Transportation Conference 2026 – *Resilience for the Future*

Session Stream: *Operations, Management & Maintenance*

This paper has been peer reviewed

Asset Management – *don't kick the 'can' down the road*

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Executive Summary

Asset Management is a term that is being used constantly as New Zealand civil infrastructure comes under the microscope.

Transport related Asset Management has many dimensions, and this paper reflects on where we have come from, assesses where we are today, and provides an insight into the future.

Asset Management is both an 'art' and a 'science', consequently my experiences, insights and learnings have grown as this technical discipline has evolved. This paper highlights the elements of asset management that are vital in sustaining an effective and enduring highway network. As a highway manager, and with our highway assets being the backbone of NZ's transport lifeline, it is imperative that we continue to effectively manage, maintain and operate the highway assets amongst the pressures of funding, capability, climatic impacts and complexity, in today's world.

As guardians of this transport lifeline, it is fundamental we optimise our asset management investment and adopt the best asset management philosophies, to set future generations up for asset sustainability, and success.

Key elements explored:

- End to end asset management – how is this interpreted and applied?
- Asset management *versus* Activity management,
- Lessons learnt and how they are integrated in a sustainable manner,
- Delivering and determining quality, with enduring results,
- Who are the key players?
- Complexities in maintaining a diverse transport network,
- Common principles to apply when transitioning good asset management into quality delivery and optimised, longer-term transport outcomes,
- Asset failure modes and drivers for renewal or replacement, and
- Action required today to avoid the future infrastructure funding bow-wave.

This is not an in-depth research paper, more a subjective reflection of today's current asset management activities and how we can refocus for the future, to ensure we don't 'stub our toes' by 'kicking the can down the road'.

Introduction

If we are world class in Asset Management, why is our infrastructure failing and how do we address the bow-wave of NZ infrastructure renewal…?

This is an overview of experiences and insights on what we need to consider as transport asset managers, to build on past experiences and insights, consider where we are today and build a sustainable future for the NZ land transport system.

Looking back in history – *what has gone before?*

The first principle I learnt when developing a new concept or idea, was the importance of undertaking a thorough literature review. Learning from those who have explored related ideas in the past, understand where we have arrived at today, and use this to build on the knowledge, experiences and sometimes failures, so that the new idea bounces on from this. Our business is routine in nature and follows a cyclic pattern, with roads having been maintained internationally in other countries for hundreds, and some, thousands of years. Therefore, road management is nothing new, with the same basic principles to be applied to maintain asset longevity. This cyclic approach includes - Investigate, design thoroughly, build well, inspect and maintain regularly, prioritise interventions, determine resources and skills necessary, deliver the timely renewals, continue to monitor - and repeat.

Like any asset, understanding how it was constructed and the ongoing maintenance needs and interventions are necessary to keep them in good order. Often competing demands or changes in community expectations may drive other investment priorities, however assets still need regular attention to ensure they last to the end of their predicted life, or beyond. Failure to intervene regularly may see the asset degrade and consequently early life failure, resulting in unplanned, high-cost replacement.

Public perception & scrutiny

"Everyone considers themselves a traffic engineer" – a phrase we often encounter highlighting the opinion of many people who travel and experience the highway network, on a daily basis. This view results in the public expressing a strong entitlement to observe and offer suggestions on how easy it is to 'maintain a highway'.

To satisfy the public and demonstrate how and why we conduct maintenance and renewal activities, we need to provide 'the context'. This is where the asset management story is imperative to demonstrate the various components that come together as we manage a complex and dynamic highway network.

Lifecycle asset management is fundamentally a simplistic concept - buy/build new, routine/regular maintenance, timely renewals/replacement – and so the life cycle continues. These principles apply to any type of infrastructure asset, which all follow this cyclical lifecycle pattern. Regular intervention, be it short-term routine maintenance, or less frequent partial replacement/renewal or full replacement, requires careful forward planning and articulation of the regular investment required.

Yet here we are – major infrastructure challenges, with increasing costs, complexity of delivering routine maintenance, and options when determining whether asset replacement, (like for like) or a new level of service is required.

Who best to solve this? – the people reading this paper, whom have a vested interest in 'enduring asset management delivery'.

Asset versus Activity Management

Understanding physical road assets compared to the broader operational requirements that support their utilisation, requires a rethink of how we describe the overall asset management process. NZ Councils have already transitioned to 'Activity Management' for transport activities, to encompass not only the pure asset management requirements, but also the elements that are associated with managing a transport system.

