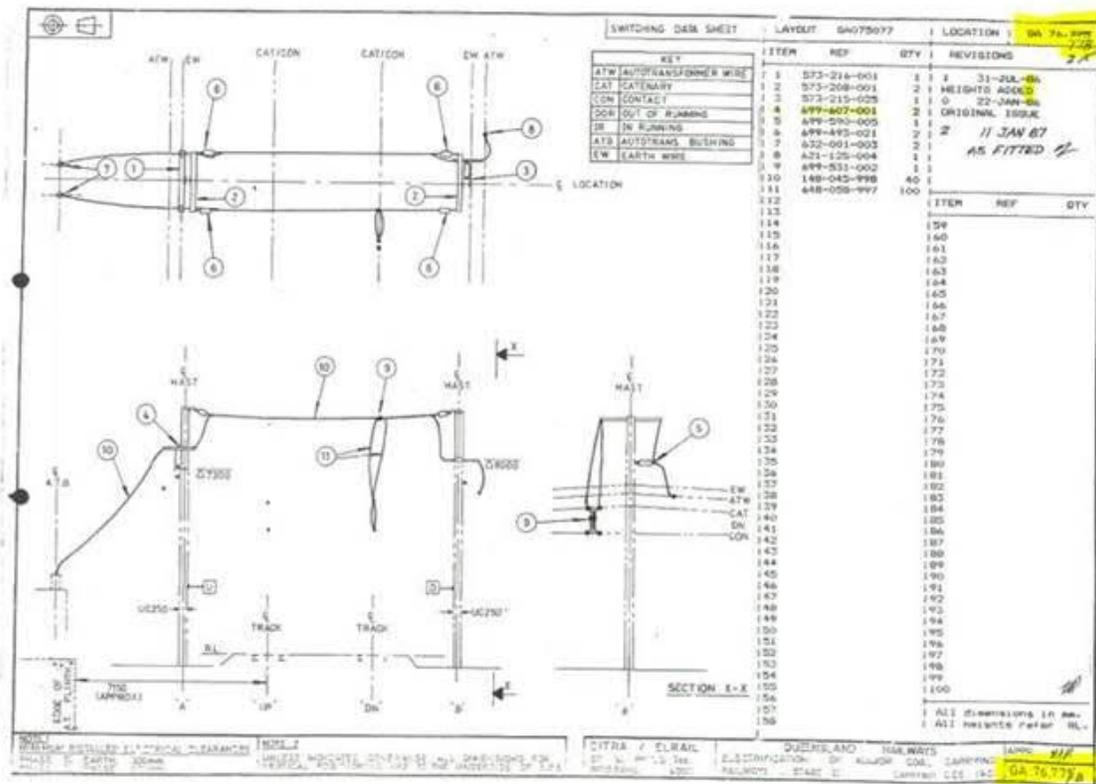


Figure 3 Balook Autotransformer Site

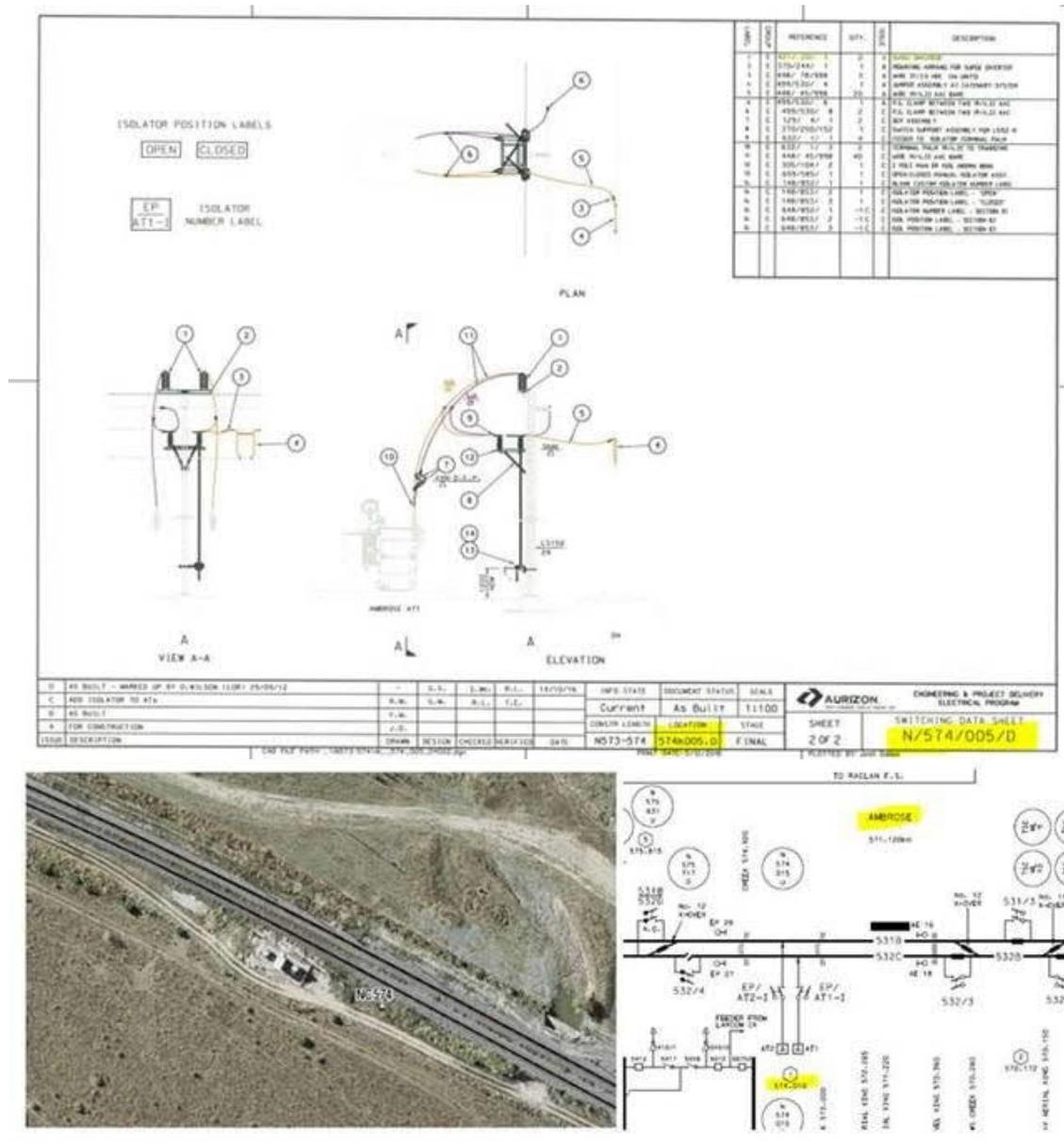


Figure 4 Epala/Ambrose Autotransformer Site

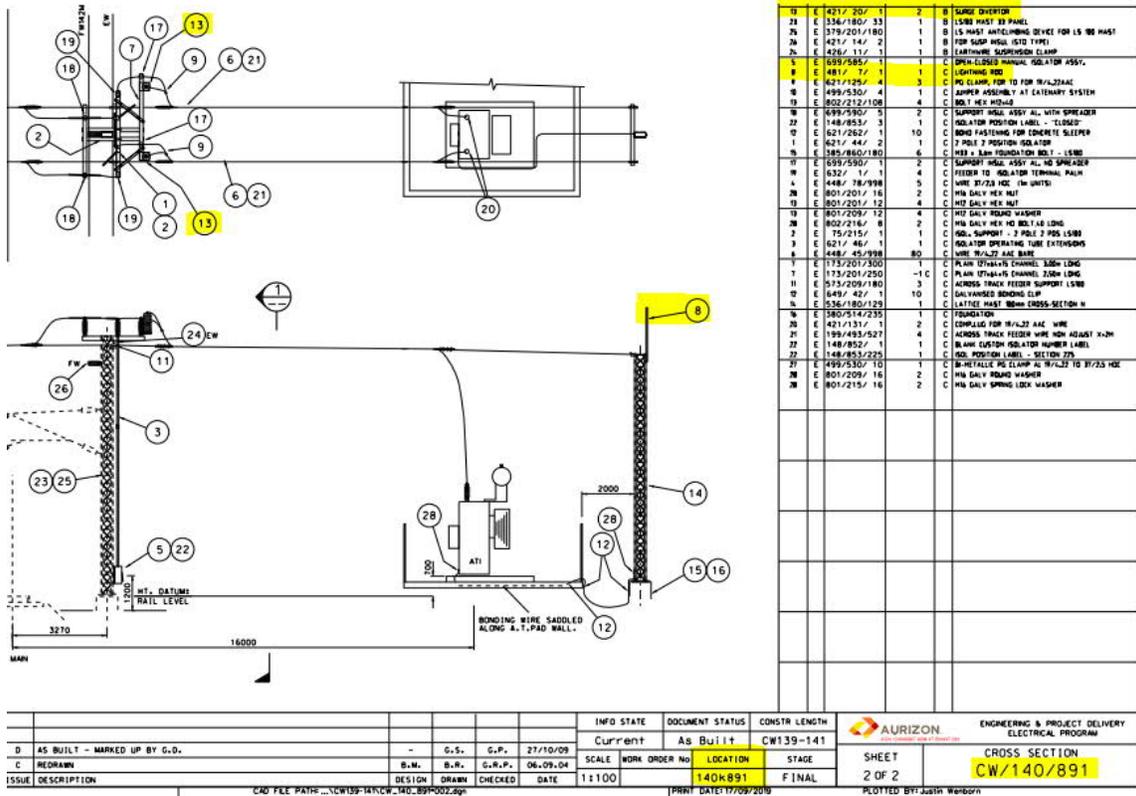
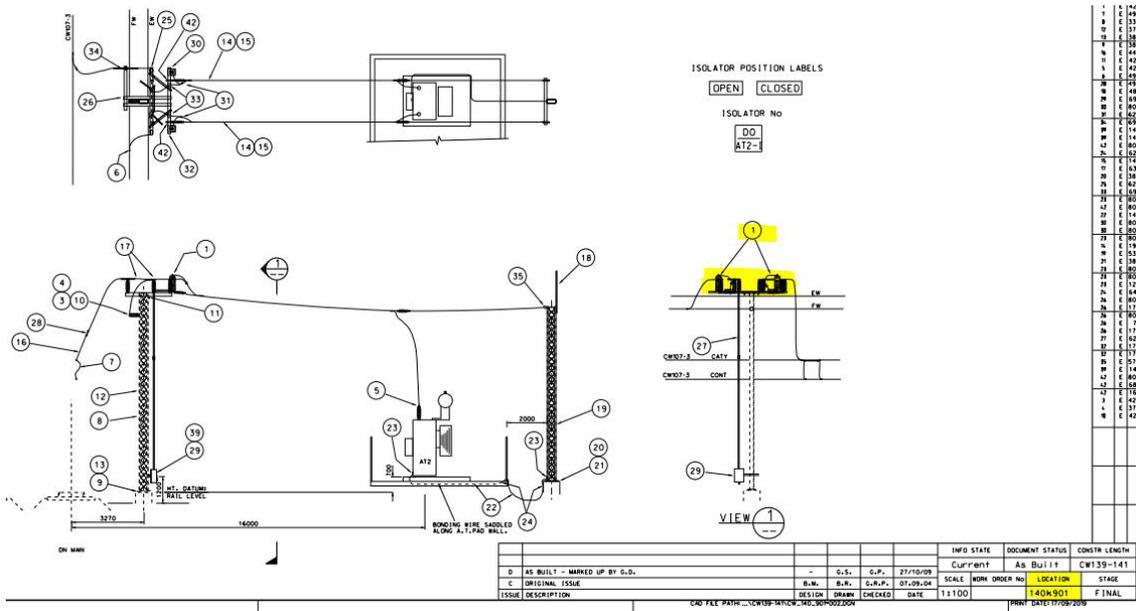


Figure 5 Dingo Autotransformer Site

We note that while Balook and Epala/Ambrose sites have surge diverters only, Dingo site has both the surge diverter and lightning rod. Surge divertors and lightning rods serve different purposes. During the recent clarification meeting of 26 September 2019, Aurizon Network advised that the decision of not installing lightning rods at Balook and Epala/Ambrose sites would have been based on risk assessment undertaken at the time of original studies, design and construction of those sites. These risk assessments are not available now. On the basis of Aurizon Network's clarification and the presence of adjacent OHLE masts at these sites, the review team is satisfied that separate lightning rods at Balook and Epala/Ambrose sites would likely not be required. However, we recommend that lightning risk assessments be undertaken in accordance with AS1768:2007 for future AT site upgrades.

