

Auckland Metro Rail System Issues: Phase 1

Ministry of Transport

Final Report

DECEMBER 2021

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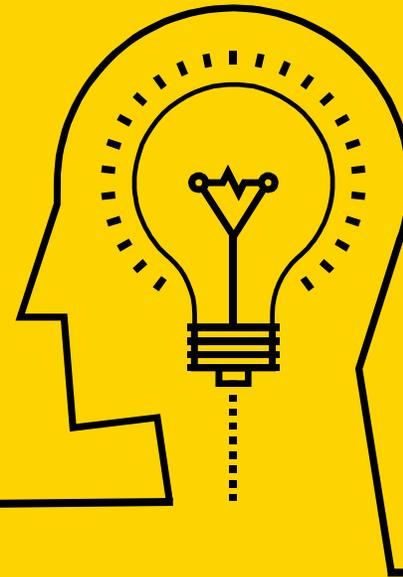
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Executive summary



Auckland Metro Rail System Issues: Independent Review

The Auckland metro rail network (AMRN) is a critical asset for both passenger and freight traffic. The identification of severe rolling contact fatigue (RCF) on the AMRN in 2019 and 2020 caused significant disruption. The Ministry of Transport has engaged Deloitte to identify and articulate whether any system level issues may have contributed to the RCF issues experienced on the AMRN, and to make recommendations on future changes to the system.

Introduction

This review comprises two phases. Phase 1 focused on issues identification and Phase 2, which is well advanced at the time of writing, is focused on recommendations to strengthen the AMRN System. The purpose of the review is not to identify any wrongdoing or compliance issues from the parties involved.

This Phase 1 Report identifies the 'system level' issues that may have contributed to the RCF issues experienced on the AMRN. By system, we mean the organisations that work together to safely and efficiently deliver services on the AMRN. These organisations include KiwiRail (KR), Auckland Transport (AT), Transdev Auckland, Construcciones y Auxiliarios de Ferrocarriles (CAF), Waka Kotahi (both its investment and safety regulation functions (WKI and WKS respectively)), the Crown (acting through the Ministry of Transport and the Treasury).

System level issues include those associated with system governance, incentives, funding, and capacity and capability.

Our approach to Phase 1 of the review has been to draw together themes and supporting evidence from interviews and workshops with system participants and key documents related to the system and its participants. We have also incorporated feedback and information provided to us in response to the draft Phase 1 report. A summary of substantive stakeholder feedback can be found on page 12.

Relationship to the Root Cause Review

The focus of this Review is not on the technical root causes of RCF, which have been explored through a separate working group. However, these technical root causes form important context for the review.

Since the fatal Hatfield crash in the UK in 2000 the risk of "managing" RCF rather than removing it has been well understood by network users and operators.

The Root Cause Review found that accelerated RCF in Auckland was due to a widespread set of localised causes which stem from a track asset that was not "fit for purpose" prior to the commencement of a more frequent, more demanding modern electric multiple unit (EMU) passenger operation on track condition and maintenance.

The Root Cause Review noted the closest single root cause was the failure to implement the recommendations of the 2014 Network Rail Consulting report during 2014-17. It found that there was under investment in the track infrastructure and a lack of rail grinding ahead of severe RCF being discovered. The new EMUs were also designed with high vehicle stiffness for passenger comfort. This may increase a vehicle's propensity to cause RCF on non-perfect track. Modelling for the Review found that the EMU wheel profile has a higher propensity to cause RCF when compared to the standard KR wheel profile, noting neither profile is likely to be optimal. The need to optimise the wheel rail interface (WRI) is acknowledged between the parties.

Timeline of events

The establishment of the ANAA Working Group in 2018 to prepare for the next Triennium coincided with newly available funding and, together with increased activity by the regulator, marked a turning point.

BEFORE

The investment environment for rail was constrained, and the Crown was not formally approached to fund additional AMRN renewals

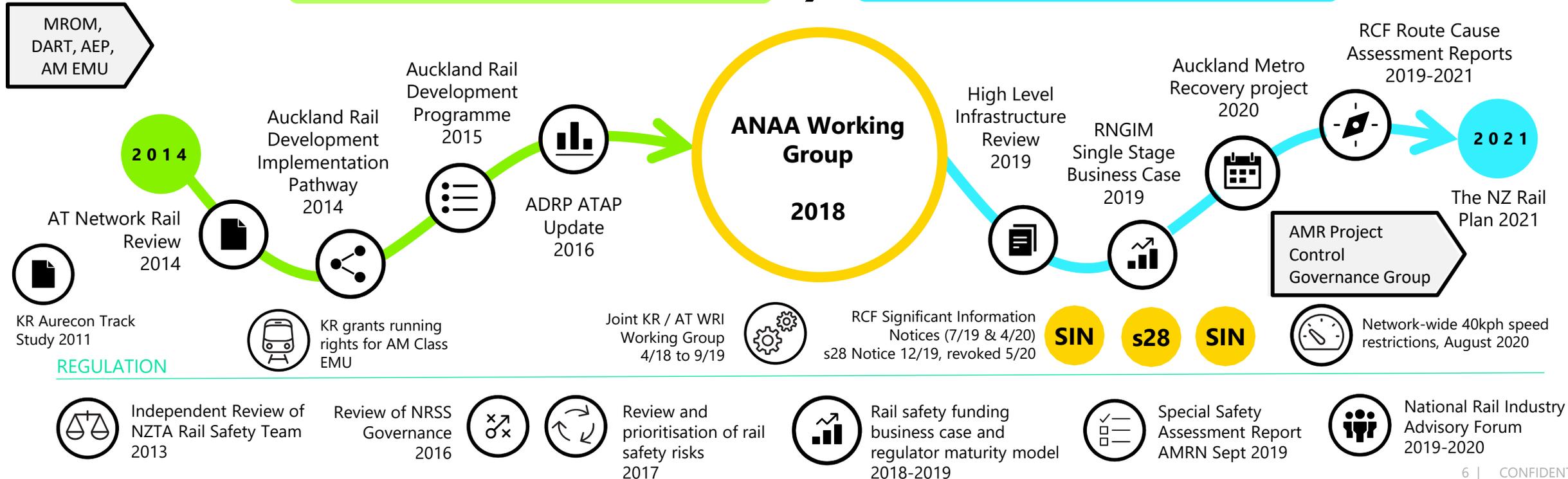
AFTER

The ANAA Working Group was established and resulted in a successful funding request under the Transitional Rail Activity Class

Government Policy Statement
2015-2017

Government Policy Statement
2018-2020

ANAA Working Group
2018



Key events

The AMRN system, and wider New Zealand rail system, has undergone significant changes over the past two decades. The key events relevant to the AMRN are outlined on slides 20-25 and summarised below.

Pre 2014

- The Crown became increasingly involved in the rail system with the acquisition of the AMRN in 2002, and the formation of KR in 2008. This was accompanied by significant Crown investment to expand AMRN capacity for metro services, including electrification for the introduction of the AM EMU vehicles in 2014. However, 'in place' track and formation infrastructure did not receive significant investment.
- The Crown adopted the MROM model in 2009. Under this model, AT was tasked with planning and commissioning metro passenger services, and KR responsible for freight services and network infrastructure. AT and KR entered an 85-year access agreement.
- In 2010, the KiwiRail Turnaround Plan was implemented, which focused on ensuring KR financial sustainability and growing its freight business.
- Concerns with the performance of WKS, the rail safety regulator, were identified in 2013.

2014 - 2018

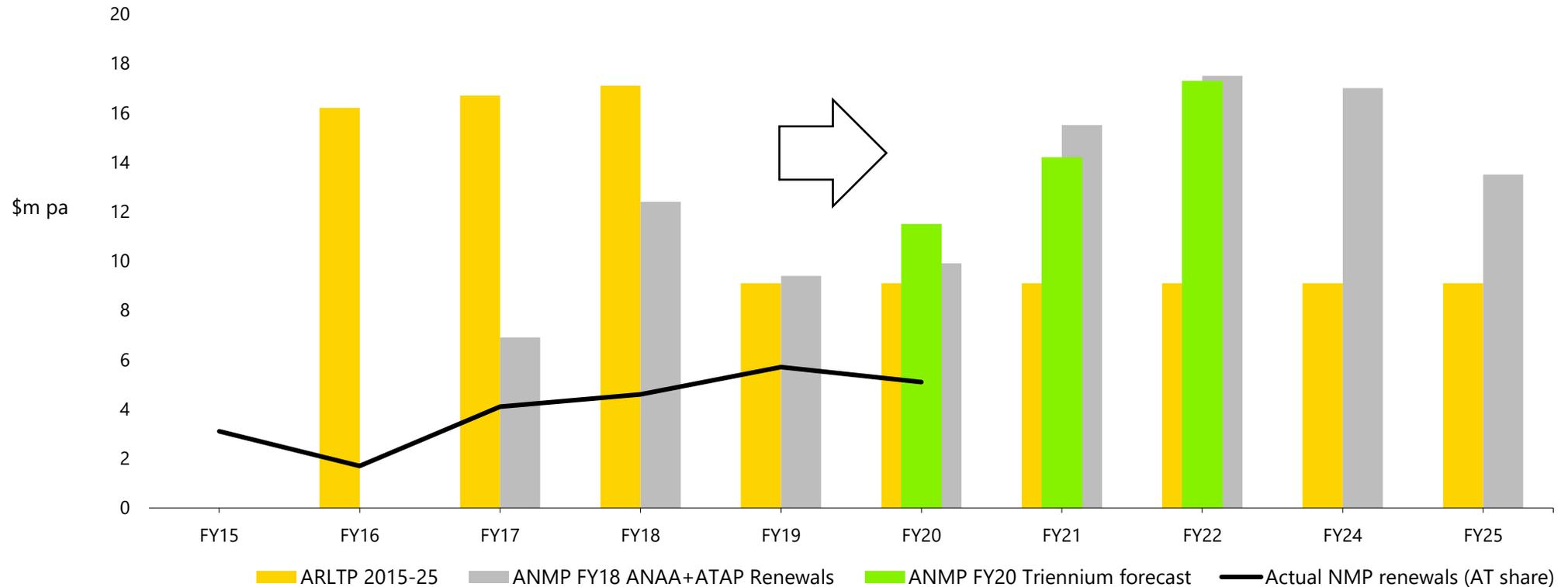
- Between 2014 and 2018, the parties increased their understanding of the infrastructure deficit facing the AMRN, with Network Rail Consulting undertaking an independent review into the AMRN. This review identified that the network required a ~\$100m programme of catch-up renewals and new maintenance practices to ensure the AMRN was fit for purpose.
- In 2016, the Crown and Auckland Council agreed to fund City Rail Link.
- The ANAA parties formed working groups to address concerns over the WRI (2017-2019) and wider network performance issues (the ANAA working group, formed in 2018).
- At a national level, WKS began increasing the capability of its regulatory branch and developing a business case for further expanding its regulatory team.
- Changes to the GPS in 2018 introduced an increased focus on metro rail and public transport, with specific funding for metro rail upgrades.

Post 2018

- The ANAA working group commissioned an independent review of AMRN infrastructure and subsequently developed a business case (RNGIM) to fund catch up renewals and new maintenance approaches. WKI approved the full \$330m RNGIM business case in 2020.
- In 2019, WKS carried out a special safety assessment into the AMRN, which identified significant deficiencies in the management of the network, including the presence of RCF.
- RCF emerged as a critical issue for the AMRN in 2020 as new testing revealed the extent of the issue, resulting in network wide TSRs. Urgent works were undertaken to enable TSRs to be removed in 2021.
- The Future of Rail review found that managed decline of rail infrastructure and short-term funding arrangements were key problems facing the national rail system. Changes to the rail funding and planning framework were implemented in 2021, while leaving the AMRN system largely unchanged.

Planned and actual AMRN renewals

In 2014, the Network Rail Study recommended \$100 million in catch-up renewals to bring the network into a steady state position. This was reflected in the 2015 RLTP and the 2014/15 NMP, but were not funding until 2019/20. These catch-up renewals were subsequently included in the 2020 ANMP Triennium budget. Over the period 2015 to 2020, the share of actual renewals funded by Auckland Transport under the ANAA averaged \$4 million per annual.



Sources:

1. Auckland Regional Land Transport Plan (RLTP) 2015-2025 (NB: We have assumed catch up renewals spending after FY18 would be spread equally over six years)
2. Auckland Network Management Plans FY15-FY20

Key findings

Our core finding is that a lack of system maturity allowed RCF to worsen and remain unresolved. The AMRN system has grown significantly in usage, in asset value and broader strategic importance. However, unclear roles and responsibilities under MROM, ineffective checks and balances, and insufficient capability, capacity and resource did not enable the system to evolve in line with growing demands. There was a lack of an enduring vision and plan required under a disaggregated model.

Characteristics of a well functioning system		Key system findings with respect to RCF
Unified objectives	A unified set of system objectives for planning and delivering the desired levels of service	<ol style="list-style-type: none"> 1. The AMRN system is fragmented and lacking a unified set of objectives and supporting planning & coordination mechanism that brings all the parties together to agree and maintain those objectives. 2. There is no detailed, and integrated, above and below rail asset management plan for the AMRN system, optimising the total cost of ownership based on agreed levels of service.
Checks and balances	Appropriate checks and balances to ensure system participants are effectively carrying out their functions	<ol style="list-style-type: none"> 3. Maintenance standards did not keep pace with the requirements of a modern metro system, raising questions over how these standards were governed and assured. 4. The safety regulator was passive and lacked the maturity and resourcing to clarify its role and work pro-actively. 5. The ANAA commercial model does not create incentives for the access provider to lift the quality of network access services to that required for a modern metro system. 6. There was an absence of effective industry governance arrangements to raise and resolve system concerns.
Enabling environment	An enabling environment that allows participants to achieve the desired service levels	<ol style="list-style-type: none"> 7. The funding model focused on short term affordability and did not enable catch up renewals or investment in capability and capacity to deliver ongoing maintenance and renewals for the long term. 8. There were competing objectives/priorities within the AMRN system, which led to insufficient access for maintenance. 9. The capacity and tools needed to support an effective cyclical maintenance programme were insufficient given usage growth and the age and condition of assets.