This broadening of the definition is becoming more prevalent as we move to a more digitally focussed, technological world, together with wider community interest in how we manage the combination of transport assets. One example is roadmarking, and the interface with new in-car technology. No longer are we solely relying on the human driver to process all the driving demands, but the supported by new in-car technology (e.g. lane assist, cornering, braking, etc) providing information, advice and warning about the road geometry and what may lie ahead, to supplement the drivers' comprehension to navigate safely. This highlights the vital role that asset features play ion overall safety and reinforces the broader relationship between pure asset maintenance versus the interaction with asset usage, which is often more important and complex than we realise.

Consequently 'activity' is a more useful description for the combination of asset management, maintenance and operational requirements.

Complexity of managing a transport network

No two days are the same when managing a complex transport network, despite the perceived repetitive, cyclic nature of maintaining a dynamic highway system. Weather, traffic, people, communities, stakeholders, the public, politicians – all together these contribute to people's vested interest in how the network operates.

My experience with high-impact disruptive events that have significantly impacted travel on our highway network, such as the 2017 Kaikōura Earthquake and 2023 Cyclone Gabrielle weather event, along with many other moderate scale incidents, is that these continually change the asset lifecycles and resilience demands on our transport system. Often, planned interventions are superseded when major events change the focus and priorities for maintaining network connectivity. Even seasonal weather patterns can interfere with annual summer maintenance renewals programmes, together with the coordination of other roadworks, that cumulatively impact people's travel patterns.

The asset management approach relies on flexibility to adapt to ever changing road conditions and demands, while ensuring that the base programme of routine and cyclic maintenance is delivered.

Ingredients for effective asset management

Commonly understood principles that are applied and delivered:

- Understand what assets are within the scope of the portfolio (ownership, responsibility, and accountability).
- Condition – regular inspection to determine the current and future condition trend.
- Data and insights – factual data is important to compare asset types and to help with prioritisation of investment.
- In field observations and knowledge – this is necessary, alongside the pure data, to ensure the information is verified, and to identify any uniqueness that may be an input into the overall asset management efficient delivery.
- Determine appropriate levels of service – knowing how the assets will perform and the expectation of investors is fundamental to ensuring asset management principles are applied, effectively.
- Investment – funding required to maintain assets is necessary, but often the amount available is below the optimal level, consequently effective asset management is about prioritisation and consequential impact assessment.
- Impacts, risk, variables, and contingencies – there are many inputs and variables in managing a highway network, so it is necessary to be adaptive.
- Quality workmanship – a fundamental requirement to ensure the optimal design life of assets is achieved and that maximum investment value is extracted.
- People – skilled, trained, knowledgeable people who understand how to apply effective asset management practices, covering the whole spectrum across investigation, design, delivery, monitor, maintain, renew or replace.

The challenges

What should we do differently, to build a more sustainable, cost-effective future for our infrastructure assets? Once deterioration has occurred, particularly with highway assets, it often requires immediate reactive action to fix or temporarily repair which is less than optimal. Hence, the need for regular and timely investment into renewals to maintain the profile of predicted spending during the lifecycle of each physical asset.

When considering the maintenance regime for transport assets, determining the optimised level of regular (routine) investment to achieve the desired outcomes, through close management of the inputs, variables, change in demand, effort, requires funding levels to match.

The willingness to pay and the necessary trade-off debate occurs when we contemplate - do we invest in new or do we maintain what we have? New assets tend to have a much higher investment profile and greater customer acceptance (we typically like new things, versus refurbishing the old), so the challenge is to ensure customers, stakeholders, asset owners and funders alike, fully understand and appreciate the importance of regular maintenance investment. This is despite the fact it may not be evident – for example much of our highway maintenance costs are buried within the road pavement and surfacings, or in supporting (oof

road) assets like environmental maintenance requirements, which are continually expanding and more complex to manage.

The investment profile – forward plans, bow-waves and prioritisation

We often see forward work programmes and funding (lava) diagrams that have layers of colour and an increasing future funding requirement – the traditional bow-wave of work ahead and ever-increasing network needs. The suggested scale of increase often doesn't eventuate - and it's questionable as to whether these forecasted stepped changes in investment are affordable or deliverable. However, these diagrams do tell a story and demonstrate the growing network demand for increased investment. But, the 'pie' or funding availability is finite, therefore decisions need to be made – make the pie larger (achieved through increasing the funding, often at the expense of other budgets), or slice the pie in different ways to ensure that the highest priority activities are funded first. This is when true asset management principles kick in. In slicing up the pie, with sub-activities dialled up or down, an explanation is required to highlight the subsequent impacts. A well-constructed asset management plan will be able to demonstrate varying levels of investment and what flow-on effect these would have to levels of service (or future condition).