Item 3 (Protection Systems)

Transformer protection systems rely on two different types of protection devices, ones that measure electrical properties of the system, and ones which measure physical properties of the transformer, known as mechanical protection. Autotransformers utilise both types of protection devices to fully protect the transformer from catastrophic damage, of which neither is regarded as primary or back-up. For example, a Buchholz relay is designed to operate before the fault would be seen by the electrical protection systems. Aurizon Network's new report fails to mention that the trip signals are required to be processed by the SCADA system prior to sending a trip signal to the relevant circuit breaker for fault disconnection. This can result in long clearing times, even for back-up protection systems.

The review evaluated the site-specific Inspection Test Plans (ITPs) provided by Aurizon Network in response to QCA's draft decision. The new information showed that existing (unreliable) Fault Locators have been replaced with upgraded ones, installed and tested at each site as claimed in their 2019 Autotransformer site-specific risk assessments as an existing control to minimise risk exposure. AECOM acknowledges the unreliable Fault Locators have been renewed as demonstrated in the provided ITPs.

These components are site-based mechanical protection devices which send a signal after being processed by SCADA to the Feeder Station to trip the supply circuit breaker, de-energising the autotransformer. However, the review team noted that the ITPs for Dingo and Epala/Ambrose under Item 8.3 "Trips and Alarms received by RTU" noted some test omissions, such as:

- a) "N/A" shown at the subitem "Activate oil temperature trip condition at source" – "FS &TSC circuit breaker open. Check ECO receives FS &TSC CB open"
- b) "N/A" shown at the sub-item "Activate explosion vent trip condition at source" – "FS &TSC circuit breaker open. Check ECO receives FS &TSC CB open"

This is different to the Balook site, which has these items ticked as tested.

During the recent clarification meeting held on 26 September 2019, Aurizon Network confirmed the review team's assumption that the most likely cause, that the testing team was unable to undertake that task at that time was due to operational reasons. Aurizon Network noted that the remarks on the ITP's could be more elaborate instead of just being marked as 'N/A' without any explanation because the following procedure was carried out during commissioning to test alarm and trip functions:

- Open trip links at Queensland Rail's Fault Locator System at relevant Feeder Station and Track Sectioning Cabin
- Approval to de-energize the overhead would be sought from Electrical Control Officer (ECO), in most dual track areas this was required to prevent train stoppages
- Test alarm and trip functions - confirm it was received both at the Fault Locator and with the ECO
- Confirm alarms and trips are reset
- Close trip links at relevant Queensland Rail's Fault Locator System to return to service

Aurizon Network further states, that, "As the trip circuit was not altered through the installation of the new Fault Locators, testing the alarm and trip functions with the trip links open is acceptable." Aurizon Network also noted that a full trip test is outside the scope of this replacement project and testing of the trip link would have been previously undertaken during the commissioning of the substation and covered under another ITP. Aurizon Network further noted that yearly oil samples are taken for the transformers and dissolved gas analysis undertaken to detect early levels of transformer degradation and failure.

The review team is of the view that the likelihood of an Autotransformer fire/explosion due to unreliable Fault Locators is further reduced and therefore can be considered to comply with the requirements of AS2067:2016, given:

- the existing population of transformers in the network has achieved an aggregated 6300 years of operation without fire or explosion, even with ageing and unreliable Fault Locators
- the unreliable Fault Locators have now been renewed/ installed/ tested/ commissioned with upgraded components, meeting a higher specification of reliability
- the upgraded components have been installed in a larger, already functioning protection network

1.5 Final Conclusion on Standard of Works

We summarise our final conclusions related to standard as follows:

Item 1 (Earth Grid)

Aurizon Network proposal to retro-fit a new bonding cable to connect the bund wall reinforcement to the existing earth grid at each site already upgraded, as soon as is practically possible, and commitment to include this task as part of future Autotransformer site upgrades satisfies requirements of AS2067:2016. However, the review team believes that the extra costs which will be incurred in future years estimated by Aurizon Network to be in the order of \$10,000 per site to retro-fit the already upgraded sites, is not efficient on the basis that costs to undertake this task as part of the planned site upgrades would have been minimal.