Primary system issues

While a range of system issues have been identified, we have classified a subset as 'primary system issues' due their proximity to the RCF root cause. The majority of these can be classified as contributors to a lack planning and coordination in the AMRN system in relation to RCF.

AMRN governance and asset management planning and practices

The AMRN system was unable to develop a detailed asset management plan, including a plan that integrates a whole of life view of both above rail and below rail assets. The governance of the AMRN may have contributed to the inability to improve the underlying asset condition and asset management practices. The system is fragmented and there is no joined up view on the AMRN network objectives and required levels of service.

Independent engineering assessments in 2014 and 2019, and the RCF root cause working group in 2021, document a need to improve asset management and network access practices to ensure the AMRN could be renewed and maintained for EMU service. Despite the significant uplift in system use in the past decade, the AMRN system was also unable to implement necessary changes in maintenance practices, such as adoption of new equipment or required levels of access, until the RCF issue became widespread.

KR is currently working on developing a new asset management plan for its national network. While we understand KR and AT are collaborating on a programme business case for the development of the AMRN over the next 30 years. The Ministry of Transport also understands that KR and AT are collaborating on the development of a dedicated AMRN asset management plan. The RNGIM programme also provides funding for improvements in asset management practices. We do not have information on the extent to which any improvements have been implemented.

Anticipating and addressing impacts from system growth

The introduction of the EMUs coincided with increased system usage but there was no adjustment to the funding model and maintenance approach to account for whole of life impacts of these factors on the network.

In 2017, once the EMUs had been operating on the network for three years, we understand AT and KR entered discussions on managing wheel rail interface (WRI) issues. However, they were unable to reach agreement on a way forward. A key recommendation resulting from the RCF root cause working group in 2021 is for the parties to further engage on WRI optimisation and total cost of ownership.

Standards are a key part of the maintenance and safety management system. Maintenance standards for below rail infrastructure are governed by KR internally. In relation to maintenance standards, while these were reviewed in 2015, it does not appear these evolved in line with the growing demands on the AMRN. WSP's review in 2019 identified a need to change standards to ensure they were aligned with modern metro passenger requirements. The RNGIM programme incorporates a review of standards, but we do not have information on the status of that review.

Primary system issues

Not all of the system issues identified related to coordination and planning. Several issues relate to whether or not there were the right checks and balances on the AMRN system participants to address the root causes of RCF. Other issues are examples of constraints on the AMRN system participants.

Ineffective checks and balances

KR's codes and standards, as they relate to maintenance, also appear to be connected to the RCF root causes. Codes and standards related to track inspections and maintenance were the sole responsibility of KR. In 2014, Network Rail Consulting identified a need to modernise standards. Questions were raised during the 2019 Special Safety Assessment in relation to adherence to these standards, and the process by which these standards are changed. We have limited information on the extent to which KR has evolved its controls over these codes and standards, but understand this is an ongoing focus for WKS.

While WKS intervened in 2019, it appears the safety regulator was not close to the AMRN, including network condition and maintenance practices such as codes and standards, prior to then. The regulator itself was under-funded and acknowledged the need to be more active in its regulatory oversight of the system.

The governance of the AMRN is also likely to have contributed to an inability to resolve the RCF root causes. Waka Kotahi's 2019 SSA observed a lack of understanding of each party's needs, constraints and inability to compromise under ANAA. Outside of the ANAA we are not aware of a standing forum that existed during this time and involved both WKI and the Crown. We acknowledge AMRN participants have subsequently worked together to secure funding for AMRN renewals and to invest in improved asset management practices, but future governance arrangements are unclear.

Constraints and inhibitors

The AMRN system funding model was a key constraint. It appears there was no consensus on the need for catch up renewals, nor was there a funding avenue available at the time to enable catch up renewals of this scale to progress. While AT and KR prepared a development pathway for the AMRN, it appears important components of this plan, such as required catch up renewals, did not secure funding until RCF became a significant issue. Identified as necessary by NR in 2014 to ensure the network was fit for purpose, the cost of these renewals was estimated at ~\$100m.

Ongoing maintenance and renewals were funded through the ANAA, which is a long term access agreement between AT and KR. We understand that the annual commercial negotiation process to set the ANAA budget often meant discussions were focussed on budget constraints, as opposed to what was required for the network. There was no transparency of these issues outside of the ANAA parties. This led to systematic underfunding of the network maintenance and renewal.

Affordability is likely to be an ongoing issue for the AMRN. AT and KR are currently working to determine the long term investment requirement for the AMRN through a programme business case, which is expected to identify the future operating and renewals budgets.

Summary of substantive stakeholder feedback

KiwiRail

KR stated that while this report's overarching conclusion was 'probably not an unreasonable starting point', they were concerned that the issues on slide 41 were presented as soundbites and questioned whether they met the threshold for system level issues, and whether they were still relevant or enduring issues to be resolved.

KR's feedback emphasised funding as a key system issue, noting that while there were many contributing factors to the RCF situation, the most significant was the lack of funding to enable an appropriate asset management planning and investment programme. Further, KR did not see the ANAA as an issue, as there was little point in changing performance targets without additional funding.

KR cited the Matangi procurement as an example of new rolling stock being introduced on a network in a similar condition to the AMRN, but not resulting in RCF. They noted a different approach to WRI as well as a series of investments to ensure the Wellington network was ready to accommodate the new rolling stock. KR also noted there was a much larger annual renewals programme agreed with GWRC for the Wellington network than compared with the programme agreed with AT for the AMRN.

KR's view is that the report would benefit from further context. In particular, prior to the Future of Rail review, KR was significantly underfunded and the rail system was in managed decline, reflecting the government's appetite for rail investment at that time.

AT

AT noted that the report was well informed and balanced, but sought greater emphasis on forward focus areas. AT sees the underlying reason for the existing situation is a lack of asset management planning, and a lack of maintenance and renewals in line with increased access and use by various parties. In their view, addressing how to uplift system capability and capacity to achieve improvements in asset management planning and forward maintenance and renewal delivery is key.

AT suggested that report would be enhanced by clarifying where accountabilities lie, and identifying if accountabilities are not clearly defined, rather than necessarily attributing failures of individual participants to the system as a whole.

AT were concerned that the report over-emphasises the role of the EMUs and WRI as causes of the RCF situation. AT stated that the RCF Working Group and supporting experts were conclusive that track, formation and associated asset management issues were contributing factors, but that studies were inconclusive in regard to vehicle and WRI as root causes. AT also noted the EMU specification was tendered by KR prior to the process being transferred to AT, with the units accepted by KR under the same formal process as the Matangi units in Wellington. AT also noted the potential role of growth in rail freight as an RCF contributor.

AT noted that they and KR have been working together successfully in recent years to secure additional investment.

OTHER

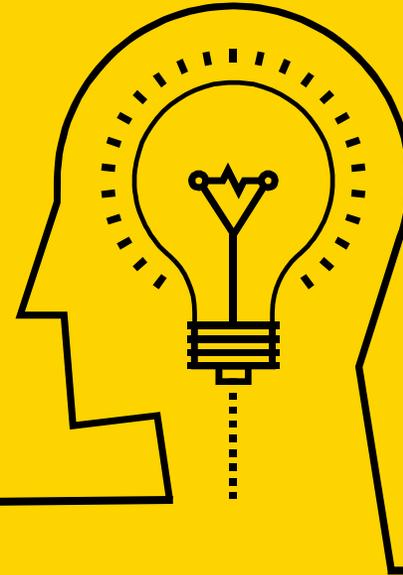
TDAK: Positive feedback on the report, noting it was comprehensive and reflected different views in a balanced way. Amongst other points of feedback, TDAK's view was that report did not sufficiently highlight the apparent lack of understanding of the state of the network by the asset maintainer. Further, TDAK saw the ANAA as more of a contributing factor rather than the primary driver of issues. They noted that proper inspection and maintenance regimes covered by KR's safety case are more directly connected to RCF.

WKI+WKS: Joint WK feedback was supportive of the report and its framework for capturing issues.

CAF: CAF's feedback primarily related to the technical Root Cause Report, which informed this report. CAF noted that it does not agree that EMU stiffness or the wheel profile were root causes of severe RCF on the AMRN. CAF also stated they were not aware of KR having concerns in 2014 over the potential below rail maintenance impact of the EMUs and that original EMU profile was agreed by all stakeholders during the design stage.

GWRC: Positive feedback on the report and emphasised need for strong asset management disciplines, and for asset management and codes and standards to be inclusive of metro passenger requirements.

Introduction



Auckland Metro Rail System Issues: Independent Review

The Auckland metro rail network (AMRN) is a critical asset for both passenger and freight traffic. The identification of severe rolling contact fatigue (RCF) on the AMRN in 2019 and 2020 caused significant disruption. The Ministry of Transport has engaged Deloitte to identify and articulate whether any system level issues may have contributed to the RCF issues experienced on the AMRN, and to make recommendations on future changes to the system.

This report focuses on identifying the system level issues that may have contributed to the RCF issues experienced on the AMRN. These issues include those associated with system governance, incentives, funding, and system maturity (including capacity and capability).

The focus of the Review is not on the technical root causes of RCF, which have been explored through a separate working group. However, these technical root causes form important context for the review.

Further, the purpose of the review is not to identify any wrongdoing or compliance issues from the parties involved.

Our approach to Phase 1 of the review has been to draw together themes and supporting evidence from interviews and workshops with system participants and key documents related to the system and its participants.

We consulted with AMRN system participants on the draft of this report and requested further information to resolve areas of uncertainty. This report incorporates additional information supplied by participants, noting that some areas of uncertainty remain where the requested information was not supplied to us.

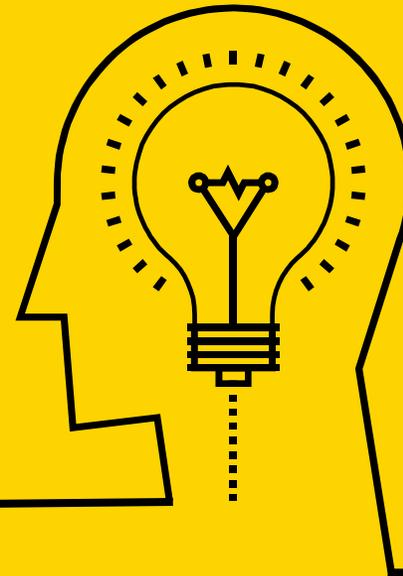
The nature of a systems level review is necessarily qualitative. There are areas of consensus and divergence amongst industry participants. Our role has been to distil industry perspectives and supporting evidence into key themes and findings. We draw on evidence from interviews, an industry workshop, and a review of a wide ranging set of documents we have been provided.

System participants we have interviewed include KiwiRail, Auckland Transport (AT), Greater Wellington Regional Council, Ministry of Transport, Transdev Auckland, Construcciones y Auxiliar de Ferrocarriles (CAF), Waka Kotahi (WKS and WKI – the WK Safer Rail and the Rail Investment teams respectively), and the Rail and Maritime Transport Union.

We are grateful for the time system participants have invested in this review to date, and the willingness of all participants to engage with this review.

Phase 2 will focus on developing and consulting on recommendations for change to resolve the issues identified through Phase 1. Phase 2 will involve further workshops with participants.

Context and timeline



It plays a key role in both the city's public transport system and the national freight network.

The rail network plays a key role in the movement of freight, especially to and from the Ports of Auckland and Port of Tauranga, and as an origin point for domestic cargo. The track through Auckland carries a third of all rail freight in New Zealand. An estimated six million tonnes moves on the Auckland network each year. On a typical weekday about 40 freight trains travel through the Auckland network.

Auckland's rail network is a key strategic transport asset.

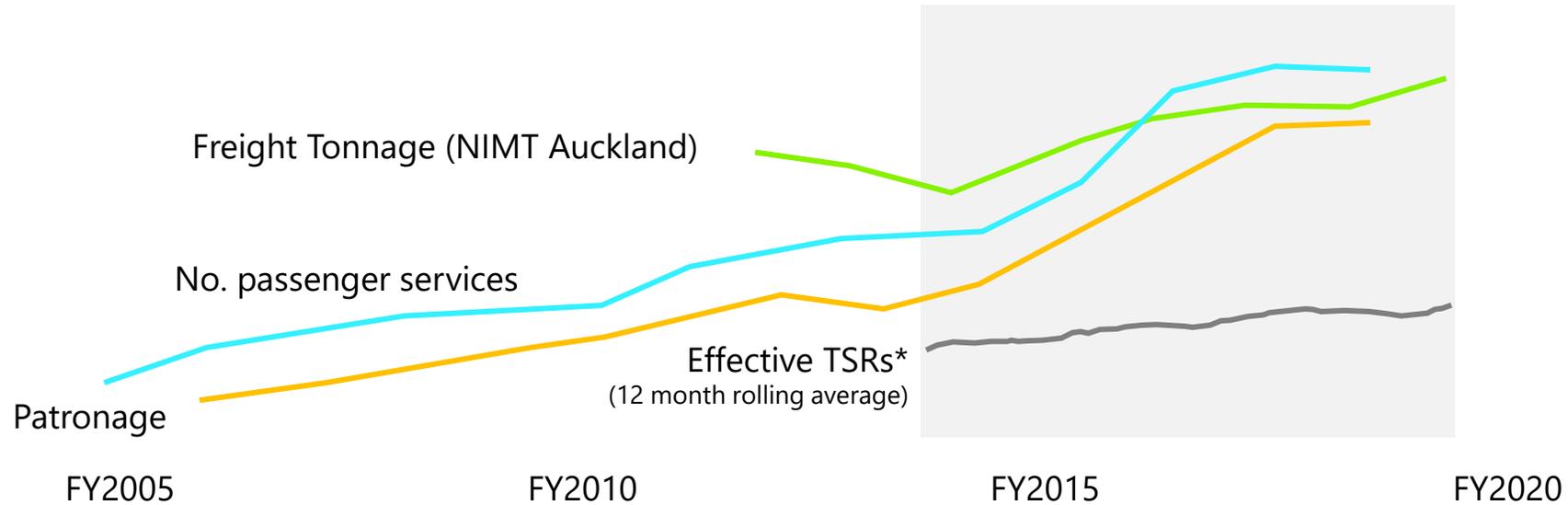
There were 22.5 million commuter trips in the year to December 2019, up from 10.2 million in FY13, and from 2.5 million in mid-2003 when Britomart opened. On a typical weekday more than 600 commuter services run on the Auckland network.