The alternate way to tackle this is to consider the type of delivery methodology – there are smarter, more efficient ways of delivering maintenance treatments or interventions (e.g. changing treatments or combining multiple activities). When explaining to funders, asset managers/maintainers must demonstrate what a change in funding delivers in the 'here and now' and, more importantly, for future asset requirements. This takes us back to the bow-wave – we can put something off for another day and let someone in the future worry about it – *kick the can down the road*. However, we know the issue does not go away, and in fact the condition often worsens and costs increase, hence the need for good asset management where we apply our juggling skills and knowledge to determine the sweet spot in timely asset investment.

When funding is limited, there are always trade-offs. So long as funders/governors understand the implications of those trade-offs we can set a strategy that aligns to the investment profile and current set of conditions. At times we have considered lowering levels of service to invest in higher priority areas, however this is often not palatable and difficult to implement, especially when our highways are lifeline assets, together with public expectations.

Effective asset management planning is the tool that enables funding scenarios and changes to levels of service to be assessed. Analysis of asset condition data, the impacts of 'dialling up' or 'dialling down' funding or asset levels of service, allows for a systematic, object-based robust approach to assess the likely outcomes. Using levels of service for each asset type, together with the combination of assets that provide a highway transport network, provides a base model to then determine what impact ever-changing demands will have over time. A strong asset management framework will provide confidence that the lives and performance of our transport assets will provide safe, reliable travel options over a sustained period, with consideration for future adaptability.

Asset Management as a ‘sales’ tool

When seeking funding for asset maintenance and renewals, comprehensive asset management plans come to the forefront. These show the size of the ‘pie’, how it can be sliced up and highlight the opportunities to increase investment to create varying outcomes. As the pie is only so big, the asset management plan shows how we aim to adequately feed all the hungry mouths.

It helps both internal governance and our politicians understand the full scope of asset management, describing the consequences if funding levels are changed or levels of service are varied. Do you invest heavily in some areas or spread the ‘marmite’ thinly and try to cover everything? This is where the consequence of short-term investment determines the future lifecycle cost and time for intervention – i.e. *don’t kick the can down the road, as there is no guarantee someone else will pick it up.*

The People dimension

Who is the most critical person in the asset maintenance lifecycle chain?

Site supervisors – the people who make the daily calls on the ground, utilising their experience and knowledge, will often determine the future success and life expectancy of assets. For example, chipsealing is both a science and an art and often daily conditions on-site mean the crew are required to vary the design in real-time and adapt to the changing site conditions, which ultimately determines the success or premature failure of the final chip seal surface. The onsite supervisor is someone who holds the keys to a successful, long-term result.

A notable example of this in action was the 49-day full closure of SH6 over the Whangamoa Saddle in 2022. This is the main highway route between Blenheim and Nelson, and there were tight timelines to restore sections of highway damaged in the August 2022 weather event. It required careful planning, with on-site designers and geotechnical experts, to make calls that ensured a quality result., Adaptation to ground conditions was required to ensure the work was finished and the highway reopened in a timely manner, without compromising asset quality. This is where theory turns into reality with decisions being made in real-time, using expertise in the field, to ensure standards are met, without compromising the tight deadline. The on-site observations also support good decision making, ensuring the result is delivered effectively and is fit for purpose.

Inspection, analysis and Asset Management delivery

Regular inspection of assets, their functionality, condition and future maintenance requirements, are essential to maintain them in good order. While this has traditionally been a very manual process, innovative technologies and techniques are allowing this to be more thorough, systematic and objective assessment, providing a wealth of asset condition data. Recent technology such as drones, satellite photography and mobile data-capture devices, together with AI analysis tools, enable a vast amount of detailed data to be captured and analysed. However, some local interpretation of this data is also needed to ensure we take account of the context and surrounding environment.

All this information is then converted into an optimised maintenance programme, to ensure that intervention is targeted, prioritised and timely – to maintain the asset condition and lifecycle. Utilising inspection insights that are then fed into the asset management process, or lifecycle asset management plan, to consistently update asset condition and develop a current forward plan of required works. Tools such as those used for pavement or surfacing deterioration modelling are used to perform an analysis of condition, funding and future predicted performance. As more information is gathered around each asset lifecycle and performance, more iterative analysis tools can be used to determine optimised asset investment and linked to the desired levels of service.

Effective asset management must be demonstrated through successful 'on the ground' delivery. To enable this to happen, asset management practices must be communicated to those who oversee the physical delivery and set the context, so they understand the 'why it is important'.

Solid, upfront planning and investment is only rewarded when it is delivered in a timely, quality and cost-effective manner. Typically, there is considerable time investment upfront in developing comprehensive and robust asset management plans, however any value diminishes if these concepts and plans are not delivered, efficiently and effectively.