For the purposes of FY17/18 capital expenditure claim, this matter is considered resolved and the bonding to earth grid arrangements is therefore, considered prudent and efficient.

Item 2 (Surge Protection)

Surge protection system are considered prudent and efficient. However, we recommend that lightning risk assessments be undertaken in accordance with AS1768:2007 for future Autotransformer site upgrades.

Item 3 (Protection Systems)

Transformer protection systems are considered prudent and efficient. However, we recommend that explanatory details be included in the Inspection Test Plans (ITPs) so as to avoid any ambiguity at a later stage.

1.6 Summary of Project’s Final Assessment

Scope

Based on the condition assessments sighted and prioritisation process to identify those autotransformers requiring replacement, the project is considered prudent and efficient in scope, supported by a medium level of documentation quality.

Standard

Based on the new information and clarifications provided by Aurizon network as detailed in this Notice of Advice, the project is considered prudent and efficient in standard, supported by a high level of documentation quality for the purposes of FY17/18 Capital Expenditure Claim.

Cost

The project is considered prudent and efficient in cost, informed by a medium level of documentation quality.

IV.00154 - FY17 Autotransformer Renewal Project	Review Summary	Scope	✓	Capital Expenditure Claim	\$1.44M
		Standard	✓	Impact of findings on Claim	\$0.00M
		Cost	✓	Total accepted	\$1.44M

2.0 IV.00323 Track Upgrade FY18

Project Overview

A track upgrade site is the combination of a site with worn rail and an area of fist fastened concrete or timber sleepers of which both the rail and sleeper require replacement. In some cases, the scope may also request replacement of the ballast. Upgrading the track structures together maximises the efficiency of multiple asset renewal activities by only mobilising to a site once.

The mainline track was constructed with concrete sleepers with fist clips which fasten the rail to the sleeper. Constant exposure to coal and coastal environments has corroded the pins and clips of the sleepers, which may lead to a wide gauge or failure of the sleeper. These sleepers are also rated at 22.5tal while current track standards call for 28tal sleepers.

The project involved upgrading 24.6km of track and 32,860 sleepers with galvanized Pandrol E-clips and new ballast in the Goonyella, Newlands, Moura and Blackwater systems. The renewal of track assets at these locations ensures the ongoing integrity of the below rail infrastructure to facilitate the current and future traffic task.

The Track Upgrade Program aims to deliver supply chain benefit through increasing transit time, increasing reliability and maintaining compliance to standards and regulations.

2.1 New Information Provided

No new information was provided by Aurizon Network in its response to QCA draft decision.

2.2 Final Conclusion

The scope of work (partial) is considered to be not prudent, supported by a medium level of documentation quality. AECOM has adjusted the length of rail considered to be not prudent in scope from 1408m to 540m rail. At a unit rate of ████████, the recommended deduction equates to \$59,400.

IV.00323 - Track Upgrade FY18	Review Summary	Scope	✘	Capital Expenditure Claim	\$23.45M
		Standard	✓	Impact of findings on Claim	\$0.06M
		Cost	✓	Total accepted	\$23.39M

3.0 IV.00343 Level Crossings Renewal Program FY18

Project Overview

Rail level crossings are the intersection between road and railway lines, allowing road users to travel over the railway tracks. Aurizon Network manages the rail infrastructure of 763 rail level crossings within the CQCN.

This project aims to identify and renew level crossings on a cyclical basis within the Goonyella, Moura, Newlands and Blackwater systems. Works for this project include upgrading control systems, signage and remote monitoring systems, as well as rectifying level crossings that have inadequate flangeways. The project seeks to mitigate against level crossing failures to minimise safety risks to all stakeholders and prevent disruption of traffic.

3.1 New Information Provided

No new information was provided by Aurizon Network in its response to QCA draft decision.