Ensuring the Auckland metropolitan rail network is resilient, reliable and CRL ready is a key priority in ATAP.

Growth on the AMRN

+13% pa over 12 years

Passenger and freight growth since DART / AEP has put considerable pressure on the AMRN performance, with the number of active temporary speed restrictions increasing steadily from late 2015 onward.

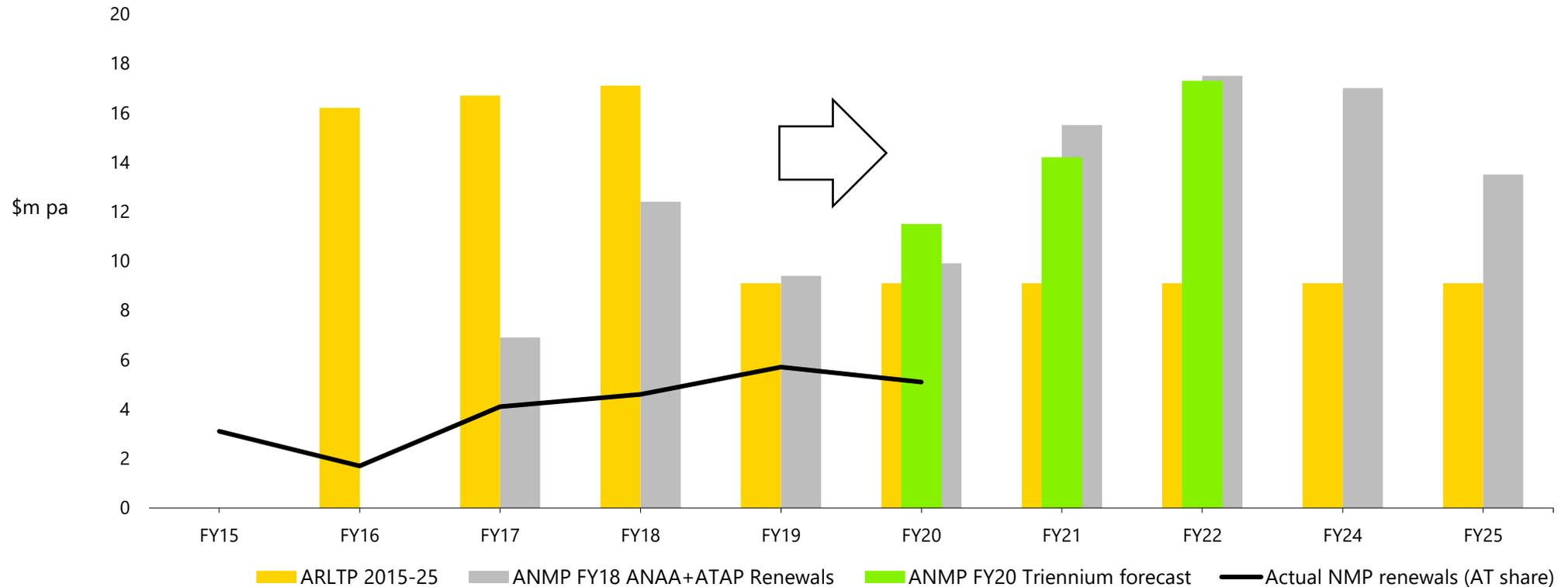


Source : Rail Network Growth Impact Management (RNIGM) SSBC, WSP | OPUS

*Temporary speed restrictions, usually put in place to mitigate the safety risks from an infrastructure fault.

Planned and actual AMRN renewals

In 2014, the Network Rail Study recommended \$100 million in catch-up renewals to bring the network into a steady state position. This was reflected in the 2015 RLTP (but not funded) and referenced in the 2018 ANMP. These catch-up renewals were subsequently included in the 2020 ANMP Triennium budget. Over the period 2015 to 2020, the share of actual renewals funded by Auckland Transport under the ANAA averaged \$4 million per annum.



Sources:

1. Auckland Regional Land Transport Plan (RLTP) 2015-2025 (NB: We have assumed catch up renewals spending after FY18 would be spread equally over six years)
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Timeline of events

The establishment of the ANAA Working Group in 2018 to prepare for the next Triennium coincided with newly available funding and, together with increased activity by the regulator, marked a turning point.

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The investment environment for rail was constrained, and the Crown was not formally approached to fund additional AMRN renewals

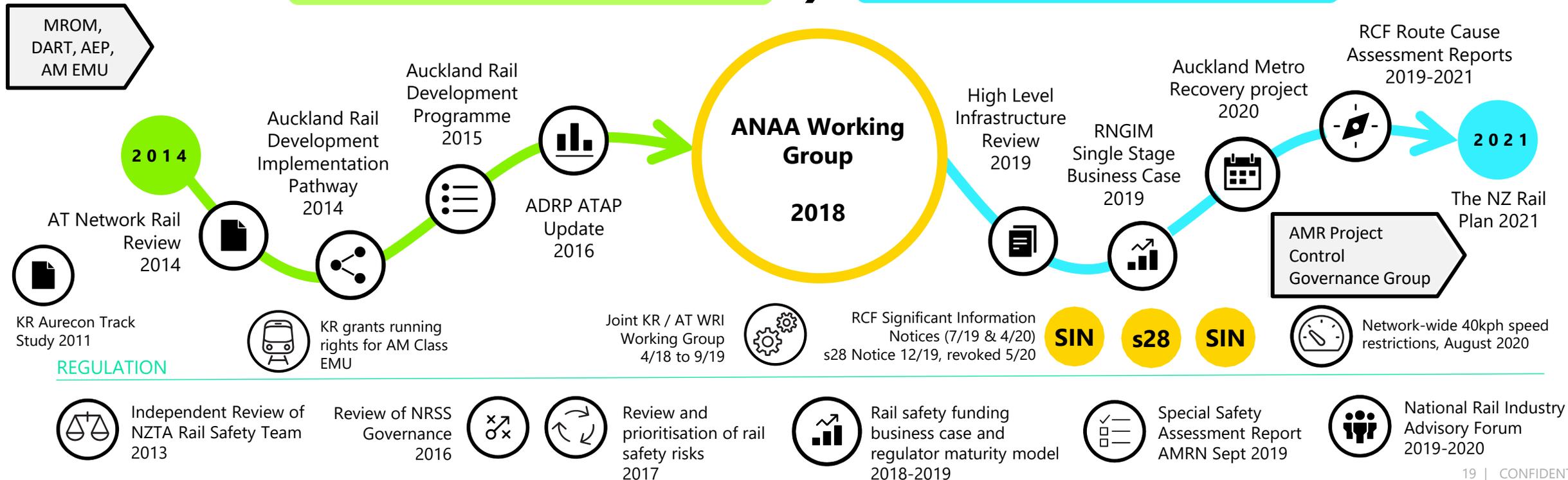
AFTER

The ANAA Working Group was established and resulted in a successful funding request under the Transitional Rail Activity Class

Government Policy Statement
2015-2017

Government Policy Statement
2018-2020

ANAA Working Group
2018



Timeline of events: Pre-2014

The transformation of the AMRN began with the Crown investment of \$600m for Developing Auckland's Rail Transport (DART) between 2006 and 2012, followed by the electrification of the network (AEP) and the procurement of a fleet of modern EMUs.

Event	Date	Description	Relevance
Crown reacquisition of rail assets	2002-2008	AMRN was acquired in 2002, and all below rail assets in 2004, leading to the formation of Ontrack. In 2008, the above rail assets were acquired and merged with Ontrack to form KR.	Resulted in significant changes in industry structure, with first vertical disaggregation between above and below-rail services, and then reintegration into a Crown-owned SOE.
Railways Act 2005	2005-onwards	Established the current licensing regime where rail participants assess and control their safety risks and provide assurance to WKS.	Created the current regulatory framework, with WK (initially Land Transport NZ) as regulator.
DART	2006-2012	Significant investment to expand capacity of system through double tracking, upgraded stations, reopening the Onehunga line, and a new connection to Manukau.	New infrastructure enabled more intensive use of network, however infrastructure already in place only received relatively minor improvement.
AEP	2007-2013	Electrification of most of the AMRN (Papakura to Swanson) and total replacement of the signaling system.	Enabled EMU use and more intensive use of network.
Matangi procurement	2007-2010	Greater Wellington Regional Council acquired new electric metro passenger fleet.	KR have stated that they were closer to the Matangi than the AM Class EMU procurements, with the Matangi trains not having the equivalent design features as the AM Class EMUs.
AM Class EMU procurement	2009-2014	The procurement of the new Auckland electric passenger fleet was first managed by ARTA (AT's predecessor) and transferred to KiwiRail in 2009. AT then completed the process in 2011.	Resulted in the introduction of new rolling stock that saw patronage grow significantly. EMU design features have been identified as one of the contributing factors to RCF, although the extent of this contribution is not agreed between KR and AT (and CAF).
KR Turnaround Plan and Metropolitan Rail Operating Model (MROM)	2009-onwards	The Turnaround Plan focused on improving KR's financial viability and its freight business, and MROM clarified that regional transport authorities were responsible for planning and procuring metro rail services.	Created existing AMRN industry arrangements, with split between freight and metro passenger services and adoption of ANAA for metro passenger access and associated fee.
Aurecon Track Study	2011	KiwiRail commissioned study into existing track quality and to identify routine or catch up renewals; found track to be in fair condition with isolated deterioration.	Did not identify significant infrastructure or funding deficit, but highlighted need for preventive maintenance programme and long-term investment programme and potential EMU impacts.



Timeline of events: 2014 - 2018

During this period catch up infrastructure renewals were identified by Network Rail Consulting. However, these were not funded. There was also a review that identified issues with the forum that governs system interoperability.

Event	Date	Description	Relevance
 Independent Review of NZTA Rail Safety Team	2013	WKS engaged an international consultant to review the performance of its rail regulatory function.	Highlighted 'considerable room for improvement' in terms of the regulator's performance and resourcing.
 Network Rail Consulting Report	2014	AT commissioned Network Rail Consulting to undertake an independent review of the track condition for Auckland to identify the works needed to bring the track asset condition up to the standard required to support reliable EMU operation.	Identified a need for a five-year programme of catch up track and formation renewals (~\$100 million in value), and suggested reviews of engineering standards and maintenance planning procedures.
 Running rights granted for AM Class EMU	2014	KR granted running rights to the AM Class EMUs in 2014, noting that it had concerns the modified EMU wheel profile would impact on rail maintenance requirements. Both AT and CAF have noted that they are not aware of these concerns being raised at the time, and that the wheel profile was approved by all stakeholders during the EMU design stage.	Allowed EMUs to begin operating on the AMRN.
   Auckland Rail Development Implementation Pathway and Auckland Rail Development Programme (ARP)	2014-onwards	<p>In 2014, an AT report proposed a pathway for development of the Auckland rail network through to 2031, including the catch up renewal programme suggested by Network Rail.</p> <p>In 2015, this was formulated into the ARDP, a joint AT and KiwiRail passenger and freight infrastructure plan from 2016 – 2045, setting out the network and infrastructure investments required to meet forecast demand.</p>	Identified an indicative programme of works to enable the network to meet post-City Rail Link (CRL) service levels. The 2014 report identified securing funding, resourcing and access as key implementation issues.
 Review of National Rail System Standards (NRSS)	2016	WKS commissioned review, which assessed the governance, operation and management of the NRSS.	Identified deficiencies with the NRSS, including out of date standards and ineffective governance.

Timeline of events: 2014 - 2018

Steps were also taken to increase the capacity and capability of the regulator. The ANAA parties formed new working groups to address network performance issues.



Event	Date	Description	Relevance
Rail safety funding business case and regulator maturity model	2017-2019	In 2017, WKS commissioned a review to identify and provide evidence-based recommendations for managing priority safety risks for New Zealand rail operations. From 2017 through to 2019, WKS developed a maturity model to enhance its rail regulatory capability and performance, and to fund those enhancements.	Enabled the rail safety regulator to expand its capacity and capability.
Future of Rail Review	2017-2019	In 2017, the Future of Rail began examining the future role rail could play in New Zealand's transport system. The review found the rail network was facing a state of managed decline due to long-term underinvestment, and that short-term funding arrangements for the rail network through the annual budget process were inadequate for a long-term network asset.	Led to significant changes in how rail is planned and funded at a national level. The Future of Rail had a component which was reviewing the MROM. However, it was agreed to maintain MROM within the new system, recognising that a future review was required.
GPS 2018	2018-2021	GPS 2018 introduced an increased focus on public transport, with a dedicated transitional funding class for metro rail infrastructure improvements.	Provided funding to address AMRN catch up renewals, introduce new equipment, and review maintenance codes and standards.
ANAA Working Group	2018	A working group was formed, consisting of AT, KR, and Transdev, in light of increasing demands on network and service failures, to the review the AMRN infrastructure, maintenance and asset renewal strategy.	Brought together the ANAA parties to address declining system performance, and led to the RNGIM business case.
Joint KR AT Wheel Rail Interface (WRI) Working Group 2018 – 2019	2018-2019	Following engagement on WRI issues in 2017, AT and KR formed a working group in 2018 to examine issues with EMU stiffness. This was in the context of granting running rights to an additional tranche of EMUs. This group last met in September 2019. The parties have agreed to re-establish a WRI group.	Illustrates that the parties were aware of WRI issues but also highlights that the WRI discussion is ongoing.