The result

A good asset management plan requires an executive summary that is understood by all, tells a cohesive story and is a living document. It then must translate into physical work programmes that demonstrate good asset management interventions delivered in a quality and timely manner. The performance of the assets must be routinely measured and reported, showing that through quality delivery, the asset condition is retained (or enhanced); and consequently, the asset lifecycle is retained.

Depreciation accounting enables the ability for asset owners to set aside funding for future asset lifecycle funding. While there is currently no requirement for highways to set aside this funding, this concept is a useful discipline to apply, to signal, and where feasible ring-fence, future maintenance budgets. If this funding is diverted, it is often challenging to attract additional funds when needed for peaks in the asset lifecycle investment profile, amongst other transport or wider infrastructure priorities.

Insights into the future

The list of opportunities to consider:

- As reliance on modern technology, data and detailed information grows, the ability to store, analyse, interpret and apply will become more important and complex.
- Greater automation, and in some areas, more sophistication is likely, yet rural NZ remains isolated and unique. Roads are basic lifelines; therefore, solutions must be fit for purpose, achievable and sustainable.
- Climatic impacts are more prevalent, relevant and in some ways, unavoidable – while we can't predict or prevent, we can forecast and prepare, then respond accordingly.

- Education – what are today's school students interested in, as they consider their future career aspirations? How can we adapt to attract and utilise their skills? Previously, engineering qualifications were a minimum requirement, but now the discipline is more diverse – are we building a sustainable future, with sufficient investment in our people, building their knowledge and experience? In the future, we may experience a more of a generalist, broad brush, light touch approach, rather than in-depth Subject Matter Experts who know and understand what is required. This will place an emphasis on site supervision to know and understand application of effective asset management practices, combined with smart technology.
- Utilisation of the data and tools – AI has been a game changer, especially with the speed and efficiency of analysis, but caveat emptor – *let the buyer beware* – it is only as good as the information being analysed.
- People, people, people – the right people with the right skills, knowledge, experience and motivation, are the key to successful asset management application.
- Effective communication – so often incorrect interpretation, or a lack of regular communication, or the inability to communicate clearly and effectively, leads to a breakdown in delivering end-to-end asset management perfection – be clear on the outcomes required and ensure communication dialogue is maintained.
- Clearly define the appropriate and accepted levels of service, then target and prioritise funding to meet these agreed service level outcomes. If they vary, then the trade-off and communicating these impacts, is essential.
- Measure what you value and report on quality and effectiveness of outputs.
- Timely investment, sometimes requiring larger upfront funding, can create delivery rewards that may be far reaching and often not seen by those determining today's investment levels. This is where the role of asset owner/steward goes far beyond the annual investment and consequently draws on the judgement of the clients determining an optimised asset lifecycle programme.

Focus areas for the future:

- The interface between transport users and transport assets (e.g. vehicles, developing technology and the type of people who travel) are not well connected. Mobility scooters are a case in point – are our pedestrian pathways set up adequately for the modern wheelchair or scooter access?
- Fit for purpose – there is no sense in delivering a gold-plated solution if the rest of the asset experiences early life failure (for example, a high cost modern 500-year design life retaining wall, on a tight tortuous alignment which may fail are various locations in a significant weather event, or be realigned or bypassed in the short to medium term). This requires smart asset lifecycle decisions and moderating the option to suit the environment (both financial and network context).
- The 'feel good, look good' approach – most people don't see what lies underneath the road or off the carriageway, but they do care about their travel experience and the tidy, clean, smooth, safe journey provides the assurance of well-managed highways.
- Profile and passion – asset management is at the heart of managing a transport network and has many intriguing twists and turns. The key role asset managers fulfil during and after impactful events on the network is evident. We need to continue raising the profile of these roles through demonstrating applied asset management techniques and describing what the future forward programme requires to be sustainable. The passion

comes from those who thrive in the 24/7 operational world of managing and renewing transport lifelines.

- Best of all – *keep it simple*. Often people get caught up with the excitement of sophistication, innovative ideas and complexity, when asset management and maintenance is simply good practice, where we provide care and attention to our network assets.

Summary

Many years in highway asset management has taught me – we must ensure we set ourselves up for success – what we do today will shape the transport outcomes for future generations. In a fast-changing world, sustainability of knowledge and experience in maintenance and delivery is critical, if we are to be smart asset managers and ensure future transport assets are 'fit for purpose'.

Let's not be spectators - let's be doers and tackle the forward bow wave of asset infrastructure demands. Let's raise our profile and reinforce the importance of efficient asset management in managing our national transport lifeline. We must demonstrate how effective we are and highlight the importance and value in effective asset management delivery – today, for the benefit of tomorrow's travellers!