3.2 Final Conclusion

AECOM considers claiming of 'FY19 Engineering Design' in year FY17/18 claim to be not prudent, supported by a low level of documentation quality. It is recommended that claim for \$177,766 for 'FY19 Engineering Design' included in total project cost claim for year FY17/18 be deferred until FY18/19 or until the completion and commissioning of the project to which the design costs relate.

IV.00343 - Level Crossings Renewal Program FY18	Review Summary	Scope	✓	Capital Expenditure Claim	\$5.42M
		Standard	✓	Impact of findings on Claim	\$0.18M
		Cost	✗	Total accepted	\$5.24M

4.0 Summary of Final Assessment

An updated summary of final Engineering Assessment of Aurizon Network's FY17/18 Capital Expenditure Claim after this Notice of Advice is presented in Table 2.

Table 2 Updated Final Assessment Summary

Project	Prudency and Efficient Assessment			Project Cost (\$ million)		
	Scope	Standard	Cost	Claim	Adjust.	Accepted
A.04599 - Havilah Culverts Upgrade	✓	✓	✓	\$8.72		\$8.72
All Growth Projects (AUGEX)				\$8.72		\$8.72
IV.00004 - Traction Fault Locator Renewal	✓	✓	✓	\$1.99		\$1.99
IV.00049 - Radio System Replacement	✓	✓	✓	\$23.35		\$23.35
IV.00144 - Rail Renewal FY17	✓	✓	✓	\$2.06		\$2.06
IV.00145 - Track Upgrade FY17	✓	✓	✓	\$5.15		\$5.15
IV.00146 - Sleeper Renewal FY17	✓	✓	✓	\$2.84		\$2.84
IV.00154 - FY17 Autotransformer Renewal Project	✓	✓	✓	\$1.44		\$1.44
IV.00168 - Turnout Renewal FY17	✓	✓	✓	\$2.69		\$2.69
IV.00170 - Bridge Ballast Renewals FY17	✓	✓	✓	\$1.28		\$1.28
IV.00261 - Telecommunications Infrastructure Renewal	✓	✓	✓	\$1.88		\$1.88
IV.00267 - Asset Protection Equipment Replacement	✓	✓	✓	\$0.24		\$0.24
IV.00270 - Ethernet to Corner SCADA Upgrade FY17	✓	✓	✓	\$3.02		\$3.02
IV.00283 - Traction SCADA System	✓	✓	✓	\$2.08		\$2.08
IV.00294 - Goonyella Supersite FY17	✓	✓	✓	\$2.15		\$2.15
IV.00321 - Sleeper Renewal Program FY18	✓	✓	✓	\$6.75		\$6.75
IV.00322 - Rail Renewal FY18	✓	✓	✓	\$21.47		\$21.47
IV.00323 - Track Upgrade FY18	✗	✓	✓	\$23.45	\$0.06	\$23.39
IV.00334 - Bridge Ballast Renewal Program FY18	✓	✓	✓	\$7.27		\$7.27
IV.00343 - Level Crossings Renewal Program FY18	✓	✓	✗	\$5.42	\$0.18	\$5.24
IV.00344 - Formation Renewal FY18	✓	✓	✓	\$12.24		\$12.24
IV.00346 - Package 1 FY18 Control Systems Renewal	✓	✓	✓	\$8.22		\$8.22
IV.00347 - Package 2 FY18 Control Systems Renewal	✓	✓	✓	\$8.04		\$8.04
IV.00360 - Network Asset Mgt System Tranche 2	✓	✓	✓	\$5.31		\$5.31
IV.00364 - Turnout Renewal FY18	✓	✓	✓	\$11.50		\$11.50
IV.00375 - Corridor Security & Fencing FY18	✓	✓	✓	\$0.77		\$0.77
IV.00384 - OH Equipment Renewal FY18	✓	✓	✓	\$3.46		\$3.46
IV.00399 - 2017 Cyclone Debbie Rectification	✓	✓	✓	\$4.44		\$4.44
All Renewal Projects (REPEX)				\$168.50	\$0.24	\$168.26
All Projects Reviewed				\$177.22	\$0.24	\$176.98