Timeline of events: After 2018

While the AMRN system participants developed a business case to secure funding for AMRN infrastructure renewals, the state of the AMRN became a focus of the regulator. RCF emerged as a prominent issue with the AMRN.



Event	Date	Description	Relevance
High level infrastructure review	2019	Independent review by WSP reporting to the ANAA working group into the specification and condition of AMRN rail assets, maintenance standards and maintenance plan.	Reconfirmed extensive track and track bed renewals were required and provided the basis for the RNGIM business case. The review identified that urgent action was needed to monitor and assess RCF and mitigate RCF through grinding or rail replacement.
RNGIM Single Stage Business Case	2019-2020	Business case prepared by WSP identifying a preferred set of interventions to address the findings of the high level infrastructure review.	Secured funding from the new NLTF transitional rail activity class, to undertake catch up renewals and to improve maintenance approaches, capacity and capability. While approved in 2020, a funding portion was released in 2019 for urgent renewals and new RCF testing approaches.
Significant Information Notice T19-004	2019	KR issued a track engineering advisory notice in relation to RCF, which modified existing inspection and mitigation requirements.	Highlighted the increasing focus on RCF, although this modification of standards became a matter of concern during the SSA.
Special Safety Assessment (SSA)	2019-2020	Following intelligence related to the AMRN asset condition, WKS initiated an SSA into the AMRN in July 2020, which identified significant concerns with the condition of the network and maintenance practices. The SSA report is dated September 2019 and remedial actions were closed out during June 2020, with ongoing monitoring in place.	The SSA made a number of significant findings, including that the levels of maintenance activities at the time were insufficient and that RCF appeared to be widespread throughout the network. The SSA also raised concerns in relation to adherence to maintenance standards, and the process for changed standards, including relation to Significant Information Notice T19-004.
Railways Act s 28 notice	2019-2020	Statutory notice from WKS imposing conditions on the operation and use of AMRN (including no increase in train services beyond existing timetables and a requirement on KiwiRail to demonstrate an appropriate maintenance programme) due to the condition of the AMRN and inadequate management of RCF. The notice was revoked in May 2020.	Highlighted the severity of the RCF issue and wider AMRN condition.

Timeline of events: After 2018

The identification of severe RCF in 2020 required the imposition of blanket speed restrictions and urgent track repairs.

	Event	Date	Description	Relevance
	National Rail Industry Advisory Forum	Late 2018-onwards	New industry grouping convened by WKS consisting of the main participants in the New Zealand rail industry alongside industry regulators, and the Ministry of Transport.	Provided for a new forum, with wider membership than the NRSS-E, to identify, discuss, resolve and implement solutions to rail industry wide matters.
	Significant Information Notice T20-004	2020	KiwiRail issued a revised track engineering advisory notice in relation to RCF, which replaced Significant Information Notice T19-004.	Updated the RCF inspection and management approach taking account of WKS's concerns raised during the SSA.
	Speed restrictions	2020	In August 2020, additional testing identified severe RCF throughout the AMRN. A network wide 40 km/hr speed restriction was applied to manage the safety risks while repairs were undertaken.	Demonstrates the impacts stemming from severe RCF on the AMRN.
	Auckland Metro Recovery project	2020-2021	Work to remediate RCF began in August 2020 with much of the urgent track work completed by Easter 2021, funded through RNGIM.	Replaced affected rail and end of sleep sleepers to enable the speed restrictions to be lifted. Ongoing work on formation and improving maintenance practices will occur under the RNGIM programme.

Timeline of events: After 2018

The parties have now reached a consensus position on the technical causes of the RCF. The government has also made significant changes to the planning and funding framework for rail in New Zealand with the introduction of the Rail Plan and the Rail Network Investment Programme.



Event	Date	Description	Relevance
Root cause analysis	2019-2021	RCF route cause assessment Reports were prepared in 2019 and 2020 by two different consultancies. In 2021, the joint working group examining the technical causes of the accelerated RCF prepared and released a report identifying the technical root causes. These broadly relate to the (1) condition of track and maintenance practices (2) the impact from the stiffness and wheel profile of the EMU vehicles, and (3) the wheel-rail interface.	Identifies the the technical root causes of the accelerated RCF on the AMRN, and a series of recommendations to ensure RCF does not again become a critical issue on the AMRN. Stakeholder feedback on this report identified different areas of emphasis and remaining areas of disagreement amongst the stakeholders on some root cause elements.
The NZ Rail Plan and RNIP	2021	<p>The Future of Rail Review confirmed the value of rail to New Zealand and highlighted that the rail network was facing a state of managed decline due to long-term underinvestment.</p> <p>The New Zealand Rail Plan sets out the Government's long-term vision for rail investment as an integrated part of the land transport investment system, and has identified resilience and reliability are key priorities for rail. It states that the long-term vision is for the rail network to provide modern transit systems in New Zealand's largest cities, and to enable increasing volumes of freight to be moved by rail.</p> <p>To replace the transitional rail activity class, there is a new rail network activity class to support investment in KR's network maintenance and renewal programme. The Rail Network Investment Programme (RNIP), developed by KR and approved by the Minister of Transport, sets out KR's planned below rail maintenance, renewal and improvement activities.</p>	Highlights ongoing importance of the AMRN for delivering on the government's objectives for rail. There is now ongoing funding from the NLTF to deliver the RNIP, noting that existing metro access arrangements remain in place.

GPS

GPS 2018-2020 enabled greater investment in rail infrastructure to support passenger rail growth. GPS 2018 has now been replaced by GPS 2021, which includes for the first time an activity class that enables NLTF funds to be invested in the KR national rail network. GPS 2021 also integrates metro network rail investment into the PT infrastructure activity class and allows for it to be considered alongside other public transport infrastructure investment.

Government Policy Statement 2015-2017

GPS 2015 provided limited guidance on investment in metro rail. This GPS did note that investment in urban passenger rail services from the NLTF (under the public transport activity class) was supplementing Crown grants.

GPS 2015 also noted there were no current Crown appropriations to rail freight services and infrastructure within the scope of the GPS.

The 2015 Auckland RLTP noted: 'The Transport Agency is currently unable to fund rail infrastructure and KiwiRail's investment is limited to freight projects where there is a demonstrated commercial return.'

Government Policy Statement 2018-2020

GPS 2018 introduced an increased focus on public transport and rail. The amount of funding for public transport and rail was increased.

The transitional rail activity class was created, which was specifically focused on below track improvements for metro passenger services, with funding at 100% FAR.

The GPS sets out the Government's strategic direction for the land transport system over the next 10 years and is updated every three years. It provides guidance on how we invest the National Land Transport Fund (NLTF), and how we assess and prioritise activities for Regional Land Transport Plans (RLTPs) and the National Land Transport Programme (NLTP).

How the Future of Rail has changed funding?

Network funding has historically been sought on an annual basis through the Budget process. Changes to the LTMA mean that funding for the rail network can be accessed from the NLTF, with the GPS providing certainty of a baseline level of support. The ANAA and WNA arrangements remain unchanged, however.



Before

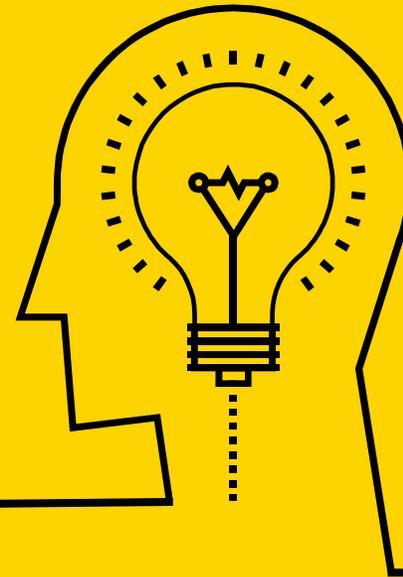
- 2010 KiwiRail Turnaround Plan and introduction of the MROM created a separation between metro and freight-related investment.
- Crown provided funding support for KR (through grants and shareholder injections) for freight network investment.
- Metro councils were expected to fund maintenance and renewals related to their services, with specific network budgets developed for the Auckland and Wellington metros, with funding split between the metro councils and KiwiRail, to fund steady state maintenance and renewals. Metro councils received support from NLTF for public transport services and infrastructure, most recently at 51% FAR.
- There was Crown investment into the metro networks through programmes such as DART and AEP. The Crown has also commissioned various upgrades (e.g. CRL, NZUP programme).



Today

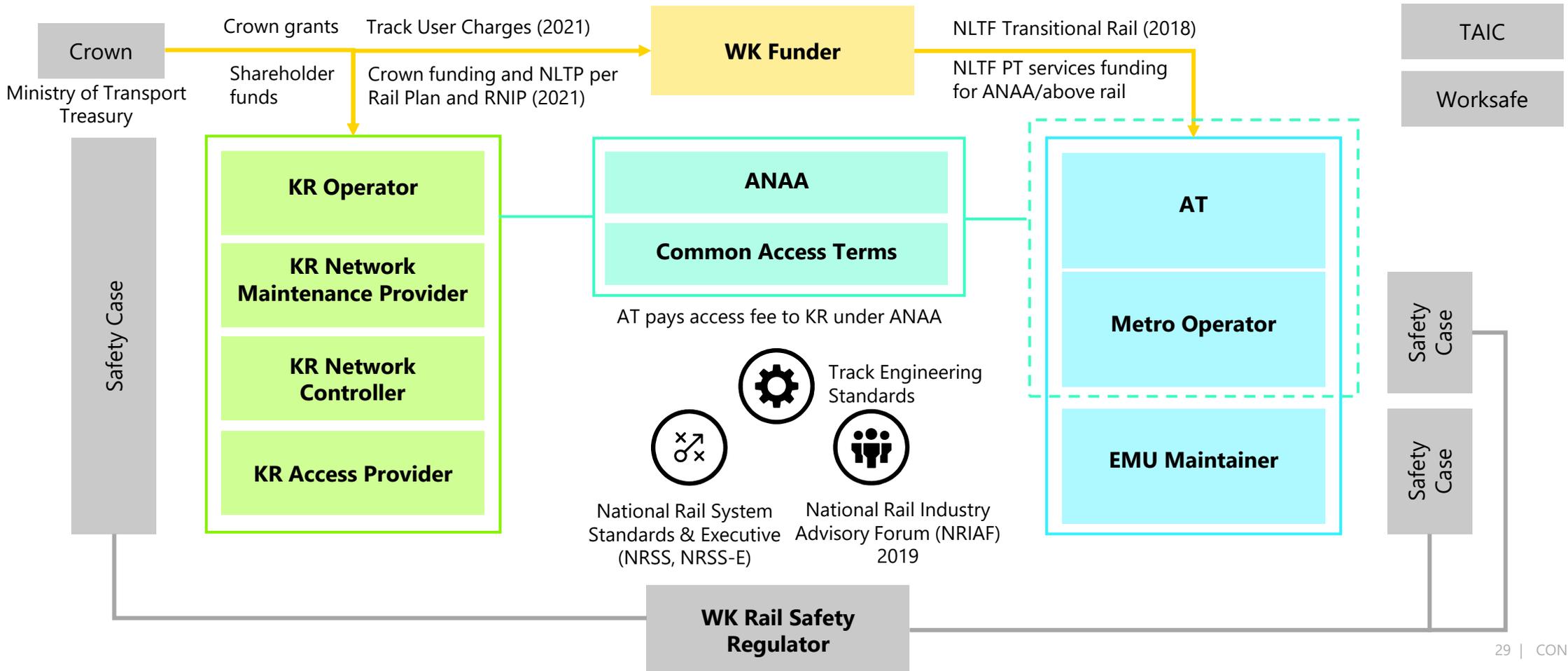
- KiwiRail can now access funding from the NLTF by developing the RNIP, aligning with the Rail Plan and RLTPs. The RNIP needs to align with the GPS, is reviewed by WKI and approved by the Minister of Transport. KR now pays track user charges into the NLTF.
- The RNIP enables funding for KR to maintain, operate, renew and improve the rail freight and tourism network (including a proportionate contribution to the cost of maintaining metropolitan rail networks used by KR's rail freight and long-distance passenger services).
- The RNIP is focused on the national network, but funds KR's share of the metro network budgets and incorporates metro network improvements. Renewals and maintenance spending related to metro passenger services, or further network upgrades for metro passenger services, would still be part funded by the metro councils (supported by WKI at 51% FAR from the public transport activity class), or funded by the Crown.
- The metro access arrangements have been retained within the current system at this time, pending a further MROM review.

The system



The system

The system consists of the organisations that work together to safely and efficiently deliver services on the AMRN. Under the MROM, the system is vertically disaggregated for metro passenger services with commercial access arrangements between above and below rail, supported by a safety regulation and co-funding model. Freight and long distance passenger services are vertically integrated with the below rail network. The core structure of the AMRN system has remained largely unchanged since the ANAA was adopted in 2012, noting planning and funding arrangements have recently changed.



Industry roles and responsibilities

Outline of key accountabilities and responsibilities related to the ANRN budget

		Crown	Auckland Transport	KiwiRail	Waka Kotahi	Metro Operator	EMU Maintainer
Network budget	AMRN metro passenger access fee		Pays access fee based on its share of the AMRN network budget	Invoices Auckland Transport for access	Pays share of AT fee at 51% FAR	Checks KiwiRail access fee invoices through wash up process	
	AMRN network budget	The Minister of Transport approves the RNIP, which incorporates the AMRN budget	Influences AMRN budget as pays large share, approves NMP	Develops the AMRN network budget for inclusion in the NMP. Also develops the RNIP, which incorporates the AMRN budget	Reviews the RNIP		
	AMRN KiwiRail freight and long distance passenger share of network budget			Pays TUC into NLTF	Pays KR share of network budget, which forms part of the RNIP		

Industry roles and responsibilities

Outline of key accountabilities and responsibilities related to planning and funding

		Crown*	Auckland Transport	KiwiRail	Waka Kotahi	Metro Operator	EMU Maintainer
Planning and funding	Network renewal funding		Responsible for share of steady-state renewals funding	Responsible for seeking funding for renewals from WKI and AT	Catch up renewals currently funded by WKI	Consulted with as part of NMP development	
	Network upgrades funding	Current programme of network upgrades are largely funded by the Crown	Works with KR on strategic planning for network, half funds CRL	Develops business cases and executes programmes	WKI can fund additional metro rail upgrades via NLTF at 51% FAR		
	Network Management Plan		AT reviews and accepts the NMP	KR develops the NMP in consultation with AT and Transdev		Consulted with as part of NMP development	
	Asset management planning (below rail)		Interest in below rail asset management approach as seeks to maximise network performance for metro passenger services	Responsible for asset management planning for below track infrastructure	Provides asset management advice through RNIP		
	Asset management planning (above rail)	Funds new KR rolling stock	Plans and procures new PT rolling stock and passenger stations	Grants running rights to rolling stock, plans and procures freight rolling stock, interest in above rail asset management to extent it has implications for below rail assets	Pays share of AT capital costs		
	Long term planning	Party to ATAP, since 2021 has also set objectives through the Rail Plan and approves the RNIP	Works with KR to develop ARDP, which informs RLTP, RNIP, ATAP	Works with AT to develop ARDP, which informs RLTP, RNIP, ATAP	Party to ATAP		

*The Ministry of Transport monitors performance of the transport system and advises on system settings, with Treasury monitoring KR’s commercial performance as an SOE. Both the Ministry and Treasury advise on system funding.

Industry roles and responsibilities

Outline of key accountabilities and responsibilities related to network operations

		Crown	Auckland Transport	KiwiRail	Waka Kotahi	Metro Operator	EMU Maintainer
Operations	Below rail maintenance and renewal delivery		Influences access to network for infrastructure works through timetable committee, and funding available through NMP	Responsible for planning and executing maintenance and renewal programme		Influences access to network for infrastructure works through timetable committee	
	Metro passenger operations		AT is responsible for planning and commissioning metro passenger services	Consulted as access provider, network controller and maintainer		Responsible for delivering metro passenger services.	
	Freight and long distance passenger operations			KR plans and operates freight and long distance passenger services			
	Network access		Member of the network timetable committee, has access rights granted under ANAA	KiwiRail chairs and has majority of representatives on network timetable committee, and controls access to network.		Observed on the network timetable committee	
	Station maintenance		Awards contract for maintenance and renewal works		Pays share of AT operating costs		
	EMU maintenance		Owns rolling stock and has running rights, and contracts CAF to maintain EMUs				Responsible for maintaining EMUs
	DMU maintenance		Contracts KiwiRail to maintain metro passenger DMUs		Responsible for maintaining DMUs		

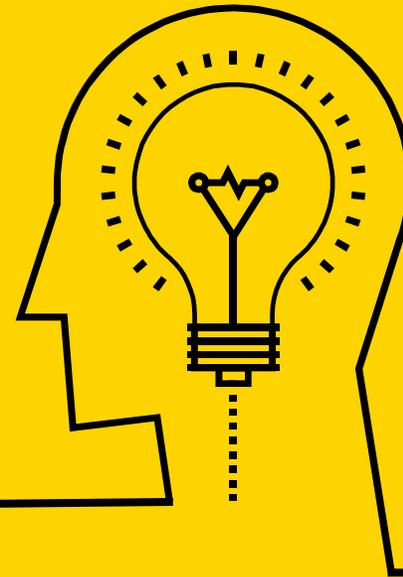
Industry roles and responsibilities

Outline of key accountabilities and responsibilities related to safety and standards

		Crown	Auckland Transport	KiwiRail	Waka Kotahi*	Metro Operator	EMU Maintainer
Safety and standards	NRS Standards & Executive			Convenes NRSS-E, develops standards for interoperability in consultation with other NRSS-E members	Observes NRSS-E	Participates in NRSS-E	Participates in NRSS-E
	National Rail Industry Advisory Forum	Observer (MoT)	Member	Member	Convenor (WKS)	Member	Member
	Track Engineering Standards			KR sets its standards and codes for maintenance and inspection	Some degree of oversight of major changes that relate to KR's safety case		
	Safety regulation	Minister has the power to set rail safety rules	Rail sector participant, but is unlicensed	Owns safety case for the network infrastructure, network control and its freight and long-distance passenger services	Grants safety licences, reviews safety cases, conducts annual audits and conducts safety enforcement activities, facilitates NRIAF, can recommend rail safety rules to the Minister	Owns safety case for metro passenger services	Owns safety case for EMU maintenance

*TAIC and Worksafe are also involved in safety oversight alongside WKS.

System issues



Root causes of RCF

RCF root cause assessment Reports were prepared in 2019 and 2020 by two different consultancies. In 2021, the joint working group examining the technical causes of the accelerated RCF prepared and released a report identifying the technical root causes. The report notes that there was no single outlier cause, but rather a widespread set of localised causes. The closest single root cause could be stated as a missed opportunity during 2014-2017 to implement the 2014 NR recommendations.

ROOT CAUSES OF RCF



Track: Sub-optimal track condition, under-investment and insufficient rail grinding

Track related root causes include:

- Historic under-investment prior to 2014 and through to August 2020, with the report noting that 'a significant underlying cause is most likely to be aged track on historic formation'.
- Insufficient rail grinding from 2015 through to August 2020.
- Suboptimal track condition at multiple sites on the network (including aged sleepers and track, and gauge exceedances)

Auckland's climate was also identified as a partial contributor to the growth of track defects.



Vehicle: High yaw stiffness may increase propensity to create RCF on non-perfect track

Vehicle related root causes include:

- High primary yaw stiffness in the EMUs (to improve passenger comfort), which may increase a vehicle's propensity to cause RCF on non-perfect track, although modelling to demonstrate this was not included in the root cause brief.
- An EMU wheel profile, which was modified from KR's standard profile to counteract wheel flange wear from vehicle stiffness, has a greater propensity to cause RCF formation over the most common KR profile (based on modelling done as part of the root cause analysis). The Root Cause Report also notes the KR profile is unlikely to be the optimal profile.



Wheel rail interface: Neither track nor the wheel profile were optimised from a total cost of ownership (TCO) perspective

WRI related root causes include:

- A lack of comprehensive grinding since 2015.
- A lack of artificial rail inclination on track structures.
- Insufficient emphasis on developing and adopting a wheel / rail profile that optimises the TCO of the holistic rail system.

Problems

In 2019, the RNGIM project team of AT, KR and Transdev identified and agreed three problem statements relating to condition and performance of AMRN. These primarily relate to the Track root cause identified by the Auckland Metro RCF Working Group. In addition to the track root cause, the Auckland Metro RCF Working Group identified aspects of the EMUs that may also have contributed to the accelerated RCF experienced on the AMRN.

● ————— ROOT CAUSES OF RCF ————— ●



Problem Statement One - Investment in the underlying rail network has failed to keep pace with growth, risking the success of planned and major projects and asset failure (40%)



Problem Statement Two - Current approaches to operating, maintaining and renewing the network struggle to cope with growth and ageing assets, and are inadequate for a future Metro environment (35%)



Problem Statement Three - Time and access for maintenance is limited and reducing with service growth, leading to inefficiencies and limiting progress on renewals needed prior to major projects (25%)



Track: Sub-optimal track condition, under-investment and insufficient rail grinding



Vehicle: High yaw stiffness may increase propensity to create RCF on non-perfect track



WRI: Neither track nor the wheel profile were optimised from a total cost of ownership (TCO) perspective

Source : Rail Network Growth Impact Management (RNGIM) SSBC, WSP | OPUS

How should a system work?

To frame the system issues it is instructive to think about how the system should have operated to have avoided RCF reaching the point of criticality and safety risk that it did. We have, therefore, considered the characteristics of a well functioning system, and specifically how it manages and addresses risks such as RCF, drawing on the Learning Legacy created by the Crossrail project in UK in relation to risk and assurance ('Three Lines of Defence').

Characteristics of a well functioning system

A starting point for assessing potential system issues is to consider what makes a well functioning system:

- A unified set of system objectives for planning and delivering the desired levels of service (i.e. planning and coordination).
- Appropriate checks and balances to ensure system participants are effectively carrying out their functions (i.e. safeguards and incentives).
- An enabling environment that allows participants to achieve the desired service levels. This would include sufficient funding, capacity and capability, clear accountabilities, and mechanisms to allow the system to respond appropriately to changed needs through time (i.e. minimising constraints or inhibitors on parties delivering the system objectives).

From our document review and materials, we found evidence that the system might not have had these characteristics in relation to RCF. We have categorised these issues into the following three high level buckets to support our analysis of the AMRN system:

- Lack of unifying objectives and planning,
- Ineffective checks and balances, and
- Constraints and inhibitors to the enabling environment.

Checks and balances ('Three Lines of Defence')

- **First line provided by delivery teams' self assurance**
- **Second line provided by internal oversight functions**
- **Third line provided by independent, often external, assurance bodies**



Source : <https://learninglegacy.crossrail.co.uk/documents/risk-and-assurance/>

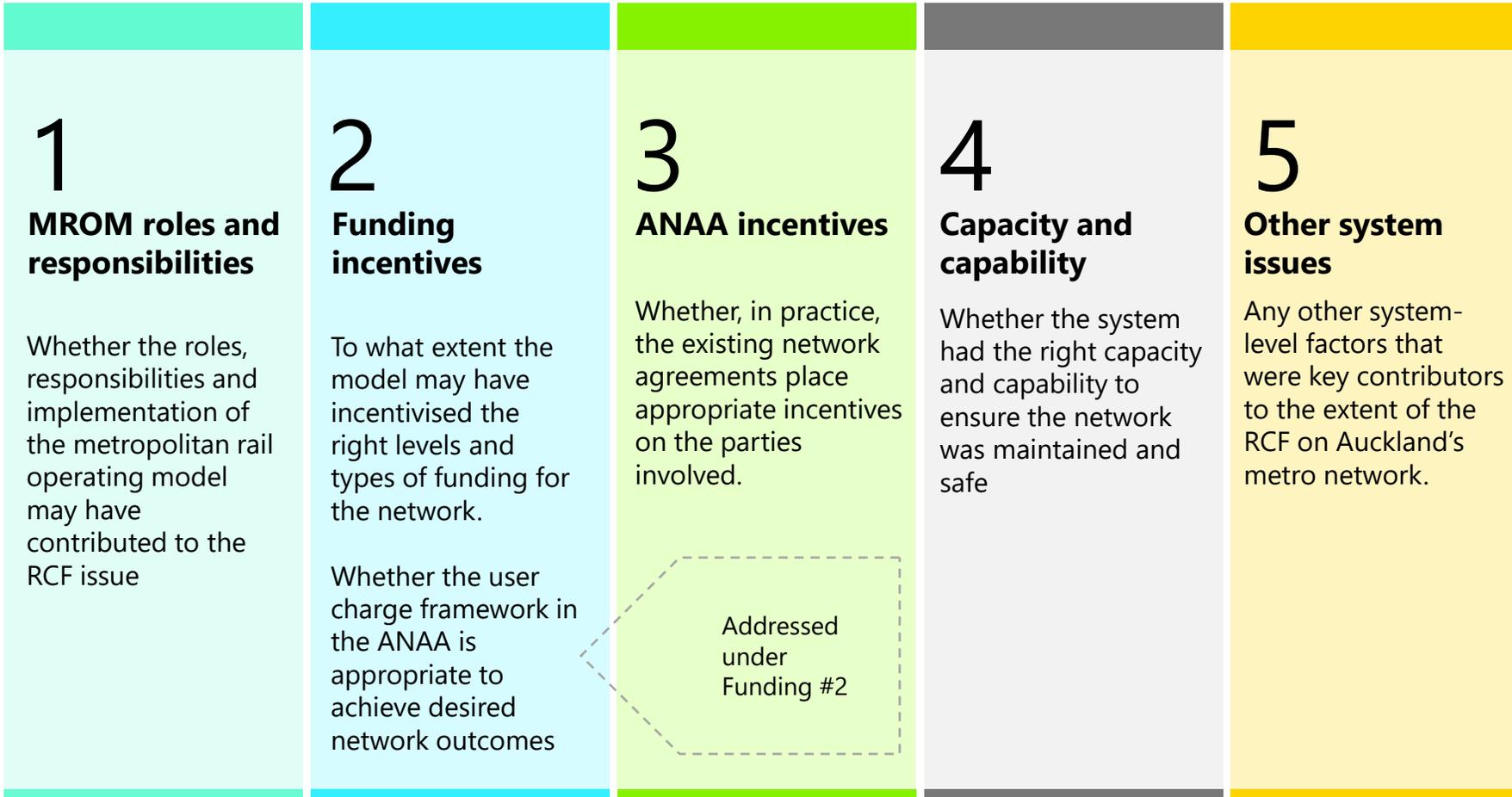
Key findings

Our core finding is that a lack of system maturity allowed RCF to worsen and remain unresolved. The AMRN system has grown significantly in usage, in asset value and broader strategic importance. However, unclear roles and responsibilities under MROM, ineffective checks and balances, and insufficient capability, capacity and resource did not enable the system to evolve in line with growing demands. There was a lack of an enduring vision and plan required under a disaggregated model.

Characteristics of a well functioning system		Key system findings with respect to RCF
Unified objectives	A unified set of system objectives for planning and delivering the desired levels of service	<ol style="list-style-type: none"> 1. The AMRN system is fragmented and lacking a unified set of objectives and supporting planning & coordination mechanism that brings all the parties together to agree and maintain those objectives. 2. There is no detailed, and integrated, above and below rail asset management plan for the AMRN system, optimising the total cost of ownership based on agreed levels of service.
Checks and balances	Appropriate checks and balances to ensure system participants are effectively carrying out their functions	<ol style="list-style-type: none"> 3. Maintenance standards did not keep pace with the requirements of a modern metro system, raising questions over how these standards were governed and assured. 4. The safety regulator was passive and lacked the maturity and resourcing to clarify its role and work pro-actively. 5. The ANAA commercial model does not create incentives for the access provider to lift the quality of network access services to that required for a modern metro system. 6. There was an absence of effective industry governance arrangements to raise and resolve system concerns.
Enabling environment	An enabling environment that allows participants to achieve the desired service levels	<ol style="list-style-type: none"> 7. The funding model focused on short term affordability and did not enable catch up renewals or investment in capability and capacity to deliver ongoing maintenance and renewals for the long term. 8. There were competing objectives/priorities within the AMRN system, which led to insufficient access for maintenance. 9. The capacity and tools needed to support an effective cyclical maintenance programme were insufficient given usage growth and the age and condition of assets.

Review terms of reference

The focus of Phase 1 has been to develop an understanding from all involved parties as to the key contributing system factors behind RCF in Auckland. Our terms of reference identify five key system issues for the review to address during this phase. These are outlined below. We use these to categorise the themes that emerged through interviews, our document review, and a workshop with system participants. Pages 40-42 of this report identify these themes and outlines our framework for analysing each of them.



Framework for attributing system issues (pre-2018)

ROOT CAUSES OF RCF

SYSTEM ISSUES CONTRIBUTING TO RCF ROOT CAUSES

Lack of unifying objectives and planning

Knowing RCF would occur, why was there no planning and agreement to adequately manage RCF to achieve the system objectives?

Ineffective checks and balances

Why did the system safeguards and incentives not work to escalate the RCF issue for resolution?

Constraints and inhibitors

What factors constrained and inhibited the system from escalating and responding to the RCF issue?

Issues identified are colour-coded to reflect the 5 groups of system issues specified in the terms of reference for the Review



Track: Sub-optimal track condition, under-investment and insufficient rail grinding



Vehicle: High yaw stiffness may increase propensity to create RCF on non-perfect track



Wheel rail interface: Neither track nor the wheel profile were optimised from a total cost of ownership (TCO) perspective

First Line

Second Line

Third Line

Framework for attributing system issues (pre-2018)

ROOT CAUSES OF RCF

SYSTEM ISSUES CONTRIBUTING TO RCF ROOT CAUSES



Track: Sub-optimal track condition, under-investment and insufficient rail grinding



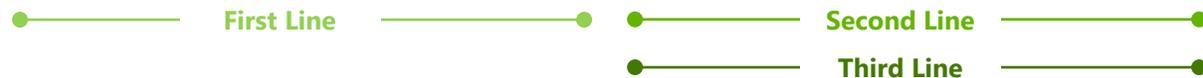
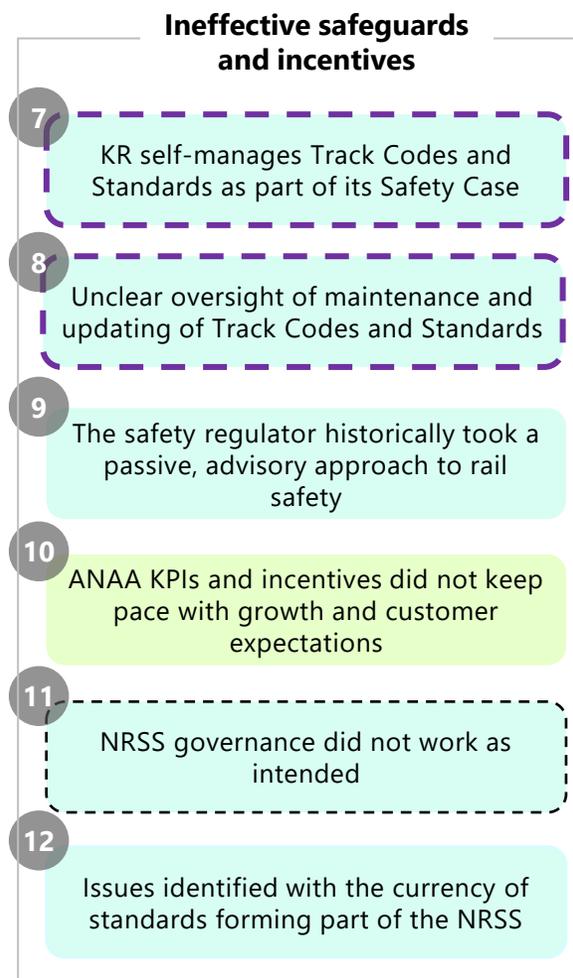
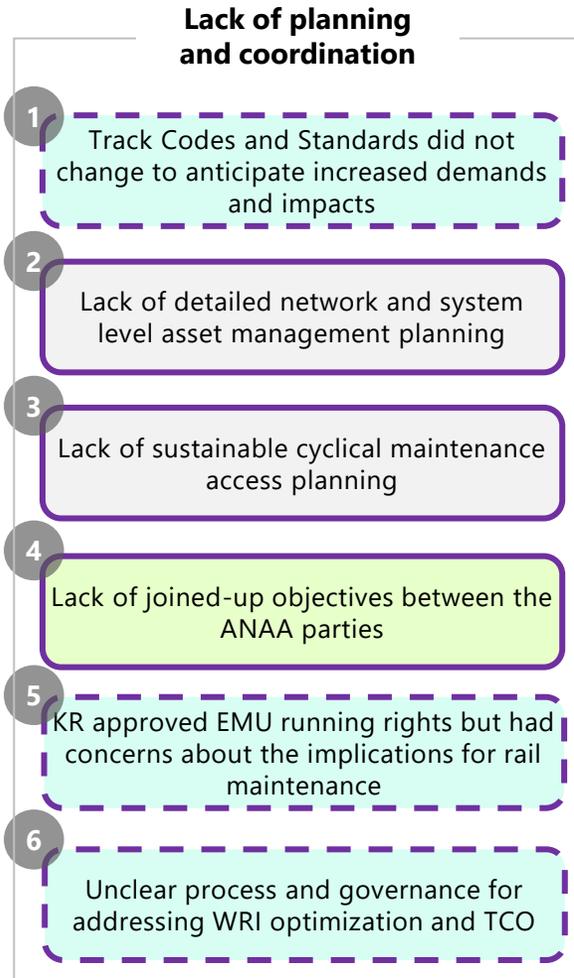
Vehicle: High yaw stiffness may increase propensity to create RCF on non-perfect track



Wheel rail interface: Neither track nor the wheel profile were optimised from a total cost of ownership (TCO) perspective

Issue requires further validation

Primary driver of root cause



System issues analysis

For each system issue identified, we provide a description of issues in the lead up to the RCF situation. We also capture subsequent changes and indicate remaining areas of uncertainty.

Description of issues (pre-2018)

Brief description of the system issues identified that may have contributed to the emergence of serve RCF on the AMRN, both through the interviews and the documentation reviewed.

Coding highlights connection back to the corresponding system issue on slide 41

Categorisation by relevant issue type and root cause

<u>ISSUE TYPE</u>	<u>ROOT CAUSE</u>
Unifying objectives/ planning	
Ineffective check and balances	
Constraints and inhibitors	

Further developments and changes planned

Brief description of relevant changes that have occurred since 2018, or that are planned, to provide full context, including remaining areas of uncertainty that relate to either the system issues that cause RCF.

Track standards and codes

Why did Track Codes and Standards not keep pace with the changing demands of the Auckland metro rail network, and were inspections sufficient to understand declining asset condition?

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Description of issues (pre-2018)

Codes and standards related to track inspections and maintenance were the sole responsibility of KR. Changes to Track Codes and Standards are approved by KR Professional Heads, who can agree to derogations. WKS reviews adherence to standards, but not the standards themselves.

It is recognised that KR's codes and standards were not up to the standard required for a modern metro network. In 2014, there were recommended changes to Track Codes and Standards, including a recommendation for more frequent and detailed inspections (NR 2014). WSP also recommended enhancements to Track Codes and Standards to align with other jurisdictions with metro & mixed traffic (WSP 2019). Several interviewees stated KR maintains the AMRN to a freight standard rather than to a more demanding metro passenger standard.

WKS raised concerns that KR were able to modify their standards to suit business requirements. WK also had concerns about adherence to the standards, adequacy of inspections and understanding of asset condition (SSA 2019).

ISSUE TYPE

ROOT CAUSE

Unifying objectives/ planning



Ineffective checks and balances



Constraints and inhibitors



Further developments and planned changes

As part of the RNGIM programme, funding has been set aside for changes to KR's codes and standards to better align them with equivalent international standards for high-capacity metropolitan and mixed-traffic rail networks (WSP 2019). However, there are multiple elements to the RNGIM programme and we have no information on what progress has been with reviewing and updating relevant codes and standards.

KR have stated that their codes and standards are subject to regular review with independent expertise used at times. KR also states there is regular compliance reporting to the executive. We have not been provided with detailed information on these processes and controls.

A WKS assessment in 2020 identified issues with adherence to codes and standards (2020 SSA). We understand that the appropriateness of the codes and standards themselves may be a future regulatory focus for WKS.

Safety regulator maturity

Would a better resourced and mature regulator have created the conditions to enable the issues that lead to accelerated RCF to be identified earlier?

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Description of issues (pre-2018)

Before 2018, the regulator likely lacked the maturity and resourcing to pro-actively review the currency of KR inspection and maintenance standards and practices. In 2013, an independent review of the WKS rail team found that regulator was perceived as 'soft' and 'passive'. The rail regulatory manager within WKS was a tier 4 role and the regulator had a limited profile in the sector. Compliance assessments were outsourced. The review specifically highlighted the 'limited ability of the rail safety regulator team to conduct safety critical lead indicator "near miss" type incident analysis' to predict emerging issues. While steps were taken to implement this review's findings, a 2018 WK report noted the identified weaknesses were not fully addressed 'due to resourcing constraints'. WKS states it was not aware of any wider systemic AMRN condition issues until it undertook a SSA in response to the draft HLR report (SSA 2019). Interviews revealed differences of opinion over WKS' role as safety regulator, and where it should sit on the spectrum between co-regulation and prescriptive regulation.

ISSUE TYPE	ROOT CAUSE
Lack of planning and coordination	
Ineffective checks and balances	
Constraints and inhibitors	

Further developments and planned changes

Since 2018, the rail regulator has expanded significantly. It is overseen by a Tier 2 Director of Land Transport, which is a statutory role created in 2020. It adopted a revised Rail Safety Regulatory Operating Model, and then the wider Tū ake, tū māia regulatory strategy. We understand WKS is considering evolutions to their operating model taking account of low probability/high impact rail safety risks, and that a further review may take place. However, we have not been provided with development plans for this model. In 2019 and 2020, WKS played an active role in overseeing KR's management of the Auckland RCF issues, noting its intervention was prompted by intelligence received from WKI. Interviewees noted that WKS as regulator is increasingly active. However, while the NRIAF was convened by WKS, its purpose is currently under review. We understand one proposed workstream for NRIAF was to examine whether new safety guidance or industry regulations were required. We understand that neither WKS nor MoT are currently pursuing the development of new rail safety regulations.

NRSS governance

What was the role of the NRSS in the approval of the EMU wheel profile and associated running rights approval process?

Description of issues (pre-2018)

11

The National Rail System Standards (NRSS) are used to control operations on KR's National Rail System (NRS), including train interoperability. The NRSS-Executive (NRSS-E) manages the development, amendment, and application of the NRS. As owner and maintainer of the NRS, KiwiRail chairs the NRSS-E and industry licence holders such as CAF and Transdev attend.

We understand NRSS-E had no involvement in the EMU procurement. A derogation was sought from the NRSS in relation to the EMU wheel profile and this was approved by KR in 2014.

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In 2013, ATRS found that, in relation to the NRSS, 'the current process for the management of a wide range of the standards is in need of a significant overhaul to ensure that standards are kept current through the establishment of a clear management structure and resources to achieve effective oversight.' A 2016 review confirmed the ATRS findings and recommended changes to the governance and operation of the NRSS (MJ 2016). WK also noted that NRS 4 Risk Management had become obsolete and had not been updated for changes in health and safety legislation in 2015 (SSA 2019).

ISSUE TYPE	ROOT CAUSE
Unifying objectives/ planning	
Ineffective checks and balances	
Constraints and inhibitors	

Further developments and planned changes

While KR stated that they conducted an informal review of the NRSS in 2018, it appears that the recommendations of the 2016 Martin Jenkins review have not been implemented. The NRSS-E has not met since 2019, with KR citing the creation of NRIAF. WK is not actively overseeing the implementation of the MJ recommendations, stating that NRSS is KR's responsibility.

In terms of wider industry groups, in 2020, WK and the industry created a group, the NRIAF, as a forum for the whole industry to identify, discuss and implement solutions to matters of common interest. While it appears that interoperability standards are a potential workstream for NRIAF, NRSS is still separate to NRIAF and NRIAF's purpose/focus is currently under review.

EMU design and WRI optimisation

Did the system lead to the procurement of EMU's without a full understanding of the WOL impact?

5

Description of issues (pre-2018)

The EMUs were introduced without a corresponding change to below rail infrastructure and maintenance practices. The EMU procurement was originally managed by the Auckland Regional Transport Authority, before being transferred to KR in 2009. AT have stated that KR developed the EMU specification and ran the procurement process. The final phase of the procurement process was transferred to AT in 2011. A contemporary document suggests there was a joint AT-KR project governance group for the final stages of the procurement process (AT 2011).

There are differing stakeholder views on whether concerns were raised during the procurement process regarding potential maintenance impacts stemming from the design of the EMUs. The Root Cause Review states that KR raised concerns, during running rights approval, that the EMU wheel profile would impact on rail maintenance requirements. However, AT and CAF both state that they were not aware of KR raising such concerns, and the other issues that were raised at the time were resolved.

6

ISSUE TYPE	ROOT CAUSE
Unifying objectives/ planning	
Ineffective checks and balances	
Constraints and inhibitors	

Further developments and planned changes

We understand a wheel rail interface group was established between 2017 and 2019, including AT, CAF and KR to review WRI issues. This group stopped meeting in late 2019. The Root Cause Report identified that the concerns related to EMU WRI and yaw stiffness would best be addressed through the establishment of relevant inter-stakeholder technical groups. We are still unsure if such groupings have been established, its membership, and how findings and trade-offs will be agreed and implemented. The previous 2017-19 WRI group was unable to reach agreement on a way forward.

Multiple roles of parties

1 MROM roles and responsibilities

Did competing interests limit the identification of, and response to, the challenges and pace of change facing the AMRN?

Description of issues (pre-2018)

The effective management of a rail system requires balancing a complex set of interests. Under the MROM, the planning and operation of the AMRN system has been disaggregated across several organisations.

Under the ANAA, there are different interests between AT (access for PT services) and KR's objectives (access for freight and maintenance). Within AT, there is a trade-off between investing for the long term (as it is responsible for the development of Auckland's transport system) and maximising short term performance and maintaining affordability (which may incentivise less maintenance access and investment). Within KR, there is a trade off between balancing access for maintenance and its freight and passenger services, and its metro access seekers. There was concern raised that KR runs freight through blocks of lines (thus compromising the efficiency of works), and concerns regarding the relative position of the AMRN within KR's business.

The dual role of WK as regulator and funder was also highlighted as a potential conflict, noting that WKI had a limited role in the AMRN system prior to 2018.

ISSUE TYPE

ROOT CAUSE

Unifying objectives/ planning



Ineffective checks and balances



Constraints and inhibitors



Further developments and planned changes

WKS is now headed by a statutory Director of Land Transport. It was also noted that the dual role was in fact helpful in the regulator becoming aware of issues with the AMRN track infrastructure through access to the 2019 HLIIR draft report.

KR, AT and Transdev formed the ANAA Working Group in 2018, which successfully developed a business case and secured funding for the RNGIM programme. RNGIM has the objective of addressing below rail infrastructure issues and improving asset management practices.

We understand KR has changed its organisational structure to ensure the AMRN is elevated, and that this structure is continuing to evolve. However, we have not been provided with detailed information on how the KR organisational structure has evolved over the past decade.

16

17

Responsibility for catch-up renewals

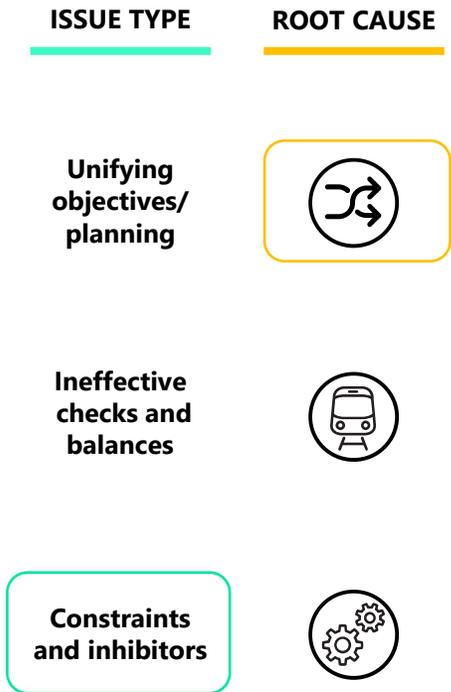
There was no agreed definition or responsibility for funding 'catch-up' renewals between central and local government.

13

Description of issues (pre-2018)

The 2014 review of the AMRN by Network Rail Consulting concluded that the network was not fit for purpose and recommended an investment of ~\$100 m. The 2015 RLTP noted that AT and KR had prepared a rail development pathway setting out investments required to deliver a robust and reliable rail system to support growth in both passenger and freight services. However, it noted a lack of funding for catch up renewals with *'no clear avenue for the funding of rail infrastructure improvements. The Transport Agency is currently unable to fund rail infrastructure [before 2018] and KiwiRail's investment is limited to freight projects where there is a demonstrated commercial return'*. We understand no formal funding requests were made for these works prior to 2018. KR noted that the national rail network was in managed decline during this period and there was perceived limited appetite for rail investment. A 2017 MoT paper highlighted views that the issue of catch up renewals had not been resolved. Interviewees noted that the ANAA was intended to fund steady state maintenance and renewals, rather than to fund rehabilitation of the AMRN.

14



Further developments and planned changes

The introduction of the transitional rail activity class in 2018 enabled the RNGIM programme to be funded at 100% FAR, with the programme focused on addressing the WSP recommendations. We understand the programme will likely be insufficient to close the existing infrastructure deficit. AT and KR are jointly working on a programme business case to identify the ongoing asset management and related funding requirements for the AMRN. However, there is no dedicated funding for further Auckland renewals from the NLTF. Instead, funding must come through the ANAA, and AT's share of this is funded at 51% FAR from the NLTF, which could mean there is an ongoing affordability constraint.

Regulator role limited by funding

Was Waka Kotahi's ability to effectively regulate rail safety limited by funding?

15

Description of issues (pre-2018)

In 2018, it was identified that Waka Kotahi had insufficient funding to effectively carry out the rail safety regulatory function.

While resourcing increased from 10.5 FTE to 15 FTE between 2015 and 2017, the regulator was still not resourced to achieve the intended safety outcomes in its operating model. 'The opportunity cost of this approach is that wider, risk-based activities cannot occur (systems and incident investigations, intelligence regarding critical risk, and management of identified critical risk) all of which are related to avoiding a catastrophic accident occurring.' (Rail Safety Regulator Consultation, 2018).

Operating costs were averaging \$2.4 million, while the funding requirement to achieve an efficient and effective rail regulator were estimated at \$3.5 million (CRIS 2018)

ISSUE TYPE	ROOT CAUSE
Unifying objectives/ planning	
Ineffective checks and balances	
Constraints and inhibitors	

Further developments and planned changes

In 2018, WKS revised their Rail Safety Regulatory Operating Model, which identified the additional resourcing required to enable the rail regulatory function to be carried out effectively. In 2019, the uplift in funding for the rail regulator was approved and implemented. Since then, there has been a significant uplift in investment in the rail system, including the recent adoption of the Rail Plan and RNIP.

The NRIAF, the purpose and focus of which is currently under review, may also explore whether there is a need for greater regulatory prescription in some areas.

In 2018, it was noted there would be a review of the current WKS funding model and cost requirements commencing in 2020. We understand that such a review will be considered after the current roading fees and funding review is complete. We also understand safer rail team is in the process of reviewing and updating its operating model to align with Tū ake, tū māia. However, we have not seen details of these activities.

Industry governance

Did the effectiveness of governance under the ANAA and the broader industry limit the identification of, and response to, the challenges and pace of change facing the AMRN?

Description of issues (pre-2018)

Rail systems are complex integrated networks. When system responsibilities are disaggregated, like the AMRN, effective governance mechanisms are required to ensure the service outcomes are delivered.

The governance of the AMRN may have contributed to the inability to improve the underlying asset condition and asset management practices. Waka Kotahi's 2019 SSA observed a lack of understanding of each party's needs, constraints and inability to compromise under ANAA. Under the ANAA, there are different interests between AT (access for PT services) and KiwiRail's objectives (access for freight and maintenance). WK's assessor suggested that the parties would benefit from appointing an independent chair to the ANAA working group (SSA 2019).

Outside of the ANAA we are not aware of a standing forum that existed during this time and involved both WK and the Crown. Interviewees noted that there was an inability to escalate issues beyond the ANAA parties to address issues such as funding.

ISSUE TYPE	ROOT CAUSE
Unifying objectives/ planning	
Ineffective checks and balances	
Constraints and inhibitors	

Further developments and planned changes

The ANAA Working Group was formed in 2018 to address declining network performance, which led to the High Level Infrastructure Review (HLIR) and RNGIM Business Case. We understand this, and the Network Steering Group, have been largely subsumed into the AMR PcG (see below). ANAA relationship committees and the Network Timetable Committee also function with a more operational focus.

The AMR PcG is focused on providing oversight for the implementation of the Auckland Metro Recovery programme. The Crown attends the PcG. However, WKI does not. KR have stated this group is being folded into a senior stakeholders group.

Another governance group, the Auckland Metro Programme Governance Board, exists to oversee major capital investment in the AMRN, with KR, AT and WKI attending.

We have not been provided with a clear stocktake of all these groups and how they interrelate. We understand AT and KR are jointly considering changes to AMRN governance arrangements.

NRIAF and NRSS have been addressed on slide 44 and 45.

18

4

Ability of the ANAA to adapt

The commercial nature of the ANAA means there is limited practical means for agreeing changes to incentives.

Description of issues (pre-2018)

4

The ANAA commercial structure and budgeting arrangements are likely to have had some influence on the state of the asset during this period. Both AT and KR faced affordability constraints. While the ANAA has a triennial basis, budget negotiations between the parties occurred annually. The absence of a long term focus may not have provided an environment for KR to grow its capacity and capability, nor facilitated transparency over asset condition.

10

The ANAA obliges KR to use its best endeavours to meet the KPIs in the agreement, with incentives limited to the performance fee and limited enforcement mechanisms beyond escalating matters to Chief Executive level. The performance fee and ANAA access fee is small relative to the scale of KR's commercial business and Crown funding.

18

Interviewees noted KPI targets do not reflect passenger experience and are not aligned with above rail KPIs. AT stated that KPIs were never fully developed as intended. Agreement of both parties is required to reset KPI targets and change KPIs. KPI bands were tightened ahead of FY 2017-2018.

ISSUE TYPE	ROOT CAUSE
Unifying objectives/ planning	
Ineffective checks and balances	
Constraints and inhibitors	

Further developments and planned changes

We understand the ANAA Working Group attempted to revisit the KPIs in 2018, but this did not progress.

We understand an ANAA 'reset' programme of work is planned by KR to ensure the ANAA is updated for the introduction of CRL. However, this is understood be in its early phases and we have not been provided with detailed information on this work.

We also understand AT and KR are engaging on improvements to the NMP and refinement of KPIs within the current ANAA.

Network access

All independent reviews highlighted the need to improve network access for AMRN maintenance and renewals the productivity of access time.

3

Description of issues (pre-2018)

Under the ANAA, track possession plans are agreed by the Auckland Network Timetable Committee, which includes representatives from KR and AT. We understand that the committee works through unanimity, where the mixed incentives of participants may have impacted maintenance access.

Questions were raised around whether there was sufficient provision, and effective use, of access windows. With increased network use, access windows were reducing. WSP identified that the efficiency of the work programme was being compromised by lack of track access and windows. Questions were raised about the productivity of the block of lines, with freight trains running through and a lack of modern maintenance practices, particularly in relation to equipment. A lack of daylight inspections due to metro services was also identified (interviews and WSP 2019). WKS also raised specific concerns around the lack of daylight inspections (SSA 2019). One interviewee noted that there was lack of cyclical maintenance windows to performance pro-active maintenance.

ISSUE TYPE	ROOT CAUSE
Unifying objectives/ planning	
Ineffective checks and balances	
Constraints and inhibitors	

Further developments and planned changes

Future access requirements will strongly relate to the asset management plan. RNGIM is also funding new equipment, infrastructure and training to improve access productivity.

We have not been provided with information on any planned changes to access arrangements, although interviewees have noted significant access will be needed to the AMRN over the coming years to implement RNGIM, and for NZUP and CRL works.

KR have stated there are ongoing discussion between them and AT on planning for access related to the capital works programme.

Asset management

Systems were in place to collect asset data but a detailed asset management plan for the AMRN has not been developed, asset management practices did not evolve to meet evolving requirements.

2

Description of issues (pre-2018)

The AMRN has lacked a long-term asset management plan, including above and below rail considerations. In 2008, the Auditor-General identified that there was no long-term plan for the rail network and limited network information (OAG 2008).

An asset management system, Maximo, was introduced in 2014 to record below rail asset information and plan maintenance and renewals. However, a detailed asset management plan for the AMRN was not developed.

While the ANMPs contain high level strategies and activities for AMRN, we observed that much of the content of the network management plans has remained largely unchanged since they were first introduced in 2013. KR’s asset management practices during this period were primarily reactive (WSP 2019, Root Cause Report).

In 2019, WKS identified that the maintenance programme was not keeping pace and that infrastructure was not being maintained in accordance with KR standards. WKS also expressed concern that the underlying asset condition was not well understood by KR (SSA 2019).

ISSUE TYPE	ROOT CAUSE
Unifying objectives/ planning	
Ineffective checks and balances	
Constraints and inhibitors	

Further developments and planned changes

A key recommendation contained in the Root Cause Report and WSP HLR is for the ANAA parties to collaborate on the development of a multi-year asset management plan for the AMRN. The RCF working group also recommended the development of a separate 30-year plan for rail grinding as part of a comprehensive AMRN maintenance and renewals regime.

We do not know if this grinding programme has been developed or not.

We understand KR and AT are developing a programme business case for the 30 year development of the AMRN. The Ministry of Transport also understands that a dedicated asset management plan for the AMRN will be created (integrating both above and below rail). However, we do not know if there will be a mechanisms in a refreshed ANAA for keeping this plan current. The shift to a proactive maintenance regime that is necessary for a modern metro system was described by interviewees as a significant challenge.

References

AT 2011 = Business Report – October 2011. Auckland Transport, October 2011.

OAG 2008 = Maintaining and renewing the rail network. Controller and Auditor-General, 2008.

Aurecon 2011 = Track Asset Renewals – Auckland Metro Area TOR – Track Study KiwiRail. Aurecon, November 2011.

ANAA = Auckland Network Access Agreement, executed in 2013.

CRIS 2018 = Stage 2 Cost Recovery Impact Statement Sustainable funding for the rail safety regulator. NZ Transport Agency Waka Kotahi, December 2018.

Rail Safety Regulatory Consultation 2018: Rail Safety: the case for an enhanced New Zealand regulator. NZ Transport Agency Waka Kotahi, October 2018.

Root Cause Report = Auckland Metro RCF Working Group: Root Cause Assessment. Prepared for KiwiRail and Auckland Transport, 17 August – 1 June 2021.

WK 2018 = Rail Safety: the case for an enhanced New Zealand regulator. NZ Transport Agency Waka Kotahi, October 2018.

SSA 2019 = 2019 Special Safety Assessment – Auckland Metropolitan Rail Network Status – Final Report. NZ Transport Agency Waka Kotahi, September 2019.

CP 2010 = Cabinet Paper: Metro Rail Network Costs for One Year [FY2011], April 2010.

MROM 2017 = MROM Review, Phase 1 – Draft Issues paper for consideration and comment. Ministry of Transport, 13 April 2017.

WSP 2019 = Rail Network Growth Impact Management (RNGIM) SSBC. WSP | OPUS, 2019.

WSP HLIR 2019 = Auckland Rail Network High Level Infrastructure Review. WSP | OPUS, 2019.

ANMP 2016 = Auckland Network Management Plan, FY16.

ANMP 2017 = Auckland Network Management Plan, FY17.

ANMP 2018 = Auckland Network Management Plan, FY18.

ANMP 2020 = Auckland Network Management Plan, FY20.

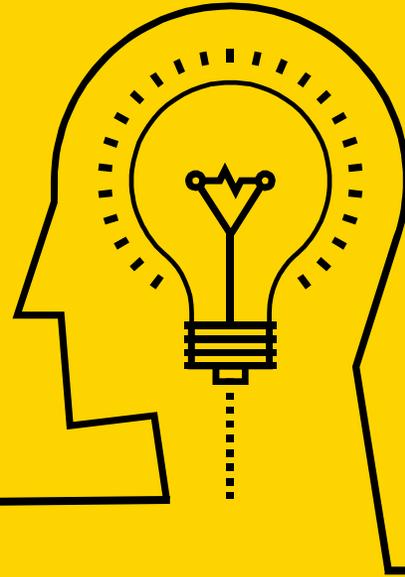
2015 RLTP = Auckland Regional Land Transport Plan 2015-2025.

NR 2014 = Auckland Metro Network Management Plan Track Study, Final Report. Network Rail Consulting, 12 June 2014.

ATRS 2013 = Independent Review Report into Rail Systems Team for NZTA. Australasian Transport Risk Solutions Pty Limited December 2013.

MJ 2016 = Review of the Governance, Operation and Management of the National Rail System Standards, Final Report. Martin Jenkins, 5 December 2016.

Information
requested



Further information

A range of further information was requested from the Review participants to confirm and validate some of the system issues identified through interviews and our document reviews. A summary of the information received is outlined below.



Issue	Participant	Information requested	Information received
Track Codes & Standards	KR	<ul style="list-style-type: none"> Detail on the process for review and assurance of KR's standards, including interface with WKS and third-party advice and review. Register of relevant codes and standards, including description of KiwiRail's code and standards taxonomy, and history of reviews and updates going back 2010. Governance process for compliance management and derogations. 	<ul style="list-style-type: none"> We have not been provided with detailed information on codes and standards. KR has supplied us with a bullet point overview outlining key roles and responsibilities, the review process, and management of derogations. KR noted it funded a review of its below rail engineering codes and standards framework and content across all disciplines, which took place in 2015.
Regulator maturity	WKS	<ul style="list-style-type: none"> Clarification of the relationship between the Rail Safety Regulatory Operating Model and the Tū ake, tū māia regulatory strategy. Details on any areas of consensus within NRIAF for new standards/Railways Act rules. Details on the governance and oversight of the rail regulatory maturity model, including progress the rail actions in Tū ake, tū māia. 	<ul style="list-style-type: none"> WKS have stated that its operating model preceded the Tū ake, tū māia regulatory strategy. WKS have stated they are in the process of reviewing and updating their operating model to further align with Tū ake, tū māia and their risk framework. We have not been provided with detailed information on potential priority areas for new standards or regulations. While there was an initial focus on this in the NRIAF work programme, NRIAF's purpose / focus is currently under review by WKS. We have not been provided with detailed information on the governance and oversight of rail regulatory maturity model and progress. WKS have stated they report regularly to their board and executive on progress against Tū ake, tū māia.

Further information

A range of further information is required from the Review participants to confirm and validate some of the system issues identified through interviews and our document reviews. A summary of the information received is outlined below.

Issue	Participant	Information requested	Information received
NRSS	KR, WKS, and Ministry of Transport	<ul style="list-style-type: none"> • Status of the Martin Jenkins recommendations regarding the NRSS. • Clarification of the current relationship between the NRSS-E and NRIAF. • A register of NRSS, including dates of last review and update, particularly for those related to WRI. • Role of NRSS-E during the EMU procurement period, particularly the relationship to specification E1317. 	<ul style="list-style-type: none"> • We have not been provided with detailed information on implementation of the MJ review recommendations. We understand that WKS is not taking an active role in overseeing the review’s recommendation. WKS have noted that KR is responsible for reviewing NRSS standards to ensure that are appropriate. KR stated that the NRSS last met in late 2019. • WKS have stated that NRIAF and NRSS-E are two separate groups serving separate functions. NRSS-E focuses on the governance of national standards, its review, appropriateness, application, whereas NRIAF is a forum consisting of members from the rail industry in NZ i.e Metro operators, industrial operators, and the heritage/tourism operators. NRIAF aims to encourage communication and collaboration among the industry members. • Other stakeholder feedback noted that there was discussion around NRSS integrating into NRIAF, but this does not seem to have progressed. WKS have stated that the appropriateness of the NRSS are the NRSS executives’ responsibility and scope, not part of NRIAF’s functions or intent. • KR referred us to the NRSS register on their website. Based on the website, the interoperability standard was last reviewed in 2013 although KR noted that an informal review of the NRSS took place within KR in 2018. • KR have stated that NRSS-E had no direct role in the Auckland EMU procurement, noting NRSS-E advises on standards but it is up to the above and below rail operators to deliver against those standards.

Further information

A range of further information is required from the Review participants to confirm and validate some of the system issues identified through interviews and our document reviews. A summary of the information received is outlined below.

Issue	Participant	Information requested	Information received
EMU design and WRI	KR and AT	<ul style="list-style-type: none"> Confirmation of KR's involvement in the final stages of the AM Class EMU procurement, including technical specification. Confirmation of the process and rationale for permitting the current EMU wheel profile through granting of running rights, including any related derogations and changes to NRSS. How did KR resolve its concerns related to the potential below rail maintenance impact? What was the outcome for WRI group between 2017-19? 	<ul style="list-style-type: none"> AT have stated that KR led the development of the technical specification for, and procurement of, the EMUs prior to this being transferred to Auckland Transport (after contract award). They state KR staff and advisors transferred with the project, and KR remained involved throughout. KR commissioned an independent peer review of the dynamic performance of the unit. This generated a number of queries that CAF were required to respond to, including revalidation of model results. AT states all outstanding items were resolved through clarification, testing or derogation. AT have stated that while they were not aware of any changes to the NRSS themselves related to the EMUs, noting 'A derogation was formally sought and approved in relation to the wheel profile. This profile was demonstrated to reduce wheel flange wear given rail profile and track geometry in Auckland. [...] Analysis of track forces and track damage exerted by the vehicle was undertaken and shown to be below required limits and therefore accepted. The derogation placed an obligation on AT to revert to the standard profile should issues arise in Auckland. This was not requested and the wheel profile was not identified as an issue by the peer reviewer.' Both AT and CAF stated that they were not aware of any KR concerns around the EMU's potential below rail maintenance impact at the time of their introduction. KR have not addressed this maintenance impact point in detail in their feedback, but noted that 'at the time of the final approval the EMUs were either complete, or on the water'. We understand that no conclusions or agreement could be reached from the 2017-19 WRI group.

Further information

A range of further information is required from the Review participants to confirm and validate some of the system issues identified through interviews and our document reviews. A summary of the information received is outlined below.

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Issue	Participant	Information requested	Information received
Multiple roles of parties	KR	<ul style="list-style-type: none"> How has KR's organisational structure evolved over the period from 2010 to today in relation to the AMRN. 	<ul style="list-style-type: none"> KR has provided a high level overview and stated that the organisational structure has changed a number of times since 2010, but core responsibilities of the AMRN have stayed relatively constant. We have not been provided with detailed information on this.
Catch-up renewals	AT, KR	<ul style="list-style-type: none"> Confirmation of the KR and AT funding requests to the Crown or WKI for AMRN catch up renewals from 2014-2017. An estimate of the residual catch up renewals deficit post-RNGIM and the required long-term maintenance and renewals funding requirement. 	<ul style="list-style-type: none"> WKI have no record of a funding application for the catch up renewals that were included in the 2015-18 RLTP (during the 2014-17 period). KR stated they do not believe there were any formal budget bids related to these renewals during 2014-17. AT stated they assisted KR with a budget bid to the Ministry of Transport in 2018, which then informed the new Transitional Rail activity class. Further, as WKI previously had a limited role in rail funding, there were no applications to WKI directly because under previous GPS'. AT have stated the original RNGIM business case preferred option did not cover the full workbank identified at the time, and that the RNGIM workbank and costs now appear to be underestimated. KR and AT are developing a programme business case that should identify the residual requirements.
Regulatory funding	WKS and Ministry of Transport	<ul style="list-style-type: none"> Confirmation of whether there has been a post-2018 rail regulator funding and maturity progress review. 	<ul style="list-style-type: none"> WKS noted that a 'plan to review rail regulatory funding model will be considered after the roading fees and funding review is complete.' They also note that they continue to develop their regulatory model for the low probability and high impact risks of the rail system.

Further information

A range of further information is required from the Review participants to confirm and validate some of the system issues identified through interviews and our document reviews. A summary of the information received is outlined below.

Issue	Participant	Information requested	Information received
Industry governance	KR and AT	<ul style="list-style-type: none"> Confirmation of WKI attendance at the AMR PcG. Information on how the AMR programme governance operates within KR and interface with other industry participants. Clarification on which forums are operational in relation to the AMRN, and how they relate to the ANAA. 	<ul style="list-style-type: none"> We have been told that WKI does not attend the AMR PcG. AT have stated 'The AMR project was stood up to deal with the initial urgent works, cutting across the established and funded RNGIM works. AMR reported to KR COO whilst RNGIM dual reported via Network Services and KR CPAD (Capital Projects and Asset Development). [...] Other aspects of the RNGIM programme were then subsumed into other workstreams. It is our understanding that KR are currently reviewing existing governance arrangements.' AT have stated: 'significant changes in the funding regime, combined with rapid mobilisation of capital projects and changes in personnel across organisations has resulted in a degree of uncertainty in this area. Governance is currently under review by AT and KiwiRail. In practice: <ul style="list-style-type: none"> Business As Usual / Operational Forums - These are primarily based around the contractual requirements of the ANAA and Operator Contract [...] The ANAA steering group and ANAA working group was established under this structure, but was overtaken by the Auckland Metro PcG established on the emergence of AMR. Capital Projects Governance – facilitated by KR CPAD with the established Metro Programme Control Group and Programme Governance Board. The latter includes NZTA and MOT and includes the NZUP projects.' AT have noted there also separate governance forums related to CRL, Future of Rail, and Metro Service Operator Transition.

Further information

A range of further information is required from the Review participants to confirm and validate some of the system issues identified through interviews and our document reviews. A summary of the information received is outlined below.

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Issue	Participant	Information requested	Information received
ANAA performance	KR and AT	<ul style="list-style-type: none"> Details of the ANAA reset workstream. Information on any requests for changes to the ANAA performance regime. 	<ul style="list-style-type: none"> No detailed information has been supplied. KR have stated that the ANAA reset is at early stage currently and will be informed by other workstreams, such as the asset management plan and the joint-AT-KR AMRN development programme business case. AT have noted they are currently in discussions with KR regarding improvements to the NMP and refinement of KPIs. However, they are unsure if this is the same ANAA reset workstream reported within KR. AT have stated that 'the original ANAA network performance KPIs were not fully defined within the ANAA schedules and were intended to be developed further. This was not done. [...] The ANAA Working Group attempted to revisit the KPIs in 2018. This did not progress.' Discussions regarding updates to the KPIs are apparently ongoing, and will involve the new metro service operator. KR has stated that during its ANAA's development, it was acknowledged it would need to be reset for the post CRL world.
Asset management	KR	<ul style="list-style-type: none"> Details of the status of AMRN asset management plan. 	<ul style="list-style-type: none"> No detailed information has been supplied. KR have stated that as part of their Auckland Metro Transformation Programme, they are developing 'a fit for purpose asset management system appropriate' for the post-CRL AMRN, and a draft will be completed by the end of 2022. KR declined to provide us with the results of their asset management maturity assessment.
Network access	KR	<ul style="list-style-type: none"> Details of any recent or planned changes to the planning and governance of AMRN access arrangements. 	<ul style="list-style-type: none"> No detailed information has been supplied. KR have stated that there are ongoing discussions between KR and AT on planning access (and ongoing governance) for the capital works programme. This includes communication of the network access requirements for customers.

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